RESEARCH OFFICE
Adventist University of the Philippines
www.aup.edu.ph/urc/health-sciences

JHS
ISSN 2599-5456

JOURNAL OF HEALTH SCIENCES

A Peer-Reviewed Journal
Published Bi-annually by the
Adventist University of the Philippines

Vol. 4 No. 2
December 2021

Journal of Health Sciences

Volume 4 | Number 2
December 2021

A Peer-Reviewed Journal
Published Bi-annually by
Adventist University of the Philippines

PRINTED IN THE PHILIPPINES

ISSN 2599-5456

RESEARCH OFFICE
Adventist University of the Philippines
Puting Kahoy, Silang, Cavite, Philippines
www.aup.edu.ph/urc/health-sciences

Journal of Health Sciences

Volume 4 | Number 2

December 2021

Table of Contents

Knowledge and Perceived Practices on Traumatic Dental Injury (TDI) Management among Primary Caregivers in a Selected Elementary School in Silang, Cavite
Zarah Gem B. Asis, Rhynette Joyce C. Borromeo, Joy Bernadette B. Cortado, Ralph Jan, D. Rodelas, Nathalya Bmay Subido, Deborah Cynthia Gatchalian, Vicky Mergal, Beryl Ben Mergal 1

Awareness on Oral Health Changes at Menopause and the Oral Health Care Seeking Behaviors of Menopausal Women in a Selected Educational Institution
Deborah Cynthia T. Gatchalian, Frida Ngo Sack Nlend, Alvin Ritchil 14

Effectiveness of Promotional Video and Reading Material on the Knowledge, Attitude, Practices and Plaque Index of Selected Pregnant Women
Angellen Aileen Barrameda, George Edward Omaking, Leuie Denn Sabino, Elline Matta, Reynaldo San Luis III, Herminiano Subido Jr., Lorcelie Taclan 21

Effects of a Physical Activity Program on Knowledge, Attitude and Practices, and Health Status among Adults
Mariefe R. Echavez, Gladys Mae R. Laborde 42

A Comparative Assessment of the Glucose Monitor (SD Check GOLD) and Semi-auto Analyzer (Biosystems BTS350) in Measuring Blood Glucose Concentration Among Diabetics, Prediabetics, and Non diabetics
Yanna Yvonne Macayan 62

Conquering Stress in Times of Pandemic: An Intervention Study to Manage Stress Among College Students
Princess Red Rodriguez, Mary Jane Botabara-Yap 73

Phytochemical and Antifungal Screening of the *Averrhoa bilimbi* Fruit Extract Against Aspergillus Niger
Heidi S. Arit, Danica Gani Jarapa, Herdell Ray Fajura Serrano, Lorcelie Taclan 80

Homophobic Attitudes and Gay Affirmative Practices Among Nursing Students
Joel Cecilio, Jea Vanice Novabos, Rhodie Mae Ephteen Javier, Jane Rodriguez 90

Transcultural Nursing Competency Experiences of Foreign Students from Selected Higher Education Institutions in the Philippines
Carmela G. Malabat, Fred B. Ruiz 107

Personality Type and Perceived Quality of Life of Selected College Students
Grace Ann M. Babao, Pavel Kolesnikov, Kheirn Karren V. Pajarito, Susy A. Jael, Beryl Ben Mergal, Angel Grace F. Bingcang, Joyosthie B. Orbe, Kristel Anne M. Rey 116

Hypertension Prevalence, Knowledge, Attitude and Health Practices among Employees of a Wellness Village: Basis for a Proposed Hypertension-Prevention Program
Joraleen Dion G. Yabut 131

A Correlational Study of the Dental Care Delivery and Patient Satisfaction at a Selected Dental Clinic
Richelle C. Esmillo, Rogemille Joy C. Arquiza, Joyce Isaiahlyn U. Buñug, Mariela Faye H. Dela Cena, Vicky C. Mergal 140

Red Cabbage (Brassica oleracea var. capitata) as an Alternative pH Indicator for Carbohydrate Fermentation in Select Gram Negative Bacilli
Winona Shenani Martino, Rebekah Sengkey, Jasper Ken Conferido, Sharon Gabriel, Philip Joekolo, Lorcelie Taclan 154

Knowledge and Perceived Practices on Traumatic Dental Injury (TDI) Management among Primary Caregivers in a Selected Elementary School in Silang, Cavite

Zarah Gem B. Asis[1], Rhynette Joyce C. Borromeo[2], Joy Bernadette B. Cortado[3], Ralph Jan, D. Rodelas[4], Nathalya Bmay Subido[5], Deborah Cynthia Gatchalian[6], Vicky Mergal[7], Beryl Ben Mergal[8]

Adventist University of the Philippines

[1]2046347@aup.edu.ph, [2]2041162@aup.edu.ph, [3]2012969@aup.edu.ph
[4]2033629@aup.edu.ph, [5]nbasubido@aup.edu.ph [6]dctgatchalian@aup.edu.ph,
[7]VCmergal@aup.edu.ph, [8]BBCmergal@aup.edu.ph8

Abstract

Traumatic Dental Injuries (TDI) are unpredictable occurrences and are considered a health problem in a child's life, because of its negative impact. Most TDI incidences happen when a child is at home or school, thus it is essential that those who are in close contact with them know how to properly manage it. A Selected College of Dentistry Clinic in a private sectarian university in Cavite conducted a study to assess the knowledge and perceived practices of primary caregivers on TDI management. The research study included 120 primary caregivers of pupils enrolled in Grades 1-6 in a private Elementary School in Cavite. This quantitative descriptive research design, correlational, and comparative design. A dichotomous scale was used to determine the level of knowledge, and a 4-point Likert scale for the extent of perceived practices. The statistical treatments used included the mean and standard deviation, Mann-Whitney Test U Test, Dwass-Steel-Critchlow-Fligner test, and one-way non-parametric ANOVA (Kruskal-Wallis). Results led researchers to come up with the following conclusions: (1) the level of knowledge of the primary caregivers are high; (2) the extent of the perceived practices of the primary caregivers are good; (3) knowledge and perceived practices on TDI management are significantly correlated, which means that the practices of the primary caregivers are dependent on the prior knowledge they acquired on TDI management; (4) a significant difference was found in the knowledge of primary caregivers considering their sex; (5) a significant difference was found in the knowledge of primary caregivers that have a Masters or Doctoral Degree.

Keywords: *Traumatic dental injury, TDI management, primary caregivers, avulsion, reimplantation*

According to the Australian Dental Journal, Traumatic Dental Injury (TDI) is defined as "an impact injury to the teeth and/or other hard and soft tissues within and around the vicinity of the mouth and oral cavity." (Lam, 2016). One of the major health problems that a child can encounter is TDI. Because of its frequency, it can affect economic productivity and quality of life. TDI is a significant public health issue (Lam, 2016). This gives a negative impact on their well-being. Avulsion of teeth is reported to be experienced by a child at an early age which affects them physically, psychologically, and emotionally. Moreover, their academic performance and their family's financial aspects are affected as well. (Ain et al., 2016). TDI is not a disease but is an injury caused by different factors in life that is unavoidable and can happen without prior notice. Studies have shown that the negative effects of TDI on the well-being of young people may be higher than the cases of caries and periodontal disease. (Lam, 2016). According to epidemiologic reports, more than half of TDI occurs in or near the house, with a quarter occurring at school (Juneja et al., 2018). Hence, giving high importance to emergency management and the need for parents or teachers to be educated is necessary.

Introduction

This study will include primary caregivers of pupil's grades 1 to 6 ages 6-12 in an Elementary School in Cavite. The emphasis of this study will be on assessing knowledge and perceived practices, excluding primary caregivers' attitudes toward TDI management. The respondents are composed of parents, guardians, and teachers in an Elementary School in Cavite. The elementary school is a private co-educational Christian university located in Puting Kahoy, Silang Cavite, Philippines. This study aims to assess the level of knowledge and perceived practices of primary caregivers on TDI management. Also, it aims to determine the correlation of their knowledge and perceived practices on TDI management.

Methodology

This study utilized the quantitative research method. This method uses the information gathered from surveys, polls, and questionnaires to highlight the mathematical, numerical, or statistical analysis of data. It also tries to explain a specific phenomenon by utilizing the numerical data that was collected and generalizing it across clusters of people (Babbins and Brians, 2020). In this study, the data was gathered through the online surveys prepared by the researchers.

A descriptive design was utilized, which studies in nature, the individuals, events, or conditions that it purposes to describe. This design has specific goals and research questions and uses observation of behaviors, or data from surveys as methods for data collection (Siedlecki, 2020). This design was chosen to meet the objectives of the study which is to determine and assess the knowledge and perceived practices of the primary caregivers of children who experienced a TDI. A correlational design was also used, in which the relationship between two variables was examined without the variables being changed (McCombes, 2019). This design was chosen to determine if there is a positive correlation between the knowledge and perceived practices of primary caregivers in managing an emergency TDI. Furthermore, a comparative study design was used to emphasize the explanation of differences and similarities between two or more phenomena (Adiyia and Ashton, 2017). This design aims to determine if there is a significant difference in the knowledge and perceived practices of primary caregivers on TDI management considering their age, sex, educational attainment, and socioeconomic status.

Population and Sampling Technique

The respondents of this study were primary caregivers of pupils from Grades 1 to 6 in an Elementary Private School located at Cavite Province. A total of 120 primary caregivers who had pupils enrolled in the year 2019-2020 participated in the study. A simple Random sampling technique was utilized in the selection of the respondents. This technique was used to extract a

research sample from a larger population. Respondents were selected using chance or random numbers and each subject has an equal chance of being selected (Thomas, 2020).

Table 1. *The Demographic Profile of the Respondents*

	Group	Frequency	%
AGE	20-29	14	11.7
	30-39	38	31.7
	40-49	55	45.8
	50-59	13	10.8
SEX	Female	74	61.7
	Male	46	38.3
EDUCATIONAL ATTAINMENT	Less than HS and HS Diploma	8	6.7
	Bachelor's Degree	70	58.3
	Master's Degree and Doctoral Degree	42	35
HOUSEHOLD INCOME	Less than PhP 10,957 and between PhP 10,957 to PhP 21,914	22	18.3
	Between PhP 21,914 to PhP 43,828	46	38.3
	Between PhP 43,828 and PhP PhP 76,699	29	24.2
	Between PhP 76,699 to PhP 131,484 and above	23	19.2

Instrumentation

This study used online survey questionnaires to gather data. The set of questions were adapted from a journal published by (Quaranta, De Giglio, &Trerotoli, 2016b) and (Danko Bakarčić, Sandra Hrvatin, Mia Maroević, and Nataša Ivančić Jokić, 2017). Some questions from the journal were revised by the researchers and several questions were also added to make it more appropriate for the respondents.

The questionnaire had 2 parts: Part I included the demographics and asked for their name (this is optional), age, sex, educational level, and household income. Part II asked more specific questions about what the respondents would do if they encounter TDI. It asked what actions they would do immediately following the accident; if they would consider seeking dental help immediately after the accident, what they would do to clean a dirty, avulsed tooth, what solution to use to wash the tooth with, what medium to store the tooth in when transporting it to the dentist, and how urgent they think is an incident wherein a permanent tooth gets avulsed. This part of the questionnaire provided options where the respondents can choose from.

Knowledge on Traumatic Dental Injury Scale. A two-point scale or dichotomous scale was used (Yes or No) to assess their level of knowledge on TDI management and a four-point Likert scale was used (Strongly Agree, Agree, Disagree, Strongly Disagree) to assess their perceived practices on TDI management.

The researchers did the pilot study twice since the statistical reliability of the first study did not reach the certain level of reliability required. Thus, the questionnaire on the second pilot study was revised by incorporating illustrations, graphic designs, reducing the set of questions, and removing one of the variables mainly the attitude on TDI management.

The instrument was prepared in the English language by the researchers, and the Filipino translation was done twice by a professor who is considered an expert, having a degree of Education, major in Filipino. For the sake of primary caregivers who only speak Filipino, the instrument was crafted in English with a Filipino translation.

Table 2. *Reliability Statistics for Item Questionnaire*

Variable	Cronbach's Alpha	N of items
Knowledge of Primary Caregivers on TDI Management	0.627	6
Perceived Practices of Primary Caregivers on TDI Management	0.621	7

Based on the results of the pilot study, the questions assessing the knowledge and perceived practices of primary caregivers on TDI management had a Cronbach's Alpha score of 0.627 and 0.621, respectively. These values are greater than 0.6, which shows that there is a certain level of reliability acquired from the items of the questionnaire that was prepared.

Table 3. *Scoring System for Knowledge and Perceived Practices*

Response Scale	Mean Interval	Interpretation
1	4.00-6.00	High
0	1.00-3.00	Low

Data Analysis

The research instrument was submitted for approval and was validated by a group of experts. An application form was passed to the AUP Ethics Review Board (ERB) for ethical considerations. Upon approval for the survey to be conducted, a pilot study was conducted on a group of 30 respondents to ensure the validity and reliability of the questionnaires. After the pilot study, the online survey questionnaire was finalized. The simple random sampling technique was used in choosing the respondents by creating a sample population from all the primary caregivers in the given elementary school in Cavite. A total of 120 respondents answered the online survey questionnaire. The researchers made certain that the respondents were able to give their consent before answering, which stated the purpose of the study, the benefits of the respondents from the study, their right to withdraw their participation, and assurance that the information they have given to the researchers will be confidential. The information was encoded, analyzed, and validated by a statistician.

Statistical Analysis of Data

The collected data were statistically analyzed using various tests. Mean and standard deviation, Mann-Whitney Test U test, Dwass-Steel-Critchlow-Fligner test, and one-way non-parametric ANOVA (Kruskal-Wallis) were among the statistical treatments used. The level of knowledge and perceived practices of primary caregivers on TDI management were determined by calculating the mean and standard deviation.

Mann-Whitney U test showed whether a significant difference exists in the level of knowledge and perceived practices of primary caregivers considering their sex. One-way non-parametric ANOVA (Kruskal-Wallis) showed whether a significant difference exists in the level of knowledge and perceived practices of primary caregivers considering their age, educational attainment, and socioeconomic status. Moreover, Dwass-Steel-Critchlow-Fligner test was used to determine the comparison on educational attainment whether a significant difference exists among the different groups. Spearman's rho test showed if there is a significant relationship exists between knowledge of TDI management and perceived practices of TDI management.

Ethical Considerations

The researchers complied with all the requirements given by the AUP Ethics Review Board (ERB). The names of the respondents were given an equivalent number which was assigned by the researchers. The survey questionnaire form only included their assigned numbers. The statistician and co-author of the research were blinded to the respondent's names. The online forms taken from the survey were kept in a Google form where only the researchers had access.

Results and Discussion

The statistical analysis and interpretation of the data collected to analyze primary caregivers' knowledge and perceived practices on TDI at a private elementary school in the Philippines are discussed in this chapter.

Knowledge of Primary Care Givers on Traumatic Dental Injury Management

Table 4 shows the frequency and percentage in response per question, which translates to the extent of knowledge of primary caregivers on TDI management. The level of knowledge of the primary caregivers showed a grand mean score of 4.03 (SD: 1.10). The results were interpreted as high. The majority of primary caregivers can identify a TDI, showing a percentage of 86.7%, which is close to Quaranta et al., (2016), who found that more than half of the respondents reported knowing what a TDI is. A nearly identical study in Kolkota found that half of the school teachers correctly identified a TDI, specifically a damaged front tooth on a 9-year-old child (Kaul et al., 2017).

Table 4. *Knowledge of Primary Care Givers on Traumatic Dental Injury Management*

Descriptive Statistics			
	N	Mean	Std. Deviation
Knowledge	120	4.03	1.10
Question 1			
A cracked tooth without bleeding is still considered a TDI			
	Frequency		Percent
0	16		13.3%
1	104		86.7%
Total	120		100.0
Question 2			
The dentist is the first person to consult after a TDI			
	Frequency		Percent
0	20		16.7%
1	100		83.3%
Total	120		100.0
Question 4			
An avulsed tooth can be put back and repositioned			
	Frequency		Percent
0	57		47.5%
1	63		52.5%
Total	120		100.0
Question 5			
Washing the tooth with a disinfectant kills the cells of a tooth.			
	Frequency		Percent
0	63		52.5%
1	57		47.5%
Total	120		100.0
Question 6			
There is no ideal medium of storage for an avulsed tooth.			
	Frequency	Percent	
0	57	47.5%	
1	63	52.5%	
Total	120	100.0	

Table 5. *Extent of Participants' Communication*

Item No.	Items	Mean	SD	Scale	Verbal Interpretation
1	Family members are satisfied with how they communicate with each other.	3.61	1.16	Agree	High
2	Family members are very good listeners.	3.15	1.28	Undecided	Moderate
3	Family members express affection to each other.	3.63	1.33	Agree	High
4	Family members are involved in each others lives.	3.65	1.11	Agree	High
5	Family members can calmly discuss problems with each other.	2.95	1.34	Undecided	Moderate
	Grand Mean	3.398	1.244		Moderate

Furthermore, the findings revealed that 83.3% of the primary caregivers understand the importance of obtaining urgent medical attention, within the first hour after an incident. This contrasted with the findings of Świątkowska et al., (2018), who found that the majority of respondents were unaware of the '60-minute golden time' required to intervene following a TDI incident.

On question #2, 80% of them wanted to visit the dentist as the first person following a TDI. This was consistent with Kaul et al., (2017) and Qauranta et al., (2016) results, which showed they would contact the dentist after TDI.

However, results showed that 47.5% are not aware that an avulsed tooth can be put back and repositioned after TDI. When it comes to washing the tooth after it has been avulsed, the majority of them, with a percentage of 52.5% are also unaware that disinfectants will destroy the tooth's cells and that there should be an ideal medium for storing an avulsed tooth. These results are close to those of (Quaranta et al., (2016) wherein half of the respondents use water and the other half use antiseptic in washing an avulsed tooth. Also, the findings of Kaul et al., (2017) discovered that majority of the respondents were unaware of the correct method to store an avulsed tooth.

Perceived Practices of Primary Caregivers on Traumatic Dental Injury Management

Table 6 shows the perceived practices of primary caregivers on TDI management with a grand mean of 2.74 (SD: 0.437). The results were interpreted as good. This means that parents have good knowledge but not enough because it is not the highest verbal interpretation.

Results also showed that majority of them would look for the avulsed tooth (mean: 2.98; SD: 0.907) and would not throw away an avulsed tooth (mean: 2.80; SD: 1.04) after TDI which agrees with the findings of Junges et al., (2015); Kaul et al., (2017); Nikam et al., (2014)

With regards to correct handling of an avulsed tooth, most of them would hold the crown, not the root or the complete extruded tooth (mean:2.82; SD: 0.944; mean: 3.02; SD: 0.917). With this in mind, their perceived practices result in less damage to the periodontal ligament and a lower risk complication of tooth complications (Świątkowska et al., 2018).

In disinfecting the avulsed tooth, the majority of the primary caregivers (mean: 2.95; SD: 1.00) prefer to clean the tooth using water, which is consistent with the findings of Kaul et al., (2017) and Quaranta et al., (2016). However, many of them prefer to clean the avulsed tooth with a cloth (mean:2.50; SD:1.02), indicating that they are disinfecting the infected avulsed tooth incorrectly. When it came to moving the avulsed tooth from home to the dental clinic, many of them preferred to hold it in a cloth, handkerchief, or piece of paper (mean:2.12; SD: 0.963). It simply indicates that they are oblivious to the correct storage medium. This was in line with the findings of Kaul et al., (2017), who found that many of them didn't know how to handle an avulsed tooth properly.

Furthermore, only a small percentage of them knew that milk is the best storage option.

Table 6. *Perceived Practices of Primary Care Givers on Traumatic Dental Injury Management*

	Mean	SD	VI
1. I will look for the avulsed tooth after traumatic dental injury.	2.98	0.907	Good
2. I will throw away an avulsed tooth after traumatic dental injury.	2.80	1.04	Good
3. I will clean the avulsed tooth by wiping it with cloth	2.50	1.02	Poor
4. I will clean the avulsed tooth with water	2.95	1.00	Good
5. I will keep the avulsed tooth in a cloth, handkerchief, or paper while transporting from home to dental clinic.	2.12	0.963	Poor
6. I will pick the avulsed tooth by the crown.	2.82	0.944	Good
7. I will pick the avulsed tooth by the root.	3.02	0.917	Good
OVERALL MEAN for the Perceived Practices of Primary Care Givers on TDI Management	2.74	0.437	Good

Correlation of Knowledge and Perceived Practices of Primary Caregivers on Traumatic Dental Injury Management

Table 7 shows the correlation of the primary caregivers' knowledge and perceived practices on TDI management, which shows a p-value of 0.011. This reveals that there is a significant correlation between the two variables, their knowledge, which is the independent variable, and their perceived practices, the dependent variable. Based on these results, it can be concluded that the primary caregivers who have a certain level of knowledge on TDI management have better perceived practices. Likewise, the primary caregivers who have little to no knowledge of TDI management will show poor practices as well.

A study was done by Gaffar et al., (2021) agrees with this, as their results showed that the respondents' ability to manage TDI was closely associated with their previous knowledge of TDI management.

Table 7. *Correlation of Knowledge and Perceived Practices of Primary Caregivers on TDI Management*

Variable		Knowledge	Practice
Knowledge of Primary Caregivers on TDI Management	Spearman's rho	_____	
	p-value	_____	
Perceived Practices of Primary Caregivers on TDI Management	Spearman's rho	0.232	_____
	p-value	0.011	_____

The moderator variables were analyzed using their p-values. The level of significance is a p-value of 0.05, and the variables that have a higher p-value than 0.05 are considered to be not significant.

Knowledge and Perceived Practices of Primary Caregivers Association with Age

Table 8 shows that there is no significant difference in the knowledge and management practices of the respondents towards TDI considering their age since the p-values (0.996, 0.302) are higher than the level of significance.

The findings are in line with previous research (Sadri et al,.2020, Ozer et al. 2012) which also indicates that there are no substantial differences in TDI knowledge and practices among different age groups. This may be because there is no enough evidence to conclude that age is a decisive factor that has a significant impact on TDI knowledge and practices.

Therefore, the researchers have failed to reject the hypotheses that stated, "There is no significant difference in the knowledge of the primary caregivers in TDI management considering their age" and "There is no significant difference in the perceived practices of the primary caregiver in TDI considering their age".

Table 8. *Knowledge and Perceived Practices of Primary Caregivers Association with their Age*

	Group	Mean	p-value	VI
Knowledge	2	4.07		
	3	4.03	0.996	NS
	4	4.04		
	5	3.92		
Practice	2	2.57		
	3	2.74	0.302	NS
	4	2.76		
	5	2.82		

Knowledge and Perceived Practices of Primary Caregivers Association with Sex

Table 9 shows that there is a significant difference in the knowledge of the respondents towards TDI considering their sex due to the fact the p-values (0.019) are apparently within the level of significance. The findings are consistent with previous research (Cheng et al., 2017, Al Saffan AD, 2018) where the disparity between male and female is statistically significant, for the reason that both parents have low knowledge in managing a TDI, but mothers have a bit of an edge compare to the father. Also, there is a deficiency of dental awareness on TDI management among parents but more so among fathers than mothers. Therefore, the researchers conclude that the hypothesis that stated, "There is no significant difference in the knowledge of the primary caregivers in TDI management considering their sex" is rejected.

Table 9. *Knowledge and Perceived Practices of Primary Caregivers Association with their Sex*

	Group	N	Mean	p-value	VI
Knowledge	0	46	4.13	0.019	S
	1	74	3.96		
Practice	0	46	2.80	0.123	NS
	1	75	2.70		

Table 10. *Independent Sample t-test for Difference of Thriving Quotient Between Male and Female*

	Gender				
	Male *M (SD)*	Female *M (SD)*	*t*	*P*	*VI*
Engaged Learning	3.1 (0.94)	2.9(0.86)	2.601	0.158	NS
Academic Determination	3.5 (0.92)	3.4 (0.84)	1.956	0.172	NS
Positive Perspective	3.9 (0.84)	2.8 (0.91)	1.630	0.352	NS
Diverse Citizenship	4.1 (0.65)	3.92 (0.64)	2.246	0.539	NS
Social Connectedness	3.1 (0.87)	3.2 (0.85)	-2.076	0.711	NS

P<.05 M=Mean SD=Standard Deviation VI=Verbal Interpretation NS = Not Significant S=Significant

Knowledge and Perceived Practices of Primary Caregivers Association with Educational Attainment

Table11 depicts that there is a significant difference in the knowledge of the respondents towards TDI considering their educational attainment since the p-value (0.015) is lower than the level of significance between the respondents who have Masters or Doctoral degree. This indicates that the primary caregivers who have a higher level of educational attainment have a higher level of knowledge on TDI management as compared to the primary caregivers who have a lower level of educational attainment. The finding is consistent and supported by previous research that those with a high educational background think consciously that emergency or first aid measures should be taken when there is TDI in children (Parikh, 2017). Thus, the researchers conclude that the hypothesis that stated, "There is no significant difference in the knowledge of primary caregivers on TDI management considering their educational attainment" is rejected.

Table 11. *Knowledge and Perceived Practices of Primary Caregivers Association with their Educational Attainment*

	x^2	df	p-value
Knowledge	2.82	3	0.420
Practice	2.29	3	0.515

	Group	N	Mean	p-value	VI
Knowledge	1	8	3.63	0.937	S
	2	70	3.84	0.386	
	3	42	4.40	0.015	
Practice	1	6	2.84	0.680	NS
	2	70	2.70	0.999	
	3	42	2.79	0.267	

Knowledge and Perceived Practices of Primary Caregivers Association with Socio-economic Status

Table 12 reflects that there is no significant difference in the knowledge and perceived practices of the respondents towards TDI management considering their socio-economic status since their p-values (0.471 0.515) are higher than the level of significance. Household income was used as a socioeconomic indicator but was not associated with the occurrence of the outcome. These findings are in disagreement with the data reported by (Kumar et al.,2014) stating that children from families with high incomes have better oral health quality.

Therefore, the researchers have failed to reject the hypotheses stated that "There is no significant difference in the knowledge of primary caregivers in TDI management considering their socio-economic status'' and "There is no significant difference in the perceived practices of the primary caregivers in TDI management considering their socio-economic status''.

Table 12. *Knowledge and Perceived Practices of Primary Caregivers Association with their Socio-economic Status*

	Group	N	Mean	p-value	VI
Knowledge	1	22	3.73	0.471	NS
	2	46	4.09		
	3	29	4.14		
	4	23	4.04		
Practice	1	6	2.84	0.515	NS
	2	70	2.70		
	3	42	2.79		

Conclusion

The primary caregivers have shown to have high knowledge and good perceived practices towards TDI management. Based on the item on the questionnaire that scored very high, most of them are knowledgeable in identifying the teeth that are involved in this. However, their knowledge regarding the avulsion of teeth is relatively low. This is also true for their perceived practices, wherein their results showed that they do not know how to clean an avulsed tooth and where to store it during transportation to the dental clinic. These are very important for primary caregivers to know since these are important factors that contribute to the prognosis of an avulsed tooth. A significant difference was found between the knowledge of the primary caregivers and their sex

The researchers have also discovered that there is a significant difference between the primary caregiver's educational attainment and their knowledge towards TDI management, which indicates that the higher their educational background, the more they know about managing a TDI. However, this also conveys that primary caregiver with a low educational background will have less knowledge in dealing with TDI. All primary caregivers should have basic knowledge in TDI management since the prognosis of an avulsed tooth depends largely on the primary caregivers' initial treatment before going to the dentist.

The researchers would like to recommend to AUP-COD that the course curriculum of Community Dentistry III incorporate educating not just the children about their oral health, but also educate the primary caregivers, specifically in TDI management. The dentists should be encouraged to take time in instructing primary caregivers regarding the nature of this and its management, even before it occurs. Researchers may conduct a new study regarding the primary caregivers' attitudes towards TDI management, and consider the same factors (age, sex, educational attainment, socioeconomic status) to determine if there is a significant difference in its relationships. Another study may also be conducted to assess Knowledge, Attitude, and Perceived Practices of Primary Caregivers on TDI Management. A study conducted on a larger population of primary caregivers will yield greater statistical reliability and will form a more definite view from the results that will be gathered.

Acknowledgement

This paper is an output of the thesis paper of four dentistry students of Adventist university of the Philippines College of Dentistry for their degree in Doctor of Dental Medicine. Thank you Shasha, Nadet, Mihai and RJ for allowing me to present this paper for the 8th ISC.

References

Adiyia, M., & Ashton, W. (2017). *Rural Development Institute Brandon University*, 13.

Ain, T. S., Lingesha, R. T., Sultan, S., Tangade, P., Ravishankar Telgi, C., Tirth, A., Kumar Pal, S., Gowhar, O., & Tandon, V. (2016). Prevalence of Traumatic Dental Injuries to Anterior Teeth of 12-Year-Old School Children in Kashmir, India. *Archives of Trauma Research, 5*(1). https://doi.org/10.5812/atr.24596

Al-Sehaibany, F., Almubarak, D., Alajlan, R., Aldosari, M., Alqahtani, N., Almaflehi, N., & AlBarakati, S. (2018). Elementary school staff knowledge about management of traumatic dental injuries. *Clinical, Cosmetic and Investigational Dentistry, Volume 10*, 189–194. https://doi.org/10.2147/CCIDE.S172105

Bakarčić, D., Hrvatin, S., Maroević, M., & Ivančić Jokić, N. (2017). First Aid Management in Emergency Care of Dental Injuries – Knowledge among Teachers in Rijeka, Croatia. *Acta Clinica Croatica, 56*(1), 110–116. https://doi.org/10.20471/acc.2017.56.01.16

Bhandary, S., & Shetty, S. (2014). Emergency Management of Dental Trauma among Physical Education Teachers of 2 Districts in Karnataka, India. *Asian Journal of Sports Medicine, 5*(2), 139–140.

Ch, S., Pani, ra, Alolaiwi, L. A., AlRukban, L. A., Nashwan, M. K., & AlRuzeyg, S. S. (2017). *Awareness of the Emergency Management of Dental Trauma in Children: A Comparison of Fathers and Mothers in Riyadh City*.

Chandukutty, D. (2017). Awareness of Dental Trauma Management among School Teachers of Kannur, Kerala, India. *Journal of Clinical and Diagnostic Research*. https://doi.org/10.7860/JCDR/2017/19308.9252

Danko Bakarčić1, Sandra Hrvatin1, Mia Maroević2 and Nataša Ivančić Jokić1. (2017). *First Aid Management in Emergency Care of Dental Injuries - Knowledge Among Teachers in Rijeka, Croatia.* 110–116.

Dennick, R. (2016). Constructivism: Reflections on twenty five years teaching the constructivist approach in medical education. *International Journal of Medical Education, 7*, 200–205. https://doi.org/10.5116/ijme.5763.de11

Freire-Maia, F. B., Auad, S. M., Abreu, M. H. N. G. de, Sardenberg, F., Martins, M. T., Paiva, S. M., Pordeus, I. A., & Vale, M. P. (2015). Oral Health-Related Quality of Life and Traumatic Dental Injuries in Young Permanent Incisors in Brazilian Schoolchildren: A Multilevel Approach. *PLOS ONE, 10*(8), e0135369. https://doi.org/10.1371/journal.pone.0135369

Gaffar, B., AlHumaid, J., Ashraf Nazir, M., & Alonaizan, F. (2021). Traumatic dental injuries in the Eastern Region of Saudi Arabia: Factors influencing teachers' management practices. *Dental Traumatology, 37*(1), 65–72. https://doi.org/10.1111/edt.12598

Goenka, P., Sharma, S., Chaturvedi, S., Nirwan, M., & Syed, A. A. (2016). Awareness in Primary School Teachers regarding Traumatic Dental Injuries in Children and Their Emergency Management: A Survey in South Jaipur. *International Journal of Clinical Pediatric Dentistry, 9*(1), 62–66. https://doi.org/10.5005/jp-journals-10005-1335

Juneja, P., Kulkarni, S., & Raje, S. (2018). Prevalence of Traumatic Dental Injuries and their relation with predisposing factors among 8-15 years old school children of Indore city, India. *Medicine and Pharmacy Reports, 91*(3), 328–335. https://doi.org/10.15386/cjmed-898

Junges, R., Keller Celeste, R., Pizzatto, L. N., dos Santos Gatti, F., Abegg, C., & Werner Samuel, S. M. (2015). Elementary Schoolteachers' Knowledge and Decision-making Regarding Dental Trauma. *Oral Health & Preventive Dentistry, 13*(4), 357–364. https://doi.org/10.3290/j.ohpd.a32676

Kashahu, L., Dibra, G., Osmanaga, F., & Bushati, J. (2014). *The Relationship Between Parental Demographics, Parenting Styles and Student Academic Achievement,* 15.

Kaul, R. (2016). Knowledge, Awareness and Attitude towards Emergency Management of Dental Trauma among the Parents of Kolkata-An Institutional Study. *Journal of Clinical and Diagnostic Research*. https://doi.org/10.7860/JCDR/2016/20682.8208

Kaul, R., Jain, P., Angrish, P., Saha, S., Patra, T. K., Saha, N., & Mitra, M. (2016). Knowledge, Awareness and Attitude towards Emergency Management of Dental Trauma among the Parents of Kolkata-An Institutional Study. *Journal of Clinical and Diagnostic Research: JCDR, 10*(7), ZC95–ZC101. https://doi.org/10.7860/JCDR/2016/20682.8208

Kaul, R., Jain, P., Saha, N., Goswami, S., Mukhopadhyay, S., Saha, S., & Sarkar, S. (2017). Evaluation of knowledge, awareness, and attitude toward emergency dental trauma management among the school teachers of Kolkata. *Indian Journal of Dental Research, 28*(6), 595. https://doi.org/10.4103/ijdr.IJDR_118_17

Kumar, S., Kroon, J., & Lalloo, R. (2014). A systematic review of the impact of parental socio-economic status and home environment characteristics on children's oral health related quality of life. *Health and Quality of Life Outcomes, 12*(1), 41. https://doi.org/10.1186/1477-7525-12-41

Lam, R. (2016). Epidemiology and outcomes of traumatic dental injuries: A review of the literature. *Australian Dental Journal, 61*, 4–20. https://doi.org/10.1111/adj.12395

Leah Campbell. (2019, August). *Children of Older Parents May be Better Behaved*. Here's Why. Healthline. https://www.healthline.com/health-news/children-born-to-older-parents-tend-to-have-fewer-behavior-problems

Marcano-Caldera, M., Mejía-Cardona, J. L., Sanchez, J. H. P., Espriella, C. M. de la, Morales, E. C., Varón, G. S., Díaz, M. G., Mesa, N. F., Villegas, P. E., Reyes, P. B., Sanchez, P. R., Fernández, P. M., Gómez-Scarpetta, R. Á., Alfaro, V. B., Aguirre, O. L. C., Soto, O. P. L., & Sigurdsson, A. (2018). Knowledge about emergency dental trauma management among school teachers in Colombia: A baseline study to develop an education strategy. *Dental Traumatology, 34*(3), 164–174. https://doi.org/10.1111/edt.12393

McCombes,S. (2019, May 1). *Correlational Research | Definition, Methods and Examples*. Scribbr. https://www.scribbr.com/methodology/correlational-research/

Nikam, A. P., Kathariya, M. D., Chopra, K., Gupta, A., & Kathariya, R. (2014). Knowledge and Attitude of Parents/Caretakers toward Management of Avulsed Tooth in Maharashtrian Population: A Questionnaire Method. *Journal of International Oral Health, 6*(5), 1–4.

Parikh, U. (2017). *Assessment of knowledge of parents towards paediatric dental traumatic injuries.*

Quaranta, A., De Giglio, O., & Trerotoli, P. (2016). Knowledge, attitudes, and behavior concerning dental trauma among parents of children attending primary school. *Annali Di Igiene Medicina Preventiva e Di Comunità, 6*, 450–455. https://doi.org/10.7416/ai.2016.2127

Siedlecki, S. L. (2020). Understanding Descriptive Research Designs and Methods. *Clinical Nurse Specialist, 34*(1), 8–12. https://doi.org/10.1097/NUR.0000000000000493

Sienkiewicz, K. L., Rainchuso, L., Boyd, L. D., & Giblin, L. (2017). *Child Care Providers' Knowledge About Dental Injury First Aid in Preschool-age Children, 91*(3), 8.

Świątkowska, M., Kargol, J., Turska-Szybka, A., & Olczak-Kowalczyk, D. (2018). What do polish parents know about dental trauma and its management in children's treatment? A questionnaire study. Acta Odontologica Scandinavica, 76(4), 274–278. https://doi.org/10.1080/00016357.2017.1420225

Thomas, L. (2020, August 28). *Simple Random Sampling | Definition, Steps & Examples.* Scribbr. https://www.scribbr.com/methodology/simple-random-sampling/

Tumen, & Kaya,S. (2017). *Prevalence of traumatic dental injuries and associated factors among 8 to 12-years-old schoolchildren in Diyarbakir, Turkey.* Tumen E C, Yavuz &, Kaya S, Uysal E, Tümen D S, Ay Y, Başaran G, Adıgüzel &, Değer Y, Laçin N - Niger J Clin Pract. http://www.njcponline.com/article.asp?issn=1119-3077;year=2017;volume=20;issue=10;spage=1259;epage=1266;aulast=Tumen

Awareness on Oral Health Changes at Menopause and the Oral Health Care Seeking Behaviors of Menopausal Women in a Selected Educational Institution

Deborah Cynthia T. Gatchalian, Frida Ngo Sack Nlend, Alvin Ritchil
Adventist University of the Philippines
dctgatchalian@aup.edu.ph

Abstract

During menopause, a woman experiences hormonal changes that can affect the whole body, oral health-related problems like Xerostomia, increase of Dental caries, changes in taste, gingivitis, Burning mouth syndrome, periodontitis and osteoporotic jaws. The aim of this study was to determine the correlation between the awareness on oral health changes of menopausal women and their oral health seeking behaviors. The study employed the Descriptive- correlational and Comparative designs through the use of the Frequency, Percentages, Mean, Standard Deviation, Kruskal Wallis and Mann- Whitney Tests for statistical analysis. The study included 42 menopausal employees who were aged 40 – 65 years and above of a selected educational institution. They were recruited through Purposive Sampling and were requested to answer an online questionnaire via Google Forms. The total Awareness level of the participants had a mean score of 6.833 with a Standard Deviation of 2.76667 which can be interpreted as an average awareness level. For the Oral health-care seeking behaviors of the respondents, it showed a mean score of 3.4262 with a Standard Deviation of 0.46699 which can be interpreted as a good level of behaviors. The results of this study concludes that there is no difference in the awareness and behaviors of the menopausal women except in terms of medications which had a p-value of 0.009 which means that there was a significant difference between them. The awareness on oral health changes and oral health seeking behaviors of menopausal women have a low positive significant relationship to each other. The researchers recommend that a new study be conducted by future investigators in a larger population of menopausal women in order to yield greater statistical reliability and validity.

Keywords: *menopause, behavior, awareness, oral health, women*

Women go through many changes along the course of their lives. One of the first changes occur during Puberty which is around the ages of 7 – 13 years (Druet, 2017). At puberty, girls experience their first period also referred to as menarche. After this, they go through regular monthly periods (menstrual cycle), which will continue for the next 20-30 years of their life (Woodham, 2015).

After twelve consecutive months without menstruation, the woman is said to be going through menopause (Coney, 2018). The average age at which this happens is 51 years, but it can occur as early as 30 and as late as 60 (Stoppler, 2019). During menopause, a woman experiences hormonal changes that can affect the whole body, leading to certain conditions such as Osteoporosis, Cardiovascular diseases, cancers and oral health-related problems. One major and very common incidence observed in postmenopausal women is the occurrence of dental problems (Yalcin, Gurgan & Gul, 2006). Examples include xerostomia, increase in prevalence of dental caries, changes in taste, atrophic gingivitis, burning mouth syndrome, periodontitis, and osteoporotic jaws (Suri & Suri, 2014).

Many studies have been made around the topic of menopause and the effects it has on the women with this condition. A study done by Palomo et al in 2013 emphasized the need to educate post - menopausal women on their Periodontal Health. On the other hand, a study in India was conducted by Malik et al in 2018, in which there were two groups. The Experimental group of 60 women received a Lifestyle modification program while the other group of 60 women were part of the Control group. It was concluded that this program was effective in lessening Menopausal symptoms and improving their health- seeking behaviors.

Research Hypotheses

1. There is no significant difference in the awareness level of oral health changes at menopause among the respondents in terms of their demographic profile according to their;
   a) Age
   b) Income
   c) Occupation
   d) Educational Attainment
   e) Medical condition
   f) Medications
2. There is no significant difference in the oral health care seeking behaviours at menopause among our respondents in terms of their demographic profile according to their;
   a) Age
   b) Income
   c) Occupation
   d) Educational Attainment
   e) Medical condition
   f) Medications
3. There is no significant relationship between the awareness level of oral health changes at menopause and the oral health care seeking behavior of the respondents.

Scope and Limitations of the Study

The scope of the study included 42 menopausal female employees who are aged 40-65 years and above of an educational institution. The limitation of this study is that it may not accurately represent the whole menopausal women population of the institution, as the study was just limited to those residing inside the University campus and those who have the accessibility to take the online questionnaire. The choices for the answers under the Oral health care seeking behavior section of the questionnaire were broadly stated which could not represent accurate replies from the respondents.

Methodology

Methods

This study utilized the Descriptive-Correlational and Comparative designs. A Descriptive-Correlational study describes the relationship among variables in a particular sample. In this study, the researchers compared the awareness levels on Oral health during menopause among the respondents in terms of their demographic profile, and similarly compared the Oral Health care-seeking behaviors of the respondents in terms of the respondents' demographic profile.

Population and Sampling Technique

The population of the study consisted of menopausal Female employees of a selected Educational Institution in Cavite. The menopausal women fell within the age range of 40-60 years old and above. This study had a total of 42 respondents. Purposive sampling technique was utilized in the selection of the respondents. It is a method of non-probability sampling which involves the sample chosen based on the characteristics of a group and the study's goal. The researchers sent e-mails to their respondents asking them to partake in the study by kindly answering the online questionnaire provided through Google Forms.

Table 1. *The Demographic Profile of the Respondents in terms of their Age*

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	40 - 45 yrs	4	9.5	9.5	9.5
	46 - 50 yrs	9	21.4	21.4	31.0
	51 - 55 years	13	31.0	31.0	61.9
	56 - 60 years	13	31.0	31.0	92.9
	more than 60 years	3	7.1	7.1	100.0
	Total	42	100.0	100.0	

Instrumentation

The researchers used a self-constructed questionnaire, with the aid of the related literature in order to identify and assess the level of awareness on oral health changes due to menopause, and the oral health care seeking behaviors of the participants. The questionnaire was administered through Google Forms where the participants took the survey online. The survey questionnaire consisted of three parts.

The first part of the questionnaire was multiple choice style, and included the demographic profile of the respondents. Questions about their age, employment status, monthly income, occupation, educational attainment, known medical condition and medications taken were asked. The second part investigated their current awareness level regarding the oral health changes that occur as a result of menopause. Example questions for this part included: "Menopause can cause dry mouth?", "Menopause can increase prevalence of caries?". A two-point scale or dichotomous scale was used, whereby the answer options were either "yes" or "no". The results were interpreted using the scoring system in Table 2.

Table 2. *Scoring and Interpretation of Awareness*

Scale	Descriptive Rating
11.44 - 13.00 Correct	Very high Level of Awareness
8.83 - 11.43 Correct	High Level of Awareness
6.22 - 8.82 Correct	Average Level of Awareness
3.61 - 6.21 Correct	Low Level of Awareness
1 - 3.60 Correct	Very Low Level of Awareness

Finally, the third part tested their oral health care seeking behaviors. A 5-point Likert Scale was used (Always, Very Often, Sometimes, Rarely, Never) and questions like; "How often do you visit the dentist?" and "How often does pain motivate you to visit the dentist?", were asked. The results were interpreted with the scoring systems below:

Table 3. *Interpretation of Oral Health Care- seeking Behaviors*

Responses	Response Scale	Mean Interval Score	Interpretation
Always	5	4.51 - 5.00	Excellent
Very often	4	3.51 - 4.50	Very Good
Sometimes	3	2.51-3.50	Good
Rarely	2	1.51-2.50	Fair
Never	1	1-1.50	Very Poor

The Pilot Study was conducted among 15 menopausal women who were relatives of some students, who do not work for the university. The results obtained from the pilot study gave a Cronbach Alpha value of 0.842 and 0.680 for Awareness level on Oral Changes at Menopause and Oral Health Care Seeking Behavior at Menopause respectively.

Data Gathering Procedure

The instrument firstly was submitted to a group of experts for validation and approval. Once it was approved, the researchers secured research clearance and permit from the Ethics Review Board (ERB) for ethical considerations. A letter to the Dean of the College of Dentistry requesting permission for the conduction of a Pilot Study was sent and approved. Upon approval, a Pilot Study was conducted on a group of 15 menopausal women to guarantee the reliability and validity of the questionnaire.

Recommendation from the statistician was to delete a total of 4 items from the Pilot Study questions to yield greater statistical reliability with a Cronbach alpha Value which is greater than 0.60. After which, the research instrument was finalized and was distributed to the respondents through Google Forms. A total of 42 participants were recruited through Purposive sampling, and the respondents were requested to answer the online questionnaire via Google Forms. The information was collected, encoded, analyzed and validated by a statistician.

Analysis of Data

The researchers treated the data statistically with the help of the college statistician and supervision of the Research Adviser. The encoded data was analyzed through the use of IBM SPSS statistics 20 computer program as follows:

1. Frequency distribution and percentages were used to determine the percentage distribution of the demographic information of the respondents.
2. Frequency and percentage were used to measure the awareness level on oral health changes at menopause for each individual item on the research questionnaire among the participants. The mean and standard deviation was then used to determine the total awareness level on oral health changes and the oral health-care seeking behaviors of the respondents.
3. Kruskal-Wallis Test and Mann-Whitney Test (Non-parametric tests) were used to determine the significant difference between the awareness level on oral health changes at menopause and the oral health care seeking behavior of the respondents in terms of their demographic profile.
4. Pearson Correlation was used to determine the relationship between the awareness level on oral health changes at menopause and oral health care seeking behaviors of the respondents.

Results and Discussion

Table 4. *Variation of Oral Health Care Seeking Behavior at menopause with Medications*

Mann-Whitney Test

	Medications	N	Mean Rank	Sum of Ranks	Mann-Whitney U	Asymp Sig. (2-tailed)	Very Interpretation
Behavior	No	27	17.85	482.00	104.00	.009	Significant
	Yes	15	28.07	421.00			
	Total	42					

Table 4 shows the Oral Health care seeking behaviors of the respondents in association with their Medications Taken using the Mann- Whitney Test, gave a p-value of 0.009.

Because the p-value is less than 0.05, there is a significant difference in the awareness of oral health changes at menopause of the respondents in terms of the Medications Taken. This may be because the respondents are specifically mindful of the medications they take. Several women during menopausal years polymedicate (are taking in multiple drugs). So, this in turn can lead to oral dryness, tooth decay, and other complications like taste alterations, sore and irregular bleeding may lead them to seek oral health care. (Hill, 2021).

The study has produced a mix of results for the significant difference in terms of Demographic profile, considering the age, income, occupation, educational attainment, medical condition and medications taken. Based on the age, income, occupation, educational attainment and medical condition, there is no significant difference which indicates the study has failed to reject the null hypothesis, however, it rejects the null hypothesis in terms of medications taken.

Correlation of Awareness level on Oral Changes that occur at menopause and the Oral Health Care Seeking Behavior of the respondents

Table 5. *Correlation of Awareness level on Oral Changes that occur at menopause and the Oral Health Care Seeking Behavior Descriptive Statistics*

	Mean	SD	N
Total Awareness	6.8333	2.76667	42
Behavior	3.4262	.46699	42

Correlations

		Total Awareness	Behavior
Total Awareness	Pearson Correlation	1	.273
	Sig. (2-tailed)		.080
	N	42	42
Behavior	Pearson Correlation	.273	1
	Sig. (2-tailed)	.080	
	N	42	42

In the latter part of this study, the results indicated that the participants have an *average level of awareness* and have *good* oral health care seeking behavior. According to Cohen (1992), the effect size is low if the r-value lies between 0.1 and 0.29. When it comes to the awareness of oral health changes at menopause associated with oral health care seeking behavior, the study revealed a *low positive non-significant* relationship between awareness and the behaviors (r = .273, p= 0.08) as shown on the Table 5 above. This implies that there is a stronger relationship between the awareness of oral health changes that occur at menopause and the oral health care seeking

behavior of the respondents. However, it is statistically not significant, indicating that the positive low relationship between awareness and behaviors in this study happened by chance.

This result is contrary to Arifa (2015) and Shah (2015) who discovered that one of the major factors preventing women from seeking health care services is lack of knowledge. Indicating that there is a significant relationship between knowledge and health care seeking behavior.

Conclusions

The following results were collected based on the analysis and interpretation of the data that was brought about from the study.

The study had 42 respondents. The overall awareness level of the participants in this study had a mean score of 4.83. This value is interpreted as an average awareness level. The 10th and 11th items have the highest percentage of correct answers with a percentage of 100%. The items stated that it is important to maintain a well-balanced diet during menopause and it is especially important to practice good Oral Hygiene during menopause. On the other hand, the women showed a relatively *low level* of awareness on the questions stated as bad breath can be a result of menopause with a percentage of 16.7% of correct answers.

A mean score of 3.4262 (SD 0.46699) was gathered for the oral health care seeking behavior of the respondents at menopause. The results were interpreted as good. The most common tooth cleaning materials they use is toothbrush and toothpaste. The item with the lowest score was how often does your time availability affect you from visiting the dentist with verbal interpretation as *fair*.

The awareness on oral health changes at menopause of the respondents when associated with their demographic profile showed no significant difference in terms of their age (p-value= 0.175), income (p-value = 0.082), occupation (p-value = 0.280), educational attainment (p-value = 0.683), medical condition (p-value = 0.662) and medications (p-value = 0.283). Since the p values are greater than 0.05 it indicates that their association is not significant.

The oral health care seeking behavior of the respondents in association to the demographic profile showed a p-value for age (0.85), income (0.332), occupation (0.817), educational attainment (0.906), medical condition (0.203), medications (0.03). Thus because the p-value when grouped in terms of these determinants is greater than 0.05 therefore there is *no significant* difference. On the other hand when in terms of medications taken, a p value of 0.009 was given. Therefore, the association is *significant*.

The awareness level on Oral changes that occurs at menopause and Oral Health care seeking behavior at menopause reviewed a low positive *non-significant* relationship (r= 0.273 p= 0.08). These values show that there is no significant relationship existing between the awareness level and the oral health care seeking behaviors indicated by the p-value of 0.08 which, apparently, is higher than the level of significance.

The following conclusions are derived based on the results: The respondents have shown an average level of awareness on oral health changes that occur at menopause and *good* oral health care seeking behavior. Even though the level of awareness is *average*, many of the respondents do not know or lack general awareness on the multiple oral health changes that occur at this period of time. It is very important for these women to know these changes as it will help them be more self-conscious. The women also showed *good* oral health care seeking behavior at menopause but they are still lacking, since they have not achieved an excellent oral health care seeking behavior.

The researchers discovered a *low positive non-significant* relationship between awareness and behavior. This proves that there is a stronger relationship between the awareness and behavior as both variables are directly proportional to each other.

Nonetheless it is important that the menopausal women in the community have a high awareness level on the Oral health changes that occur at menopause in order to develop a better Oral Health care-seeking behavior.

References

Arifa, S. (2015). Health Seeking Behaviour of the Menopausal women in urban slum of Dhaka City. http://repository.library.du.ac.bd:8080/bitstream/handle/123456789/813/Sonia%20Arifa.pdf?sequence=1&isAllowed=y

Cohen, J. (1992, June 1). *Statistical power analysis - Jacob Cohen*, 1992. SAGE Journals. https://journals.sagepub.com/doi/abs/10.1111/1467-8721.ep10768783

Coney, P. (2019, October 19). Menopause: Practice Essentials, Overview, Physiology. https://emedicine.medscape.com/article/264088-overview

Druet, A. (2018, February 14). When does menstruation begin? Retrieved from https://medium.com/clued-in/when-does-menstruation-begin-8b6680052903

Hill, A. (2021, March 26). Medications & oral health. Retrieved from https://www.newmouth.com/oral-health/effects/medications

Malik, E., Sheoran, P., & Siddiqui, A. (2018). Health-promoting behaviors and menopausal symptoms: An interventional study in rural India. *Journal of Mid-life Health, 9*(4), 200. doi:10.4103/jmh.jmh_96_18

Palomo, L., Chitguppi, R., Buencamino, M., Santos, D., & Thacker, H. (2013). A need to educate postmenopausal women of their periodontal health. *Journal of Indian Society of Periodontology, 17*(2), 225. doi:10.4103/0972-124x.113082

Shah, K. K. (2015). Survey on relation between menopause and oral health. *Research Journal of Pharmacy and Technology, 8*(8),1150. doi:10.5958/0974-360x.2015.00205.x

Stoppler, M.C. (2019, March 20). Symptoms and Signs of Menopause Symptoms, Signs, Age, Herbal Remedies and Treatments. https://www.emedicinehealth.com/menopause/symptom.htm

Suri, V., & Suri, V. (2014). Menopause and oral health. *Journal of Mid-life Health, 5*(3), 115. doi:10.4103/0976-7800.141187

Woodham, C. (2015, April 17). U.S News & world report. Why Kids Are Hitting Puberty Earlier Than Ever.

Yalcin, F., Gurgan, S., & Gul, G. (2006). Oral health in postmenopausal Turkish women. *Oral Health Prev Dent, 4*, 227-233.

Effectiveness of Promotional Video and Reading Material on the Knowledge, Attitude, Practices and Plaque Index of Selected Pregnant Women

Angellen Aileen Barrameda, George Edward Omaking, Leuie Denn Sabino, Elline Matta, Reynaldo San Luis III, Herminiano Subido Jr., Lorcelie Taclan
Adventist University of the Philippines
hisubido@aup.edu.ph

Abstract

The incidence of pregnant women in the communities who were able to receive basic oral health care is low. This study determines the effectiveness of using a promotional reading material and a video material on the knowledge, attitude, practices and plaque index of selected pregnant women. Respondents' knowledge, attitude, practices, and plaque index before and after exposure to both media was determined. Differences across profiles was also determined according to their age, educational attainment and stage of pregnancy. This study utilized the pre and post tests research design. Before and after the interventions, a survey questionnaire was utilized to assess the knowledge, attitude, practices of the participants. From clinical oral examination the Plaque Index was taken using the Plaque Index by Silness and Loe. Based on the data collated, the weighted mean and standard deviation for knowledge, attitude and practices are computed where a 5-point likert scale was used. The pretest and posted results were compared. Twenty pregnant women were selected from two barangays in Cavite, Philippines. Plaque index assessment was done during the first visit. Pre-survey questionnaires were distributed and answered by the respondents. Afterwards, the promotional reading material and promotional video were distributed. After 66 days a post test was conducted. Findings reveal that the use of the promotional video and the reading material had a significant effect towards the Knowledge, Attitudes, Practices and Plaque Index of the pregnant women. However, the use of the promotional reading material was found to be more effective. Both interventions made a significant difference on the attitude when age was considered.

Keywords: *oral health, pregnancy, knowledge, attitude, practice, plaque index, promotional video, promotional reading material*

The Problem and Its Background

Based on the Regional Health Unit data statistics of Region IV – CALABARZON, Philippines there is a total population of 6,830 eligible pregnant woman for basic oral health care but there were only 21 pregnant women (0.31% of the total eligible pregnant women to receive basic oral health care) who were provided with the basic dental care.

The WHO portrays oral health as clear from chronic mouth and facial pain, oral and throat cancer, oral sores, birth malformations such as cleft lip and palate, periodontal disease, tooth decay and loss of teeth, as well as other mouth and oral cavity-affecting diseases and disorders. Maternity is a physiological state that induces numerous changes in the mouth and other physiological changes in the woman's body Naseem et al., (2015).

A lot of research studies discussed variety of myths that most pregnant women believed in on oral health in which these misconception leads to more oral health problem. Ramesh et al., (2017) stated that unfortunately, most females think that dental problems were also common throughout maternity but will recede upon childbirth. They do not seek professional dental care or are reluctant to undergo dental procedures for fear of possible harm to themselves or their babies. Most antenatal clinics do not routinely perform oral health screening and there have been no standards for the daily screening and comparison of expectant mothers alluded to a dentist for oral care as part of prenatal care.

Different studies show that most pregnant women have poor knowledge, lack of awareness, negative attitude as well as poor level of practices towards oral health that needs improvement. According to Bamanikar & Kee (2013) pregnant women have insufficient dental health maintenance knowledge such as on brushing at least 2x a day, utilizing floss every day, brushing between meals and getting dental examination minimum of every 6 months. Most pregnant females experience dental problems during pregnancy encompassing both soft and hard tissues. Pregnant mothers' awareness of the significance of dental hygiene while pregnant has found to be low and needs to be improved. Proper health education should be given to obtain sufficient oral health practices. Attitude toward dental visit must be improved. Regular oral screening and health education are needed to improve oral health status in maternity. Naseem et al., (2015) stated that in addition to oral hygiene self-maintenance, pregnant women face many other obstacles to maintaining an optimum dental health. Such obstacles to accessing dental care involve lack of awareness and importance, negative oral health experience, negative attitudes towards dental health care practitioners, and dental personnel's negative attitudes towards expectant mothers.

Gambhir et al., (2015) stated that few health promotion activities throughout childbirth must be carried out to help expectant mothers to be motivated and educated on the significance of good oral health which is the same goal the researchers in this study wanted to achieve. Creative, consistent, and comprehensive public health communication techniques are required to elevate oral well-being to women. By these, the researchers thought that the use of promotional video and promotional reading material will lead to a significant increase in knowledge, practice, and positive attitude of maternal females during childbirth, on their oral well-being. According Nair et al., (2015) thorough dental health schooling all through maternity leads to drastic knowledge and attitude improvements.

Educational videos have appeared as the common instrument for improving health education in the fast-changing scientific age. Embedding of video in bringing oral health awareness can make a substantial distinction in the audience knowledge and attitude. Video improves, sensationalizes, and gives a sense of realism that can greatly affect the viewer. Therefore, audiovisual presentations can be a useful medium in teaching about oral health. Naseem, S. et al., (2016).

As stated by Oliveira, et al (2014), printed instructional resources were used to enhance awareness, satisfaction, and care compliance. It is suggested that health practitioners use training materials produced as a support method for verbal communication. According to Rigo et al.,

(2016) Teaching materials could get a significant impact on patient learning. It could also aid patients in acknowledging suspicions that may emerge if they are not conversing with a health care professional. Enforcing the advertising of prenatal oral care through posters and leaflets has provided huge progress at the national level, with direct reflections on the behavior of mothers.

A lot of mediums were used to improve one's knowledge, practices and attitude towards oral health. Other research studies indicated that mediums available are effective though some are not. In this study the researchers are to compare the effectiveness of promotional reading material versus video in imparting pregnant women of knowledge, practices and right attitude towards oral health.

The most recent study done about expectant mother's knowledge, attitudes and practices was by Mandere (2013) which is entitled, *A Survey on the knowledge, attitude, and practices in oral health of pregnant women in Imperial and Muzon areas of Silang, Cavite*. In the said research , results demonstrated that the child bearing female's knowledge, attitude and practices on dental hygiene during motherhood is average therefore, this study aims to find out if there can be an enhancement in knowledge, attitudes and practices on dental care of pregnant woman when utilizing different media of communication to inform them.

Objectives of the Study

General

To determine the effectiveness of promotional reading material and promotional video on the knowledge, attitude, practices and plaque index of selected pregnant women.

Specific

1. To evaluate the knowledge, attitude, practices, and plaque index of pregnant women before and after comprehending the reading material.
2. To assess knowledge, attitude, practices, and plaque index of pregnant women before and after watching the promotional video.
3. To determine if there is a significant difference between the knowledge, attitude, practices, and plaque index of pregnant women before utilizing the promotional reading material and video.
4. To determine if there is a significant difference between the knowledge, attitude, practices, and plaque index of pregnant women after utilizing promotional reading material and video.
5. To compare if there is a significant difference between the knowledge, attitude, practices, and plaque index on the oral health of pregnant women utilizing promotional video and promotional reading material.
6. To identify if there is a significant difference between the knowledge, attitude, practices on oral health of the pregnant women when grouped according to age after being exposed to promotional reading material or promotional video intervention.

Null Hypothesis

There is no significant difference between the knowledge, attitude, practices and plaque index of pregnant women before and after comprehending the reading material.

There is no significant difference between the knowledge, attitude, practices and plaque index of pregnant women before and after watching the promotional video.

There is no significant difference between the knowledge, attitude, practices, and plaque index on the oral health of pregnant women between utilizing the promotional reading material and promotional video.

There is no significant difference between knowledge, attitude, practices, and plaque on the oral health of pregnant women when grouped according to age.

Significance of the Study

The results of the study will help in identifying which promotional oral health medium is effective for pregnant women of Silang Cavite. Furthermore, the results of the study will be beneficial to the following:

The barangay health center officials,

- To help them be aware of the effective intervention to be able to create oral health programs for pregnant women.

The whole university,

- This will be beneficial to aid in creating outreach materials and community extension services to pregnant woman.

The dentists and clinicians,

- This will help guide the dentists and clinicians formulate better ideas for oral health practices of their pregnant women clients and improve oral health awareness during the whole span of their pregnancy.

The pregnant women,

- To improve their awareness and knowledge on oral health; refine their attitude and practices on oral health during the whole span of their pregnancy with the help of the promotional reading material and promotional video.

The future researchers,

- This will also help the researchers have an idea in creating different effective medium on promoting knowledge, attitude, practices in oral health for pregnant women.

Scope and Limitations of the Study

This study is done to assess the pregnant women in their 1st and 2nd trimester, aged 15- 44, and living in Silang , Cavite. The study only includes age range 15-40 because according to WHO Statistics (2020), 21 million girls aged 15-19 years become pregnant in developing regions and 12 million of them give birth, every year. This study only includes person without any diseases nor disabilities. Only under 1st and 2nd trimester were also included because the study will be conducted for two months, and the researchers assumed that pregnant women on their 3rd trimester will have difficulty coming back for the post survey part.

The study is limited due to time constraint, accessibility of the area and the patients. The study also limits the researchers to only Barangay Imperial and Barangay Pasong Langka, Silang Cavite having the greatest number of pregnant women that meet the inclusion and exclusion criteria.

Review of Literature

Knowledge, Attitude and Practices of Pregnant Women

Great dental hygiene is viewed as a significant element of general well-being. Many dental illnesses like tooth decay and gum disease were preventable by creating awareness among individuals. In a study made by Gambhir et al., (2015) results demonstrated that the knowledge and awareness of pregnant ladies about dental health proved lacking. Pregnant females are commonly uninformed regarding the possible negative effects of disregarding dental hygiene. Maternity is a “trainable” period that females are encouraged to act healthy. Women and families need to hear from a different source as to the significance of dental treatment throughout maternity.

In a recent study by Chawla et Al., (2017), they found that throughout pregnancy period, most expectant mothers had little knowledge of dental health care. Similar results were observed in studies conducted by Hajikazemi et al. and Bamanikar and Kee, in which they found that awareness concerning oral care between expectant mothers was low. Shimaa, et al., (2018) mentioned the aftereffects of their investigation which clearly revealed that not exactly 50% of the pregnant women have no idea about the most appropriate time for visiting a dental specialist during pregnancy. This can be clarified by the fact that most of the pregnant women do not focus on their oral health.

Alongside they do not tend to visit a dental specialist during pregnancy. In fact, in a study made by Dagang and Kakumoto (2011) they mentioned that most of the pregnant women have few misconceptions on oral health that are pregnancy related:59% did not know that dental caries is a communicable disease that can be passed down from mother to child; 70% believes that pregnancy epulis and other gingival inflammation are not normal for pregnant woman; 29% believes that pregnancy exacerbates the wearing out of decaying of teeth. Some still believe in the old wives' tales related to pregnancy.

Lack of knowledge that dental treatments are safe during pregnancy may affect the decision of pregnant women on seeing a dentist during pregnancy. They may not know about the impacts of their dental well-being on the baby and their gestation outcomes. A lot of research indicated that expectant mothers have a dismissive feeling regarding their oral hygiene and oral health consideration usage in their gestational period. According to the study made by Nogueira et al., (2016) approximately 57.82 per cent of expectant mothers have little awareness of the methods and measures which should be discarded promptly from the first tooth eruption. When asked about the consequences caused by sugar intake the same percentage was observed. 77.55 percent and 87.75 percent report lacking understanding of the value and dangers of fluoride use. George et al.,, (2013) mentioned that only about half of women know that tooth decay may transfer from the parent to the child's mouth (47.5%) and improper dental hygiene of the mother could lead to reducing birth weight (47.5%). It is also clear that certain expectant mothers are uncertain about the appropriateness of receiving dental services during both motherhood and early childhood. Almost 1/3 of expectant mothers (32.5 percent) are not certain on when the first dental visit is the ideal moment for a baby.

Pregnant women frequently have confusion about oral health during pregnancy which keeps them from looking for dental consideration. They accept that helpless oral well-being is an ordinary and acknowledged part of pregnancy or dental treatment can hurt the baby. Saskatchewan Prevention Institute. (2014) mentioned that some pregnant women do not organize their oral well-being during pregnancy since they credit more significance to sound teeth for their infant than for themselves and do not believe that a visit to the dentist while being pregnant to be significant. Wrong perceptions and convictions about the security of dental treatment that may add to the low pace of administration use should be adjusted through oral well-being training of pregnant women, oral consideration, and pre-birth care suppliers.

The Saskatchewan Prevention Institute. (2014) emphasized that the increase in danger of some of these dental conditions is attributable to motherhood. Periodontitis and Gingivitis are the common oral conditions for pregnant women. Although pregnancy builds the hazard for certain oral illness, there seems to be gaps in women's knowledge about this risk. A few ladies likewise seem to see negative changes in their oral well-being; for example, bleeding gums as an ordinary and acknowledged piece of pregnancy that don't require treatment. Most oral ailments are asymptomatic; the reason why individuals will in general postpone treatment. Most moms in one report who didn't visit a dentist during pregnancy asserted that they had no dental issue. In fact, most moms in this investigation saw their oral well-being status to be acceptable or excellent. This infers the moms both consider these side effects to be not characteristic of oral medical problems nor see their oral medicinal services as a critical need and, would prefer to defer visit until after childbirth.

Lack of awareness and knowledge directly affects the dental health practices and attitudes of the expectant mothers. According to the study made by Mahdi et. al. (2016) assessment of dental health practices among expectant mothers demonstrates that 66% have poor dental practices and 34% had average dental hygiene practices; none of them have great dental hygiene methods. Most females reported that 85.5 percent tooth-brushed greater than one times a day, while 14.5 percent tooth-brushed one times a day. Only 9.5 percent used different dental hygiene techniques, such as dental floss, toothpick, miswak, and mouthwash. A limited number of females have been observed

having visited a dentist prior to motherhood; of its primary reason has been oral pain. A significant number of women have not even seen a dentist in their lifetime. Only 10.2% of expectant mothers would have decided to visit a dental specialist during gestation; the primary reason for the visit was toothache. Of the 377 females that have not visit the dentist all through maternity, 62.1 percent did not do so because they did not consider they will need oral treatment and 27.9 percent believed that dental treatment could negatively affect them and their child.

In contrary to the previous research mentioned, Dagang amd Kakumoto (2011) stated in their study that the pregnant participants had a very positive attitude towards proper oral health care for a safe and healthy pregnancy. 99% agree and strongly agree on this matter and 92% agreed that it is important for pregnant women to see a dentist. This shows that almost everyone believes that oral health care is essential and somewhat important especially to pregnant women. However, 47% of these women only go to the dentist when needed. 75.5% have never seen a dentist during their pregnancy stage. This high percentage of positive attitude may be brought about by their own concern for their baby's well-being. The results tend to be positive maybe because of the thought of whatever sounds beneficial to a person or anything that promotes health is good even they do not practice it themselves. That is why having the right knowledge on dental health care is essential throughout motherhood, because it influences the attitude and practices of expectant mothers. Even along other women who had sufficient dental coverage, they do not know the importance of dental visits during pregnancy.

Plaque Index of Pregnant Women

Most pregnant women notice changes in their gingiva during pregnancy, making it look red or bleed during brushing and some may have swelling as well. All these changes are referred as gingivitis and can start as early as the 2nd month of pregnancy due to the reaction of the hormones to irritants such as plaque.

According to Chuan et al., (2016) in 1965, it was verified that plaque in Loe 's study may lead to gingivitis. In this study, especially throughout the interproximal regions, the mean total PI had been high mostly in various trimesters, resulting in a positive connection between pregnancy gingivitis and dental PI. The result was in line with Loe 's research. Promoting plaque prevention could thus reduce dental plaque and gingivitis during motherhood.

Nickbin-Poshtamsary et al., (2018) discovered that there was no notable change in the index for dental plaques on a case example of its baseline. But there is a decrease in dental plaque index after 3 months of educational intervention. Hence, education and training can be very effective in improving oral and dental health during pregnancy. Maspero et al., (2020) stated precautionary sanitation guidelines utilized by the Department of Dental Hygiene of the University of Milan. This was identified as an efficient form of manipulating microbial plaque throughout gestation. A noticeable drop in plate index and microbial parts have been computed from the first visit as well as the subsequent check-ups.

According to Lally (2009), changes in habits vary depending on the person's behavior and other factors. This was stated in the study that said it takes 66 days to be exact and 2 months on average before the behavior becomes a habit.

Age on Oral Health

Tooth decay and gum disease both are relatively typical in chronic diseases. Tooth decay can influence people throughout their lifetime from early childhood to old age. Caries is often said to be the most prevalent chronic disease in childhood. According to Marcenes et al., (2013) caries are a cumulative ailment and the incidence of caries rises with age. The periodontal disease primarily affects adults and older people. Because most adults do have gingivitis (bleeding gums), roughly 11percent of the global adult population possesses severe progressive periodontal disease, that could inevitably turn into early tooth loss.

According to a study conducted by Geethapriya et al., (2017), age does not appear to have any effect on the status of dental caries, hygiene status and oral health awareness. Both the young and elderly were of similar caries status. Though older people are cognitively more mature, there was lack of positive attitude towards putting knowledge into practice. Shellin et al., (2018) found that elderly people of different cultural backgrounds recognize the significance of their mouths to their overall health and well-being. Elderly people cherish their personal interactions and also their well -being. These individuals see the mouth as the gate to the majority of the bodies and to our social life, affecting our image, sexual orientation, speech and enjoyment of food. As stated by Deghatipur et. al., (2019) older women had less dental caries however clearly additionally missing teeth which showed they received ill-advised dental care. Mandere, (2013) also concluded in her study that there is an insignificant variation in oral health practices when age is considered.

Video and Reading Material on Oral Health

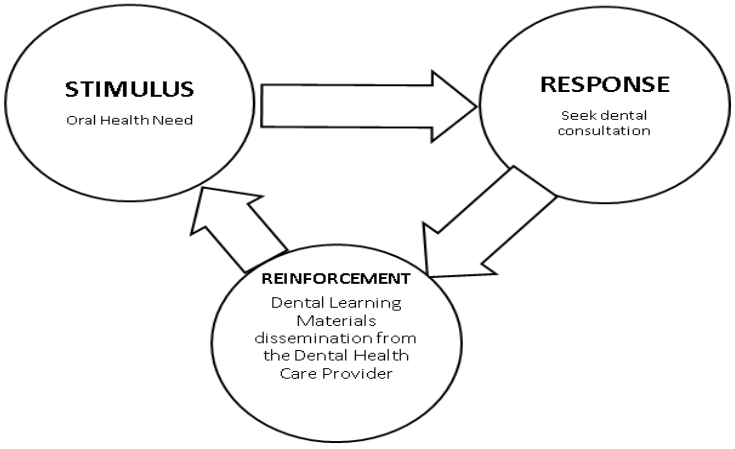
Improvement in knowledge using educational mediums can influence their oral hygiene practices and attitudes. Thomas et al., (2008) mentioned that teaching and motivating women to keep up great oral health and giving moderate dental social insurance is key in diminishing dental illness. Making better oral health instruction would turn into a need in prenatal consideration to teach ladies in danger of the significance of keeping up oral health. In addition, Nair et al., (2016) stated that watching video was found to be effective that will enhance knowledge on oral health and be used for providing information. As stated by Naseem et al., (2016), the inserting of video in bringing verbal health awareness and mindfulness can make a critical contrast within the information and state of the mind of the open.

Naseem et al., (2016) stated in their study that varying media helps are significant instruments in education, along these lines of health education, as these have an enduring impact on the target population. Studies utilizing audiovisual are found to make dental well-being awareness of targeted populations more successful as these aids to improve oral health. Audiovisuals for several years are used as a teaching tool; a real benefit of this is a better visual representation of practical techniques throughout small number learning. It has been shown that animated instructions are more efficient than regular lectures, as a method for teaching clinical skills

Costa de Oliveira et al., (2014) stated that health professionals could use teaching strategies and communicate information to assess the health education resources developed. The utilization of teaching aids allows learning process of teaching through facilitated interactions among speakers (medical practitioners), patients and families (people who read), and printed teaching materials. Published teaching materials were used to enhance learning, satisfaction, and medication compliance, and also to stimulate self-care for patients.

Theoretical Framework

Figure 1. *Behaviorist Theory*



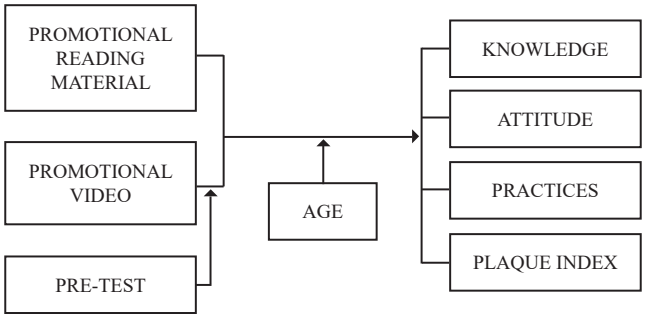
Learning theories is a set of principles on how learning occurs. One of the theories is Behaviorist Theory by B.F Skinner in which new behaviors or change in behavior is acquired through association of stimulus and response. This theory will be applied through repetitive practice, participation points and establishing rules. Krapfl (2016) stated that behavioralism, often recognized as behavioral psychology, is the theory of learning that states that all behaviors are acquired through conditioning. Conditioning is carried out through interaction with the environment.

Behaviorists accredit that our responses to environmental stimulus form our actions as the patient needs an oral health care, repetitive consultation and exposure to a variety of dental learning materials will help to aid in the improvement of the knowledge, attitude and practices behavior regarding different oral health issues.

Research Paradigm

There are different factors that affect the knowledge and attitude of pregnant women to oral health care.

Figure 2. *Variables and Its Correlation*



The illustration above shows that the promotional video and reading material will be used as an intervention to test which one is more effective for the improvement of the knowledge, attitude, practices and plaque index of the pregnant women, using the pre-test results as the baseline and age as the modifying factor.

Definition of Terms

- **Health education -** This refers to the learning experiences that help individuals and communities improve their health.
- **Oral Health** - It is a state of being free from mouth and facial pain, oral and throat cancer, oral infection and sores, periodontal (gum) disease, tooth decay, tooth loss, and other diseases and disorders that limit an individual's capacity in biting, chewing, smiling, speaking, and psychosocial well-being.
- **Oral Health Practice** - It is the practice of taking care of the teeth and its supporting structures through tooth-brushing, flossing, and using mouthwashes
- **Oral hygiene** - It is a practice of keeping the mouth cavity in a healthy condition.
- **Plaque Index** - This refers to a recording of both soft debris and mineralized deposits on the teeth.
- **Promotional reading material** - It is a typewritten or handwritten material consisting of instructions or information.
- **Promotional video** - This refers to a video that is used for instructional purpose.
- **Trimester** - It refers to a period of three months, a division of duration of pregnancy.

Methodology

This chapter explains the instrumentation, data gathering procedures and statistical analysis used in this research.

Research Design

The research utilized an experimental or interventional study design. Survey questionnaires and plaque index were used to assess the respondent's knowledge, attitude and practices.

Inclusion and Exclusion Criteria

The study only included the pregnant women with ages of 15 to 40 years old in their 1st to 2nd trimester of pregnancy that are living in Barangay Imperial and Barangay Pasong Langka, Silang, Cavite. 14 years old below and 41 years old and above patients with disability and medically compromised pregnant women are excluded.

Population and Sampling

The researchers used purposive sampling technique in choosing the respondents based on the set of exclusion and inclusion criteria. The study was composed of 20 pregnant women on their 1st and 2nd trimester living in Barangay Imperial and Pasong Langka, Silang, Cavite.

Instrumentation

Questionnaires were used to assess the pregnant women's knowledge, attitudes and practices on oral health utilizing reading material and promotional video. The set of questions that were used are adapted and revised from the existing research of Mandere, (2013) entitled, *A Survey on the knowledge, attitude and practices in oral health of pregnant women in Imperial and Muzon areas of Silang, Cavite.*

The pre-survey and post-survey questionnaires were validated and approved by the Adventist University of the Philippines-University Research Center, certified statistician, three dentists, two laymen and two URC expert. The questionnaires were also translated in Filipino by a Filipino professor from the university's Language Department.

The questionnaire form has five parts: the first part contained demographic questions about age, stage of pregnancy, and educational attainment. The second part contained 9 item questions that measured the respondents' knowledge about oral health during the whole span of pregnancy. The response options are 'Strongly Agree, Agree, Neutral, Disagree, Strongly Disagree'. The knowledge scores are interpreted using a five-point Likert scale as shown on Table 1. The knowledge data interpretations were adapted from Sözen, Erol & Guven, Ufuk. (2019). *The Effect of Online Assessments on Students' Attitudes Towards Undergraduate-Level Geography Courses. International Education Studies.*

Table 1. *Interpretation of Level of Knowledge*

Mean Average	Scale Response	Level of Knowledge
4.21–5.00	Strongly Agree	Very High
3.41–4.20	Agree	High
2.61–3.40	Neutral	Average
1.81–2.60	Disagree	Low
1.00–1.80	Strongly Disagree	Very Low

The third part contained 7 item questions that are related to the respondents' attitude on oral health. The response options are 'Strongly Agree, Agree, Neutral, Disagree, Strongly Disagree'. The attitude scores are interpreted using a five-point Likert scale as shown on Table 2. The attitude interpretations were adapted from Latif, Rusnani & Dahlan, Akehsan & Abdul Mulud, Zamzaliza & Nor, Mohd. (2017). *The Impact of Rusnani Concept Mapping (RCM) on Academic Achievement and Clinical Practices among Diploma Nursing Students. Education in Medicine Journal.*

Table 2. *Interpretation of Level of Attitude*

Mean Range	Scale Response	Level of Attitude
4.21–5.00	Strongly Agree	Very Positive
3.41–4.20	Agree	Positive
2.61–3.40	Neutral	Average
1.81–2.60	Disagree	Negative
1.00–1.80	Strongly Disagree	Very Negative

The fourth part contained of 10 item questions that measured the respondents' practices on oral health. The response options are 'Strongly Agree, Agree, Neutral, Disagree, Strongly Disagree'. The attitude scores are interpreted using a five-point Likert scale as shown on Table 3. The practices interpretations were adapted from Latif, Rusnani & Dahlan, Akehsan & Abdul Mulud, Zamzaliza & Nor, Mohd. (2017). *The Impact of Rusnani Concept Mapping (RCM) on Academic Achievement and Clinical Practices among Diploma Nursing Students. Education in Medicine Journal.*

Table 3. *Interpretation of Level of Practices*

Mean Range	Scale Response	Level of Practices
0.00–1.50	Always	Very Good
1.51–2.50	Often	Good
2.51–3.50	Sometimes	Average
3.51–4.50	Rarely	Poor
4.51–5	Never	Very Poor

The fifth part contained a chart to assess the respondent's oral hygiene. Vital signs such us blood pressure, respiratory rate, pulse rate were also indicated as well as the history of medical condition and tooth-brushing frequency.

Plaque Index of the respondents were examined with the use of Plaque Index by Sillness and Loe. This index is used in longitudinal studies and clinical trials as our study lasted for two months with twice plaque assessment utilizing promotional reading material and video. It indicates the thickness of plaque at the cervical margin of the tooth in which all surfaces of tooth #16, #12, #24, #44, #32 and #36 (FDI Notification) the distal, mesial, lingual, buccal were examined. Plaque are then scored (Table 4), calculated (Table 5) and interpreted (Table 6). The scoring, calculation and interpretation were adapted from Peter (2008), Essentials of Preventive and Community Dentistry (3rd ed.).

Table 4. *Criteria for Scoring for Plaque Index*

Score	Criteria
0	No plaque
1	A film of plaque is adhering to the free gingival margin and adjacent area of tooth the plaque may be seen in situ only after application of disclosing solution or by using probe on tooth surface
2	Moderate accumulation of soft deposits within the gingival pocket, or the tooth and gingival margin which can be seen with the naked eye
3	Abundance of soft matter within the gingival pocket and/or on the tooth and gingival margin

Table 5. *Calculation of Plaque Index Scores*

Plaque index for area	0-3 for each surface
Plaque index for a tooth	Scores added and then divided by four.
Plaque index for group teeth	
Plaque index for the person	Indices for each of the teeth are added and then divided by the total number of teeth examined.
Plaque index for group	All indices are taken and divided by number of individuals.

Table 6. *Interpretation of the Result of Plaque Index*

Rating	Scores
Excellent	1
Good	1.1-1.9
Fair	2.0-2.9
Poor	3.0-4.0

Interventional Tools

The promotional reading material and video was adapted and revised from Oral Health Care During Pregnancy Steering Committee 2018 Oral Health Care During Pregnancy: Practice Guidance for Maryland's Prenatal and Dental Providers. Baltimore, MD: Maryland Department of Health, Office of Oral and was revised by the researchers and edited by a professional visual artist. The contents of both the reading material and the video were approved by the researcher's adviser, panels and by the Ethical Review boards.

Data Gathering Procedure

The researchers visited twenty-one barangays in the area of Silang, Cavite and got a census of the pregnant women from their barangay health workers. The researchers left a copy of the informed consent in each area to be able to choose participants for their study. Only two barangays with a total of twenty-five respondents were included due to the lack of response from the other barangay health workers. Also the respondents did not show-up on the said schedules and there was lower number of pregnant women that was able to meet the inclusion criteria in the other barangays. Twenty-five respondents are clustered into two groups; 13 respondents in one cluster and 12 respondents on the other cluster. The respondents are randomly selected to which medium they were exposed to, either with the reading material or promotional video.

The researchers performed the plaque index assessment on their first visit inside the barangay health center. Pre-survey questionnaires were distributed and answered by each cluster, to assess knowledge, attitude and practices. The researchers also measured each participant's oral health practices by checking their plaque index using thePlaque index by Silness and Loe during the initial visit. Afterwards, the promotional reading material and promotional video were distributed.

Two participants who signed the informed consent didn't arrive. The researchers went back several times to the barangay health centers to explain the purpose of the research and get initial data from each participant.

After 66 days from their initial visit, the researchers together with the help of some clinician went back to the barangay health centers for post-survey questionnaire and for plaque index re-assessment. Due to different dates of initial visit the researchers went back to the barangay health centers several times to get the data needed. The researchers went to the residence of the participants who were not able to come to the barangay health center for reassessment. Also due to lack of cooperation of the respondents to come back every week for promotional reading material and promotional video viewing and reading the researchers reminded the respondents through text

messages every week to comply. During this visit, post-survey questionnaires were distributed to the participants and plaque index were re-assessed. The promotional reading material that was distributed during the initial visit is retrieved from the participant that belongs to the group that was exposed to the reading material and the video material was re-watched during the second visit. Out of 25 only 20 respondents were able to come back during the post-survey period due to a lot of reasons such as: miscarriage, mistakenly pregnant, change of residence and early delivery.

The results were handed over to a biostatistician for analysis. With the results and analysis of the data collected, the researchers decided to turn over both mediums to the health centers.

Statistical Analysis

The data gathered was subjected to appropriate statistical tools given as follows:

1. Weighted Mean

The knowledge, attitudes and practices of the respondents was evaluated using 5-point Likert scale. Likert Scale is a five-point scale which is used to allow the respondents to express how much they agree or disagree with the set of statements.

2. Paired T-test. Computation ccc

Paired T-test was used to analyze the significant difference of knowledge, attitude, practices and plaque index of pregnant women utilizing reading material and promotional video. A paired t-test is used to compare two population means where you have two samples in which observations in one sample can be paired with observations in the other sample.

Results and Discussion

This chapter presents the data gathered, the results of the statistical analysis done and interpretation of findings. These are presented in tables following the sequence of specific research problem regarding the effectiveness of utilizing promotional reading material and promotional video on knowledge, attitude and practices on oral health among pregnant women.

Table 7. *Pre-Test and Post- Test Results of Promotional Reading Material Group*

		Mean		Std. Deviation		Verbal Interpretation	
		Pre	Post	Pre	Post	Pre	Post
Knowledge	10	3.7333	3.5333	.42294	.41837	High	High
Attitude	10	3.8762	4.0714	.45741	.28769	Positive	Positive
Practices	10	2.0197	1.8944	.57214	.70610	Good	Good
Plaque Index	10	3.0000	2.6000	.00000	.69921	Poor	Fair
Valid N	10						

Table 7 shows that there are 10 respondents that participated in the pre and post-tests for promotional reading material in this study. A mean of 3.7333 (SD: .42294) represents high knowledge was obtained after the pre-test survey which decreased on the post-test survey with mean of 3.5333 (SD: .41837) that still represents high knowledge. A mean of 3.8762 (SD: .45741) represents a positive attitude in the pre-test survey and an increase in the post-test survey with mean of 4.0714 (SD: .28769) still representing a positive attitude. A mean of 2.0197 (SD: .57214) represents good practice in the pre-test survey which decreased in the post-test survey with mean of 1.8944 (SD: .70610) that still represents good practice. A mean of 3.0000 (SD: .00000) represents a poor plaque index in the pre-test survey which increased in the post-test survey with mean of 2.6000 (SD: .69921) representing a fair plaque index.

The result of the decrease in plaque index coincides with the study of Nickbin-Poshtamsary et al., (2018), Maspero et al., (2020), and Shah et al., (2016), that report a significant reduction in plaque index was achieved after 3 months of educational intervention. The study of Adriana

et al., (2013) concluded that there was an increase in knowledge in the expectant mothers after utilizing an educational manual. In another study conducted by Selvarajan et al., (2019), the results of their study showed a significant increase in both the knowledge and attitude among the expectant mothers. Presumably, there was lack in number of the respondents in this study; also, respondents did not manage to read repeatedly the promotional manual given to them, which is the reason why there was contradicting result from the other studies.

Table 8. *Pre-Test and Post- Test Results of Promotional Video Group*

		Mean		Std. Deviation		Verbal Interpretation	
		Pre	Post	Pre	Post	Pre	Post
Knowledge	10	3.7333	3.5333	.42294	.41837	High	High
Attitude	10	3.8762	4.0714	.45741	.28769	Positive	Positive
Practices	10	2.0197	1.8944	.57214	.70610	Good	Good
Plaque Index	10	3.0000	2.6000	.00000	.69921	Poor	Fair
Valid N	10						

Table 8 shows that there are 10 respondents that participated in the post-test for the promotional video in the study. A mean of 3.5873 (SD: .41324) represents high knowledge as seen in the result of the pre-test survey but this decreased in the post-test survey result with mean of 3.2889 (SD: .64406) that represents average knowledge. A mean of 3.8971 (SD: .55011) represents a positive attitude in the pre-test survey result which increased in the post-test survey with mean of 4.0143 (SD: .14206) that still represents a positive attitude. A mean of 1.9256 (SD: .76514) represents good practice in the pre-test survey result which increased in the post-test survey with mean of 2.0533 (SD: .69730) that still represents good practice. A mean of 3.2000 (SD: .63246) represents a poor plaque index as shown in the pre-test survey result and increased in the post-test survey with a mean of 3.0000 (SD: .47140) that still represents a poor plaque index.

The results agree with the study of Naseem et al., (2016) and Nair et al., (2016) that pointed out utilizing audiovisual is found to be effective in improving oral health knowledge. On the other hand, the result of the decrease in plaque index coincides with the study of Nickbin-Poshtamsary et al., (2018), Maspero et al., (2020), and Shah et al., (2016), which explained that a significant reduction in plaque index was achieved after 3 months of educational intervention. The educational film regarding oral health was found to be effective in increasing oral health-related knowledge of the subjects. Evidently, in this study there was lack in the number of respondents; also the respondents had shown lack of attention in watching or had failed watching the promotional video repeatedly during the whole span given to them; thus, leading to a contradictory result in this study.

Table 9. *Comparison of Promotional reading material group and Promotional video group before intervention based on Knowledge, Attitude, Practices, and Plaque Index of Pregnant Women*

		Mean		Std. Deviation		Sig.	Verbal Interpretation
		Promotional Reading Material	Promotional Video	Promotional Reading Material	Promotional Video		
Knowledge	10	3.7333	3.5873	.42294	.41324	.780	Not Significant
Attitude	10	3.8762	3.8971	.45741	.55011	.338	Not Significant
Practices	10	2.0197	1.9256	.57214	.76154	.143	Not Significant
Plaque Index	10	3.0000	3.2000	.00000	.63246	.001	Significant

Table 9 represents the comparison of knowledge, attitude, practices, and plaque index of pregnant women before utilizing promotional reading material and promotional video. A mean score of 3.7333 for Knowledge (SD: 0.42294) for promotional reading material group and 3.5873 (SD: 0.41324) for promotional video group while a mean score of 3.8762 for Attitude (SD: 0.45741) for promotional reading material group and 3.8971 (SD: 0.55011) for promotional video group while a mean score of 2.0197 for Practices (SD: 0.57214) for promotional reading material group and 1.9256 (SD: 0.76514) for promotional video group while a mean score of 3.0000 (SD: 0.0000) for plaque index for promotional reading material group and 3.2000 (SD: 0.63246) for promotional video for pregnant women were calculated. Apparently, the results show that in the comparison of Knowledge, Attitudes, Practices and Plaque index of pregnant woman before utilizing the promotional reading material and video, only plaque index has a significant value while the rest have no significant value. In most recent study of Mandere (2013), research results showed that the pregnant women's knowledge, attitude and practices on oral health during pregnancy is already average the reason behind having an insignificant result on the knowledge, attitude and practice index of pregnant women after utilizing promotional reading material and promotional video. A mean score of 3.5333 for Knowledge (SD: .41837) for promotional reading material group and 3.2889 (SD: .41837) for promotional video group while a mean score of 4.0714 for

Table 10. *Comparison of Promotional Reading material group and Promotional video group after intervention based on Knowledge, Attitude, Practices, and Plaque Index of Pregnant Women*

		Mean		Std. Deviation		Sig.	Verbal Interpretation
		Promotional Reading Material	Promotional Video	Promotional Reading Material	Promotional Video		
Knowledge	10	3.5333	3.2889	.41837	.41837	.385	Not Significant
Attitude	10	4.0714	4.0143	.28769	.14206	.096	Not Significant
Practices	10	2.0197	2.0533	.57214	.69730	.951	Not Significant
Plaque Index	10	2.6000	3.0000	.69921	.47140	.025	Significant

Table 10 represents the comparison of knowledge, attitude, practices, and plaque Attitude (SD: .28769) for promotional reading material group and 4.0143 (SD: .14206) for promotional video group were obtained. Further, a mean score of 2.0197 for Practices (SD: .57214) for promotional reading material group and 2.0533 (SD: .69730) for promotional video group while a mean score of 2.6000 (SD: .69921) for plaque index for promotional reading material group and 3.0000 (SD: .47140) for promotional video for pregnant women were calculated. Apparently, the results show that in the comparison of Knowledge, Attitudes, Practices and Plaque index of pregnant women after utilizing the promotional reading material and video, only plaque index has a significant value while the rest have no significant value. Maspero et al., (2020) noted that significant decrease of the plaque index and bacterial components between the first visit and the subsequent check-ups were calculated. Apparently, in this study, both intervention having the same content were used; however, the lack of number of respondents was the main reason why there is an insignificant result in knowledge, practices and attitude.

Table 11. *Comparison of Promotional reading material and Promotional video intervention based on Knowledge, Attitude, Practices, and Plaque Index of Pregnant Women*

		Mean		Std. Deviation		Sig.	Verbal Interpretation
		Promotional Reading Material	Promotional Video	Promotional Reading Material	Promotional Video		
Knowledge	10	-.2000	-.2984	.44383	.66139	.218	Not Significant
Attitude	10	.1952	.1171	.44014	.61889	.481	Not Significant
Practices	10	-.1253	.1278	.35790	.63035	.120	Not Significant
Plaque Index	10	.4000	.2000	.69921	.42164	.036	Significant

Table 11 presents the comparison of knowledge, attitude, practices, and plaque index of pregnant women utilizing promotional reading material and promotional video. A mean score of -.2000 for Knowledge (SD: .44383) for promotional reading material group and -.2984 (SD: .66139) for promotional video group was obtained .While a mean score of .1952 for Attitude (SD: .44014) for promotional reading material group and .1171 (SD: .61889) for promotional video group while a mean score of -.1253 for Practices (SD: .35790) for promotional reading material group and .1278 (SD: .63035) for promotional video group while a mean score of .4000 (SD: .69921) for plaque index for promotional reading material group and .2000 (SD: .42164) for promotional video for pregnant women were calculated. Apparently, the results show that in the comparison of Knowledge, Attitudes, Practices and Plaque index of pregnant women utilizing the promotional reading material and video, only plaque index has a significant value but the rest have no significant value. Aruna et al., (2014) study resulted in insignificant difference between the lecture method of learning and computer assisted learning after the teaching process.

Table 12. *Knowledge, Attitude, Practices of Pregnant Women according to Age after Intervention*

	Age Group	N	Mean	Std. Deviation	Sig.	Verbal Interpretation
Knowledge	15-28 yrs. old	9	3.6526	.36313	.380	Not Significant
	29-40 yrs. old	11	3.6667	.46878		
Attitude	15-28 yrs. old	9	3.9048	.27664	.010	Significant
	29-40 yrs. old	11	3.8719	.63176		
Practices	15-28 yrs. old	9	2.2478	.68764	.918	Not Significant
	29-40 yrs. old	11	1.7475	.56462		
Plaque Index	15-28 yrs. old	9	3.2222	.44096	.302	Not Significant
	29-40 yrs. old	11	3.0000	.44721		

Table 12 presents the level of knowledge, attitude, practices and plaque index of pregnant women according to age group. A mean score of 3.6526 for Knowledge (SD: .36313) for age group 15 to 28 years old and 3.6667 (SD: .46878) for age group 29 to 40 years old while a mean score of 2.2478 for Practices (SD: .68764) for age group 15 to 28 years old and 1.7475 (SD: .56462) for age group 29 to 40 years old and a mean of 3.2222 for plaque index (SD: .44096) for age group 15 to 18 years old and 3.0000 (SD: .44721) for pregnant women were calculated. Apparently, the results show that the level of Knowledge and Practices of both age group are high and good, but they have no significant effect. In Clark et al., (2015) study, it is notable that the expression of configural learning vary between age groups. The result is in agreement with the study of Mandere (2013) which concluded that there is no significant difference in practices of oral health when age is considered.

On the other hand, a mean score of 3.8869 for Attitude (SD: 0.26806) for age group 15 to 28 years old and 3.8825 (SD: 0.60349) for age group 29 to 40 years old for pregnant women were calculated. Apparently, the results show that the level of Attitude of both age group is positive and has a significant effect.

Summary of Findings, Conclusion, and Recommendations

Summary and Findings

Based on the analysis and interpretation of data gathered in this study, the results are as follows:

In utilizing the promotional reading material, the knowledge during the pre-test period with mean of 3.7333 decreased in the post-test period with a mean of 3.5333, but both scores still remained on a high level of knowledge as they range between 3.41–4.20 as a result of not utilizing the given promotional reading material and those that are previously learned can't be unlearned easily. The attitude during the pre-test period having a mean of 3.8762 increased on the post-test period with a mean of 4.0714, but both scores on Attitude still remained on positive level as they range between 3.41–4.20 as a result their perception towards oral health has improved after utilizing the promotional reading material. The practices during the pre-test period with a mean of 2.0197 decreased during the post-test period with mean of 1.8944, but both scores on Practices still remained on a good level as they range between 1.51–2.50. As a result, their focus on practicing oral health care slightly improved after utilizing the promotional reading material. The plaque index during the pre-test period with mean of 3.000 increased during the post-test period with a mean of 2.6000, but both still remained on a poor level as they range between 3.51–4.50; thus, as a result their focus on practicing oral health care slightly improved after utilizing the promotional reading material.

On the other hand, in utilizing the promotional video, the knowledge during the pre-test period with mean of 3.5873 decreased to a mean of 3.2889 during the post-test period, which shows that from high level of knowledge it has decreased to an average level of knowledge . As the high-level ranges between 3.41–4.20 and average level ranges between 2.61–3.40 and the result of not utilizing the given promotional video and those that are previously learned can't be unlearned easily. The attitude during the pre-test period with a mean of 3.8971 increased to a mean of 4.0143 during the post-test period, but both scores on Attitude still remained on the positive level as they ranged between 3.41–4.2020 where as a result, their perception towards oral health improved after utilizing the promotional video. The practices during the pre-test period with a mean of 1.9256 increased to a mean of 2.0533 during the post-test period, but both scores still remained on a good level of practice as they ranged between 1.51–2.50. With this result, the researchers assumed that the respondents were confused and were not able to absorb the information properly after utilizing the promotional video. Lastly, the plaque index during the pre-test period with a mean of 3.2000 increased to a mean of 3.0000 during the post-test period, but both still remained on poor level as they ranged between 3.51–4.50. This result shows that their focus on practicing oral health care slightly improved after utilizing the promotional video.

The knowledge, attitudes and practices of pregnant woman have no significant effect when comparison was made with utilizing promotional reading material and promotional video but the plaque index of pregnant women has a significant effect. The knowledge, practices and plaque index of pregnant women when grouped according to age has no significant effect while the attitude has.

Conclusion

Based on the results the researchers conclude that the use of promotional reading material is a more effective oral health intervention rather than a promotional video as it resulted on having a more significant effect on the plaque index. The plaque index resulted on having a fair verbal

interpretation on post assessment period from poor verbal interpretation on the pre assessment period. Both interventions have a significant effect only on the attitude of the pregnant women on both age groups.

Thus, the researchers concluded that the null hypotheses that stated "There is no significant difference between the knowledge, attitude, and practices on oral health of pregnant women utilizing reading material and promotional video" is proven. But the null hypothesis "There is no significant difference between the plaque index on oral health of pregnant women utilizing reading material and promotional video" is not proven.

The knowledge, practices, and plaque index of pregnant women on oral health also remained in the same level of interpretation when grouped according to age. Therefore, the researchers concluded that the null hypotheses that stated that "There is no significant difference between knowledge, practices and plaque on oral health of pregnant women when grouped according to age." is proven. But the researcher's null hypothesis that stated "There is no significant difference between the attitude on oral health of pregnant women when grouped according to age" is not proven.

Recommendation

Proven that there is a significant effect on reducing the plaque index when exposed to promotional reading material; promotional reading material is more beneficial to be utilized to aid in the awareness on oral health among pregnant women. Also, the researchers recommend that a larger sample size must be gathered by future researchers to have more accurate representation of the population.

References

Al Khamis, S.; Asimakopoulou, K.; Newton, J.T.; Daly, B. (2016) Oral Health Knowledge, Attitudes, and Perceptions of Pregnant Kuwaiti Women: A Qualitative Study. *Jdr Clinical and Translational Research, 1*(3): 211-217, https;//doi.org/10.1177/2380084416665075

Azofeifa, A., Yeung, L. F., Alverson, C. J., & Beltra´n-Aguilar, E. (2014). Oral health conditions and dental visits among pregnant and nonpregnant women of childbearing age in the United States, National Health and Nutrition Examination Survey, 1999–2004. *Preventing Chronic Disease, 11*, E163. http://dx.doi.org/10.5888/pcd11.140212

Bouzaglou A, Aubenas I, Abbou H, Rouanet S, Carbonnel M, Pirtea P and Ayoubi JMB (2020) Pregnancy at 40 years Old and Above: Obstetrical, Fetal, and Neonatal Outcomes. Is Age an Independent Risk Factor for Those Complications? *Front. Med.* 7:208. https;//doi.org/10.3389/fmed.2020.00208

Chia Yee Yong (2015). *Is Behaviorism the best remedy for behavior construction? A discussion about Behaviorism*. Chiayeeyong https://sites.google.com/site/chiayeeyong/master/semester2/adiscussionaboutbehviorism?fbclid=IwAR3GX_Agpf9iHCC2p16koYJysOqraxIBNVUTdrzwWnOGHf7joOr2FAsJo

Chuan-Chen Ho, Ming-Yung Chou. (2016). Periodontal status in Taiwanese pregnant women. *Journal of Dental Sciences*, Volume 11, Issue 2, 2016, Pages 146-151, ISSN 1991-7902, https://doi.org/10.1016/j.jds.2016.03.007.

Clark, R, Freedberg, M, Hazeltine E, Voss, MW (2015) Are There Age-Related Differences in the Ability to Learn Configural Responses? *PLOS ONE 10*(8): e0137260. https://doi.org/10.1371/journal.pone.0137260

Dagang NOT, Kakumoto HB (2011) Knowledge, attitudes and practices on oral health care of obstricians and pregnant women in a tertiary hospital

Deghatipour, M., Ghorbani, Z., Ghanbari, S., Arshi, S., Ehdayivand, F., Namdari, M. & Pakkhesal, M. (2019) Oral health status in relation to socioeconomic and behavioral factors among pregnant women: a community-based cross-sectional study, 19, 117 (2019). https://doi.org/10.1186/s12903-019-0801-x

Dr. Roshni Ramesh MDS1, Dr.Arun Sadasivan MDS2,Dr.S Reshmi MD(2017). Oral Health Awareness Among Pregnant Women in Neyyattinkara, Kerala- A Cross sectional Study https://pdfs.semanticscholar.org/46c9/1dc3bdad0043d4321354518fd0076b44f9f8 pdf

Emmatty, R., Mathew, J. J., & Kuruvilla, J. (2013). Comparative evaluation of subgingival plaque microflora in pregnant and non-pregnant women: A clinical and microbiologic study. *Journal of Indian Society of Periodontology, 17*(1), 47 51. https://doi.org/10.4103/0972-124X.107474

Field Health Services Information System (FHSIS), *DOH CALABARZON (2018) Dentalcare (Part 2) Pregnant Women and Older Person provided Region-IV CALABARZON. DOH.* http://ro4a.doh.gov.ph/images/Health_Statistics/Fied_Health_Service_Information_System/FHSIS_Quarterly_Report/Quarterly_Report_2018/Dent l_Care/FHSIStat_Dental_Care2_JanMar_2018.pdf?fbclid=IwAR263NuXBj1V8jk-6BQDcAxSnaPpSpOp_LkyhPKhq1hr_ZPNKeHXwluvbo

G Nair, Divya & J Fernandes, Sweety & Roach, Erna. (2015). Effectiveness of Video Assisted Childbirth Preparation on Knowledge, Childbirth Experience & Stress. *International Journal of Nursing Education, 7*. 229. 10.5958/09749357.2015.00110.5.

Gambhir, R. S., Nirola, A., Gupta, T., Sekhon, T. S., & Anand, S. (2015). Oral health knowledge and awareness among pregnant women in India: A systematic review. *Journal of Indian Society of Periodontology, 19*(6), 612–617. https;//doi.org/10.4103/0972-124X.162196

Geethapriya, P. R., Asokan, S., & Kandaswamy, D. (2017). Comparison of Oral Health Status and Knowledge on Oral Health in Two Age Groups of Schoolchildren: A Cross-sectional Study. *International Journal of Clinical Pediatric Dentistry, 10*(4), 340–345. https://doi.org/10.5005/jp-journals-10005-1462

George A., Johnson M., Blinkhorn A., Ajwani S., Bhole S., Yeo A.E., Ellis S. (2013). The oral health status, practices, and knowledge of pregnant women in south western Sydney, https;//doi.org/10.1111/adj.12024

Hafsatou Diop, Sunah Hwang, David Leader, Hugh Silk, Lucy Chie, Emily Lu, Sarah L. Stone, and Katherine Flaherty (2016). Massachusetts Oral Health Practice Guidelines for Pregnancy and Early Childhood Source: Massachusetts Oral Health Practice Guidelines for Pregnancy and Early Childhood

Kaur S, Kaur B, Ahluwalia SS (2015) Oral Health Knowledge, Attitude and Practices amongst Health Professionals in Ludhiana, India. *Dentistry* 5:315. https;//doi.org/10.4172/21611122.1000315

Kelly, J., (2012) Learning Theories: The Learning Center. http://thepeakperformancecenter.com/educational-learning/learning/theories/

Krapfl, *J.E. BEHAV ANALYST* (2016) 39: 123. https://doi.org/10.1007/s40614-0160063-8

Latif, Rusnani & Dahlan, Akehsan & Abdul Mulud, Zamzaliza & Nor, Mohd. (2017). The Impact of Rusnani Concept Mapping (RCM) on Academic Achievement andClinical Practices among Diploma Nursing Students. *Education in Medicine Journal, 9*. 1-12. 10.21315/eimj2017.9.4.1.

Mandere, S. (2013). A Survey on the knowledge, attitude, and practices in oral health of pregnant women in Imperial and Muzon areas of Silang, Cavite

Marcenes, W., Kassebaum, N. J., Bernabé, E., Flaxman, A., Naghavi, M., Lopez, A., et al. (2013). Global burden of oral conditions in 1990–2010: A systematic analysis. *Journal of Dental Research, 92*(7), 592–597

Maspero, C., Fama, A., Giannini, L., Galbiati, G., Batia, S., Farronato, M. (2020).Preventive hygiene protocol of University of Milan for women during pregnancy: A qualitative and quantitative bacterial plaque analysis prospective original study. *The Saudi Dental Journal*,Volume 32, Issue 1, 2020, Pages 29-35, ISSN 10139052, https://doi.org/10.1016/j.sdentj.2019.05.007.

Merriam Webster Dictionary (1828). https://www.merriamwebster.com/?fbclid=IwAR24lXOQTL3MIq8oCcC1tx4hpBWr861Lqr310x3osuv9DxF-gnFOPSfyWr0

Mustafa Naseem, Zohaib Khurshid,Hammad AliKhan, Fayez Niazi, Sana Zohaib and Muhammad Sohail Zafar (2016).Oral health challenges in pregnant women: Recommendations for dental care professionals. https://doi.org/10.1016/j.sjdr.2015.11.002

Naseem Shah, Vijay Prakash Mathur, Vartika Kathuria, and Tanupriya Gupta(2016). Effectiveness of an educational video in improving oral health knowledge in a hospital setting. 7(2): 70–75. doi: 10.4103/0975-962X.184646

Nenava,Darpan (2015). Dental indices https://www.slideshare.net/darpannenava/dentalindices?fbclid=IwAR0NwKx1z UEYjqM65mnyDtUnFJWtPSWbk1eerF6qPvuIqy13tYUIy_XETA

Nickbin-Poshtamsary,S., Emam-Sigaroudi, A., Farmanbar, R., Radafshar, G., Atrkar Roushan, Z., (2018) The Effect of Educational Program on Dental Plaque and Caring Performance of Pregnant Mothers. *CJHR. 2018; 3*(2) :58-63 URL: http://cjhr.gums.ac.ir/article-1-87-en.html

Nogueira BML, Nogueira BCL, Fronseca RRdS, Brandao GAM, Menezes TOdA and Tembra DPdS (2016) Knowledge and Attidudes of Pregnant Women about Oral Health.

Oral Health Care During Pregnancy Steering Committee (2018). Oral Health Care During Pregnancy: Practice Guidance for Maryland's Prenatal and Dental Providers. Baltimore, MD: Maryland Department of Health, Office of Oral Health

Oral health. (n.d.) Farlex Partner Medical Dictionary. (2012). https://medical-dictionary.thefreedictionary.com/Oral+health

Rigo, L.,Dalazen, J., &Garbin, R.R. (2016). *Impact of dental orientation given to mothers during pregnancy on oral health of their children, 14*(2): 219–225.doi:10.1590/S1679-45082016AO3616

Roshani M. Chawla, Sahana H. Shetiya, Deepti R. Agarwal, Pranjan Mitra, Nikhil A. Bomble, D. Satya Narayana (2017). Knowledge, Attitude, and Practice of Pregnant Women regarding Oral Health Status and Treatment Needs following Oral Health Education in Pune District of Maharashtra: A Longitudinal Hospital based Study. *J Contemp Dent Pract. 2017 May 1, 18*(5): 371–377. Published online 2017 May 1.

Saskatchewan Prevention Institute (2014). *Knowledge, Attitudes, Beliefs, and Practices Regarding Oral Health among Pregnant Women* [Review]. https://www.google.com/url?sa=t&source=web&rct=j&url=https%3A%2F%2Fsprevention.ca%2Fwp-content%2Fuploads%2F2016%2F11%2FKnowledge-Beliefs-Regarding-Oral-Health-Among-Pregnant-Women-Lit-Review.pdf&ved=2ahUKEwiuw4KVq3iAhUTH3AKHflaBS8QFjADegQICBAB&usg=AOvVaw1QVAmrYJgiz6xbBkLBrme

Selvarajan, N. B., Krishnan, R., & Kumar, S. (2019). Effect of Dental Health Education on the Knowledge and Attitude Among Expectant Mothers: A Questionnaire Study. *Journal of pharmacy & bioallied sciences, 11*(Suppl 2), S194–S197.https;//doi.org/10.4103/JPBS.JPBS_293_18

Shah, N., Mathur, V., Kathuria, Gupta (2016). Effectiveness of an educational video in improving oral health knowledge in a hospital setting. *Indian J Dent. 2016 Apr Jun, 7*(2): 70–75. https;//doi.org/10.4103/0975-962X.184646

Shanmugam, A., P, Thenmozhi (2014). *Comparative Study to assess the effectiveness of lecture method of learning versus computer assisted learning*.

Shedlin, M. G., Birdsall, S. B., & Northridge, M. E. (2018). Knowledge and behaviours related to oral health among underserved older adults. *Gerodontology, 35*(4), 339–349. https://doi.org/10.1111/ger.12367

Sheyla Costa de Oliveira, Marcos Venícios de Oliveira Lopes & Ana Fátima Carvalho Fernandes (2014). Development and validation of an educational booklet for healthy eating during pregnancy. *Rev. Latino-Am. Enfermagem* vol.22 no.4 Ribeirão Preto July/Aug. 2014 http://dx.doi.org/10.1590/0104-1169.3313.2459

Soben P. (2008) Essentials of Preventive and Community Dentistry 3e. Arya (MEDI) *Publishing House* (INDIA)

Sözen, Erol & Guven, Ufuk. (2019). The Effect of Online Assessments on Students' Attitudes Towards Undergraduate-Level Geography Courses. *International Education Studies, 12*. 1. 10.5539/ies.v12n10p1.

Sudan H.M. El-Mahdi Ibrahim, A.M. Mudawi and I.A. Ghandour (2016).Oral health status, knowledge and practice among pregnant women attending Omdurman maternity hospital.

Sunita Bamanikar&Liew Kok Kee (2013).Knowledge, Attitude and Practice of Oral and Dental Healthcare in Pregnant Women. 28(4): 288–291. https;//doi.org/10.5001/omj.2013.80

Thomas, N.J., Middleton, P.F. & Crowther, C.A. (2008). Oral and dental health care practices in pregnant women in Australia: a postnatal survey. BMC Pregnancy Childbirth 8, 13 (2008). https://doi.org/10.1186/1471-2393-8-13

Tinosi, A.; Sales-Piresi, S. (2010). Knowledge of pregnant before and after of the application of an educational manual in oral health.Universidade de São Paulo, Faculdade de Odontologia, Departamento de Odontopediatria, Ortodontia e Saúde Coletiva. *Al. Octávio Pinheiro Brisolla*, 9-75, 17012-901, Bauru, SP, Brasil.

World Health Organization. (2020). *Adolescent pregnancy*. https://www.ho.int/newsroom/factsheets/detail/adolescentpregnancy?fbclid=IAR2vCEsSsaAHv3gwmtUMWmFnMaIrKsQMN2No5GVjSz2FMUtHRmDx0Mdx18

Effects of a Physical Activity Program on Knowledge, Attitude and Practices, and Health Status among Adults

Mariefe R. Echavez, Gladys Mae R. Laborde
Adventist University of the Philippines
hisubido@aup.edu.ph

Abstract

Physical activity plays a significant role in health promotion as well as the prevention of non-communicable diseases among adults. Inadequate physical activity is one of the risk factors that lead to death worldwide. The goal of this health education program is to improve the knowledge, attitude, and practices on physical activity as well as the health status of adults in a town in Romblon through the use of lifestyle medicine modalities. The study consists of two phases. The first phase was a needs assessment which is a descriptive design and the second phase was a case study. Fifty-five respondents answered the needs assessment survey. Six participants were selected for the case study through 55 sampling. The result shows that after the program, there was a 40.5% improvement in the knowledge of the participants on physical activity based on the pre-test and post-test given. The knowledge score improved from *poor* to *very high*. Moreover, the pre-test showed a *positive* attitude (M = 2.78) and the post-test reflected a *very positive* attitude (M = 4.00). The physical activity level of the participants before the program was at *low* level (M = 1.30) and improved to *high* level (M = 2.67) after the program. In addition, health status in terms of blood pressure, resting heart rate, and BMI were improved. The study concludes that the health education program on physical activity was successful in improving the knowledge, attitude, and practices of the participants. Hence, promoting physical activity can help to develop awareness among adults and improve their health. Further study is recommended focusing on barriers and benefits of physical activity.

Keywords: *Knowledge, Attitude, Practices, Physical Activity*

The Problem and its Background

A regular and adequate level of physical activity reduces the risk of noncommunicable diseases (NCDs) such as cardiovascular diseases, cancer, and diabetes. It is also associated with reduced risk of mortality from cardiovascular disease, cancer, chronic lower respiratory tract diseases, accidents and injuries, Alzheimer's disease, diabetes mellitus, influenza and pneumonia, and nephritis, nephrotic syndrome, or nephrosis (Zhao et al., 2020). However, inadequate physical activity is a worldwide public health problem because one in four adults is not active enough (World Health Organization [WHO], 2018). Physical inactivity is associated with an increased risk of premature death (Carlson et al., 2018). This study of physical activity is one of the current needs globally and locally due to the need of every middle-aged adults physical inactivity. World Health Organization (WHO, 2019) defined physical activity as any bodily movement produced by skeletal muscles that require energy expenditure. Popular ways to be active are through walking, cycling, sports and recreation, and can be done at any level of skill and for enjoyment.

The term "physical activity" should not be confused with "exercise", which is a subcategory of physical activity that is planned, structured, repetitive, and aims to improve or maintain one or more components of physical fitness. Beyond exercise, any other physical activity that is done during leisure time, for transport to get to and from places, or as part of a person's work, has a health benefit (WHO, 2019).

According to WHO (2018) rates of physical inactivity throughout the world suggest that the promotion of regular physical activity is effective. Countries must develop or update their policies and allocate the necessary resources to increase physical activity," Bull (2019) quotes that "Policies should increase all forms of physical activity, including through physical education that develops physical literacy, more sports, active play and recreation opportunities, as well as providing safe environments so young people can walk and cycle independently. Further he said, comprehensive action requires engagement with multiple sectors and stakeholders, including schools, families, sport and recreation providers, urban planners, and city and community leaders.

Thus, to improve adherence to physical activity, health professionals should strengthen the health message with the more compelling argument that "physical activity makes life worth living". Increasing physical activity is not just global and local issues but it is also an individual issue. Perhaps it requires a whole of society and culturally relevant approach and therefore demands a collective effort across different sectors and disciplines. While this is characteristic of life in the developed countries, this has now invaded Philippine shores and wreaked havoc on the health and wellness of our citizenry.

According to Philippine National Guidelines on Physical Activity (2010), in every walks of life, in every age groups, there is development of a trend toward sedentary lifestyle. As a result of increases in physical inactivity, overweight and obesity increased. Thus, there is an urgency to promote physical activity among adults in the Philippines. Hence, there is a need to design and implement a program on physical activity.

Goal and Objectives

The goal of this health education program is to improve the effects of a Physical Activity program on knowledge, attitude, and practices and health status among adults. The study sought to answer the following questions:

1. What is the demographic information of the participants in terms of age, marital status, educational attainment, occupation, and monthly income.
2. What is the health status of the participants in terms of blood pressure, resting heart rate, and BMI before and after the physical activity program.
3. What is the level of knowledge, attitude, and practice of participants before and after the physical activity program?
4. How does the physical activity intervention affect the health of the participants?

Scope and Limitation of the Study

The study was participated by the adults in Mabulo. It determined the changes in level of knowledge, attitudes, and practices regarding physical activity after the implementation of the program. It also revealed the health outcomes of the program in terms of blood pressure, heart rate, and BMI.

There were eight sessions which included lectures about physical activity such as staying active, demonstration of physical activity by coordinator, question and answer portion, and demonstration of physical activity by groups. This study was limited only on the health status, knowledge, attitude, and practices among adults. A structured questionnaire was used to determine demographic profile, background assessment, and assessment in knowledge, attitude and practice and based on the identified needs, a health education program about physical activity was created and implemented among six participants who were chosen thoroughly to undergo with the program.

Significance of the Study

The importance of this study is to promote and educate the adults in Mabulo, San Fernando, Romblon about the importance of physical activity, to enhance educational awareness and wellbeing in their knowledge, attitude and practice. It would be beneficial for the following:

Adults. This program were effective among the adults in the community. As it resulted to a better understanding of the importance of regular physical activity upon themselves and to their household in general. And the rest of the household were benefited as well with the program.

Barangay Mabulo Community. With the helped of this study the community were provided with program such as lectures, demonstrations and on-site education to enhance the knowledge, attitude and practice of the community in regards to physical activity.

Researchers. This researched was a basis and a guidelines for the researchers to perform with more thorough study or to further the study in the future.

Review of Literature

This chapter further presents the review of literature of physical activity among adults. Other related studies discussing physical activity and physical inactivity that contributes knowledge, attitude and practices that promotes physical activity, and lifestyle intervention in relation to physical inactivity.

Magnitude of the Problem

Inadequate physical activity is one of the risk factors that lead to death worldwide. Insufficient physical activity is a key risk factor for non-communicable diseases (NCDs) such as cardiovascular diseases, cancer, and diabetes. Thus, physical activity has significant health benefits and contributes to prevent NCDs. According to World health Organization (2019) Globally, 1 in 4 adult is not active enough. And more than 80% of the world's adolescent population is insufficiently physically active. Further, policies to address insufficient physical activity are operational in 56% of WHO Member States. WHO Member States have agreed to reduce insufficient physical activity by 10% by 2025 (WHO, 2019).

The magnitude of the problem of physical activity is the leading key for non-communicable disease. Thus, it has negative results in the quality of life and the effect on mental health. Updates from different countries globally indicate the adequate increase of physical inactivity and affects all walk of life. Studies had shown global age -standardized prevalence of insufficient physical activity was 27·5% (95% uncertainty interval 25·0–32·2) in 2016, with a difference between sexes of more than 8 percentage points (23·4%, 21·1–30·7, in men vs 31·7%, 28·6–39·0, in women). Between 2001, and 2016, levels of insufficient activity were stable (28·5%, 23·9–33·9, in 2001; change not significant). The highest levels in 2016, were in women in Latin America and the Caribbean

(43·7%, 42·9–46·5), south Asia (43·0%, 29·6–74·9), and high-income Western countries (42·3%, 39·1–45·4), whereas the lowest levels were in men from Oceania (12·3%, 11·2–17·7), east and southeast Asia (17·6%, 15·7–23·9), and sub-Saharan Africa (17·9%, 15·1–20·5). Prevalence in 2016 was more than twice as high in high-income countries (36·8%, 35·0–38·0) as in low-income countries (16·2%, 14·2–17·9), and insufficient activity has increased in high-income countries over time (31·6%, 27·1–37·2, in 2001).

Stevens (2018) indicates, "If current trends continue, the 2025 global physical activity target (a 10% relative reduction in insufficient physical activity) will not be met. Policies to increase population levels of physical activity need to be prioritized and scaled up urgently."

Physical inactivity and lack of exercise are major societal health problems. Most experts in exercise psychology, if asked how to support people in growing their motivation for physical activity and exercise, would probably recommend shifting the decisional balance by creating a belief that there are more benefits to be had from becoming active than barriers to be overcome, bolstering their appraisals of self-efficacy, and creating social environments that promote perceptions of autonomy, competence, and relatedness (Biddle & Vergeer, 2019).

These recommendations are evidence-based (e.g., Teixeira et al., 2012; Young et al., 2014). Many empirical studies show that people who are sufficiently physically active differ in these variables from those who are less active. There are also longitudinal and intervention studies demonstrating that changing these motivational variables makes behavior change more likely.

A study shows that physical inactivity is now described as a pandemic that needs urgent action. And research showed that 1 in 4 adults in the world are inactive (Haileamlak, 2019). It is evidenced that physical inactive people are 20-30% times more likely at risk of death compared to active individuals or adults.

Noncommunicable diseases (NCDs) contribute to two-thirds of the world's deaths. Nearly 80% of NCD deaths, close to 30 million per year, occur in low- and middle-income countries. Several factors influence the occurrence of NCDs including diet and lifestyle. As earlier, physical inactivity is the major risk factor for non-communicable diseases. About 9% of all deaths globally are attributed to physical inactivity (Haileamlak, 2019).

There are other ways to avoid this magnitude of impact of physical activity, having physical exercise is the best option or best way to increase physical activity. Every countries must plan lifestyle intervention with aimed to promote knowledge, attitude and cardio vascular diseases. Further, introduce the lifetyle medicine intervention education program that will enhance the knowledge, attitude and practices on physical activity among adults.

Risk Factors

According to WHO, (2018) globally, around 23% of adults aged 18 and over were not active enough in 2010 (men 20% and women 27%). In high-income countries, 26% of men and 35% of women were insufficiently physically active, as compared to 12% of men and 24% of women in low-income countries. Low or decreasing physical activity levels often correspond with a high or rising gross national product. The drop in physical activity is partly due to inaction during leisure time and sedentary behavior on the job and at home. Likewise, an increase in the use of "passive" modes of transportation also contributes to insufficient physical activity.

The risk factors of physical activity for non-communicable diseases (NCDs) such as cardio vascular diseases, cancer, and diabetes. Thus, physical activity has a significant health benefits and healthy lifestyles that can intervene non-communicable diseases (NCDs). Studies showed that health risk are linked to physical inactivity as described by John Hopkins Medicine (2020) are as follows: Less active and less fit people have a greater risk of developing high blood pressure. Lack of physical activity can add to feelings of anxiety and depression. Physical inactivity may increase the risk of certain cancers. Inactivity tends to increase with age. However, Physical activity can reduce your risk for type 2 diabetes. Studies show that physically active people are less likely to

develop coronary heart disease than those who are inactive. This is even after researchers accounted for smoking, alcohol use, and diet. Physically active overweight or obese people significantly reduced their risk for disease with regular physical activity. Older adults who are physically active can reduce their risk for falls and improve their ability to do daily activities.

Centers for Disease Control and Prevention (2019) works to reduce the risk factors of the lack of physical activity and its harmful effects as such Heart Disease. Not getting enough physical activity can lead to heart disease, even for people who have no other risk factors. It can also increase the likelihood of developing other heart disease risk factors, including obesity, high blood pressure, high blood cholesterol, and type 2 diabetes. According to one study of physical activity that total absence of moderate to vigorous physical activity is connected with incidence of higher cardiovascular morbidity and mortality as mentioned in this studies (Thompson PD, 2007). Not getting enough physical activity can raise a person's risk of developing type 2 diabetes. Physical activity helps control blood sugar (glucose), weight, and blood pressure and helps raise "good" cholesterol and lower "bad" cholesterol. Adequate physical activity can also help reduce the risk of heart disease and nerve damage, which are often problems for people with diabetes. Epidemiological studies have suggest that moderate-to-vigorous physical activity protects against the development of type 2 diabetes as well as the metabolic syndrome, which often lead up to diabetes and cardiovascular disease (Matti Uusitupa, S. & Keinanen-Kiukaanniem (2002). Physical activity not only helps control high blood pressure (HBP or hypertension), it also helps you manage your weight, strengthen your heart and lower your stress level. A healthy weight, a strong heart and general emotional health are all good for your blood pressure (Health Topics, 2016). Getting the recommended amount of physical activity can lower the risk of many cancers, including cancers of the bladder, breast, colon, uterus, esophagus, kidney, lung, and stomach. These effects apply regardless of weight status. Research shows that people who exercise regularly appear to have a lower cancer risk and those who regularly physically active are less to develop lung cancer (Cancer. Net Editorial Board, 2019).

Best Practices for Preventive Health Management

Unhealthful lifestyle behaviors are the main source of global burden of NCD's that accounted up to 71% of death worldwide. (WHO, 2021). The directive of lifestyle medicine come out as organized approach for the management of chronic diseases or NCD's. The practice of lifestyle medicine requires skills and ability in addressing numerous health risk behaviors and improving health management. Effective communication between lifestyle medicine provider and participant is a vital element for promoting behavior change - the main element of lifestyle medicine.

Lifestyle medicine use evidenced- based lifestyle therapeutic intervention that include six course of action to manage someones health. To treat and counter illness by replacing unhealthy behaviors with positive ones (Casey,2021)

Six pillars of lifestyle medicine are as follows:

Nutrition. Basically consumption of foods that are full of nutrients and fiber, mostly whole, derived from plant such as vegetables, fruit, beans, lentils, whole grains, nuts and seeds. Studies shows that a low-fat, plant-based diet that improved coronary artery disease stenosis and maintained that disease reversal at five years (kelly & Shull, 2019).

Exercise. Most effective personal used of physical activity plans. Walking, gardening or jogging, these need to maintained beacause this are parts of physical activity. According to kelly & Skull (2019) Avoid prolonged sitting throughout the day, and include movement the day, exercise is medicine.

Stress. Managing stress can lead to improved with healthy coping strategies. Anxiety, depression, obesity, immune dysfunction and more will reversed as long as you know how to manage stress and reduction techniques leads to improved wellbeing. Studies had shown that meditation

can decrease the negative impact of stress, however, more research is needed on meditation to promote happiness (Kelly & Skull, 2019).

Substance Abuse. Positive behaviors that improve health cessation of tobacco used and limiting the intake of alcohol can helped reverse your lifestyle. Kelly & Skull (2019) quotes, " Behavioral intervention such as listen and reflect to assure understanding, non-judgemental and accepting, roll with resistance and accept setbacks as expected, and know that changes may be slow.

Sleep. Improving sleep is what all we need. Lack of quality sleep can lead to a laboured immune system. Coping behaviors to improve sleep will increased your immune system and healthy lifestyle. Kelly & Skull (2019) suggests to identify the lefestyle-based activity and the dietary, environmental and coping behaviors that can imrpoves sleep health.

Relationships. Maintaining a healthy relationships and social connectedness are essential to emotional resilliency. Research had shown that connectedness/social networks and emotional well-being, physical health and longevity can influence healthy relationship (kelly & Skull, 2019).

Theoretical Framework

The transtheoretical Model of Behavior Change (TTM) is a stages of change that helps to assess where an individual is in the process of behavioral change (Rippe, 2019). One of the most popular models for studying physical activity behavior is the transtheoretical model or the stages of change. The transtheoretical model has emphasized on describing how the attitude changes (John Wiley & Sons, 2008). This model believes that change happens gradually and in stages therefore must be accounted for when seeking to change a behavior (Kelly and Shull, 2019). The series of stages are Precontemplation, Contemplation, Preparation, Action, Maintenance, and Termination.

Precontemplation

It is a stage wherein the individual has no intention to undergo changes usually for the next six months. Factors affecting this stage are: 1) lack or insufficient knowledge regarding the results of unhealthy behavior, and 2) past failures to change and so have lost the morale to start over again. Attitudes to watch out are: being resistant, unmotivated, or not ready to join lifestyle change programs. Individuals in this stage are to be educated regarding the benefits of change including the proper estimation of cost as they tend to overestimate which causes them more harm to themselves and to others (Rippe, 2019).

Contemplation

It is a stage wherein an individual has the intention to undergo changes within the next six months. This individual has awareness of the benefits and the proper estimation of the cost. However, weighing the benefit and the cost may cause them to be stuck in this stage for quite some time and thus are not yet prepared to change (Rippe, 2019).

Preparation

It is a stage wherein an individual has the intention to change immediately for the next one month. This individual has plans to join lifestyle programs and have things needed prepared already (Rippe, 2019).

Action

It is a stage wherein an individual has specific, clear, and detailed lifestyle changes plans applicable for the next six months. However, this individual must reach research-based criteria depending on a behavior that they want to change to assure reduction of disease risk (Rippe, 2019).

Maintenance

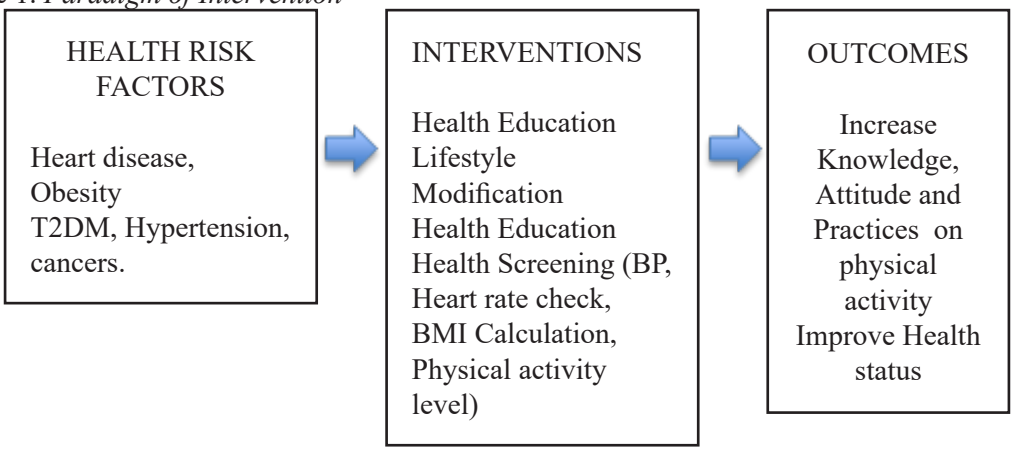
It is a stage wherein an individual is working to prevent relapse. This individual has growing confidence in sustaining the lifestyle changes made and is less tempted to do otherwise. Studies suggest that this stage lasts from six months to five years. One important factor of Maintenance is a well-prepared action plan to sustain maintenance and to prevent relapse (Rippe, 2019).

By considering the transtheoretical model for individual's level of readiness for change when setting physical activity goals and developing exercise program helps to avoid the changes that the client is hesitant to adopt.

Paradigm of Intervention

Figure 1 shows the paradigm which aimed on the improvement of knowledge, attitude, practices on physical activity and health status among adults.

Figure 1. *Paradigm of Intervention*



Methodology

This section explains in detail the methods used in conducting the study. This study used a qualitative perspective in analyzing the experiences of participants who underwent a physical activity program. It includes the research design, sampling techniques and Data gathering procedure.

Research Design

Generally, the study utilized two phases of research design. The first phase was descriptive design (quantitative) also known as the needs assessment. And the second phase was a case research study, known as qualitative research design.

Sampling Technique

The program was conducted in Mabulo, San Fernando, Romblon. The researcher selected 55 participants for the first phase to respond to the need assessment survey. The second phase, selected six participants among adults. It utilized the convenience sampling method also known as availability sampling. The subjects of this non-probability sampling technique are selected because of their availability. Due to this reason, samples cannot be used as a representation of the whole population (Gravetter & Forzano, 2011).

Data Gathering Procedure

The data was gathered through paper survey method purposively distributed to the targeted participants who join in physical activity. The data collection was carried out in the first and eight sessions of the program. Prior to the filling of survey questionnaires, the research's names and purpose of the survey were explained to the participants individually. All participants voluntarily

participated the study. Due to COVID-19 protocol, distancing was applied, and the data of the six participants were utilized for pre-assessment and post-assessment of this program.

Program Protocol

Move – Move your way: Effects of a Physical Activity Program on Knowledge, Attitude and Practices, and Health Status among Adults. This is the health education program module that was implemented for the participants at least eight (8) sessions.

Title of the Module: Move – Move Your Way: Effects of a Physical Activity Program on Knowledge, Attitude and Practices, and Health Status among Adults.

"Move – move your way" is a promotion program that emphasize the importance of physical activity to prevent non communicable diseases by checking the blood pressure, sedentary lifestyle, (BMI) Body mass Index and heart rate before and after the activity, Global Physical Activity questionnaire (GPAQ) before and after the end of the program and compare the results. This study features the composition of knowledge, attitude and practices. The goal is to reach the highest level of knowledge, attitude and practice of physical activity among adult in Mabulo, San Fernando, Romblon.

"Move – move your way" program is comprises of eight sessions modules approximately eight weeks that embodied with specific schedule according to the availability of the participants and the severity of COVID 19 situation in the area. The first session is launching of the program that comprises the awareness, distribution of pre-test questionnaires and learning application process by means of demonstrating the importance of physical activity and formation of adults club. Further, let them aware of the COVID19 protocol to prevent transmission and sustainability of the program.

The consecutive six sessions from session two to seven sessions comprised of assessment, evaluation, demonstration, and further awareness of the risk of physical inactivity. The eight sessions is the closing program and the gathering of post-test questionnaire and presentation of certificate of accomplishment among adults who successfully finished the program.

"Move – move your way" was created among adults of barangay Mabulo who have poor access on health services and health education as based on my observations to this community for the past years. Based on some interview there are some cases of physical inactivity among adults in this particular area. This program was able to address adult's knowledge, attitude, and practices on physical activity. Further the program was able to help them to take appropriate action when their families and friends are in their sedentary lifestyle by utilizing the importance of physical activity.

Statement of Goals and Objectives with Evaluative Criteria

The goal of this health education program is to reach the highest level of Knowledge, Attitude, and Practices on Physical Activity among adults with risk factor of Non communicable Diseases in Mabulo in San Fernando Romblon.

Knowledge Objective

At the end of the program 50% of the participants will have a 30% increase in general knowledge about physical activity based on pre-test/post test scores.

Evaluative criteria: The objective will be considered met if 50% of the participants are able to show 30% of increase in knowledge based on the results of the pre-test and post-test. This will be evaluated by administering test before and after the program to determine the percentage of knowledge obtained by the participant. Below is the illustrated formula to compute the % increase in knowledge.

$$\% \text{ increase in knowledge} = \frac{\text{Post test score- Pretest score}}{\text{Pretest score}} \times 100$$

Attitude Objective

At the end of the program 80% of the participants will show positive outlook about physical activity.

Evaluative criteria: Before the end of the 8 sessions program, the participants will manifest the following such as: Become a promoter of physical activity to their community and to family. Motivate community by forming a group, who will do physical activity, like an aerobic fitness group, this will be evaluated at the end of the program through a checklist and interview during the last session.

Practice Objectives

At the end of the program 80% of the participants will be able to perform moderate to high physical activity level.

Evaluative criteria: This objective will be considered met, if 80% of the participants are able to improve the physical activity level.

Target Audience

This module is designed among adults in barangay Mabulo who are having physical inactivity in their community and church.

Components and Activities

Table 1. *Week 1: Session 1*

Registration of participants
Opening Program
• Welcome Remarks
• Opening Prayer
• Awareness Talk – Program Host
• Q&A
• Instruction of Pre-test/Questionnaires
• Gpaq/assessment
• Closing Prayer

Table 2. *Week 2: Session 2*

a. Welcome Remarks
b. Opening Prayer
c. Ice Breaker – “Jumping Vex”
d. Organize the group (Division of groups to 5 groups) (assuming 30 participants)
Group activites
e. Lecture – Staying Active
f. Activity - Physical exercise (“Shake your Body”)
g. Evaluation of the program
h. Closing Prayer

Table 3. *Week 3: Session 3*

a. Assessment and Attendance
b. Prayer
c. Ice Breaker
d. Lecture – Cardiovascular Disease
e. Activity – “Let’s keep Moving”
f. Closing Prayer

Table 4. *Week 4: Session 4*

a. Roll call and Assessment
b. Prayer
c. Short activity: "Forward – Backward""
d. Lecture – Hypertension
e. Q & A
f. Activity – "Onward Forward"
g. Closing Prayer

Table 5. *Week 5: Session 5*

a. Assessment and Attendance
b. Welcome and Prayer
c. Group Feedback
d. Lecture – Healthy Living
e. Activity – " Shake your Booty"
f. Q & A of the participants
g. Closing Prayer

Table 6. *Week 6: Session 6*

a. Roll call and Review Attendants
b. Welcome and Prayer
c. Activity – Demonstration of Physical Exercise
d. Q & A of participants
e. Closing Prayer

Table 7. *Week 7: Session 7*

a. Roll call and Review Attendants
b. Welcome and Prayer
c. Group Activity – "Brainstorming"
d. Activity – Physical Activity Reloaded
e. Q & A of participants
f. Closing Prayer

Table 8. *Week 8: Session 8*

a. Roll call
b. Welcome and Prayer
c. Evaluation/Assessment/Post-test Questionnaires
d. Group presentaion of learned knowledge
e. Distribution of Certificate
f. Closing Prayer

Results and Discussion

This chapter contains the results and discussion of the goal and objectives of the study in terms of the demographic information of the participants age, marital status, educational attainment, occupation, and monthly income, as well as the health status of the participants in terms of blood pressure, body mass index and global physical activity questionnaires before and after the program. Further, this chapter presents the level of knowledge, Attitude, and Practices of participants before and after the program and will answer how the physical activity intervention affected the participants after the program. A series of programs were conducted using a module.

The program lasted for eight successive sessions with seminars on different health topics and daily physical activities in relevant to the needs of each participants.

Participants' Demographic Information

The first research objective was pertains to the demographic information of the participants in terms of age, marital status, educational attainment, occupation, and monthly income. There were a total of six adults. Aged 39 to 61 years old as shown in table 2. The marital status are all married. Family occupation were businessmen, construction, house keeper and fishermen which comprised to a monthly income between 5,000 to 15,000. Table 9 presents the demographic information of the participants.

Table 9. *Participants' Demographic Information*

Age	**N (6)**
39	1
45	1
55	1
42	1
58	1
61	1
Marital Status	
Married	6
Single	0
Educational Attainment	
High School Graduate	3
College Graduate	3
Occupation	
Construction	1
Businessmen	1
House keeper	2
Fishermen	2
Monthly Income	
Between 5,000 - 10,000	4
Betweem 10,000 - 15,000	2

Participants' Health Status

The second research objective was to determine the health status of the participants in terms of blood pressure, Resting heart rate, BMI before and after the program. The tables 10, 11, and 12 indicates the participants overall health status.

Table 10. *Participants' Blood Pressure*

Participants		Pre-test	Classification	Post-test	Classification
1.	1	130/100	Stage 1	120/80	Elevated
2.	2	140/90	Stage 2	130/90	Stage 1
3.	6	160/100	Stage 2	140/80	Stage 2
4.	3	145/90	Stage 2	130/80	Stage 1
5.	5	130/100	Stage 1	120/80	Elevated
6.	4	138/80	Stage 1	118/80	Normal

Legend: Normal <120/80: Elevated 120-129/<80; Stage 1 130-139/80-89; Stage 2 >140/90

Table 10 revealed that half of the participants have stage 1 Hypertension (130 mmHg systolic / 90-100 mmHg diastolic) while the rest of them have stage 2 Hypertension or high blood pressure above 140/90 during the pre-test. However, after post-test one participant had normal blood pressure (118/80), two participants are elevated (120/80) , and two stage three (130/90, 130/80) and one stage two (140/80). Studies suggest that physical activity is an important factor for improving the general health and preventing the development NCDs (Reiner, 2013).

Experimental evidence from interventional studies have further confirmed a relationship between physical activity and hypertension as the favorable effects of exercise on blood pressure reduction have been well characterized in recent years (Diaz, 2014). Further, physical activity is commonly recommended as an important lifestyle modification that may aid in the prevention of hypertension.

Table 11. *Participants' Heart Rate*

Participants		Resting Heart Rate (Pre-test)	Resting Heart Rate (Post-test)
1.	1	66	64
2.	2	80	78
3.	6	70	70
4.	3	77	67
5.	5	72	71
6.	4	83	66

Legend: 60 -100 beats per minute (Normal); 100 – 150 (Fast)

Result shows that the resting heart rate of all the participants improved after the program. Participants 6 improved the most. At pre-test the resting heart rate is 83 and it became 66 at post-test.

Table 12. *Participants' BMI (Body Mass Index)*

Participants		Weight and Height Classification			
	Height	Weight (kg) (Pre-test)	Result (BMI)	Weight (kg) (Post-test)	Result (BMI)
1.	154.9	50.7	21.2	50.5	21.0
2.	163	57	21.6	56.5	21.3
3.	157	54.8	22.1	54.8	22.1
4.	157	66.8	26.9	67.5	27.2
5.	168	71	25.3	70.2	25.0
6.	168	63.8	22.8	63.2	22.4
Average			23.3		23.1

Legend: Underweight (BMI 18.5) ; Normal weight (BMI 18.5-22.99); Overweight (BMI 22.99-25); Class 1 Obesity (BMI 25-39.9)

The overall pre-test BMI was 23.3, which was considered normal, while the post-test showed 23.1; an improvement of 0.2. Generally, all the participants showed improved weight and BMI, except for the participants #4.

Participants' Level of Knowledge, Attitude, and Practices

This section explored research objective 3 which looks up the level of knowledge, attitude, and practices of participants after the pre-test and post-test of physical activity. Table 5 describes the results of the pre-test and post-test on knowledge.

Table 13. *Pre-test and Post-test Scores of Participants on Knowledge*

Participants	Pre-Test		Post-Test		Difference	% Change
	Score	Interpretation	Score	Interpretation		
1.	4	Poor	9	Very High	5	50
2.	5	Average	10	Very High	5	50
3.	4	Poor	8	High	4	40
4.	5	Poor	9	Very High	4	40
5.	7	High	10	Very High	3	30
6.	3	Poor	6	Average	1	10
Average	4.5	Poor	9	Very High	4.5	40.5

Legend: Verbal Interpretation: 9-10 – Very High; 7-8 –High; 5-6 Average; 4-3 – Poor Knowledge; 0-2 –Very poor

The pre-test participants had poor level of knowledge with an overall mean score of 4.5 and after the program, the participants' level of knowledge increased to the overall mean score of 9, which is interpreted very high. There were 40.5% changes in score from baseline and end line of the health promotion program. The result also shows that 5 out of 6 participants (83%) had at least 30% increase in knowledge on physical activity. Table 14 shows the attitude pre-test and post-test.

Table 14. *Attitude of the Participants Regarding Physical Activity*

Item	Pre-Test		Post-Test	
	Mean	Interpretation	Mean	Interpretation
1. The older I get, the more I need to increase my physical activity.	3.67	Positive	4.00	Very Positive
2. Gardening everyday is enough	3.25	Positive	4.00	Very Positive
3. I think that physical activity is important even for those who are not overweight/obese.	3.00	Postive	4.00	Very Positive
4. Physical activity will decrease my risk of developing stroke.	3.00	Positive	4.00	Very Positive
5. I think that 30 minutes of moderate physical activity, 5 times per week has a health benefit at all.	3.00	Positive	4.00	Very Positive
6. Physical activity will keep me healthy.	2.83	Positive	4.00	Very Positive
7. I like to do physical activity.	2.50	Negative	4.00	Very Positive
8. I choose physical activity rather than sitting.	2.50	Negative	4.00	Very Positive
9. I engage in physical activity for enjoyment	2.30	Negative	4.00	Very Positive
10. I like to do physical activity only with compasion	1.80	Negative	4.00	Very Positive
Overall	2.78	Positive	4.00	Very Positive

Legend: Verbal Interpretation: 1.00-1.75 Very Negative; 1.75-2.50 Negative; 2.51-3.25 Positive; 3.36-4.00 Very Positive

The result shows that the pre-test and post-test scores on attitude of the participants on physical activity. It shows that the pre-test had an overall mean of 2.78, which is interpreted as positive attitude while the overall mean score in the post-test was increased to overall mean of 4.00, which is interpreted as very positive. The result also shows that all the participants (100%) had positive outlook on physical activity. Table 7 presents the level of practices on physical activity.

Table 15. *Physical Activity Level Before and After the Program*

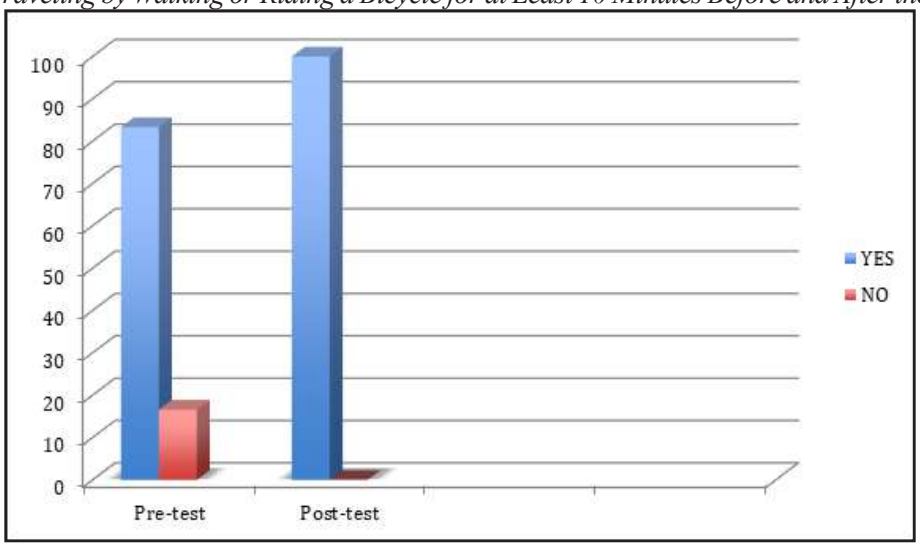
	Pre-Test			Post-Test		
	Mean	Met-Min/Week	Interpretation	Mean	Met-Min/Week	Interpretation
1.	1.6	Less than 600	Low	3.00	At least 3000	High
2.	1.6	Less than 600	Low	3.00	At least 3000	High
3.	1.6	Less than 600	Low	3.00	At least 3000	High
4.	1.00	Less than 600	Low	1.00	At least 600	Low
5.	1.00	Less than 600	Low	3.00	At least 3000	High
6.	1.00	Less than 600	Low	3.00	At least 3000	High
Overall	1.30	Less than 600	Low	2.67	At least 3000	High

Legend: 1.00-1.66 = Less than 600 (Low); 1.67-2.33 = At least 600 (Moderate); 2.34-3.00 = At least 3000 (High)

The result shows that the pre-test and post-test practices of the participants on physical activity. The overall mean score at pre-test is 1.30, which is interpreted as low practices while the overall mean score in the post-test improved with the mean score of 2.67, which is interpreted as high practices with the difference of 1.37 after the post-test.

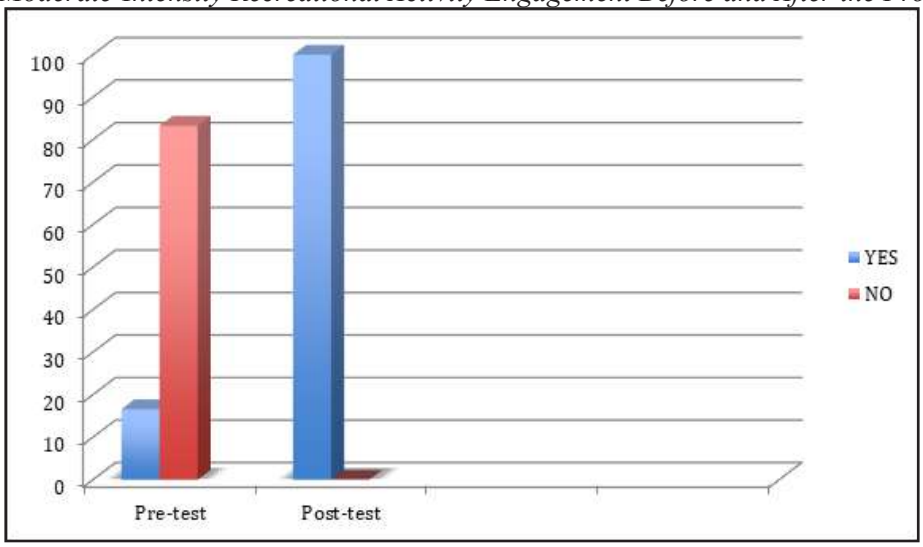
The result also shows that 5 out of 6 participants (83%) improved the physical activity. level. Recent studies show that when adults engage in physical activity, it will leads to health benefits, such as an increase in muscle power and improvement in mental health, physical health, cognitive functions, and self-assurance (Petterson, 2017). Figure 2 shows the result of the participants engagement by walking or using bicycle for at least 10 minutes continuously to get to and from places.

Figure 2. *Traveling by Walking or Riding a Bicycle for at Least 10 Minutes Before and After the Program*



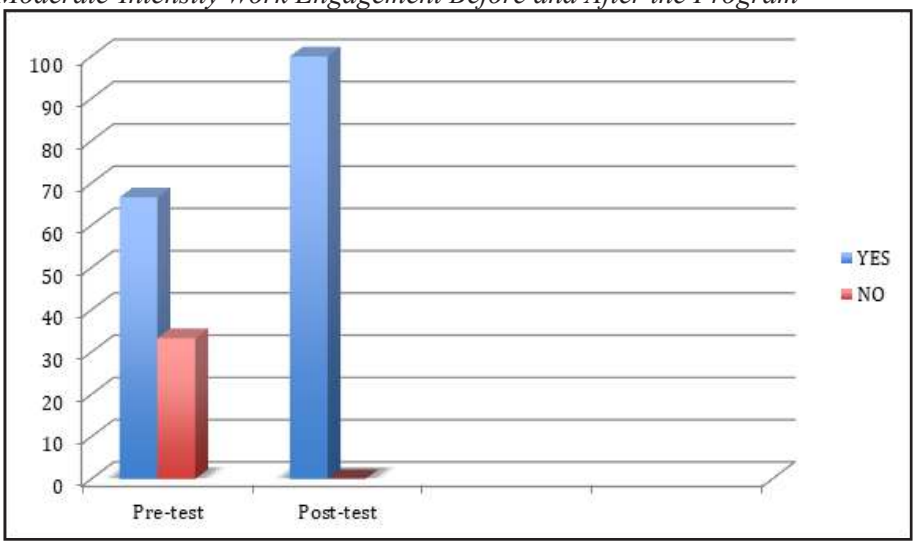
The result shows that at pre-test, 83.33% of the participants answered yes in walking or using bicycle for at least 10 minutes continuously to get to and from places, while 16.67% says no. The post-test has a result of 100% say answered yes using bicycle for at least 10 minutes continuously to get to and from places, while 0% say no. Figure 3 presents the result of participants engagement to moderate intensity sports, fitness or recreational activities that causes a small increase in breathing or heart rate such as brisk walking, (cycling, swimming, volleyball) for at least 10 minutes continuously before and after the program.

Figure 3. *Moderate-Intensity Recreational Activity Engagement Before and After the Program*



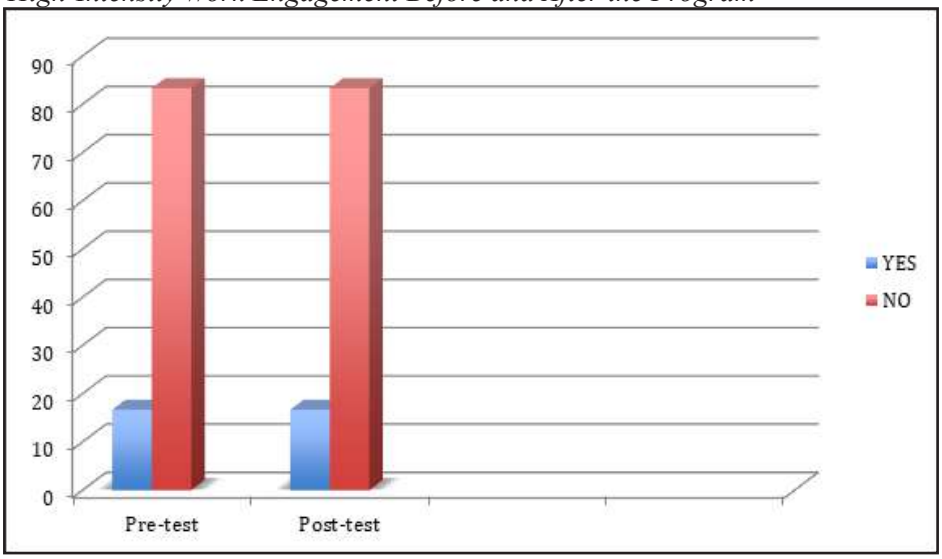
The results revealed that majority of the participants were not engaged in moderate – intensity sports, fitness or recreational activities with 83.3% answered no and that only 16.6% of the participants answered yes at pre-test. At post-test, 100% answered yes while 0% answered no involvement in moderate–intensity sports, fitness or recreational activities. Figure 4 shows the participants involvement to moderate – intensity physical activity that causes large increases in breathing or heart rate such as brisk walking or carrying light loads for at least 10 minutes continuously.

Figure 4. *Moderate-Intensity Work Engagement Before and After the Program*



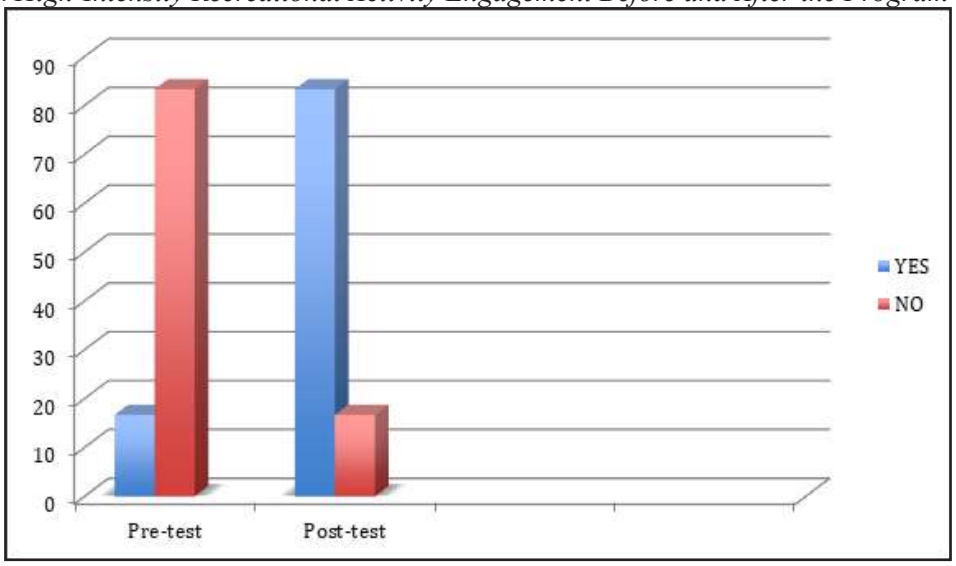
The result reveals that majority of the participants did not experience moderate –intensity physical activity that causes increases in breathing with 66.67% answered yes and 33.33% answered no at pre-test. At post-test 100% answered yes and 0% answered no involvement in moderate-intensity physical activity at work that increases in breathing or heart rate. Figure 5 presents the work involvement of participants to vigorous – intensity physical activity that causes large increases in breathing or heart rate like lifting heavy loads for at least 10 minutes continuously.

Figure 5. *High-Intensity Work Engagement Before and After the Program*



The result shows that at pre-test, 16.67% of the participants answered yes on work that involve vigorous – intensity physical activity that causes large increase in breathing, while 83.33% answered no. The post-test has a result of 16.67% who answered yes while 83.33% answered no. Figure 6 shows the vigorous – intensity sports, fitness or recreational activities engagement of the participants. These activities caused large increase in breathing or heart rate like running, football or other sports for at least 10 minutes continuously.

Figure 6. *High-Intensity Recreational Activity Engagement Before and After the Program*



The result shows that majority of the participants did not experience vigorous –intensity sports, fitness or recreational activities with 83.3% answered no and that only 16.67% of the participants answered yes at pre-test. At post-test, 83.33% answered yes while 16.67% answered no. Physical Activity has been proven to have a significant health benefits and contributes in preventing non-communicable diseases. Thus, further improves overall well-being in adults. Hence, promoting physical activity can help to develop awareness among adults and they become more conscious with their health and lifestyle. There should be more educational program be carried out by our health workers.

Effects of Physical Activity Intervention Program

Table 16 shows the summary of the effect of physical activity intervention program to the health status and knowledge, attitude and practice of the participants.

Table 16. *Effects of Physical Activity Intervention Program*

Overall Health Status	- Improved BMI - Improved Blood Pressure - Improved Heart Rate
Level of Knowledge	- Reached highest level of awareness - Participants' improved intellect
Attitude	- Participants attitude awareness change from positive to very positive on the need to be physically active. Example of a participant's comment: "It feels good when I do physical activity everyday, I had a good night sleep and my blood pressure normalized."
Practices	- Participants were able to achieve >150 minutes of moderate to vigorous intensity physical activity per week, and achieving change of diet and their lifestyle. - Participants created a group and performed physical activity every morning.

Studies has shown that many benefits of physical activity and the low prevalence rates, it is imperative that interventions be designed that effectively promote the adoption and maintenance of active lifestyles in large numbers of people, particularly among adults (Healthy People, 2010). According to Tom Walker, (2020) " Every move counts, especially now as we manage the constraints for the COVID-19 pandemic. We must all move every day safely and creatively." To improve commitment to physically active.

Health promoters and professionals should provide update for the health message with regards to physical activity, that can make life worth meaningful. Further, the use of lifestyle therapeutic intervention such as the use of whole grain food, plant based diet, restorative sleep, healthy eating, active living, healthy weight, avoidance of risky substances, and replacing unhealthy behaviors with healthy ones. These lifestyle medicine intervention were more helpful in preventing non-communicable diseases.

Summary, Conclusion, and Recommendation

This chapter discusses the summary, conclusion derived from the program, and the recommendations for future studies.

Summary

After the program, there was a 40.5% improvement in the knowledge of the participants on physical activity based on the pre-test and post-test given. Moreover, there was a 1.22 difference in the attitude of the participants from pre-test to post-test. The pre-test showed a positive response with a mean of 2.78 and the post-test reflected a very positive attitude with a mean of 4.00 after the program. Lastly, with the participants practices, there is a low response in the pre-test with a mean of 1.30; and a high response after post-test with a mean of 2.67. There was an 1.37 increase in practice of the participants from pre-test to post-test.

Conclusion

The study concludes that the health education program on physical activity was successful in improving the knowledge, attitude, and practices of the participants. Hence, educating physical activity were able to helped developed awareness among adults and improve their health status. Further study is recommended focusing on barriers and benefits of physical activity.

Recommendations

In light of the results and conclusions, the researcher recommends the following:

The participants should continue to incorporate physical activity daily with their family members, friends and the community to prevent non-communicable diseases. Also, they need to share the knowledge what they learned about physical activity.

The community health workers perform a wide range of vital healthcare roles in the community. They provide essential services that promote health, prevent diseases and deliver health care services to the communities. And because of these duties, community health care workers should be also well informed about physical activity so that they can raise awareness about physical activity in the community. They can provide many opportunities to physical activities like bicyle lanes, sidewalks sports fields and etc.

This study needs further qualitative research that should be done closely that integrates on the different factors that affects the behavioral changes among adults about physical activity.

References

A.F. Petterson, L.O. Wahlund, L. Bronge et al.,(2017) Physical Activity level in People with Age Related White matter Changes Correlates t better Motor performance, Lower Comorbidity and Higher Cognitive Level; MBC Geriatrics, vol. 17, no. 1, p. 142

Carson, J. A. S., Lichtenstein, A. H., Anderson, C. A. M., Appel, L. J., Kris-Etherton, P. M., Meyer, K. A., Peterson, K., Polonsky, T., and Van Horn, L. (2019). *Dietary Cholesterol and Cardiovascular Risk: A Science Advisory From the American Heart Association.* https://doi.org/10.1161/CIR.0000000000000743

Center for Disease Control and Prevention (2019) *Physical Activity Prevention and Facts*, USA

Cancer.Net Editorial Board (2019) *Physical Activity and Cancer Risk*. https://www.cancer.net/doctor-approved-patient-info-from-ASCO

Center for Disease Control and Prevention (2020) Physical Inactivity among Adults John Hpkins Medicine (2020) *Importance of Physical Activity*.

Casey, Leslie (2021) *American College of Lifestyle Medicine*. https://www.lifestylemedicineporg.

Freeman LW. Mosby's Complementary & Alternative Medicine: A Research-based Approach. *Elsevier Health Sciences, 2*; 2015.

Glanz K. Rimer BK, Viswanath K. Health Behavior and Health Education: Theory, Research, and Practice. New York: John Wiley & Sons; 2008. (Google Scholar)

Healthy Living (2019) www.heart.org›healthy-living›fitness›fitness-basics

Healthy People (2010) US Department of Health and Human Services. Vol. 2. 2nd edition Washington, DC; US Dept of Health and Human Services, Office of Disease Prevention and Health Promotion;

Health Topics (2016) https://www.heart.org>health-topics>high-blood-pressure

Inquirer.Net. (2015). *Do you know how many Filipinos die daily from heart attack and stroke?* https://business.inquirer.net/200169/do-you-know-how-many-filipinos-die-daily-from-heart-attack-and-stroke

Jeanna Vazquez (2020) *Studies Find Even Minimal Physical Activity measurably Boosts Health*; Press Release; Care at UC San Diego Health

Keith M. Diaz (2014) *Center for Behavioral Cardiovascular Health, Department of Medicine*, Columbia University Medical Center, New York, NY

Kelly, J., & Shull, J. (2019). Foundation of Lifestyle Medicine: The Lifestyle Medicine Board Review Manual 2nd Edition. *American College of Lifestyle Medicine.*

Matthew Y. Kwan, John Cairney, Guy E. Faulkner, Eleanor E. Pullenayegum (2012) Physical Activity and Other Health – Risk Behaviors During the Transition Into Early Adulthood: A Longitudinal Cohort Study. *American Journal of Preventive Medicine* Volume 42, Issue 1, January 2012, pages 14-20

Matti Uusitupa, S & Keinainen-Kukaanniem (2002) Physical Activity in the Prevention of Type 2 Diabetes: *The finish Diabetes Prevention Study*.

Miriam Reiner, Christina Niermann, Darko Jekauc & alexander Woll (2013) Long-term Health Benefits of Physical Activity- A Systematic Review of Longitudinal Studies; *BMC Public Health, 13*, Article no. 813.

N. L. D. Chatzisarantis, M. S. Hagger, S. J. H. Biddle, and B. Smith (2005) The stability of the attitude-intention relationship in the context of physical activity; *Journal of Sports Sciences*, vol. 23, no. 1, pp. 49–61.

Physical Activity Guidelines for Americans (2008). https://health.gov>sites>default>paguide

Rippe, J. M. (2019). Lifestyle Medicine Third Edition. Taylor & Francis Group, LLC.

Stevens, Grechen (2018) Worldwide trends in insufficient physical activity from 2001-2006: A Pooled Analysis of 358 Population-based Surveys with 1.9 Participants.

Tom Walker (2020) Leisure Opportunities news: Increasing physical activity globally could ... said Dr Fiona Bull, Head of the Physical Activity Unit which led the..

Thompson PD, Franklin BA, Balady GJ, Blair SN, Corrado D, Estes NAM, III, Fulton JE, Gordon NF, Haskell WL, Link MS, Maron BJ, Mittleman MA, Pelliccia A, Wenger NK,

The science and Ethics of Antipsychotic Use in Children, 2015. https://www.nature.com

Willich SN, Costa F, (2007). Collaboration With the American College of Sports M Exercise and Acute Cardiovascular Events: *Placing the Risks Into Perspective: A Scientific Statement From the American Heart Association Council on Nutrition, Physical Activity, and Metabolism and the Council on Clinical Cardiology. Circulation, 115*(17):2358–2368.

Tuso, Philip (2015) Strategies to increase physical activity-PubMed: Healthy people. *Improve Health in America*. https://pubmed.ncbi.nlm.nih.gov.

World Health Organization (2018) *Prevalence of Insufficient Physical Activity,* Geneva.

World Health Organization (2019) *Physical Activity Impact/Magnitude*, USA.

WHO. (2019) *Increasing Exercise Levels Globally would Prevent, 5*. https://www.leisureopportunities.co.uk › news › WHO-i.

A Comparative Assessment of the Glucose Monitor (SD Check GOLD) and Semi-auto Analyzer (Biosystems BTS350) in Measuring Blood Glucose Concentration Among Diabetics, Prediabetics, and Non diabetics

Yanna Yvonne Macayan
Adventist University of the Philippines
YYCMacayan@aup.edu.ph

Abstract

Many chronic diabetics are strongly recommended to do self-monitoring to control glucose metabolism and prevent complications. A practical way to do this is using glucometer, a device developed to measure glucose concentration from capillary samples in the comfort of the home. It is crucial to test if these glucometers are comparable to the standard laboratory method for glucose analysis. The objective of this study was to determine how well measurements from a glucometer using the SD Check GOLD are correlated with the measurements from a standard semi- auto analyzer such as the Biosystems BTS-350 using samples from a clinical laboratory in Mauban, Quezon. A cross-sectional study was conducted with a total of 45 randomly selected subjects; 16 diabetics, 14 prediabetics, and 15 non-diabetics. Venipuncture and finger prick samples were obtained, and glucose levels were measured. The mean concentration for the diabetics (n=16) using the glucometer were *significantly different* from that of the analyzer (174.910 ± 50.75 vs 192.563 ± 61.49, p= 0.017), and over-estimated the glucose concentration. Similar readings for prediabetics (117.600 ± 13.10 vs 117.600 ± 13.10, p=0.001) and non-diabetics (85.614 ± 7.20 vs 88.930 ± 7.21, p=0.001) were observed. The correlation between the two methods was *good* and *strongly significant* (r=0.963, p=0.000). The glucometer used in this study has the tendency to over-estimate glucose level as compared to standard laboratory procedure and therefore must be anticipated by diabetic patients especially those under anti-diabetic medications. The author recommends that further studies be done using multiple glucometer brands and add another group of subjects, Type 1 diabetics.

Keywords: *Glucometer, self-monitoring blood glucose, diabetes, hyperglycemia, hypoglycemia*

Diabetes mellitus (DM) is a serious disease caused by the body's failure to produce enough insulin, improper use of inulin or both. It is characterized by hyperglycemia, the elevated blood glucose concentration, because of the lack of insulin regulation (ADA, 2014; Hromadnikova et al., 2020). Type 1-DM, which mostly occurs in individuals 18 years and below accounts for only 5-10% of diabetics while type-2 DM, mostly observed in people 40 years above, accounts for 90-95% of all diabetics (ADA, 2014; ADA 2020; NDEP, 2014). DM, the most common of all endocrine disorders, is one of the biggest public health concerns confronting the world today (Baptista, 2020; Nelms and Sucher, 2020; Vicente et al., 2020). It causes morbidity, disability, and mortality worldwide. Symptoms of DM is often marked by polyuria, polydipsia, weight loss and sometimes polyphagia and blurred vision (ADA, 2014; de Arruda, 2020). It has been estimated that 8.3% or 387 million of the population worldwide are living with diabetes and is expected to increase by 205 million by the year 2035 with more than 85% of them living in low- and middle-income countries (IDF, 2011; Rathman & Giani, 2004). Hypoglycemia, on the other hand, is low blood glucose and occurs most commonly in diabetics as a result of over medication with insulin or other antidiabetic medications. It is not as common as hyperglycemia and characterized by sweating, irritability, confusion, fast heartbeat, feeling shaky, coordination problems, and seizures (Bishop et al., 2017; Wild et al., 2004).

To significantly reduce mortality and morbidity in critically ill diabetic patients, glycemic control has been recognized as a priority treatment (Becker et al., 2017; Derde, Vanhorebeek, & Van den Berghe, 2009; Van den Berghe,2004). Getting the accurate blood glucose concentration is an essential parameter for establishing diagnosis as well as therapy (ADA, 2007). The COVID-19 pandemic has added challenge to diabetic patients as it has limited their access to hospitals for regular check-ups and blood work. While current clinical management during the pandemic is still a work in progress, diabetic patients can still self-monitor their glucose levels using glucometer (Caballero et al., 2020; Polonsky & Fisher, 2013).

Glucometers are devices developed to measure levels of glucose of capillary blood obtained through finger or heel puncture using a lancet. Since the device is automatic, it is fast and easy to use mostly using the photometric or electrochemical reactions technology (Louie et al., 2000; Polonsky, 2013; Topping et al., 2019). Currently, diabetics achieve self-monitoring blood glucose (SMBG) in two general methods, the glucometer and the laboratory-based testing using chemistry analyzers (Court et al., 2002). Although the use of glucometers is preferred because of it's portable and practical, auto analyzers are perceived as more reliable and accurate (Agarwal et al., 2008; Cameron et al., 2010; Clark & Foster, 2012; Miguel, 2016). However, it is essential to have correct and meaningful glucose measurement to have effective SMBG. In recent years, conflicting results have been reported about the reliability of these devices. Studies by Patel and Patel (2016) and Shete et al. (2016) concluded that capillary blood is the best sample for glucose estimation than venous blood. Another finding suggest that glucometer has acceptable sensitivity ang specificity compared to auto analyzers therefore can be used for screening and even early diagnosis (Chlup et al., 2011; Nayeri et al., 2014). However, Nunnelley et al. (2018) detailed that glucose estimation is not different from glucometer and auto analyzer if fluorinated plasma is used. Other studies emphasized that SMBG using glucometer regardless of samples is better in controlling diabetic complications than not monitoring at all (Baig et al., 2007; Cameron et al., 2010; Court et al., 2002; Janapala et al., 2019; Kenya et al., 2014; Miguel, 2016; Polonsky & Fisher, 2013) .Currently in the Philippines, however, little to no literature is available on the accuracy of these devices. Meanwhile, SD Check GOLD glucometer is one of the main glucometers used in Mauban, Quezon, a town in the Philippines, including the JYKEL Clinical Laboratory. This calls to question the need to determine accuracy and reliability of the glucometer in comparison with the standard laboratory method. This study attempted to explore the accuracy of one of the many brands of glucometers available in the Philippine market. The following specific research questions were addressed:

Research Question 1: What is the level of accuracy of the SD check GOLD glucometer as compared to the standard laboratory method?

Research Question 2: Is there a significant difference between the glucose concentration of diabetic subjects using the glucometer and the standard laboratory method?

Research Question 3: Is there a significant difference between the glucose concentration of prediabetic subjects using the glucometer and the standard laboratory method?

Research Question 4: Is there a significant difference between the glucose concentration of non-diabetic subjects using the glucometer and the standard laboratory method?

Research Question 5: Is there a significant difference between the glucose concentration of using the glucometer and the standard laboratory method when assessed according to age of diabetic, prediabetic, and non-diabetic subjects?

Research Question 6: Is there a significant difference between the glucose concentration of using the glucometer and the standard laboratory method when assessed according to gender of diabetic, prediabetic, and non-diabetic subjects?

Research Question 7: Is there a correlation of diabetic, prediabetic, and non-diabetic subjects when measured using glucometer and standard laboratory method?

Theoretical Framework

SMBG is important to prevent diabetic complications. There are two general ways to do this, lab test and glucometer. However, conflicting results have been identified with some studies claiming that the use of glucometer is sensitive and specific enough to be used for diagnosis and monitoring (Chlup et al., 2011; Nayeri et al., 2014). Another study stated that its accuracy is dependent on the sample with fluorinated plasma being the best sample to be used (Nunnelley, 2018).

This study aimed to explore the accuracy and reliability of glucometer compared to the standard laboratory procedure in determining glucose concentration. To do this, samples from diabetic, pre-diabetic, and non-diabetic subjects were collected and tested for glucose using the SD check GOLD and the semi-auto analyzer Biosystems BTS-350. It is hypothesized that there is no significant difference between the performance of two methods. Age and gender of all the groups of subjects were also considered and checked whether they have an influence in the performance of the two methods. It is hypothesized that these factors would not affect the performance of the two methods. Moreover, correlation was also checked to see if there was a strong correlation between the two methods.

Method

Research Design

The study design was cross-section comprising of a total 45 randomly selected patients; 16 diabetics, 14 prediabetics, and 15 non-diabetics.

Population and Sampling Technique

The study was carried out in Mauban, a town in southern Quezon. Diabetic, prediabetic, and non-diabetic subjects were patients of JYKEL Clinical Laboratory and were randomly selected for this study. The study and its significance were explained to all subjects. Inclusions for the subjects were age of 18-60 years old and must have prior record in the laboratory. Those with other known metabolic disorders were excluded from the study

Sample collection

Consent was obtained from the subjects and information including socio-demographic information including sex, age, and type of DM were collected by the author during the interview. Blood samples were collected by a registered medical technologist from the ante cubital vein and capillary of the fingers for the reference glucose oxidase method and glucometer measurements respectively after an overnight fast (8-14 hours). Blood cells can rapidly lower the specimen's

glucose concentration causing false low glucose levels. Therefore, serum was separated from blood cells as soon as it clotted and centrifuged (ADA,2014; Bishop et al.., 2017; Louie, 2000). All samples were testing in JYKEL Clinical Laboratory, a laboratory licensed by the Philippine Department of Health. Procedures followed were all based from the laboratory manual and manufacturer's instructions.

Procedure

a. Measurement of glucose level using the glucometer

Glucose level in capillary blood was measured with the SD Check GOLD using standard procedures described by the manufacturer.

b. Measurement of glucose level using the glucometer

Glucose level in venous blood was also measured with the semi-auto analyzer (BTS-350) following standard procedures described by the manufacturer and standard operational procedures manual in the JYKEL Clinical Laboratory.

Statistical Analysis

The data collected from the study was analyzed using SPSS version 23 and results presented as mean ± standard deviation. The comparison of the mean values from the two methods was done using independent t test at a 95% confidence interval and the differences were considered statistically significant if $p < 0.05$. To address the first to sixth research questions paired t-test was used and Pearson Correlations was used for the seventh research question.

Ethical Considerations

Ethical considerations were observed to ensure confidentiality in handling the data. Waiver was signed by the subjects and they were made aware of the extent of the use of the blood samples collected.

Results

The blood glucose level of the diabetic, pre-diabetic, and non-diabetic subjects who are part of this study was determined simultaneously with the glucometer (SD Check GOLD) and semi-auto analyzer (Biosystems BTS-350) in the laboratory of the JYKEL Clinical Laboratory located in Mauban, Quezon. All the groups showed significant statistical differences between blood glucose determinations using the two different methods. Looking at the means, glucometer tends to overestimate the measurement in all cases, averagely by 17.653 mg/dL in diabetics, 10.190 mg/dL in prediabetic, and 3.316 mg/dL in non-diabetics.

Table 1. *Mean Glucose Concentration of Diabetic Patients*

MEAN GLUCOSE CONCENTRATION (mg/dL) ± SD				
	Semi-auto Analyzer (n=16)	Glucometer (n=16)	P value	
Mean (FBS)	174.910 ± 50.75	192.563 ± 61.49	0.017*	
Age			BS 350	SD
30-50	176.943 ± 54.98	184.714 ± 56.21	0.443	0.653
51-75	173.333 ± 50.60	198.667 ± 68.00		
Gender				
Female	184.750 ± 57.73	205.600 ± 72.57	0.101	0.011*
Male	158.517 ± 34.83	170.833 ± 30.93		

**significant at p 0.05*

Among the diabetic group shown in Table 1, the result showed statistically significant difference (p= 0.017) between glucose levels obtained with the semi-auto analyzer(174.910 ± 50.75) and glucometer (192.563 ± 61.49). When the glucose concentrations were assessed based on age and gender, results showed no statistically significant difference although the glucometer showed a higher result. This shows that age and gender differences do not affect the methods' performances. Data shows glucometer tends to overestimate the glucose concentration compared to the semi-automated analyzer. This can be a problem for patients undergoing insulin therapy due to the overestimation of the glucose concentration. If a patient is doing SMBG at home using SD Check GOLD there can be an overestimation of glucose level and the patient may opt to inject insulin even if it is not needed.

Table 2. *Mean Glucose Concentration of Prediabetic Patients*

MEAN GLUCOSE CONCENTRATION (mg/dL) ± SD				
	Semi-auto Analyzer (n=14)	Glucometer (n=14)	P value	
Mean FBS	117.600 ± 13.10	127.790 ± 15.21	0.001*	
Age			BS 350	SD
			350	
30-50	117.937 ± 15.94	124.440 ± 18.174	0.366	0.352
51-60	116.99 ± 6.92	122.600 ± 9.40		
Gender				
Female	117.628 ± 15.08	123.600 ± 17.02	0.428	0.669
Male	117.525 ± 7.73	124.250 ± 11.53		

**significant at p 0.05*

In the prediabetic group, mean glucose level of 117.600 ± 13.10 was obtained using the semi-auto analyzer while the glucometer yielded a mean glucose concentration of 127.790 ± 15.21. Comparing the two means using t-test, the result was 0.001. This means that there was a significant difference between the methods used in testing for FBS. In the same group, when blood glucose level was assessed according to age and gender of patients, no significant difference was observed between the glucose levels regardless of patients' age and gender. Prediabetics are not yet categorized as having diabetes and usually have a glucose level of 100-125 mg/dL and if these patients test FBS using glucometer, the patient may be misdiagnosed as diabetic (ADA,2014; Bishop et al.., 2017).

Table 3. *Mean Glucose Concentration of Non-diabetic Patients*

MEAN GLUCOSE CONCENTRATION (mg/dL) ± SD				
	Semi-auto Analyzer (n=15)	Glucometer (n=15)	P value	
Mean FBS	85.614 ± 7.20	88.930 ± 7.21	0.001*	
Age			BS 350	SD
			350	
20-40	86.427 ± 7.63	90.080 ± 7.38	0.171	0.475
41-60	82.367 ± 4.81	84.330 ± 5.03		
Gender				
Female	84.538 ± 6.49	87.500 ± 6.07	0.500	0.632
Male	88.846 ± 8.28	90.570 ± 8.52		

**significant at p 0.05*

Among the non-diabetic group, a similar pattern was observed. There was a statistically significant difference between the two methods have a p-value of 0.001. The mean glucose level of 85.614 ± 7.20 was obtained using the semi-auto analyzer while 88.930 ± 7.21 was obtained using the glucometer having a mean difference of 3.32 mg/dL.

Age did not seem to affect the testing as seen with the p-value of 0.171 using the Biosystems BTS-350 and 0.475 using the glucometer. In the same category, it was observed that the glucometer overestimates the glucose concentration having a mean difference of 3.65 mg/dL in the age group 20-40 and 1.96 mg/dL in the age group 41-60.

In the gender category, the observable results show no significant difference between the two methods. Comparing the means with t-test p-value of 0.500 in Biosystems BTS-350 and 0.632 in SD Check GOLD were computed. This means that gender does not influence the glucose testing of the two methods.

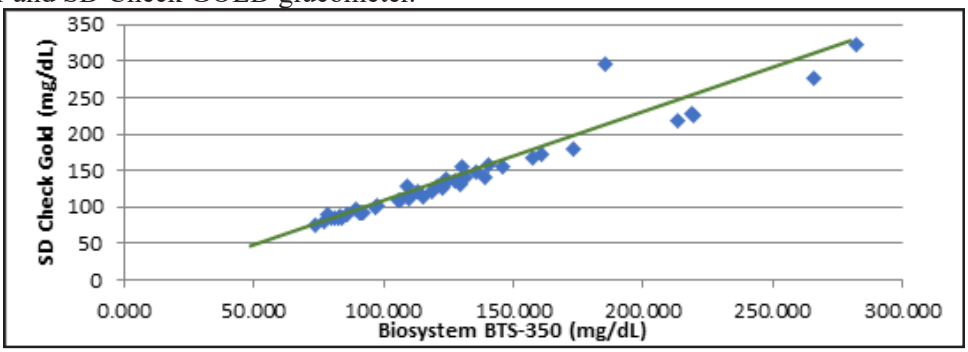
Table 4. *Glucose Correlation of Diabetic, Prediabetic, and Non-diabetic Patients*

	Diabetic	Prediabetic	Non-Diabetic	ALL
Pearson Correlation (r)	0.907*	0.946*	0.917*	0.963*
P-value	0.000	0.000	0.000	0.000

**significant at p 0.05*

All the results indicated a strong and signifcant correlation between the glucometer and the semi-auto analyser (Pearson correlation = 0.963, p-value= 0.000) as illustrated in Figure 1.

Figure 1. Correlation between glucose levels measured using Biosystems BTS-350 semi-auto analyser and SD Check GOLD glucometer.



Discussion

Self-monitoring blood glucose is an essential component of diabetic care. Levels of blood glucose provide important information about how the body is controlling blood glucose metabolism, whether glucose-lowering medications work, and the effect of illness and stress in it (Cameron et al., 2010; Court et al., 2002; Janapala et al., 2019; Kenya et al., 2014; Miguel, 2016; Polonsky & Fisher, 2013). Among the SMBG, glucometer has become the most prominent method because of its practicality and cost effectivity (ADA, 2007). However, conflicting results regarding the glucometer's accuracy and reliability has been observed (Ginsberg, 2009; Rajendran & Rayman, 2014; Salacinski, 2014). Hence, the aim of this study is to assess the efficiency of glucometer in comparison with the standard glucose/peroxidase colorimetric technique used in assaying glucose in the laboratory.

The results between the two methods were significantly significant in the three groups as the glucometer tended to over-estimate the measurements. These results corroborate observations made in other studies (Gohlke, 2017; Nunneley, 2018; Tauk, 2015). However, other studies

conducted by by Patel and Patel (2016) and Shete et al. (2016) reported that although glucometers tend to over-estimate glucose concentration, there is no statistical difference. Results shown above indicate that capillary blood glucose may be reproducible as venous blood glucose as venous blood glucose concentration, which is the standard sample used in laboratory analysis. While the brand and the standards for comparison in these studies are varying, the underlining working principles are the same and therefore make the results of this current study comparable to other studies (Bimenya et al., 2003). It is also interesting to note that most glucometers, which use capillary blood as samples.in the market have 83% sensitivity and 97.5% specificity in comparison with the laboratory standard. Despite having a good specificity, it is not as sensitive as the auto analyzers in the lab therefore it must be use with caution (Nayeri et al., 2014). This can also explain as to why the performance of SD check GOLD is not comparable to the Biosystems BTS-350. Another explanation is the difference in the level of glucose levels in capillary and the veins. Venous plasma glucose level is influenced after using glucose by tissues and effects of insulin, glucagon, other hyperglycemic hormones (Bishop et al.., 2017; Osman et al., 2017). These factors account partly in the variation of results of the glucometer and the semi-automated analyzer as well as changes in the temperature and humidity (Ginsberg, 2009). The results of the study also show that age and gender have no influence on the levels of glucose analysis by both methods.

One of the threats of having over-estimated glucose results for medicating, or diet portion controlling diabetics is hypoglycemia (Bimenya et al., 2003; Nayeri et al., 2014; Sudan, 2014). It is a condition needing medical emergency and symptoms occur usually between 45 to 50.4 mg/dL. However, there is no exact cut-off value for this, and symptoms vary from patient to patient. That's why patients with this tendency are strongly suggested to self-monitor their glucose concentration (Kumar & Kumar, 2004).

Even though there is significant difference in the two methods in the t-test, the results still show a strong correlation in the results generated by both methods. In this aspect, glucometer used in this study is relatively accurate at measuring patients with diabetes. This observation is aligned with the studies conducted by Louie et al., 2000 and Corstjens et al., 2006 when they used glucometers to assess critically ill patients. But other studies suggest that weak correlation was observe and only selected glucometer brands show strong correlation (Bimenya et al., 2003; MostafaGharehbaghi & Ghergherehchi, 2016). With all the contrasting findings, it is not good to generalize that all brand of glucometers is accurate and consistent in their measurements until it has been standardized. Truly, there is a need for standardization of glucometer brands against trusted methods. This will be beneficial specially for diabetic patients who do not have access to nearby hospitals.

Overall, the results of this study showed that SD check gold is not comparable to the results of the standard laboratory method. It is imperative that attention is given in making policies standardizing the use of glucometer in the Philippines as may diabetics are dependent in it for SMBG (ADA, 2017).

Limitations

This study only used the brand and model SD check GOLD glucometer; hence results cannot be generalized for all brands of glucometers found in the Philippine market. Also, subjects used in this study are only Type 2 diabetics.

Conclusion

It is concluded in this study that there is a significant difference in the accuracy of the glucometer (SD check GOLD) and the semi-auto analyzer (Biosystems BTS 350) and therefore over-estimation on the part of the glucometer must be anticipated. The author recommends that further studies be done using multiple glucometer brands and add another group of subject, Type 1 diabetics.

References

Agarwal, M. M., Dhatt, G. S., & Safraou, M. (2008). Gestational diabetes: Using a portable glucometer to simplify the approach to screening. *Gynecologic and Obstetric Investigation, 66*(3), 178-83. Retrieved from https://search.proquest.com/docview/223758479?accountid=38643

American Diabetes Association. (Jan 2014). *Diabetes Care 37 (Supplement 1)*. S81-S90; DOI: 10.2337/dc14-S081

American Diabetes Association. (Jan 2020). *Diabetes Care 43 (Supplement 1)*. S1-S2; DOI: 10.2337/dc20-Sint

American Diabetes Association. (Jan 2017). *Standards of Medical Care in Diabetes 40 (Supplement 1)*. S4-S5; DOI: 10.2337/dc17-S003

Baig, A., Siddiqui, I., Jabbar, A., Azam, S. I., Sabir, S., Alam, S., & Ghani, F. (2007). Comparison between bed side testing of blood glucose by glucometer vs centralized testing in a tertiary care hospital. *Journal of Ayub Medical College, Abbottabad : JAMC, 19*(3), 25–29.

Baptista, M. H. B., Dourado, F. C., Gomides, D. d. S., Teixeira, C. R. d. S., de Freitas, M.,Cristina Foss, & Pace, A. E. (2019). Education in diabetes mellitus for blood glucose self-monitoring: A quasi-experimental study. *Revista Brasileira De Enfermagem, 72*(6), 1601-1608. doi:http://dx.doi.org/10.1590/0034-7167-2018-0731

Becker, T., Teixeira, C. R. d. S., Zanetti, M. L., Pace, A. E., Almeida, F., & Torquato,Maria Teresa da Costa Gonçalves. (2017). Effects of supportive telephone counseling in the metabolic control of elderly people with diabetes mellitus. *Revista Brasileira De Enfermagem, 70*(4), 704-710. doi:http://dx.doi.org/10.1590/0034-7167-2017-0089

Bimenya, G. S., Nzarubara, G. R., Kiconco, J., Sabuni, S., & Byarugaba, W. (2003). The accuracy of self monitoring blood glucose meter systems in Kampala Uganda. *African Health Sciences, 3*(1), 23–32.

Bishop, M.L., Fody E., Schoeff L. (2017). *Clinical Chemistry: Principles, Procedures and Correlations*, 6th ed. Lippincott Williams and Wilkins

Caballero, A. E., Ceriello, A., Misra, A., Aschner, P., McDonnell, M. E., Hassanein, M., Fonseca, V. A. (2020). COVID-19 in people living with diabetes: An international consensus. *Journal of Diabetes and its Complications, 34*(9) doi:http://dx.doi.org/10.1016/j.jdiacomp.2020.107671

Cameron, C., M.Sc, Coyle, Doug,M.Sc, PhD., Ur, E., M.D., & Klarenbach, Scott,M.D., M.Sc. (2010). Cost-effectiveness of self-monitoring of blood glucose in patients with type 2 diabetes mellitus managed without insulin: CMAJ. Canadian Medical Association. *Journal, 182*(1), 28-34. Retrieved from https://search.proquest.com/docview/204841782?accountid=38643

Chlup, R., Doubravova, B., Peterson, K., Zapletalova, J., & Bartek, J. (2011). Wavesense technology glucometer linus for routine self-monitoring and clinical practice. *Acta Diabetologica, 48*(1), 35-40. doi:http://dx.doi.org/10.1007/s00592-010-0213-5

Clarke, S. F., & Foster, J. R. (2012). A history of blood glucose meters and their role in self-monitoring of diabetes mellitus. *British Journal of Biomedical Science, 69*(2), 83-93. Retrieved from https://search.proquest.com/docview/1029870107?accountid=38643

Corstjens AM, Ligtenberg JJ, van der Horst IC, Spanjersberg R, Lind JS, Tulleken JE, Meertens JH, Zijlstra JG. (2006). Accuracy and feasibility of point-of-care and continuous blood glucose analysis in critically ill ICU patients. *Crit Care. 10*(5):R135. doi: 10.1186/cc5048. PMID: 16981981; PMCID: PMC1751062.

Court, M., Nicolucci, A., Franciosi, M., Pellegrini, F., & De Berardis, G. (2002). The value of self-monitoring of glood glucose / self-monitoring of blood glucose can be effective in type 2 diabetes only if it serves a clearly identified purpose: *Response.. Diabetes Care, 25*(7), 1255-1256. Retrieved from https://search.proquest.com/docview/223054155?accountid=38643

de Arruda, G. O., Marcon, S. S., Peruzzo, H. E., Ruiz, A. G. B., Back, I. R., Nass, E. M. A., Lino, I. G. T. (2020). Educational intervention in men with diabetes mellitus: Effects on behavior and anthropometric profile. *Acta Paulista De Enfermagem, 33*(2), 1-10. doi:http://dx.doi.org/10.37689/acta-ape/2020AO0128

Derde, S., Vanhorebeek, I., & Van Den Berghe, G. (2009). Insulin treatment in intensive care patients. *Hormone Research, 71*(1), 2-11. doi:http://dx.doi.org/10.1159/000173736

Ginsberg B. H. (2009). Factors affecting blood glucose monitoring: sources of errors in measurement. *Journal of Diabetes Science and Technology, 3*(4), 903–913. https://doi.org/10.1177/193229680900300438

Gohlke, M. K., Nunnelley, W. Z., & Brandebourg, T. D. (2017). Comparison of a point-of-care glucometer and an automated biochemical analyzer to measure glucose concentrations in whole blood, serum, and plasma from porcine blood samples. *Journal of Animal Science, 95*, 157-158. https://search.proquest.com/docview/1947371645?accountid=38643

Hromadnikova, I., Kotlabova, K., Dvorakova, L., & Krofta, L. (2020). Diabetes mellitus and cardiovascular risk assessment in mothers with a history of gestational diabetes mellitus based on postpartal expression profile of MicroRNAs associated with diabetes mellitus and cardiovascular and cerebrovascular diseases. *International Journal of Molecular Sciences, 21*(7), 2437. doi:http://dx.doi.org/10.3390/ijms21072437

International Diabetes Federation. (Jan 2011). *Diabetes Education Module*. https://app.box.com/s/rg8z68egdo3wtrkw1ftjeok2vizrepy1

Janapala, R. N., Jayaraj, J. S., Nida, F., Tooba, K., Norina, U., Amulya, D., Issac, S. (2019). Continuous glucose monitoring versus self-monitoring of blood glucose in type 2 diabetes mellitus: A systematic review with meta-analysis. *Cureus, 11*(9) doi:http://dx.doi.org/10.7759/cureus.5634

Kenya, S., Lebron, C., Reyes Arrechea, E., & Li, H. (2014). Glucometer use and glycemic control among hispanic patients with diabetes in southern florida. *Clinical Therapeutics, 36*(4), 485-93. doi:http://dx.doi.org/10.1016/j.clinthera.2013.12.009

Kumar, G., Ban, L. S., & Kumar, S. (2004). Correlation of capillary and venous blood glucometry with laboratory determination. *Prehospital Emergency Care, 8*(4), 378-83. https://search.proquest.com/docview/221118088?accountid=38643

Louie, R. F., Tang, Z., Sutton, D. V., Lee, J. H., & Kost, G. J. (2000). Point-of-care glucose testing: Effects of critical care variables, influence of reference instruments, and a modular glucose meter design. *Archives of Pathology & Laboratory Medicine, 124*(2), 257-66. Retrieved from https://search.proquest.com/docview/211921101?accountid=38643

Miguel, N. H. (2016). Brazilian multicenter study for the evaluation of patients satisfaction of blood glucose self-monitoring with BGStar® blood glucose meter in insulinized patients with diabetes mellitus type 1 and 2. *Diabetology & Metabolic Syndrome, 8* doi:http://dx.doi.org/10.1186/s13098-016-0180-2

MostafaGharehbaghi M, Ghergherehchi R. (2016) Comparison of diagnostic value of blood glucose meter with that of laboratory method in neonatal hypoglycemia. *Journal of Guilan University of Medical Science. J Guilan Univ Med Sci., 25*(97):106–12.

National Diabetes Education Program (NDEP). 2014. Overview of diabetes in children and adolescents. US Department of Health and Human Services

Nayeri, F., Shariat, M., Behbahani, H. M. M., Dehghan, P., & Ebrahim, B. (2014). Blood glucose measurement by glucometer in comparison with standard method in diagnosis of neonatal hypoglycemia. *Acta Medica Iranica, 52*(8), 627-22. https://search.proquest.com/docview/1555941186?accountid=38643

Nelms, M.N., Sucher K.P. (2020). Nutrition Therapy and Pathophysiology, 4th edition. Cengage Learning.

Nunnelley, W. Z., Maxwell, H. S., Bayne, J. E., & Brandebourg, T. D. (2018). Validation of glucometer technology for measurement of glycaemia during glucose tolerance tests and endotoxin challenge in pigs. *Journal of Animal Science, 96*, 82. https://search.proquest.com/docview/2046690155?accountid=38643

Osman, N. K., Helegbe, G. K., Paul, A. A., Akontatiba, N. A., Ankrah, J., Nsoh, G. A., Ahenkora, B. (2017). A comparative assessment of the glucose monitor (SD codefree) and auto analyzer (BT-3000) in measuring blood glucose concentration among diabetic patients. *BMC Research Notes, 10.* doi:http://dx.doi.org/10.1186/s13104-017-2789-0

Patel N., Patel K., (2015). A comparative study of venous and capillary blood glucose levels by different method. *GSC Medical College Journal of Medical Sciences (GCSMC J Med Sci.), 4*(1):53–6.

Polonsky, William H,P.H.D., C.D.E., & Fisher, Lawrence,P.H.D., A.B.P.P. (2013). Self-monitoring of blood glucose in noninsulin-using type 2 diabetic patients: Right answer, but wrong question: Self-monitoring of blood glucose can be clinically valuable for noninsulin users. *Diabetes Care, 36*(1), 179-82. doi:http://dx.doi.org/10.2337/dc12-0731

Rajendran, R., & Rayman G. (2014). Point-of-care blood glucose testing for diabetes care in hospitalized patients: an evidence-based review. *Journal of Diabetes Science and Technology, 8*(6), 1081–1090. https://doi.org/10.1177/1932296814538940

Rathmann, W., & Giani, G. (2004). Global prevalence of diabetes: Estimates for the year 2000 and projections for 2030: Response to wild et al. *Diabetes Care, 27*(10), 2568-9; author reply 2569. doi:http://dx.doi.org/10.2337/diacare.27.10.2568

Salacinski, A. J., Alford, M., Drevets, K., Hart, S., & Hunt, B. E. (2014). Validity and Reliability of a Glucometer Against Industry Reference Standards. *Journal of Diabetes Science and Technology, 8*(1), 95–99. https://doi.org/10.1177/1932296813514315

Shete S., Khan H., Siddiqui A.M., Shinde A. (2016). A comparative study of venous and capillary blood glucose levels by semi auto analyser and glucometer. *International Journal of Recent Trends in Science and Technology (IJRTS), 1*(19):46–8.

Sudan K. (2014). Comparison between glucometer and chemical analyzer for measuring blood glucose of diabetic patients. *International Journal of Current Research (Int J Curr Res.), 6*(5):6610–3.

Tauk, B. S., Drobatz, K. J., Wallace, K. A., & Hess, R. S. (2015). Correlation between glucose concentrations in serum, plasma, and whole blood measured by a point-of-care glucometer and serum glucose concentration measured by an automated biochemical analyzer for canine and feline blood samples. *Journal of the American Veterinary Medical Association, 246*(12), 1327–1333. https://doi.org/10.2460/javma.246.12.1327

Topping, J., Reardon, M., Coleman, J., Hunter, B., Shojima-Perera, H., Thyer, L., & Simpson, P. (2019). A comparison of venous versus capillary blood samples when measuring blood glucose using a point-of-care, capillary-based glucometer. *Prehospital and Disaster Medicine, 34*(5), 506-509. doi:http://dx.doi.org/10.1017/S1049023X19004850

Van den Berghe, G. H. (2004). Role of intravenous insulin therapy in critically ill patients. *Endocrine Practice, 10*, 17-20. https://search.proquest.com/docview/1695374290?accountid=38643

Vicente, M. C., da Silva, C.,Rosa Ribeiro, Pimenta, C. J. L., Bezerra, T. A., de Lucena, H.,Karolyne Vieira, Valdevino, S. C., & Macedo Costa, Kátia Neyla,de Freitas. (2020). Functional capacity and self-care in older adults with diabetes mellitus. *Aquichan, 20*(3), 1-11. doi:http://dx.doi.org/10.5294/aqui.2020.20.3.2

Wild, S. H., Roglic, G., Green, A., Sicree, R., & King, H. (2004). Global prevalence of diabetes: Estimates for the year 2000 and projections for 2030: Response to rathman and giani. *Diabetes Care, 27*(10), 2569. doi:http://dx.doi.org/10.2337/diacare.27.10.2569-a

Conquering Stress in Times of Pandemic: An Intervention Study to Manage Stress Among College Students

Princess Red Rodriguez, Mary Jane Botabara-Yap
Adventist University of the Philippines
prrgrodriguez@aup.edu.ph
mjbbotabara@aup.edu.ph

Abstract

The COVID-19 pandemic has brought many challenges throughout the population spectrum. The sudden shift of classes from face-to-face to that of full online has brought into spotlight the mental health issue of various group including the college students. The aim of this study was to determine the effect of a stress management program on perceived stress, knowledge, attitude and preventive practices among the college students in the Adventist University of the Philippines. The study utilized pre-test/post-test quasi experimental design among 40 participants through random sampling. The intervention program was conducted from March 6 until April 17, 2021 and consisted of motivational talks, lectures, focused group discussion, testimonials and support group. Descriptive (mean and percentage) and inferential (paired t-test) statistics were used to analyze the data. Both groups showed moderate stress, very good knowledge (mean-15.1), poor attitude (mean- 2.4) and good preventive practices pre and post intervention (mean- 2.8). There is no significant difference in both groups prior to the program, however it showed significant difference in the perceived stress scale which strongly indicates that the stress level of the participants decreased after the stress management program (mean- 4.3, SD- 5.05, p- .001). Moreover, the attitude and practice gain scores of the participants were higher, while the gain score for perceived stress was lower in the experimental group. Further, preventive practices showed significant difference in the gain score (mean- 4.3, p- $\leq$.05) as compared to knowledge (mean- 2.12) and attitude (mean- 1.9). Result showed that the stress management program was a success and is recommended to be done regularly for the college students.

Keywords: *academic stress, stress management program, pandemic, perceived stress scale*

Stress affects all types of people regardless of age, gender, beliefs or status in life (Mazo, 2015). Students with high academic stress were reported to experience different mental health problems such as depression, anxiety, irritability and headaches (Deb, Strodl & Sun, 2015). The number of suicide cases and students with mental disorders has increased significantly, with at least one suicide referral every day (Tomacruz, 2018).

Stress and mental health of college students is a vital public health matter because when a student is healthy, they will also become healthy workers in the future. Going to schools or universities could be a positive and encouraging experience for the students but studies have shown that college students nowadays are more stressed than before (Portoghese et al., 2019; Pryor et al., 2010), and stress is being described as the number one interference to academic performance (American College Health Association, 2010).

A recent study from the United Sates showed that among the 71% surveyed students regarding their mental stress, shown increased stress and anxiety brought about by the recent COVID pandemic. In a Malaysian study, it was shown that health sciences students such as medical laboratory science students, are experiencing moderate to high amount of stress which was linked to academic requirements as the major source of stress (Othman et al., 2013, p. 255).

In the Philippines, according to the Social Whether Stations (SWS) survey conducted in the fourth quarter of 2019, 27 percent or one of four Filipinos are frequently experiencing stress in their everyday living (Hallare, 2020). Tee et al., (2020) reported that younger people are more prone to experience stress, anxiety and depression due to the psychological impact of the pandemic; and that student who experience stress in high amount can lead to reduced school performance with low grades and increased number of drop outs which results to decreased graduation rates (Byrd & McKinney, 2012; Keyes et al., 2012; Salzer, 2012; Storrie et al, 2010).

Thus, this study aimed to determine the effect of a tailored mental health program for a chosen group of medical and laboratory students who are currently in their clinical division (Junior year), in a chosen university in Luzon, Philippines.

Methodology

This study utilized quantitative research design, specifically pretest/posttest design. A tailored mental health program was presented to a group of students chosen randomly and who attended a total of eight sessions from a pre-created module. Pretest and posttest results were measured against a control group to determine its effect.

The 40 participants, 20 experimental and 20 controlled, respectively were chosen through random sampling technique. Students from the clinical division of the Medical Laboratory Science (MLS) Department of a chosen university in the Philippines are specifically chosen because it is at this stage that the students face the most challenging period of their four-year academic journey; moreover, the main researcher is a faculty of said department.

A structured and self-administered questionnaire was distributed to the participants before and after the program. The questionnaire is composed of 84 items which are mostly close-ended questions and are divided into six parts: 1) demographic profile questions which describe the participants' age, gender, religion, nationality, family income, and other academic information; 2) general questions; 3) knowledge questions about stress answerable by true or false which measured the participants' knowledge on the myths and facts about stress; 4) perceived academic stress with answers in the form of Likert scale; 5) practices on stress management for the past four weeks with the responses ranging from (1) Always, (2) Often, (3) Rarely, (4) Never; and the 5) perceived stress scale which would measure the intensity of their stress which was adopted from Cohen (1994) and was considered as the most widely used instrument for measuring the level of stress.

For the data gathering, an approval from the university's Ethics Review Board (ERB) was obtained; the program protocol was duly presented and was approved. A letter for the letter of permission was secured from the MLS Department Head before the data gathering procedure. A

list of students in the clinical division was acquired from the Head of Department and participants and were chosen randomly and allocated the respective group (experimental and control). Once chosen, the consent to participate was delivered and disseminated to the students and once the consent is signed, the questionnaire was given via google form and both groups received a thorough explanation of what are expected from them. The program took place for a period of eight sessions through virtual platform and was attended by all the participants. A posttest questionnaire was conducted after the program to measure the effect of the program on knowledge, attitude, practice and perceived stress of the students.

Results and Discussion

Majority of the participants have ages ranging from 18-21 years old, 85% are female, coming from different religious affiliations of which the Seventh-day Adventist has the highest percentage with 59%, followed by the Roman Catholic with 26%, 10% from Born Again Christian and 2.5% each for Aglipayan Church and Members of Church of God International. For the family income, more participants come from a family with an income of more than 30,000php per month.

Table 1. *Demographic information of the participants*

		N	%
Age	18-21 yrs old	37	95
	>21 yrs old	2	5
Gender	Male	6	15
	Female	33	85
Religion	Seventh Day Adventist	23	59
	Roman Catholic	10	26
	Aglipayan	1	2.5
	Born again Christian	4	10
	Members of Church of God International	1	2.5
Family Income	10,000-30,000php	13	33
	>30,000	26	67

To determine the homogeneity of both experimental and control group, paired t-test was conducted for both groups prior to the program as shown in table 2.

Table 2. *Paired T-test of the Pre-Program Level of Both Groups*

	Levene's Test for Equality of Variances		t-test for Equality of Means						
	F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
								Lower	Upper
Pre-Knowledge	.081	.778	1.456	37	.154	.67895	.46643	-.26613	1.62402
			1.455	36.845	.154	.67895	.46658	-.26656	1.62446
Pre-Attitude	.001	.970	.861	37	.395	.07544	.08767	-.10219	.25307
			.858	36.094	.396	.07544	.08791	-.10284	.25372
Pre-Practice	1.028	.317	.922	37	.362	.07961	.08634	-.09533	.25454
			.916	33.950	.366	.07961	.08690	-.09701	.25622

{table continues on the next page}

Pre PSS	1.246	.271	-.874	37	.388	-1.43421	1.64188	-4.76097	1.89255
			-.875	36.963	.387	-1.43421	1.63825	-4.75373	1.88531

*P<0.05 is significant

It is revealed in the result that both groups were homogenous as the scores in knowledge, attitude, practice and perceived stress scale were all non-significant. An almost similar result was noted in the posttest between the two groups. However, table 3 presents the descriptive pretest and posttest result of the experimental group's knowledge, attitude and practice. Result showed that the participants have very good knowledge during pre-test and posttest and for this, the module did not cover much on enhancing their knowledge but rather, concentrated on enhancing the participants' attitude and practice.

Table 3. *Descriptive comparison of pretest and posttest on knowledge, attitude, practice and perceived stress of the participants.*

	Pretest	Verbal Interpretation	Posttest	Verbal Interpretation
Knowledge	15.1	Very Good Knowledge	14.4	Very Good Knowledge
Attitude	2.4	Poor attitude	2.5	Poor attitude
Practice	2.8	Good practice	2.9	Good practice
Perceived Stress	23.3	Moderate Stress	19.0	Moderate Stress

The overall mean for the attitude during pretest was 2.4 and was increased to 2.5 in posttest, considered as *poor attitude*. The participants believed that they will be a successful student (pretest/posttest mean-3.0 and 3.3) and are positive that they will pass their courses during the semester (pretest/posttest mean-3.0 and 3.3), despite believing that the examinations are difficult (pretest/posttest mean-1.5 and 1.3) and not having enough time to relax (pretest/posttest mean-2.0 and 2.5).

The overall mean for the practice of preventive measures regarding stress during pretest was 2.8 and was increased to 2.9 during posttest, both considered as *good practice*. The highest preventive practices which the participants do are: to pray (pretest/posttest mean-3.7 and 3.9), talk to family members and friends when they are stressed (pretest/posttest mean-3.5 and 3.8) and doing something they enjoy (pretest/posttest mean-3.4 and 3.8); the lowest mean was to cram doing school requirements (pretest/posttest mean-2.0 and 2.1) not exercising (pretest/posttest mean-2.2 and 2.5), not getting at least eight hours of sleep at night (pretest/posttest mean-2.3 and 3.4), and not eating a balanced diet (pretest/posttest mean-2.6 and 2.9); however, it is noteworthy that these practices improved after the program. For the perceived stress scale, from a mean of 23 during the pretest, it was reduced to 19 in the posttest. To test whether the difference of the mean scores is statistically significant between the two groups, the paired T- test was again conducted and the result showed that the perceived stress scale of the participants was significant (p value = 0.001, SD=1.13), which further denotes that the program for the clinical division students in conquering stress was successful in reducing their stress level.

Table 4. *Paired T-test of the Difference of the Pre- and Post-Program Levels of the Participants*

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	Pre-Knowledge - Post Knowledge	.55000	1.76143	.39387	-.27437	1.37437	1.396	19	.179

{table continues on the next page}

Pair 2	Pre-Attitude – Post Attitude	-.08333	.22980	.05138	-.19088	.02422	-1.622	19	.121
Pair 3	Pre-Practice – Post Practice	-.08604	.29256	.06542	-.22296	.05088	-1.315	19	.204
Pair 4	Pre PSS – Post PSS	4.30000	5.05860	1.13114	1.93250	6.66750	3.801	19	.001

To determine the gain scores of the two groups in terms of knowledge, attitude and practice, result showed that it was the practice that showed significant difference among the variables tested (p value=0.045) as presented in table 5.

Table 5. *Paired T-test of the Gain Scores of the Participants and Non-Participants*

	F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
								Lower	Upper
Gain Score for Knowledge	2.125	.153	-1.050	37	.301	-.55000	.52390	-1.61152	.51152
			-1.054	36.531	.299	-.55000	.52162	-1.60737	.50737
Gain Score for Attitude	1.963	.169	.334	37	.740	.03070	.09189	-.15548	.21689
			.331	31.594	.743	.03070	.09278	-.15837	.21977
Gain Score for Practice	4.317	.045	.368	37	.715	.04766	.12954	-.21480	.31013
			.363	28.887	.719	.04766	.13120	-.22071	.31603
Gain PSS	1.365	.250	-1.179	37	.246	-2.03684	1.72752	-5.53712	1.46344
			-1.175	35.899	.248	-2.03684	1.73312	-5.55211	1.47843

The result shows that the participants may have already taken up and applied some skills that they have learned from the program that would help them in managing their stress as a student. It was not surprising that the result of the knowledge is also not significant as it is not addressed in the program.

Due to the alarming cases of increased mental health disorders of the youth during this time of COVID-19 pandemic, studies have recommended the need for interventions to address the growing concern of mental health problems particularly among the college students.

There is now a call to the higher educational institutions (HEIs) leaders to start prioritizing the mental health of the students, to generate preventive methods, and to include in the health screening the mental health aspect to be able to identify particularly those with psychiatric symptoms and be given proper interventions (Inside Higher Ed. 2020b; Son et al, 2020; Sun et al, 2021). Virtual outreach programs which are done online such as webinars, psychoeducation, mental health interventions or services, counselling and the likes are recommended for the schools to be able to effectively reach those in need and to continuously promote mental health and to increase awareness of the connection of mental health to the academic performance (Inside Higher Ed. 2020b; Linardon, et al, 2019, Sun et al, 2021).

Stress management program is one of the most common interventions done by any type of institutions to care for their subjects. Stress management programs have been proven effective in reducing stress which may also prevent other mental health problems and may therefore be regularly implemented in schools (Amanvermez et al, 2020). It was even suggested by a body of students to incorporate stress management programs in the curriculum (Yasmin et al, 2020). Through stress management programs, students with more serious mental health problems might also be encouraged to seek for more treatment and these programs can also be a means for development of other mental health interventions (Benjet, 2020).

Conclusion

This study determined the effect of a stress management program to the selected college students in a university in Luzon, Philippines during this time of pandemic. The results showed that after the eight-session program, the participants have applied some techniques in stress management which made the gain score of the practice significant and more importantly the stress level of the participants was reduced. This study shows that mental health programs are vital to the wellbeing of the students and is therefore recommended to be done regularly by the higher educational institutions.

Acknowledgement

This study is an output of the stress management program for the Public Health Field Study.

References

Amanvermez, Y., Rahmadiana, M., Karyotaki E., de Wit, L., Ebert, D. D., Kessler, R. C. & Cuijpers, P. (2020). Stress management interventions for college students: A systematic review and meta-analysis. *Clinical Psychology Science and Practice*, e12342 https://doi.org/10.1111/cpsp.12342

American College Health Association. (2010). American College Association – National College Health Assessment 2010 National Data. Hanover, MD.

Benjet C. (2020). Stress management interventions for college students in the context of the COVID-19 pandemic. *Clinical psychology : a publication of the Division of Clinical Psychology of the American Psychological Association*, e12353. Advance online publication. https://doi.org/10.1111/cpsp.12353

Byrd, D. R., McKinney, K. J. (2012). Individual, interpersonal, and institutional level factors associated with the mental health of college students. *J Am Coll Heal., 60*(3):185–93.

Deb, S., Strodl, E., & Sun, J. (2015). Academic stress, parental pressure, anxiety and mental health among Indian high school students. *International Journal of Psychology and Behavioral Sciences, 5*(1), 26–34. https://doi.org/10.5923/j.ijpbs.20150501.04

Hallare, K. (2020, March 31). 27% of Filipinos frequently experience stress – SWS. *Inquirer.Net.* https://newsinfo.inquirer.net/1251893/27-of-filipinos-frequently-experience-stress

Inside Higher Ed. (2020b, August 17). *Suicidal ideation on the rise for college-aged adults due to COVID-19*. https://www.insidehighered.com/news/2020/08/17/suicidal-ideation-rise-college-aged-adults-due-covid-19-pandemic

Keyes, C. L., Eisenberg, D., Perry, G. S., Dube, S. R., Kroenke, K., Dhingra, S. S. (2012). The relationship of level of positive mental health with current mental disorders in predicting suicidal behavior and academic impairment in college students. *J Am Coll Heal., 60*(2):126–33.

Linardon, J., Cuijpers, P., Carlbring, P., Messer, M., Fuller-Tyszkiewicz, M. (2019). The efficacy of app-supported smartphone interventions for mental health problems: a meta-analysis of randomized controlled trials. *World Psychiatry*. 18:325-36. https://doi.org/10.1002/wps.20673.

Mazo, G. N. (2015). Causes, Effects of Stress, and the Coping Mechanism of the Bachelor of Science in Information Technology Students in A Philippine University. *Journal of Education and Learning, Vol. 9*(1) pp. 71-78.

Othman, C. N., Farooqui, M., Yusoff, M. S. B., & Adawiyah, R. (2013). Nature of Stress among Health Science Students in a Malaysian University. *Procedia - Social and Behavioral Sciences, 105*, 249–257. https://doi.org/10.1016/j.sbspro.2013.11.026

Portoghese, I., Galletta, M., Porru, F., Burdorf, A., Sardo, S., D'Aloja, E., Finco, G., & Campagna, M. (2019). Stress among university students: factorial structure and measurement invariance of the Italian version of the Effort-Reward Imbalance student questionnaire. *BMC Psychology, 7*(1), 1–7. https://doi.org/10.1186/s40359-019-0343-7

Pryor, J.H., Hurtado, S., DeAngelo, L., Palucki Blake, L., & Tran, S. (2010). The American freshman: National norms fall 2010. *The Higher Education Research Institute*. Retrieved from http://heri.ucla.edu/pr-display.php?prQry=55

Salzer, M. S. (2012). A comparative study of campus experiences of college students with mental illnesses versus a general college sample. *J Am Coll Heal., 60*(1):1–7

Son, C., Hegde, S., Smith, A., Wang, X., & Sasangohar, F. (2020). Effects of COVID-19 on College Students' Mental Health in the United States: Interview Survey Study. *Journal of Medical Internet Research, 22*(9), e21279. https://doi.org/10.2196/21279

Sun, S., Goldberg, S. B., Lin, D., Qiao, S., & Operario, D. (2021). Psychiatric symptoms, risk, and protective factors among university students in quarantine during the COVID-19 pandemic in China. *Globalization and Health, 17*(1). https://doi.org/10.1186/s12992-021-00663-x

Storrie, K., Ahern, K., Tuckett, A. (2010). A systematic review: students with mental health problems—a growing problem. *Int J Nurs Pract., 16*(1):1–6.

Tee, M. L., Tee, C. A., Anlacan, J. P., Aligam, K. J. G., Reyes, P. W. C., Kuruchittham, V., Ho, R. C. (2020). Psychological impact of COVID-19 pandemic in the Philippines. J Affect Disord. doi: 10.1016/j.jad.2020.08.043.

Tomacruz, S. (2018, September 11). A cry for help: Mental illness, suicide cases rising among youth. Rappler. https://www.rappler.com/newsbreak/in-depth/suicide-cases-mental-health-illness-youth-rising-philippines

Yasmin, H., Khalil, S., & Mazhar, R. (2020). COVID 19: stress management among students and its impact on their effective learning. *International technology and education journal, 4*(2), 65-74.

Phytochemical and Antifungal Screening of the Averrhoa bilimbi Fruit Extract Against Aspergillus Niger

Heidi S. Arit, Danica Gani Jarapa,
Herdell Ray Fajura Serrano, Lorcelie Taclan
Adventist University of the Philippines
hsarit@aup.edu.ph
dangleejarapa@gmail.com
2050244@aup.edu.ph

Abstract

Aspergillosis is a fungal infection and is a continuing problem in the world today. The respiratory infection increases the risk to those who are immunocompromised. Evidence shows that the *Averrhoa bilimbi* fruit contains the following pharmacological properties such as antihypertensive, antidiabetic, antithrombotic, cytotoxic, hypolipidemic, hepatoprotective, antimicrobial, anthelmintic, and antioxidant properties. However, the antifungal property of this medicinal plant has not been established. The objective of this study is to determine the bioactive constituents and investigate the antifungal ability of *Averrhoa bilimbi* fruit extract against *Aspergillus niger* organism. The study utilized a complete randomized design to determine the phytochemical properties and antifungal efficacy of *Averrhoa bilimbi* fruit extract against *Aspergillus niger*. The extraction of *Averrhoa bilimbi* fruit was tested according to the procedure of Standards and Testing Division of the Department of Science and Technology (DOST). Qualitative analysis was also used to determine the phytochemical constituents of the fruit extract. Antifungal Assay was done to test the susceptibility of the extract to the *Aspergillus niger.* A positive control (clotrimazole) was used as a comparison. The Result of antifungal screening of the extract reveals a complete inhibitory activity with mild reactivity against the test organism *Aspergillus niger* which is comparable with clotrimazole. It is therefore recommended that similar studies be conducted to establish the antifungal property of the plant.

Keywords: *antifungal property, aspergillus niger, averrhoa bilimbi, antifungal assay*

Plants have been used for medicinal purposes for ages and such use has not changed even until today. *Averrhoa bilimbi* (A. bilimbi) is a medicinal plant in the *Oxalidaceae* family and has been used for different purposes (Ahmed & Alhassan 2016). The plant was originally found in Southeast Asia in countries such as West Malaysia and Indonesia. It has been cultivated in Bangladesh, Indonesia, Malaysia, Philippines, Singapore, and Thailand. The plant has been the important source of medicine since the old times. It has been used for therapeutic purposes as recorded in Egyptian medicinal papyrus which was written in the fourteenth century. *A. bilimbi* also has pharmacological activities which have been reported as antihypertensive, antidiabetic, antithrombotic, cytotoxic, hypolipidemic, hepatoprotective, antimicrobial, wound healing, antihelminthic, and antioxidant.

Averrhoa bilimbi is also known as cucumber tree, kamias, and belimbing asam. The leaves of this plant have been discovered to have not only antimicrobial, but also antifungal properties; however, more studies can be made on the fruit of *A. bilimbi* (Aziz, 2016).

According to Centers for Disease Control and Prevention (CDC), for over 180 species of *Aspergillus*, less than 40 of which have identified to effect human infections. Species *Aspergillus niger* is an opportunistic filamentous fungus and it is one of the most familiar to genus *Aspergillus* species. It induces "black mold" disease to specific vegetables and fruits such as grapes, onions, peanuts, and apricots. In addition, black mold is prevalent to cause hazards if food is contaminated. American Thoracic Society stated that *Aspergillus* lives not just in soil, plants, or decaying materials, but it also exists in the dirt in your home, rugs, heating and ventilation ducts, certain foods including dried fish and dried cannabis plant. *Aspergillus niger* has the least like chance to cause diseases to humans compared to other *Aspergillus* species. Rarely, critically underlying lung disease such as aspergillosis can occur and cause severe illness in the person's lungs.

In the study conducted by Juman et al. (2019), it was revealed that *Averrhoa bilimbi* fruit extracts exhibit wider inhibitory zone than the leaves' extract against pathogenic *Candida* species that causes candidiasis, if left untreated.

Incidence of fungal infections to humans causes a significant rise in the past three decades. Usually, fungal infection does not affect much to low-risk individuals but high risk to those who are in long-term use of antibiotics, immunosuppressive therapies, intensive care unit patients those who are infected with HIV and invasive surgical procedures such as organ transplant and stem cell transplant (Gou et al., 2019).

A case reported that *Aspergillus niger* has been the cause of fungal pneumonia but is rarely known and did not respond to a drug voriconazole in a patient who has been into a long-term steroid treatment (Person et al., 2010).

However, regardless of the progress in the making of antifungal drugs, fungi are still a threat to human health and can spread in healthcare settings according to Centers for Disease Control and Prevention (CDC). There is a relation between the making of antifungal drugs and the several factors that contribute to the emerging opportunistic pathogens and increasing drug-resistant strains that hinder the effectivity treatment against opportunistic infections. The continuing spike range in the numbers of individuals being immunocompromised are not addressed properly even by powerful and effective drugs; hence, development of new antifungal agents should be created to fight against drug-resistant microorganisms (Mazu et al., 2016).The study will determine the phytochemical properties of *Averrhoa bilimbi* fruit extract through qualitative analysis and to test the antifungal efficacy of the *Averrhoa bilimbi*.

Results

Table 1. *Phytochemical Test for Plant Constituent of Averrhoa bilimbi*

Constituents	Results
Sterols	(-)
Triterpenes	(+)
Flavonoids	(+)
Alkaloids	(+)
Saponins	(+)
Glycosides	(+)
Tannins	(-)

Note: (+) Indicates the presence of constituents, (-) Indicates the absence of constituents

Table 1 displays the *Averrhoa bilimbi* fruit extract's phytochemical analysis results. It showed the positive (+) presence of alkaloids, flavonoids, glycosides, saponins, triterpenes, and the absence (-) of sterols and tannins. Among the seven phytochemical constituents of *Averrhoa bilimbi* extracts, bioactive fatty acid-containing constituents were triterpenes, alkaloids, saponins, glycosides while, ethanol-containing constituents showed only the presence of the flavonoids. Fatty acids and ethanol are potent in disrupting pathogenic fungal membranes thus, inhibiting its reproduction. As we can see in the test, there is the absence of tannins and sterols which are ethanol, these are essential in inhibiting the growth of molds.

The proteins and membranes which determine the composition of structure and functions of the cell are the primary target of ethanol to invade, because by targeting this, it inhibits glucose and amino acids thereby, reducing its capability to multiply in the process of reproduction (Eleutherio et al., 2019).

It was found that tannins acted on inhibiting spore germination and mycelial growth. Tannins targets the cell wall causing disruption in the permeability of the membrane leading to a spillage of sugar as one of the intracellular contents. In vivo test, it showed remarkable p value of < 0.05 reduction in an artificially inoculated citrus fruit against P. digitatum and decreases disease status of mold green on citrus fruit significantly by 70% in the study of Zhu et al. (2019).

The phytochemical test manifest a lack of some essential bioactive constituents effective in suppressing the growth of fungi thus, appears to be less effective compared to clotrimazole.

Chemical Constituents Interpretation Flavonoids

Flavonoids (or bioflavonoids) also called Vitamin P; and citrin are usually abundant in fruits, vegetables, seeds, nuts, stems, flowers, tea, wine, propolis and even in honey. They are secondary type of metabolites coming from plants and is ubiquitous in cell photosynthesizing. Over time, this biochemical constituent has been the choice as the active ingredients utilized to combat human diseases.

Based on studies, the broad spectrum of infectious diseases such as parasitic infections, opportunistic infections, resistant bacterial infections, tuberculosis, fungal infections, viral infections, and in varied cancers, flavonoids can be highly useful. (Bose et al., 2018).

The study of Guerra et al. (2017) showed that Cou-UMB16 in Benzopyrone tested and showed significant result that suppresses the Aspergillus species.

Triterpenes

According to Chudzik et al., (2015) they discovered that natural compounds such as triterpenes displayed a broad spectrum of biological effects. In addition, demonstrated to have anti-viral, anti-bacterial, anti-oxidative, anti-fungal, anti- inflammatory properties, chemo-preventive, and anti-fungal properties.

Alkaloids

Alkaloids in plants have been long-used therapeutically for the last thousands of years and its compound liable for its effectiveness was found not until the 19th century. Alkaloids belong to one of the biggest class of natural products that has different variety of chemical entities. Some alkaloids are highly dangerous to animals, but these are helpful to be used as sedatives, antiseptics, analgesics, and act as antifungal and antibacterial agents (Bribi, 2018). In some studies, the gathered information about alkaloids show a very good effect as anticancer mechanism (Lu et al., 2012). In the review study conducted by Khan et al. (2018), alkaloids obtained in various plants shows antifungal effects against diverse fungi. In addition, alkaloids possess little immunity, but these require in-depth studies and clinical trials for validity. Hence, this is showing chances of natural alkaloids to be considered as promising antifungal agents.

Saponins

Saponins belongs to a wide group of compounds present in many plants. Saponins are broken down to triterpenoid and steroid glycosides. They are found in most herbs and vegetables. Saponins were found to have an anti-inflammatory mechanism which aids in skin inflammation and edema. Also, it was reported that saponin extracts from ginseng exhibit neovascularization in burn skin that accelerate wound healing (Kim et al., 2011). According to Niziol-Lukaszewska and Bujak (2018), plants are high in saponins which are usefully applied as active agents in cosmetics because of their antioxidant, regenerative mechanism, and promising anti-aging capabilities. In the past years, the use of saponins as a possible content in the development of a drug posed a great challenge. Although saponins has detergent-like properties, few steroidal saponins was accessed in the market as a drug, such as Di-ao-xin-xu-kang for cardiovascular and cerebrovascular diseases in China for the past ten years and Chuan-shan-long injection for rheumatism (Yang, 2006).

Glycosides

Naturally, glycosides are plants' secondary metabolites that have magnificent therapeutic effects. There is also a compound glycoside in which through glycosidic linkage sugar is attached. In many years, glycosides have been displaying promising therapeutic agents to treat various diseases, to name a few, cancer, myocardial injury, and diabetes. Saponins can activate the biological process of hemolysis as well. Also, they possess anti-thrombolytic, antiviral, antioxidant, antifungal, and antidepressant mechanisms. In some other studies have shown the used of glycosides in against various strains of fungi Aspergillus fumigatus for instance. However, weakness of antifungal efficacy of some glycosides credited to numbers of sugars attached to aglycon part of steroidal nuclei that fueled the polarity of the compound causing direct attack to be less effective (Khan et al., 2017).

Table 2. *Antifungal Activity Test of Averrhoa bilimbi*

Sample/Control	Replicate 1 1 (mm)	Replicate 2 1 (mm)	Replicate 3 1 (mm)	Total Mean Zone of Inhibition	Reactivity	Inhibitory
Fresh Fruit of Kalamyas Extract (10mm)	10.00	10.00	10.00	10.00	2	+++
Positive Control Clotrimazole (10mm)	16.83	-	-	16.83	3	+++
Negative Control Sample-free disk (10mm)	0.00	-	-	0.00	0	(-)

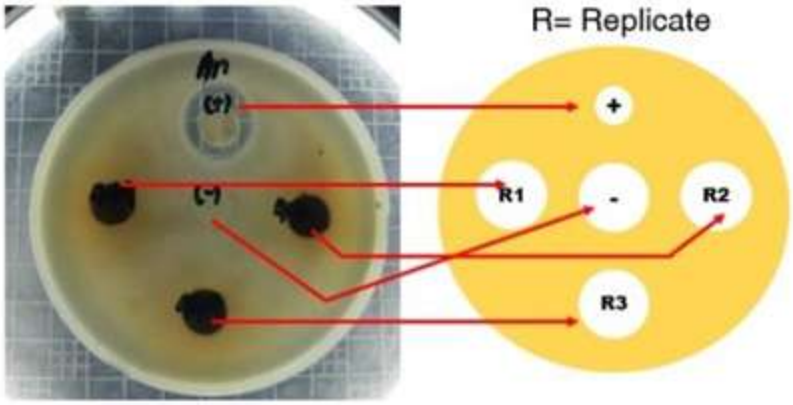
Note: Inhibitory Activity Rating: (-) negative; (+) slight; (++) partial; and (+++) complete

Reactivity Rating:

0- None (No detectable zone around or under specimen)
1- Slight (Some malformed or degenerated cells under the specimen)
2- Mild (Zone limited under the specimen)
3- Moderate (Zone extends 5-10 mm beyond specimen)
4- Severe (Zone extends greater than 10 mm beyond specimen)

Table 2 represents the disc diffusion test result of Averrhoa bilimbi fruit extract against *Aspergillus niger*.

Figure 1. *Zone Inhibition and Reactivity of Averrhoa bilimbi Fruit Extract*



The *Averrhoa bilimbi* fruit extract underwent Disk Diffusion Method to determine if there is antifungal resistance/susceptibility against *Aspergillus niger*.

Table 2 shows that the extract sample of the fresh fruit of kalamyas produces complete inhibitory activity with mild reactivity against the specimen, *Aspergillus niger*. However, the susceptibility of *A. niger* in comparison to clotrimazole, the positive control, clotrimazole propagated moderate reactivity and complete inhibitory activity as compared to *Averrhoa bilimbi* fruit extract.

On the other hand, the sample-free disc, that was used as negative control, presented no reactivity or inhibitory activity in opposition towards the specimen.

In Figure 1, all disc size sample and controls measured 10 millimeters (mm). The reactivity of *Averrhoa* extract was tested in three replicates. In replicate 1, the zone of inhibition revealed 10 mm, replicate 2 revealed the zone of inhibition at 10 mm and replicate 3 had the zone of inhibition revealed as 10 mm against *Aspergillus niger*. To compute, the total mean zone of inhibition of *Averrhoa* replicates are equal to zero, exhibiting mild reactivity (2), meaning the inhibition zone is limited under the filter paper disc. On the other hand, clotrimazole which served as the positive control exceeded to its disc size of 10 mm to 16.83 mm. The total mean zone of inhibition of clotrimazole was 16.83 mm.

Clotrimazole exhibits moderate reactivity (3) which implies that the zone of inhibition extends 5 to 10 mm past the specimen. However, the sample-free disc, used as the negative control, showed zero (0) number of inhibitions resulted to zero in total mean zone of inhibition. This implies a lack of detectable zone around or under the specimen. For the inhibition it was referred to as the "halo" seen in the plate as (+) in Figure 1. For the inhibitory activity rating, this refers to a qualitative description. If there is colony present or if it is clear in the zones of inhibition. A cartoon representation provided below in figure 2.

Figure 2. *Cartoon representation of Inhibitory Activity*

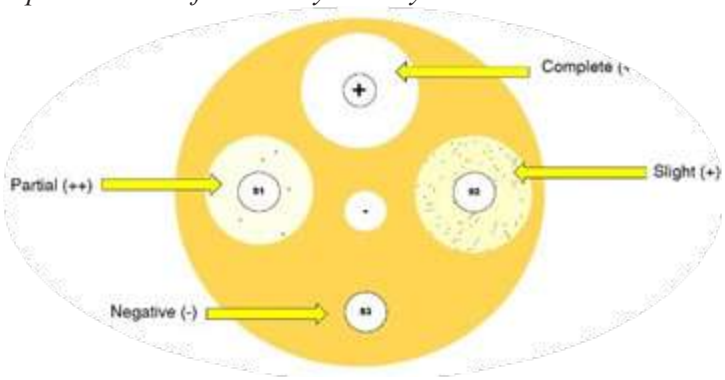


Figure 2 represents the inhibitory activity rating of the *Averrhoa bilimbi* against *Aspergillus niger*. In the photo provided, there are four discs presented. First, the positive control disc which appeared (+++) complete inhibitory rating which indicates that there is no colony growth in the zone of inhibition observed.

Second is sample 1 where the picture showed (++) partial inhibitory activity which indicates limited growth of the fungal colony in the zone of inhibition. Third is sample 2 where the picture showed a slight (+) inhibitory activity that indicates a minimal grow of the fungal colony in the zone of inhibition. Lastly, sample 3 where the picture showed (-) inhibitory activity that indicates a complete growth of the fungal colony in the zone of inhibition and that the sample exhibits failure to inhibit the growth of fungus.

The test result revealed that *Averrhoa bilimbi* extract and clotrimazole produced the same (+++) complete inhibitory rating. This implies that clotrimazole and *A. bilimbi* extract have equivalent rate with regards to their effectiveness in inhibiting the growth of *Aspergillus niger*.

Broad-spectrum antifungal agents such as Clotrimazole inhibits fungal activity can be used as a remedy for various infections like vaginal yeast, ringworm, athlete´s foot, and oral thrush. It inhibits synthesis of ergosterol in which it is an important component of fungal cell membrane and destroys its permeability status. Clotrimazole is necessary for biosynthesis of ergosterol since it targets the specific enzyme called lanosterol 14 a-demethylase. Thus, it prohibits the production of ergosterol following cell lysis (National Library of Medicine, 2021)

Clotrimazole excipients consist of polysorbate 60, benzyl alcohol, cetostearyl alcohol, cetyl esters wax, sorbitan monostearate, octyldodecanol, purified water, and sorbitan monostearate in which these inactive ingredients are potent in the killing of fungus that causes infection. ("DailyMed - CLOTRIMAZOLE ANTIFUNGAL- clotrimazole cream", 2021).

Benzyl alcohol, cetostearyl alcohol, and octyldodecanol are ethanol. According to Rogawansamy (2015), fungal spores can be killed with a high concentration of ethanol. Its killing effectiveness is within the maximum of 70% ethanol. The primary goal of ethanol is to attack the proteins and membranes of the fungus, which determine its structure and functions. In the process, it eventually inhibits glucose and amino acids thus decreasing its ability to grow, much more in cell division of its reproduction (Eleutherio et al., 2019).

On the other hand, sorbitan monostearate and octyldodecanol are fatty acids. According to Bhattachryya et al. (2020), fatty acids have powerful derivatives that break pathogenic fungal membranes such as Candida and Trichophyton. Fatty acids display antimicrobial effectivity by attacking various cellular functions including fatty acid metabolism and protein synthesis thus, perturbing the cell membrane.

In the phytochemical test result, among the seven phytochemical constituents of Averrhoa bilimbi extracts, bioactive fatty acid-containing constituents were triterpenes, alkaloids, saponins and glycosides while, ethanol containing constituents showed only the flavonoids. Fatty acids and ethanol are potent in disrupting pathogenic fungal membranes thus, inhibiting its reproduction. In

this case, clotrimazole and *Averrhoa bilimbi* fruit extracts have the same complete inhibitory effects against *Aspergillus niger*, but not within its reactivity effects. *Clotrimazole* exhibits moderate reactivity while Averrhoa bilimbi showed mild reactivity. In this test, there is the absence of tannins and sterols which are essential in inhibiting the growth of molds. In the study of Zhu et al. (2019), they have found that tannins acted on inhibiting spore germination and mycelial growth. Tannins target the cell wall causing disruption in the permeability of the membrane leading to spillage of sugar as one of the intracellular contents. Tannins showed a remarkable p value of < 0.05 reduction in an artificially inoculated citrus fruit against *P. digitatum* in vivo test and decreased disease status of mold green on citrus fruit significantly by 70%.

In the study of Rana et al., (2016) they have found that the methanolic extract of *A. bilimbi* fruit part displayed positive antifungal effect on C. albicans, A. niger and S. cerevacae.

In addition, the in vitro screening of *Averrhoa bilimbi* leaves done by Carandang et al. (2017), found that its methanolic extract has a convincing effectiveness against *Microsporum canis*, a fungus that causes skin infections such as tinea capitis, tinea corporis, and ringworm.

Further, Kumari (2017), stated that the more the sample extract from the *Averrhoa* fruit and leaf is concentrated, the more it gives an acceptable inhibitory response in opposition towards certain selected Gram-negative bacteria and Gram- positive bacteria.

Conclusion

It can be concluded that Averrhoa bilimbi, specifically its fruit extract, possesses essential bioactive compounds such as alkaloids, flavonoids, glycosides, saponins, and triterpenes that influence its anti-fungal ability against Aspergillus niger organism.

References

Alhassan, A. M., & Ahmed, Q. U. (2016). Averrhoa bilimbi Linn.: A review of its ethnomedicinal uses, phytochemistry, and pharmacology. *Journal of Pharmacy & Bioallied Sciences, Wolters Kluwer-Med know Publication 8*(4), 265-271. https://doi.org/10.4103/0975-7406.199342

Aspergillosis-Types of Fungal Diseases-Fungal Diseases- CDC (2019). November 4. https://www.cdc.gov/fungal/diseases/aspergillosis/index.html

Aziz, N. A. (2016). A Review of the Antimicrobial Properties of three Selected Underutilized Fruits of Malaysia. *International Journal of Pharmaceutical and Clinical Research, 8*(9), 1278–1283

Batac, M., & Denning, D. (2017). Serious fungal infections in the Philippines. *European Journal of Clinical Microbiology & Infectious Diseases, 36*. https://doi.org/10.1007/s10096-017-2918-7

Bhattacharyya. A., Sinha. M., Singh. H., Patel. R. S., Ghosh. S., Sardana. Kabir., Ghosh. S., Sengupta. S. (2020). Mechanistic Insight Into the Antifungal Effects of a Fatty Acid Derivative Against Drug- Resistant Fungal Infections. Microbiol., 08 September 2020 https://doi.org/10.3389/fmicb.2020.02116

Bongomin, F., Gago, S., Oladele, R. O., & Denning, D. W. (2017). Global and Multi- National Prevalence of Fungal Diseases- Estimate Precision. *Journal of Fungi, 3*(4). https://doi.org/10.3390/jof3040057

Bose, S., Sarkar, D., Bose, A., Subhash, CM. (2018). Natural Flavonoids and its Pharmaceutical Importance. The Pharma Review July- August 2018. PMID: 22876957 DOI: 10.2174/13895713804999775 https://www.researchgate.net/publication/328577501 Natural Flavonoids and Its Pharmaceutical Importance

Bribi, N. 2018. Pharmacological Activity of Alkaloids: A Review. Asian Journal of Botany (2018) Volume 1 doi:10.63019/ajb.vli2.467

Carandang, VC., Hernandez, MR., Alvaira CE. (2017). In vitro Screening of Anti- Fungal Effect of Averrhoa bilimbi leaves Methanolic Extract Against Microsporom canis. Lyceum of the Philippines- St. Cabrini College of Allied Medicine Research Vol.2 No. 2 March 2017 https://lpulaguna.edu.ph

Chudzik, M., Karzonek-Szlacheta, I., Krol, IW. (2015). Triterpenes as Potentially Cytotoxic Compounds. *Open Access Molecules. Molecules 2015, 20*, 1610- 1625; doi: 10.3390/ molecules20011610. www.mdpi.com/journal/molecules

Crowley, D. C., Gallager C. (2014). Clotrimazole as a pharmaceutical: past, present and future., *Journal of Applied Microbioloy*/Volume 117. Issue 3/ p. 611-617. https://doi.org/10.1111/ jam.12554 https://sfamjournals.onlinelibrary.wiley.com/doi/full/10.1111/jam.12554

DailyMed. US National Library of Medicine. Clotrimazole Antifungal- Clotrimazole cream. https://dailymed.nlm.nih.gov/dailymed/drugInfo.cfm?setid=e03d9368- e1b4-4e37-87e4-3ee241916aed

Eleutherio, E. (2019). Molecular Mechanisms Involved in Yeast Fitness for Ethanol Production. *Advances In Biotechnology Microbiology, 12*(5). doi: 10.19080/aibm.2019.12.555847

Gou, T., Ye, Y., Huang, L., Cheng, B. (2019). Recurrent fever of unknown fungal infection in a low-risk patient a case report. August 2019-Volume 98 Issue 33 pe16908. doi:10.1097/ MD.0000000000016908

Guerra, F., Araújo, R., Sousa, J. P., Silva, V. A., Pereira, F. O., Mendonça-Junior, F., Barbosa-Filho, J. M., Pereira, J. A., & Lima, E. O. (2018). A new coumarin derivative, 4-acetatecoumarin, with antifungal activity and association study against Aspergillus spp. *Brazilian journal of microbiology : [publication of the Brazilian Society for Microbiology], 49*(2), 407–413. https://doi.org/10.1016/j.bjm.2017.06.009

Gunawan, AC., & Paano, A. (2013). Structure Elucidation of Two New Phytol Derivatives, A New Phenolic Compound and Other Metabolites of Averrhoa bilimbi . DLSU Res. Congress, 1–8. Kumari, S. C. (2017). Studies on Bilimbi. *International Journal of All Research Education and Scientific Methods, 5*(7) https://www.researchgate.net/ publication/324476579_Pharmacological Activity of Alkaloids A Review

Juman, M., Nordin, ML., Woldegiorgis, A., Zulkiple, SA. (2019). In Vitro Study of Antifungal Activity of Averrhoa bilimbi Extracts Against Candida Species. *International Journal of Veterinary Scienc*e. P-ISSN: 2304-3075, E-ISSIN: 2305-4360. www.ijvets.com

Khan, H., Khan, Z., Amin, S., Mabkhot, Y. N., Mubarak, M. S., Hadda, T. B., Maione, F. (2017). *Plant Bioactive Molecules Bearing Glycosides as Lead Compounds for the Treatment of Fungal Infection: A review. Science Direct Elsevier*. 2017 Elsevier Massons SAS. http://dxdoi.org/1.1016/j.biopha.2017.06.077

Khan, H., Mubarak, M., Amin, S., (2017). Antifungal Potential of Alkaloids as An Emerging Therapeutic Target. *National Library of Medicine National Center for Biotechnology Information*. https://pubmed.ncbi.nlm.nih.gov/27440186

Kim, YS., Cho, IK., Jeong, MJ., Jeong, SJ., Nah, SY., Cho,YS., Kim, SH., Go, A., Kim, S.E., Seong Soo Kang, SS., Moon, CH., Kim, JC., Kim, SH., Bae, CS. (2011). Therapeutic Effect of Total Ginseng Saponin on Skin Wound Healing. *PMC US National Library of Medicine National Institutes of Health.* Doi: 10.5142/jgr.2011.25.3.360 https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3659532

Kumari, C. (2017). Studies on Bilimbi. International Journal of All Research Education and Scientific Methods (IJARESM) ISSN: 2455-6211, Volume 5, Issue 7, July-2017, Impact Factor: 2.287. https://www.researchgate.net/publication/320892417 Studies on Bilimbi

Lima, V., Mélo, E., & Santos Lima, LD. (2001). Physicochemical Characterstics of Bilimbi (Averrhoa bilimbi L.). Revista Brasileira de Fruticultura, 23(2), 421– 423. https://doi.org/10.1590/S0100-29452001000200045

Lu, J., Bao, J., Chen, X., Huang, M., & Wang, Y. (2012). Alkaloids Isolated from Natural Herbs as the Anticancer Agents. Evidence-Based Complementary And Alternative Medicine, 2012, 1-12. doi: 10.1155/2012/485042

Mazu, T. K., Bricker B.A., Flores-Rozas, H., Ablordeppey, S. (2016). The Mechanistic Tarhets of Antifungal Agents: An Overview. National Library of Medicine National Institute of Health. Mini Rev Med Chem. 2016; 16(7). 555-578. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5215921

Mokhtar, S. I., Aziz, N. (2016). Antimicrobial properties of Averrhoa bilimbi Extracts at Different Maturity Stages. *Journal of Medical Microbiology & Diagnosis*.

Mokhtar and Aziz, J Med Microb Diagn 2016, 5:3 doi:10.4172/2161- 0703.1000233

National Center for Biotechnology Information (2021). PubChem Compound Summary for CID 2812, *Clotrimazole*. https://pubchem.ncbi.nlm.nih.gov/compound/Clotrimazole.

Niziol-Lukaszewska, Z., Bujak, T. (2018). Saponins as Natural Raw Materials for Increasing the Safety of Bodywash Cosmetic Use. *Journal of Surfactants and Detergents*/ Volume 21, Issue 6 p.767. https://doi.org/10.1002/jsde.12168

Person, AK., Chudgar, SM., Stout, JE. Aspergillus niger: An Unusual Cause in Invasive Pulmonary Aspergillosis. *Journal of Medical Microbiology*

Rana SMM., Billah, MM., Hossain MS., Saifuddin AKM., Islam SKMA, Banik S., Naim Z., Raju GS. (2016) Susceptibility of Microorganism to Selected Medicinal Plants in Bangladesh. *Asian Pacific Journal of Tropical Biomedicine* 2014; Volume 4, Issue 11, 911-917

Rogawansamy, S., Gaskin, S., Taylor, S., Pisaniello, D. (2015). An Evaluation of Antifungal Agents for the Treatment of Fungal Contamination in Indoor Air Environments. *International Journal of Environmental Research and Public Health. nt J Environ Res Public Health*. 2015 Jun; 12(6): 6319–6332.

Yang, C. H., Zhang, Ying., Jacob, M. R., Khan, S. I., Zhang, Y. J., Li, X. C., (2006). Antifungal Activity of C-27 Steroidal Saponins. *American Society for Microbiology*. doi:10.1128/AAC.50.5.1714.2006. https://www.ncbi.nlm.nih.gov/pmc/articles

Zhu, C., Lie, M., Andargie, M., Zeng, J., Li, J., (2019) Antifungal activity and mechanism of action of tannic acid against Penicillium digitatum. *Elsevier, Physiology and Molecular Plant Pathology* Vol 107, August 2019, Page 1.

Homophobic Attitudes and Gay Affirmative Practices Among Nursing Students

Joel Cecilio, Jea Vanice Novabos,
Rhodie Mae Ephteen Javier, Jane Rodriguez
Adventist University of the Philippines
rmemjavier@aup.edu.ph

Abstract

Worldwide, there is a rise of homosexual acceptance in the society. However, there has been no studies done in the Philippines about homophobic attitudes and gay affirmative practices in the healthcare field. Thus, the researchers determined the relationship between homophobic attitudes and gay affirmative practices in the healthcare field. This descriptive-correlation research was conducted to 121 students in the College of Nursing in a private institution using purposive sampling. They answered adapted and modified questionnaires on Homosexual Attitude Scale (HAS) and Gay Affirmative Practice (GAP). Data gathered were analyzed using descriptive and inferential statistics such as mean, standard deviation, Pearson's correlation coefficient, analysis of variance (ANOVA). Results revealed that there was a *low homophobic attitude* of the respondents and fair in terms of gay affirmative practices. Correlational analysis revealed that homophobic attitude and gay affirmative practices were *moderately negatively related*. Furthermore, there was *no significant difference* in the gay affirmative practices of the respondents in terms of age, gender, and religion; however, there was a *significant difference* between homophobic attitudes and nationality, in which Filipinos had more tendencies of having homophobic attitudes. Moreover, there was *no significant difference* in the gay affirmative practices of the respondents in terms of age, gender, nationality, and religion. This study will contribute to future researchers' knowledge about the presence, or lack thereof, of homophobia within the scope of a Christian community. The researchers will then be able to relay their studies to furthering acceptance within the healthcare field.

Keywords: *Homophobic Attitudes, Gay Affirmative Practices*

There has been enormous amount of information for both the LGBT (lesbian, gay, bisexual, and transgender) community and nurses, but very little on nursing care to the LGBT community. Every client walking in a hospital should be treated as people, each having their own sets of care plans. Sexual orientation of the patient should not affect the care of the nurse (Nesbitt, 2014).

In the late 19th century, a German psychologist, Karoly Maria Benkert, created the word "homosexuality". Although the word was new, the idea of "homosexuality" has been around for a while. This term describes the idea of same-sex desirability and serves as an umbrella term for the LGBT population (Pickett, 2015). Throughout history, there have been accounts of homosexual acts – widely man to man. The idea is accepted based on the culture, society, region, and values. In the Western part of the world, homosexual acts started becoming an issue due to the rise of the Roman Empire. In the year 370 AD, the Roman church views men having sexual acts with men as a crime and was punished by burning (Wilhelm, 2014).

Mis (2014) conducted a survey in the Philippines about the acceptance of LGBT in society. She found that among the other South-East Asian countries, Philippines had the highest acceptability rate of homosexuality in society (73%); whereas China was 21%, Malaysia 9%, and Indonesia 3%. But, when asked a different question about the same topic, 65% of Filipinos answered that it was immoral to be a homosexual. This 65% statistic is supported by the population of the Philippines identified as Roman Catholic.

Although there have been laws concerning the discrimination of LGBT individuals in the Philippines, one of which states that homosexual individuals have the right to the highest standard of health care and protection from medical abuses (Committee on Women & Gender Equality, 2017), there has been, however, no reports of a strong enforcement of the said law.

It has recently been established that the LGBT community has been expanding but there is only a small amount of information found in the nursing care within the community. The reason for such small information was due to the staff not accepting the submissions they receive and showing of little interest to the topic. Another factor is that there is a need for the LGBT community's participation to gain more evidence for nursing practices in order to provide the basis for interventions to improve nurses' readiness to care for the population (Jackman, 2017).

There were no studies done about homophobic attitudes and gay affirmative practices within the healthcare area, thus the researchers explored more on this topic. Since it is the patient's right to have access to the highest standard of health care, the researchers determined if there is a presence of homophobic attitudes among nursing students and the extent of their gay affirmative practices.

Methodology

Research Design

The main setting of the study is in the College of Nursing in a private institution for this quantitative – descriptive correlational study. The measured the homophobic attitudes of the respondents and the extent of their gay affirmative practices. The descriptive study describes the nursing student's homophobic attitudes and the extent of the gay affirmative practices. A correlational study is done to describe the statistical association between two or more variables. The correlational study was utilized in order for the researchers to determine the relationship of age, gender, nationality, and religion to homophobic attitudes and gay affirmative practices. Moreover, it also provides the researchers a leeway to identify which variables affect the gay affirmative practices.

Population and Sampling Technique

This study was conducted among the 121 enrolled College of Nursing students in a private university who have been through at least one year of clinical exposure. There were 40 nursing students in the second year level, 28 students of third year level, and 53 fourth year students both with clinical exposure, irrespective of age, gender, nationality, and religion. The 121 students is derived from the six variables in the study multiplied by 20 respondent per variable.

Instrumentation

The researchers are using questionnaires adapted from Catherine Crisp and Mary E. Kite. The questionnaire is divided into three parts. The first part is the demographic profile of the respondents. The respondents were requested to provide data such as age, gender, nationality, and religion.

The second part of the questionnaire is the Homosexuality Attitude Scale (HAS) by Mary E. Kite and Day Deaux. It is a 21-item questionnaire that measures the homophobic attitude of the respondents. The last 21 items for the HAS will be in a five point Likert scale from: 5 = Strongly Agree, 4 = Agree, 3 = Neutral, 2 = Disagree, 1 = Strongly Disagree. The mean scores for the respondents were categorized as follows: 4.50-5.00 = Very High; 3.50-4.49 = High; 2.50-3.49 = Average; 1.50-2.49 = Low; 1.00-1.49 = Very Low.

The third part of the questionnaire is the Gay Affirmative Practice (GAP) Scale by Catherine Crisp. It is a 15-item questionnaire that measures the extent of a healthcare provider's treatment with gay and lesbian clients. The 15 items of the GAP Scale will be in the five point Likert scale from: 5 = Always, 4 = Usually, 3 = Sometimes, 2 = Rarely, 1 = Never (Crisp, 2006). The mean scores for the respondents were categorized as follows: 4.50-5.00 = Very Good; 3.50-4.49 = Good; 2.50-3.49 = Fair; 1.50-2.49 = Poor; 1.00-1.49 = Very Poor.

The GAP Scale's 15-items that dealt with behavioral practices has an alpha Cronbach of .94, whereas the HAS's 21-items that dealt with homophobic attitudes has an alpha reliability of .92.

Data Gathering Procedures

After the approval of the Ethical Review Board, the surveys were distributed during the intersemester of the academic year 2018-2019 in a private institution among nursing students.

There was an informed consent before the questionnaires emphasizing the reason of the study with signatures from the study's advisers and the researchers. Before the respondents answer the questionnaire, the researchers explained the mechanics and ensured that any questions that the respondents may have has been answered. The confidentiality of the data and the anonymity of the respondents were ensured by instructing the respondents not to write their names. The student researchers retrieved 121 questionnaires.

Analysis of Data

After the gathering of the data, the student researchers worked closely with the statistician in analyzing the data. The basis of the significant data is 0.05.

For the first two research questions, the researchers used descriptive statistics which uses the mean and standard deviations of the entirety of the respondents' answers. In the first research question, the results determined whether or not the respondents have a low or high homophobic attitude. For the results of the second research question, the extent of gay affirmative practices of the respondents is determined in the range of very poor to very good.

The third research question utilized the Pearson correlation to measure the statistical relationship between homophobic attitudes and the extent of the respondents' extent of gay affirmative practices. This type of statistical analysis is used when determining the relationship between two quantitative variables.

The last research question was answered by the ANOVA test. This test determined the significant differences in the homophobic attitudes and gay affirmative practices when the moderating factors of age, gender, nationality, and religion were considered.

Ethical Considerations

With the topic of this study, there are ethical concerns that are to be dealt with. For example, the words used in this study may be offensive and insulting to a select few. This study, being a

sensitive topic, especially in a Christian university, the researchers were mindful and sensitive in their approach. Utilizing therapeutic communication techniques and emphasizing confidentiality was the approach of the student researchers while gathering data from the respondents.

Results and Discussions

Homophobic Attitude of the Respondents

This section describes the homophobic attitude of the respondents. The following criteria were set at the start of the study. For the scale of five-point Likert-scale:

4.50 – 5.00 = Very high 1.50 – 2.49 = Low
3.50 – 4.49 = High 1.00 – 1.49 = Very Low
2.50 – 3.49 = Average

The fear of being surrounded or around people who identify themselves as lesbian, gay, bisexual, transgender, or any other non-heterosexual orientation or the fear of becoming such sexual orientations are previous meanings of the word "homophobia". Presently, the word is commonly used as a person that derogates, degrades, or even attempts to "change" the homosexual counterpart into the "normal" sexual orientation (Good Therapy, 2016).

As presented in Table 5, the respondents answered disagree on the following items: (3) *I won't associate with known homosexuals if I can help it* (*mean* = 2.3554); (4) *I would look for a new place to live if I found out my roommate was gay* (*mean* = .2562); (5) *homosexuality is a mental illness* (mean = 2.4628); (7) *gays dislike members of the opposite sex* (*mean* = 2.1157); (9) *homosexuals are more likely to commit deviant sexual acts, such as child molestation, rape, and voyeurism than heterosexuals* (*mean* = 2.1653); (10) *homosexuals should be kept separate from the rest of the society* (*mean* = 1.7190); (11) *two individual of the same sex holding hands or displaying affection in public is revolting* (*mean* =2.3306); (16) *homosexuals should be forced to have psychological treatment* (*mean* = 2.1983). However, the respondents answered somewhat agree on the following items: (12) *the love between two males or two females is quite different than the love between two persons of the opposite sex* (*mean* = 3.1074); (17) *the increasing acceptance of homosexuality in our society is aiding in the deterioration of morals* (mean = 3.0248). The grand mean of the homophobic attitude using the HAS was 2.4416, with a standard deviation of 0.66924. This means the homophobic attitude of the respondents is low.

Table 5. *Homophobic Attitude Scale (N=121)*

Statements	Mean	SD	Scaled Response	VI
3. I won't associate with known homosexuals if I can help it.	2.3554	1.04473	Disagree	Low
4. I would look for a new place to live if I found our my roommate was gay.	2.2562	1.24183	Disagree	Low
5. Homosexuality is a mental illness.	2.4628	1.32314	Disagree	Low
7. Gays dislike the opposite sex.	2.1157	1.04235	Disagree	Low
9. Homosexuals are more likely to commit deviant sexual acts, such as child molestation, rape, and voyeurism than heterosexuals.	2.1653	1.10565	Disagree	Low
10. Homosexuals should be kept separate from the rest of the society.	1.7190	0.96801	Disagree	Low
11. Two individual of the same sex holding hands or displaying affection in public is revolting.	2.3306	1.18595	Disagree	Low

{table continues on the next page}

12. The love between two male or two females is quite different than the love between two persons of the opposite sex.	3.1074	1.32163	Somewhat Agree	Average
16. Homosexuals should be forced to have psychological treatment.	2.1983	1.12264	Disagree	Low
17. The increasing acceptance of homosexuality in our society is aiding in the deterioration of morals.	3.0248	1.26197	Somewhat Agree	Average
Grand Mean	2.4416	0.66924	Disagree	Low

Legend: 1.00-1.49 = strongly disagree, 1.50-2.49 = disagree, 2.50-3.49 = somewhat agree, 3.50-4.49 = agree, 4.50-5.00 = strongly agree

The item "the increasing acceptance of homosexuality in our society is aiding in the deterioration of morals" has the highest mean of 3.0248. This implies that the respondents are aware that there is a progression of activities in terms of the LGBT community to have more civil liberty. The LGBT movement's main goal is to have the same access and rights as their heterosexual counterparts; however, the implication of these rights may be overstepping moral boundaries. With the results of the study, it shows that the respondents were somewhat not agreeable to the LGBT community's desire to have an equal society due to the implication of the overstepping of moral boundaries (Feldman, n.d.).

However, for item 10 Homosexuals should be kept separate from the rest of the society has the lowest mean with 1.7190 – along with the majority of the questions towards homophobia, the respondents answered disagree, this implies that the majority of the respondents do not think badly about the LGBT community. A research done by the William Institute at the University of California – Los Angeles, shows that since 1980, social acceptance of the LGBT community has been steadily increasing due to the access of information and freedom of the press. With the increase of acceptance, there are also implications on the country's economic development policies – policies and programs that mainly help with the reduction of violence and discrimination against the LGBT community (Dowd, 2018).

These findings support the literature, which states that the Philippines has a low homophobic attitude and that the country is accepting to the LGBT movement. In recent Philippine news, in 2018, there have been attempts to pass bills concerning same-sex marriages; however, it is met with a strong opposition by the Catholic Church because of the values that it upholds. With the Philippines being a Catholic country, the church still hold some political influence in the country (Tan, 2018).

Extent of Gay Affirmative Practices

This section describes the extent of the respondents' gay affirmative practices. The following criteria were set at the start of the study. For the scale of five-point Likert-scale:

4.50 – 5.00 = Very Good 1.50 – 2.49 = Poor
3.50 4.49 = Good 1.00 – 1.49 = Very Poor
2.50 – 3.49 = Fair

In Table 6, the respondents answered sometimes on the following questions: (22) *I help my clients reduce shame about homosexual feelings* (mean = 2.9174); (23) *I help gay/lesbian clients address problems created by societal prejudice* (mean = 3.4298); (24) *I inform clients about gay affirmative resources in the community* (mean =3.0165); (25) *I acknowledge to clients the impact of living in a homophobic society* (mean = 3.2314); (27) *I help gay/lesbian clients overcome religious oppression they have experienced based on their sexual orientation* (mean = 3.4050); (29) *I verbalize that a gay/lesbian orientation is as healthy as a heterosexual orientation* (mean = 31074); (31) *I help clients identify their internalized homophobia* (mean = 3.2562).

However, respondents answered usually on the following questions: (26) *I respond to a client's sexual orientation when it is relevant to treatment* (*mean* = 3.5787); (28) *I provide interventions that facilitate the safety of gay/lesbian clients* (*mean* = 3.4025); (30) *I demonstrate comfort about gay/lesbian issues to gay/lesbian clients* (*mean* = 3.5620); (32) *I educate myself about gay/lesbian concerns* (*mean* = 3.6116); (33) *I am open-minded when tailoring treatment for gay/lesbian clients* (*mean* = 4.0000); (34) *I create a climate that allows for voluntary self-identification by gay/lesbian clients* (*mean* = 3.6529); (35) *I discuss sexual orientation in a non-threatening manner with clients* (*mean* = 3.9339); (36) *I facilitate appropriate expression of anger by gay/lesbian clients about oppression they have experienced* (*mean* = 3.7190). The grand mean of the respondents' gay affirmative practices using the GAP Scale is 2.4904, with a standard deviation of 0.97087. This means that the respondents' gay affirmative practices are *fair*.

Table 6. *Gay Affirmative Practice Scale*

Statements	Mean	SD	Scaled Response	VI
22. I help my clients reduce shame about homosexual feelings.	2.9174	1.40586	Usually	Good
23. I help gay/lesbian clients address problems created by societal prejudice.	3.4298	1.27034	Usually	Good
24. I inform clients about gay affirmative resources in the community.	3.0165	1.40821	Sometimes	Fair
25. I acknowledge to clients the impact of living in a homophobic society.	3.2314	1.27646	Sometimes	Fair
26. I respond to a client's sexual orientation when it is relevant to treatment.	3.5787	1.23661	Usually	Good
27. I help gay/lesbian clients overcome religious oppression they have experienced based on their sexual orientation.	3.4050	1.28179	Sometimes	Fair
28. I provide interventions that facilitate the safety of gay/lesbian clients.	3.7025	1.23588	Usually	Good
29. I verbalize that a gay/lesbian orientation is as healthy as a heterosexual orientation.	3.1074	1.30257	Sometimes	Fair
30. I demonstrate comfort about gay/lesbian issues to gay/lesbian clients.	3.5620	1.20342	Usually	Good
31. I help clients identify their internalized homophobia.	3.2562	1.24853	Sometimes	Fair
32. I educate myself about gay/lesbian concerns.	3.6116	1.27392	Usually	Good
33. I am open-minded when tailoring treatment for gay/lesbian clients.	4.0000	1.11803	Usually	Good
34. I create a climate that allows for voluntary self-identification by gay/lesbian clients.	3.6529	1.20907	Usually	Good
35. I discuss sexual orientation in a non-threatening manner with clients.	3.9339	1.13824	Usually	Good
36. I facilitate appropriate expression of anger by gay/lesbian clients about oppression that have experienced.	3.7190	1.06633	Usually	Good
Grand Mean	2.4904	0.97087	Sometimes	Fair

Legend: 1.00-1.49 = never, 1.50-2.49 = rarely, 2.50-3.49 = sometimes, 3.50-4.49 = usually, 4.50-5.00 = always

According to Healthy People (n.d.), there is a lack of information of just how many people identify themselves as part of the homosexual community; however, there is research that strongly state that the LGBT community's health problems are related to the societal opinion, discrimination, and the rejection of their civil and human rights. The problems that the LGBT community faces greatly are psychiatric disorders, substance abuse, and suicide. There are also instances of violence and physical abuses.

Among the questions for gay affirmative practices, question 33 I am open-minded when tailoring treatment for gay/lesbian clients has the highest mean of 4.0000 which can be described as fair. With this statement, it implies that the respondents are willing to gain other opinions and inputs while planning for care for a homosexual patient. The elimination of biases towards the LGBT community will ensure that the homosexual patient is getting the standard quality care and lead to an increase in their mental and physical well-being (Healthy People, n.d.).

The grand mean of 2.4904 with a verbal interpretation as fair implies that the respondents are not performing above the norm of health care, but rather just staying on a typical standard of health care. However, for 2019-2022, the Health Resources and Services Administration (HRSA) put out objectives for ensuring the underserved and vulnerable populations to having better access to health care. Another objective is enhancing the quality of care and increasing the access to necessary services for those in need (HRSA, 2019).

Relationship between Homophobic Attitude and Gay Affirmative Practices

The results of the relationship between the respondent's homophobic attitude and gay affirmative practices is presented in Table 7. The table reveals that for the 121 respondents, there is a -0.525 relationship between homophobic attitude and gay affirmative practice. This implies that the higher the homophobic attitude of the respondent, their gay affirmative practice would be lower. Thus the hypothesis of "there is no significant relationship between homophobic attitudes and gay affirmative practices among nursing students" can be rejected because homophobic attitude does impact the gay affirmative practice of an individual.

Table 7. *Relationship between Homophobic Attitude and Gay Affirmative Practice (N=121)*

		Variables		
		Homophobic Attitude	Gay Affirmative Practices	VI
Homophobic Attitude	Pearson Correlation Sig. (2-tailed)	1	-0.525**	S
Gay Affirmative Practice	Pearson Correlation Sig. (2-tailed)	-0.525** 0.000	1	S

*** Correlation is significant at the 0.01 level (2-tailed)*

Relationship Interpretation: ±1 = perfect positive/negative, ±0.90-±0.99 = very high positive/negative, ±0.70-±0.89 =high positive/negative, ±0.50-±0.69 = moderate positive/negative, ±0.30-±0.49 = low positive/negative, ±0.10-±0.29 = very low positive/negative, ±0.00-±0.09=markedly low, negligible positive/negative.

Resulting to a moderately negative relationship, this implies that with a high homophobia comes a poor treatment towards the client. This result is supported by the programs and laws that the American government is trying to set up to protect the LGBT community from hate crimes. Hate crimes are harsh actions done by a perpetrator that targets a certain person because of his or her affiliation with a certain social group (LGBTMAP, n.d.).

In fact, a study done by the Center for American Progress in 2017, emphasized that LGBT people have been refused treatment by their healthcare providers due to their sexual orientation or gender identity. There has been a cry to the legislative branch that being a patient should come first before healthcare providers looking on at their sexual orientation. With the known fact that that there is a presence of discrimination in the health care field, members of the LGBT community tend to shy away from seeking care (Human Rights Watch, 2018).

Along with this, there was a group of conservative religious organizations that challenged a law concerning non-discrimination in the healthcare field, stating that it would require healthcare professionals to give out care that violate their values and religious beliefs (Mirza & Rooney, 2018).

Difference in Homophobic Attitudes with Corresponding Dimensions

Tables 8 – 12, shows the difference of the respondents' homophobic attitudes considering age, gender, nationality, and religion.

Age

In Table 8, the researcher categorized respondents' age in 18-19, 20-21, and 22-above years old. The table supports the null hypothesis of "there is no significant difference in the homophobic attitudes when age is considered" because of the p-value being .127.

Table 8. *Homophobic Attitude when Age is Considered*

Age	N	Mean	SD	F-Value	Sig.	VI
18-19	13	2.5897	.87601			
20-21	70	2.3361	.66171	2.102	.127	NS
22-above	38	2.5852	.58067			
Total	121	2.4416	.66924			

Legend: S=Significant NS=Not Significant VI=Verbal Interpretation

The overall population of the respondents belong in the early adulthood. This group have seen and witnessed the start and social struggles of the LGBT movement. This group also has just finished physical changes such as puberty and growth, and has been through some time in a formal education. Selecting a mate, making new life-long friendships, and getting their lives together are the goals of those in early adulthood. It can be considered as a new kind of freedom (Beck, 2016). Furthermore, as the results show, respondents who are 20-21 years old have less homophobic attitudes than 18-19 years old and 22 years old and above. According to Ring (2017), there have been studies done that supported the results that Generation Z people are more accepting of the LGBT community and they are the ones who tend to be identified as LGBT. In addition to this, it is greatly thought that understanding and acceptance among the younger generations can lead to far greater things in the society's future.

On the other hand, a recent study done in June of 2019 by GLAAD, an organization with the recent updates about LGBT advocacy through the use of media and culture, showed that the young adults are now starting to become uncomfortable due to the broadening and spread of the LGBT spectrum, and the younger generation finds this confusing due to the different labels and the need to be politically correct. These young people who have duly supported the LGBT movement are no becoming detached allies (Suleman, 2019).

Gender

In Table 4.4b, the null hypothesis is supported. There is no significant difference in the homophobic attitudes when gender is considered due to the p-value being .555.

Table 9. *Homophobic Attitudes when Gender is Considered*

Gender	N	Mean	SD	F-value	Sig.	VI
Male	45	2.6148	1.04300	0.351	0.555	NS
Female	76	2.4167	0.92473			

Since there is no significant difference in the homophobic attitudes when gender is considered, this finding suggests that whether male or female have the same homophobic attitude. A study done by male respondents in Australia (21%) agree that it was difficult for them to treat individuals who identify themselves as part of the LGBT community the same way as they would treat a heterosexual. This study was specifically for the male gender because they tend to hold a much more harmful view towards homosexual individuals (Davey, 2015).

Furthermore, the use of social media as a platform to express one's feelings has a positive effect on the society. Through data analysis, since 2012, the use of the phrase "no homo" (short for "I am not homosexual") has been used more than 14 million times on the social media platform, Twitter. The majority of the tweets that bore this phrase were used by males as their defense to protect their masculinity (Halnon, 2019).

In addition, around the 1930s, there was a rise in fears of being identified as lesbian. Women athletes were sure to present a feminine façade and emphasized their heterosexuality. However, those women were struggling to find a perfect combination of sports and feminism because of the society's fear of women becoming manly (Blakemore, 2018).

Nationality

In Table 10, the null hypothesis of "there is no significant difference in the homophobic attitudes when nationality is considered" can be rejected due to the p-value of .010. There is significant negative difference between homophobic attitudes and nationality as indicated by an F-value of 4.790. This means that Filipinos tend to be more homophobic than other nationalities.

Table 10. *Homophobic Attitudes when Nationality is Considered*

Nationality	N	Mean	SD	F-value	Sig.	VI
Filipino	92	2.3618	.68080			
American	10	2.3714	.43109	4.790	.010	S
Others	19	2.8647	.57060			

Table 11. *Homophobic Attitudes when Nationality is Considered*

(I) Nationality	(J) Nationality	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Filipino	American	-.00963	.21612	.999	-.5226	.5034
	Others	-.50286*	.16356	.007	-.8911	-.1146
American	Filipino	.00963	.21612	.999	-.5034	.5226
	Others	-.49323	.25357	.131	-1.0951	.1087
Others	Filipino	.50286*	.16356	.007	.1146	.8911
	American	.49323	.25357	.131	-.1087	1.0951

**The mean difference is significant at the 0.05 level*

According to Grimwald (2015), in the Filipino society, even though media claims that the country is progressing to accepting more homosexuals in society, the stigma is still present and because of this, individuals who identify themselves as homosexual individuals are still hesitant to "come out of the closet", or to proudly out themselves to the society to avoid discrimination. There are quite a few celebrities on media that outwardly show their gender identity; however, most of the LGBT community believe that the way those celebrities portray themselves is not accurate representation of the LGBT community.

With the wide acceptance of the LGBT community in the Philippines society, they are still the main target of gender discrimination. Being a majorly Roman Catholic country, there has been a strong opposition to LGBT equality in the Senate that has kept attempts in passing an anti-LBGT discrimination bill (Conde, 2018).

The study results negate the survey done in the Philippines and it resulted to 73% of the Filipinos believe that homosexuals should still be accepted by the society. This statistic puts Philippines in second place, after Australia, which has the highest rate of acceptance of homosexuals at 79%. Despite the high levels of religiosity, Filipinos are more tolerant towards homosexual individuals and practices (Salaverria, 2018).

Religion

Table 12 supports the null hypothesis of "there is no significant difference in the homophobic attitudes when religion is considered" with the p-value being .116. This implies that no matter the religion, whether it be Seventh-day Adventist or not, there is an equal tendencies between the two groups to have homophobic views.

Table 12. *Homophobic Attitudes when Religion is Considered*

Religion	N	Mean	SD	F-value	Sig.	VI
SDA	100	2.4867	.63591			
Non-SDA	21	2.2268	.79181	2.505	.116	NS

In the United States of America, there are studies resulting in a negative relationship between regular, active participation in church activities and the disapproval of homosexuality. Irrespective of religious affiliation, homosexual acts are frowned upon. But when the individual gets convicted to do so, ministers are ready to "pray the gay away" – which is done with the help of others through meditation, prayer, and retraction form the past sexual acts, a homosexual individual can be able to change his or her sexual orientation (University of California-Santa Barbara, 2017).

Moreover, there is a thought that the Church has the right to practice its own doctrine without the government interfering. World churches have become aware of the increasing acceptance of the LGBT community in the society, so they have the need to be more powerful in exercising their doctrines. There are still a handful of countries around the world that think of sexual acts as illegal and is considered a capital offense if caught doing so, these places are mostly Muslim countries (Wood, 2017).

Furthermore, according to Massie (2016), the crux of the LGBT discrimination is religion. Unlike what the study revealed, there has been reforms in the world churches – in which they have changed their theology and affirming that homosexual acts are not sinful. These churches are also emphasizing the difference between faith and sexuality; wherein, faith should not have a basis in gender identity.

Difference Between Gay Affirmative Practices with Corresponding Dimensions

Tables 13 shows the difference of the respondents' gay affirmative practices considering age, gender, nationality, and religion.

Age

In Table 13, the results supports the null hypothesis of "there is no significant difference in the gay affirmative practices when age is considered" with the p-value being .529.

Table 13. *Gay Affirmative Practices when Age is Considered*

Age	N	Mean	SD	F-value	Sig.	VI
18-19	13	2.2462	1.11135			
20-21	70	2.4781	.92285	.640	.529	NS
22-above	38	2.5965	1.01756			

Based on the study's results, it implies that irrespective of age, the student nurses can still practice gay affirmative nursing care. According to a 2015 article in the Journal of Nursing Management, patients feel more comfortable and would have a better experience when the nurse is around the same age. Healthcare professionals know how to deal with more types of situations if they have been in the job for so long. There's a better patient-nurse understanding (University of Texas-Arlington, 2017; American Nurses Association, n.d.).

In addition, older nurses have more advantages in terms of knowledge and skills than their younger counterparts due to the experience they have already went through and the dedication and loyalty they have for their job. Experienced nurses gain satisfaction with patient contact and establishing rapport with the patients (Urthaman, Chua, & Ang, 2016).

Gender

Table 14 supports the null hypothesis of "there is no significant difference in the gay affirmative practices when gender is considered" with the p-value being .323.

Table 14. *Gay Affirmative Practices when Gender is Considered*

Gender	N	Mean	SD	F-value	Sig.	VI
Male	45	2.6148	1.04300	.984	.323	NS
Female	76	2.4167	.92473			

The table reveals that whether male or female have the same gay affirmative practices. According to a study done in the University of Arizona, it discusses about how there is a difference between gender differences and social behaviors. Women are more caring, expressive, and nurturing – women were born with a need to care; whereas, men were born to be independent, assertive, and aggressive. There is also a carried stigmatization in how male nurses care for the patient, as study shows, the general population trusts female nurses more because they are seen with the therapeutic use of touch which can be thought of as caring and loving for female, but when male nurses use the therapeutic use of touch, it is more seen as a type of harassment (Kronsberg, Bouret, & Brett, 2018).

Historically, nursing is considered a women's field because of their innate caregiving attribute; however, in the mid-19th century, men came in the nursing field and were relied on for their physical strength and bravery in taking care of patients during epidemics. Based on the General Social Survey, there is a progressive positive attitude towards gender roles. But as stated previously, male nurses tend to take up jobs that showcases their masculinity, whereas women stay at the bedside (Advisory Board, 2018; West et. al, 2016).

Nationality

With the p-value of .164, the null hypothesis of "there is no significant difference in the gay affirmative practices when nationality is considered".

Table 15. *Gay Affirmative Practices when Nationality is Considered*

Nationality	N	Mean	SD	F-value	Sig.	VI
Filipino	92	2.3978	.94454			
American	10	2.8733	1.43345	1.833	.164	NS
Others	19	2.7368	.74617			

Based on the results shown in Table 15, there is no difference in gay affirmative practices when nationality is considered which implies that gay affirmative practice among the respondents will still be provided irrespective of their nationalities.

The statement above is negated with a survey done by the American Association of Colleges of Nursing revealing there always has been a presence of racial inconsistency in the nursing field due to 30% of the nurses identifying that they are "non-white" and less than 20% of the nurses belong in minority groups. The result shows that many nurses are unaware of the ways other cultures deal with health issues (Louisiana State University-Alexandria, 2017).

On the other hand, Landry (2016), published an article conceptualizing a way for healthcare providers to have a more culturally competent provision of care. According to her studies, it shows that health care providers typically basic understanding and terminology of the LGBT community. She concluded that being aware of the different cultures and practices, especially to the LGBT community, the population will have their mental and physical needs met by the health care providers.

In a Filipino culture, nurses who are caring for individuals who identify themselves as part of the LGBT community will be facing a much difficult situation when it comes to gay affirmative practices. In the Filipino culture, a client's family would want to know about the client's status, even before the healthcare provider gets a chance to speak with the client. These cultural practices have to be respected to avoid conflict with the client (Mullahy, 2015).

Religion

Table 16 supports the null hypothesis of "there is no significant difference in the gay affirmative practices when religion is considered" with the p-value being .443

Table 16. *Gay Affirmative Practices when Religion is Considered*

Religion	N	Mean	SD	F-value	Sig.	VI
SDA	100	2.5880	.97102	.591	.443	NS
Non-SDA	21	2.0254	.84472			

These results reveal that when religion is considered, gay affirmative practices of the respondents are not affected. Healthcare organizations are investing to provide education for staff about the different religions in the world to gain awareness of the differences in values and traditions. With this education, it will enhance the individualization of care to every patient. As long as there is an open line of communication between the patient and the healthcare provider, religion can be infused in the care plan which will enhance trust and build a great patient-nurse relationship (Cultural Link, 2018).

Healthcare providers deciding which procedures to perform can be a threat to everyone's health and wellbeing because it deals more on personal beliefs. There have been accounts where healthcare providers have been fired for giving care for patients but goes against the religious values of the affiliated hospital. The journal argues that the patient's wellbeing must come before the personal values and beliefs of the healthcare professional. If not, then there will be a grave consequence to those who are refused treatments (Movement Advancement Project, 2018).

There has been a pulling away of federal healthcare anti-discrimination bill. This anti-discrimination bill increases religious exemptions for healthcare providers to refuse LGBT people from gaining access to healthcare services (Thoreson, 2018).

Summary of the Findings

The homophobic attitude of the respondents is low. Majority of the respondents described their gay affirmative practices as fair, since they answered sometimes in questions that asks towards gay affirmative practices.

There is a *significant moderately negative relationship* between homophobic attitudes and gay affirmative practice among the respondents. This implies that when there is a low homophobic attitude, then there will be a much higher quality of gay affirmative practices among nursing students.

There is a significant difference in the homophobic attitudes of the respondents when nationality is considered. Filipinos tend to be more homophobic than those non-Filipinos are.

Conclusion

Based on the findings of the study, it was concluded that the respondents described their homophobic attitude as low. The gay affirmative practices of the nursing students is fair. Between the two variables, homophobic attitudes and gay affirmative practices, there was a negative relationship. There was a significant difference in homophobic attitudes when nationality is considered.

References

Advisory Board. (2018, January 9). How being a male nurse became so stigmatized – and what's being done about it. Retrieved from https://www.advisory.com/daily-briefing/2018/01/09/male-nurses

Alessi, E., Dillon, F., and Kim, H. (2015, February). Determinants of Lesbian and Gay affirmative practice among heterosexual therapists. *American Psychological Association. 52*(3), 298-307. doi: 10.1037/a0038580

Allen, L., Bromdal, A., Quinlivan K., Rasmussen, M., Sanjakdar, F. (2015). Homophobia, transphobia, young people, and the question of responsibility. *Studies in the Cultural Politics of Education*. doi: 10.1080/01596306.2015.1104850

American Nurses Association. (N.d.). *Workforce*. Retrieved from https://www.nursingworld.org/practice-policy/workforce/

Beck, J. (2016, January 5). *When are you really an adult?*. Retrieved from https://www.theatlantic.com/health/archive/2016/01/when-are-you-really-an-adult/422487/

Bianchi, M., Carnaghi, A., Cavallero, C., Di Blas, Hunt, C., L., Hvastja-Stefani, L., Pelamatti, G., and Piccoli, V. (2016). Adolescents' appraisal of homophobic epithets: the role of individual and situational factors. *Journal of Homosexuality, 63*(10), 1422-1438. doi:10.1080/00918369.2016.1158000

Blakemore, E. (2018, August 2). *Homophobia in women's sports*. Retrieved from https://daily.jstor.org/homophobia-in-womens-sports/

Cherry, K. (2019, March 20). *Cognitive Behavioral Therapy.* Retrieved from https://www.verywellmind.com/what-is-cognitive-behavior-therapy-2795747

Clark, C., McLaughlin, W., Moody, B., Simon, S., and Walters, C. (2018). *Gay Affirmative Practice: A Model for Counseling LGB Youth*. Retrieved from https://digitalcommons.georgiasouthern.edu/ccec/2018/2018/12/

Cohn, J., Love, M., Lyall, S., Mullins, J., Smith, A. (2015, April 1). Exploring the relationship between gay affirmative practice and empathy among mental health professionals. *Journal of Multicultural Counseling and Development, 43*(2). doi:10.1002/j.2161-1912.205.00066.x

Committee on Women & Gender Equality (2017, February 7). *Prohibiting discrimination on the basis of sexual orientation or gender identity.* Retrieved from http://www.congress.gov.ph/legisdocs/first_17/CR00101.pdf

Conde, C. (2018, June 5). *Philippine city passes law against LGBT discrimination*. Retrieved from https://www.hrw.org/news/2018/06/05/philippine-city-passes-law-against-lgbt-discrimination

Crisp, C. (2006). The Gay Affirmative Practice Scale (GAP): A new measure for assessing cultural competence with gay and lesbian clients. *Social Work, 51*(2), 115–126.

Cultural Link. (2018, October 17). *The impact religion can play in healthcare.* Retrieved from https://theculturalink.com/2016/10/17/the-impact-religion-can-play-in-healthcare/

Davey, M. (2015, March 31). *Homophobia among teenage boys at frightening level, says Beyondblue*. Retrieved from https://www.theguardian.com/world/2015/mar/31/homophobia-among-teenage-boys-at-frightening-levels-says-beyondblue

Dowd, R. (2018, April 18). *Acceptance of LGBT people and rights has increased around the world*. Retrieved from https://williamsinstitute.law.ucla.edu/press/press-releases/lgbt-acceptance-increases-press-release/

EurekaAlert. (2019, January 22). *The feminization of men leads to a rise in homophobia.* Retrieved from https://www.eurekalert.org/pub_releases/2019-01/udg-tfo012219.php

Feldman, K. (N.d.). *Straight vs. gat; is morality the only issue?*. Retrieved from https://www1.cbn.com/biblestudy/straight-vs.-gay%3A-is-morality-the-only-issue%3F

Garcia, J. (2013). Kritika Kultura Ateneo. *Nativism or universalism: situating LGBT discourse in the Philippines, 20*. 48-69. Retrieved from https://journals.ateneo.edu/ojs/index.php/kk/article/view/KK2013.02003/840

Good Therapy (2016, May 17). *Homophobia*. Retrieved from https://www.goodtherapy.org/blog/psychpedia/homophobia

Grimwald. (2015, January 21). *Homophobia in the Philippines and why it persists to this day*. Retrieved from https://www.getrealphilippines.com/2015/01/homophobia-in-the-philippines-and-why-it-persists-to-this-day/

Halnon, E. (2019, April 17). *Men often use homophobic tweets to protect masculinity*. Retrieved from https://phys.org/news/2019-04-men-homophobic-tweets-masculinity-article.html

Health Resources and Services Administration. (2019, May). *Improve access to quality health care and services*. Retrieved from https://www.hrsa.gov/about/strategic-plan/goal-1.html

HealthyPeople. (N.d.) *Lesbian, Gay, Bisexual, and Transgender Health*. Retrieved from https://www.healthypeople.gov/2020/topics-objectives

Hopkins, N., Kalinauskaite, M., Wakefield, J. (2016, June 4). The nation and the family: the impact of national identification and perceived importance of family values on homophobic attitudes in Lithuania and Scotland. *Sex Roles, 75*(9-10), 448-458. doi: 10.1007/s11199-016-0641-y

Human Rights Watch. (2018, July 23). *US: LGBT people face healthcare barriers*. Retrieved from https://www.hrw.org/news/2018/07/23/us-lgbt-people-face-healthcare-barriers

InterNations (2014, February 6). *Homophobia and hate crimes*. Retrieved from https://www.internations.org/usa-expats/guide/29460-safety-security/racism-and-discrimination-in-the-us-16290/homophobia-and-hate-crimes-2

Jackman, M (2016, July 22). *Culture, Health, & Sexuality*. Retrieved from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5213255/

Kite, E. & Deaux, D. (1986) Attitudes Toward Homosexuality: Assessment and Behavioral Consequences. *Basic and Applied Social Psychology, 7*:2, 137-162, DOI: 10.1207/s15324834basp0702_4

Kronsberg, S., Bouret, J., and Brett, A. (2018) Lived experiences of male nurses: dire consequences for the nursing profession. *Journal of Nursing Education and Practice, 8*(1). doi: 10.5430/jnep.v8n1p46

Landy, J. (2017). Delivering culturally sensitive care to LGBTQI patients. *The Journal for Nurse Practitioners, 13*(5). doi: 10.1016/j.nurpra.2016.12.015

Lelutiu-Weinberger, C. and Pachankis, J. (2017, October 5). Acceptability and preliminary efficacy of a lesbian, gay, bisexual, and transgender-affirmative mental health practice training in a highly stigmatizing national context. *LGBT Health 4*(5), 360-370. doi:10.1089/lgbt.2016.0194

LGBTMAP. (N.d.). *Talking about: inclusive hate crimes laws*. Retrieved from http://www.lgbtmap.org/file/talking-about-inclusive-hate-crime-laws.pdf

Lousiana State University-Alexandria. (2017, March 30). *How does culture affect healthcare?* Retrieved from https://online.lsua.edu/articles/healthcare/does-culture-affect-healthcare.aspx

Massie, V. (2016, June 15). *LGBTQ religion activist: it's time to talk about America's faith based homophobia problem*. Retrieved from https://www.vox.com/2016/6/15/11932454/orlando-shooting-LGBTQ-homophobia-religion

McLeod, S. (2019). *Cognitive Behavioral Therapy.* Retrieved from https://www.simplypsychology.org/cognitive-therapy.html

Mirza, S. and Rooney, C. (2018, January 18). *Discrimination prevents LGBTQ people from accessing health care*. Retrieved from https://www.americanprogress.org/issues/lgbt/news/2018/01/18/445130/discrimination-prevents-lgbtq-people-accessing-health-care/

Mis, M. (2014, May 16). *Is the Philippines really Asia's most gay-friendly country?*. Retrieved from http://news.trust.org//item/20140516162146-jipm9/

Movement Advancement Project. (2018, March). *Religious refusals in health care: A prescription for disaster*. Retrieved from http://www.lgbtmap.org/file/Healthcare-Religious-Exemptions.pdf

Mueller, E. (N.d). *Homosexuality in history*. Retrieved from https://www.adventistbiblical research.org/sites/default/files/pdf/Homosexuality%20in%2 0History.pdf

Mullahy, C. (2015, May 6). *New case management opportunities for minority nurses*. Retrieved from https://minoritynurse.com/category/lgbt-nurses/page/2/

Muller, A. (2016). Sexual orientation, gender identity, and the implementation of the right access to health care in South Africa, *Health and Human Rights Journal. Health for all?* 18(2), 195-208. Retrieved from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5395001/pdf/hhr-18-195.pdf

Nesbitt, V (2014) *LGBT Health*. Received from https://journals.lww.com/ajnonline/Fulltext/2014/09000/LGBT_Health.3.aspx#pdf-link

Nkosi, S (2017). *Christianity and homosexuality: contradictory or complimentary? A qualitative study of the experiences of Christian homosexual university students*. Retrieved from http://www.journals.ac.za/index.php/sajhe/article/view/891

Papadaki, E., Papadaki, V., Plotnikof, K. (2013). *Social work students' attitudes towards lesbians and gay men: the case of the social work department in Crete*, Greece. Social

Pickett, B. (2015, July 5). *Homosexuality.* Retrieved from https://plato.stanford.edu/entries/homosexuality/

Ring, T. (2017, April 1). *Study: millennials most likely to be LGBT or accepting*. Retrieved from https://www.advocate.com/politics/2017/4/01/study-millennials-most-likely-be-lgbt-or-accepting

Salaverria, L. (2018, July 1). PH LGBT-friendly, but 61% oppose same-sex marriage. Retrieved from https://newsinfo.inquirer.net/1005757/ph-lgbt-friendly-but-61-oppose-same-sex-marriage?utm_expid=.XqNwTug2W6nwDVUSgFJXed.1

Sanders, C. (2017). *Assessing Predictors of Homophobic Attitudes in Female College Students in a Socially Conservative State*. Retrieved from https://shareok.org/bitstream/handle/11244/317256/oksd_sanders_HT_2017.pdf?sequenc e=1&isAllowed=y

Santossa, A. and Tognasso, G. (2017, June 1). Attitudes toward homosexuality in adolescence: An Italian study. *Journal of Homosexuality, 65*(3), 361-378. doi:10.1080/00918369.2017.1320165

Smith, D. (2017, May 12) *Homophobic and transphobic violence against youth: The Jamaican Context*. Received from https://www.tandfonline.com/doi/full/10.1080/02673843.2017.1336106

Suleman, N. (2019, June 25). *Young Americans are increasing 'uncomfortable' with the LGBT community, GLAAD study shows.* Retrieved by https://time.com/5613276/glaad-acceptance-index-lgbtq-survey/

Tan, R. (2018, June 19). *In the fight for gay marriage in the Philippines, Duterte could be an unlikely ally*. Retrieved from https://www.washingtonpost.com/news/worldviews/wp/2018/06/19/in-the-fight-for-gay-marriage-in-the-philippines-duterte-could-be-an-unlikely-ally/?utm_term=.18ed85470717

Thoreson, R. (2018, July). *"You don't want second best": Anti-LGBT discrimination in US health care*. Retrieved from https://www.hrw.org/report/2018/07/23/you-dont-want-second-best/anti-lgbt-discrimination-us-health-care

United States Department of Health and Human Services. (2015). *Advancing LGBT health & well-being*. Retrieved from https://www.hhs.gov/sites/default/files/dhhs-lgbt-2015-annual-report.pdf

University of California-Santa Barabara. (2017, February 17). *Homosexuality and religion*. Retrieved from https://sexinfo.soc.ucsb.edu/article/homosexuality-and-religion

University of Texas-Arlington. (2017, January 3). *Importance of addressing ageism in nursing.* Retrieved from https://academicpartnerships.uta.edu/articles/healthcare/importance-of-addressing-ageism-in-nursing.aspx

Urthaman, T., Chua, T., and Ang, S. (2016). Older nurses: A literature review on challenges, factors in early retirement and workforce retention. *Proceedings of Singapore Healthcare, 25*(1). doi: 10.1177/2010105815610138

West, M., Wantz, D., Campbell, P., Rosler, G., Troutman, D., Muthler, C., (2016, January 21). Contributing to a quality patient experience: applying evidence based practice to support changes in nursing dress code policies. *The Online Journal of Issues in Nursing, 21*(1). doi: 10.3912/OJIN.Vol21No01Man04

Wilhelm, A. (2014, May 8). *A timeline of gay world history*. Retrieved from https://www.galva108.org/single-post/2014/05/08/A-Timeline-of-Gay-World-History

Wood, K. (2017, July 7). *The greater the religious fervency, the greater the homophobia.* Retrieved from https://www.secularism.org.uk/opinion/2017/07/the-greater-the-religious-fervency-the-greater-the-homophobia

Youn, G. (2018). Attitudinal changes toward homosexuality during the past two decades (1994-2014) in Korea. *Journal of Homosexuality, 65*(1). doi: 10.1080/00918369.2017.1310

Transcultural Nursing Competency Experiences of Foreign Students from Selected Higher Education Institutions in the Philippines

Carmela G. Malabat[1], Fred B. Ruiz[2]
[1]Adventist University of the Philippines, Philippines
[2]Our Lady of Fatima University, Philippines
cgmalabat@aup.edu.ph
ruiz_fb@yahoo.com

Abstract

The need for transcultural nursing competency experiences amongst students points to an array of improvements in nursing education. The study utilized a descriptive qualitative research design through a semi-structured interview guided by the central question, *"What characterizes the transcultural nursing experiences of the key informants in the clinical and classroom settings?"* Interviews alongside audio recordings served as key in eliciting the transcultural experiences of the key informants. Data collected through purposive sampling were transcribed verbatim, deeply analyzed, encoded, and synthesized. Thematic interlace, thematic embodiment, peer review, expert validation, and triangulation were done. Three themes surfaced: *Transformational acculturation* (experiences in theoretical and clinical settings with highlights on what changed them upon nursing school entrance); *transitional acculturation* (adaptation by application of theory to practice where there is continuity of learning from classroom to clinical); and *transpersonal acculturation* (experiences in theoretical and clinical settings emphasizing involvement beyond their sense of self, pointing to sublime experiences in nursing education). The themes' interrelationship portrayed students going through this triad of *transcultural adaptation* with dynamic and unending lifelong learning experiences. In essence, students go through the process of cultural adaptation, so they need to experience that quality nursing care be tailor-fitted to clients of distinct backgrounds.

Keywords: *Transcultural nursing competency experiences*

The delivery of a culturally appropriate and competent care at these times is a complex and multidimensional undertaking for nurses from all walks of life. Nursing programs carry the responsibility to adequately prepare students in providing culturally competent care (Von Ah & Cassara, 2013). It is never an option for a nurse to choose a client to care for with regards to race, nationality, or status. A student nurse is fashioned once training has commenced; thereby, molding him to become culturally competent, having reached the desired level of competence across the completion of the BSN program.

The quantity of foreign residents in the country who appeared before the field offices of the Bureau of Immigration has mounted from 95,007 to 106,036 in 2016 and 2017, respectively. Also, there were 15,765 foreign students who were given study visas (SunStar Philippines, 2017). The datum that several foreign students are here denotes that majority of them if not all are in pursuance of quality formal education. Alongside the entrance of foreign students are the distinct peculiarities they each possess in relation to disparities in their traditions, beliefs, norms, cultures, and practices.

The aforementioned data indicate that there is a need for the education of these foreign students, particularly on transcultural nursing competencies. Out of various programs where foreign students engage themselves into in relation to factors such as a community-based, and now an outcomes-based curriculum is nursing. In addition, they also take into consideration the utilization of the globally-accepted English language in most countries as the avenue of instruction, and the excellent lineup of teaching faculty.

Upon returning to their country of origin, these students are more likely to engage in their nursing practice where they need to dispense the best quality nursing care. Further, this steers the query "Are these foreign students culturally competent during the course of their studies?" Cultural competence shown by nurses and other health care personnel can help clients at a vantage point (Mitchelson & Latham, 2000). Research studies show that international education can be effective in the transition and adaptation to another culture whereby self-understanding and sensitivity to the needs of others emanate (Ruddock & Turner, 2007). In light of these data, the demand for the preparation of an experienced nursing workforce that can adapt itself to a transforming heterogeneous humanity is of the essence.

In various professional career programs like medicine, nursing, and respiratory therapy, the education on culturally appropriate and competent care practices is seldom experienced by students (Giger, 2017).

The burden of preparing students to becoming nurses who are culturally competent does not remain on nurse educators' shoulders alone. Universities, colleges, and nursing programs are starting to focus on increasing diversity as they pursue to effectively teach nursing students to serve different clients and communities (Bednarz, Schim, & Doorenbos, 2010).

The call to prepare students to become experienced in dealing with culturally diversified clientele is imperative, so as to provide compassionate care to the populace. Significantly, teachers of nursing programs need to guide students to integrate professional values and behaviors in caring for their clients through their experiential encounters with clients from diverse cultures (Mixer et al., 2013; Giger, 2017; Shattell, Nemitz, Zackeru, Starr, Hu, & Gonzales, 2013).

In light of the need for students to experience transcultural nursing competencies in the care of their patients, the researcher's desire is to bridge the gap brought about by the pressing need of equipping nurses to be culturally competent, so as to provide the best quality nursing care.

Statement of the Problem

This study aims to assess the transcultural nursing competency experiences of foreign nursing students as outcomes of curriculum and education in nursing schools in the National Capital Region (NCR) and Region IV-A of the Philippines. Specifically, it is focused on the central question, *"What characterizes the transcultural experiences of the respondents in the clinical and classroom settings?"*

Methodology

Research Design

The study utilized a descriptive qualitative research design through a semi-structured interview guided by the central question, *"What characterizes the transcultural nursing experiences of the key informants in the clinical and classroom settings?"*

Population and Sampling

The key informants of this study were foreign nursing students from selected nursing schools in the National Capital Region (NCR) and Region IV-A. Purposive sampling was used based on the following criteria: second year, third year and fourth year foreign nursing students; exposed to the clinical area; foreign and not permanent residents of the Philippines and currently enrolled during the school year of 2018.

Key informants who were purposively selected based on the aforementioned criteria were interviewed until saturation has been reached.

Instrumentation

An aide memoire, which was a semi-structured interview guided by the central question, *"What characterizes the transcultural experiences of the respondents in the clinical and classroom settings?"* was utilized to explore the transcultural nursing competency experiences of the key informants. This contained questions about the respondents' perceived transcultural nursing competency experiences in the clinical and classroom settings. This was submitted for content validation by experts in qualitative research.

Ethical Considerations

The objectives, procedures, and projected benefits of this research were clearly laid down to the key informants. They had the privilege to refrain from participating in this research, and they can withdraw from involving themselves at any time, if they chose to do so.

The key informants were given a consent form on the agreement to participate. Undue force of any kind was discouraged to cause the respondents to join in this study. Further, in conducting this study, the researcher was duty-bound to observe ethical principles on autonomy, beneficence, and confidentiality. The basis of autonomy rests on the idea that individuals are to be regarded as independent agents who are able to make decisions on their own, such as, if they desire to involve themselves in research studies such as this.

The key informants were given the freedom to take part in the study and withdraw if they wish to. The concept of beneficence centers on maximizing the benefits for the key informants and the prevention of any harm. Another principle that was observed throughout this research was confidentiality where respondents' anonymity was maintained, and that the data provided by them were never publicly divulged without their consent.

Data Gathering Procedure

The researcher presented a communication letter duly noted and certified by the research adviser and recommended by the Dean of the Graduate School of the Our of Lady Fatima University to the nursing schools in the National Capital Region (NCR) and Region IV–A of the Philippines who had foreign nursing students enrolled in their respective institutions.

Data gathering dealt with the use of the aide memoire, which was a semi-structured interview. Once saturation point was reached, then redundancy was expected if the researcher continued interviewing more key informants. Particularly, in reference to this study, saturation point was reached with the sixth key informant, which indicated that there were no more new ideas or thoughts added, and confirmation had been achieved.

Statistical Analysis

The researcher acted as the facilitator during the data gathering process. The use of audio recordings and interviews in gathering the responses from the key informants were employed. An interview served as the key process of eliciting the transcultural nursing competency experiences in both the classroom and clinical settings of foreign nursing students from selected higher education institutions in the country.

The first step was the collection of pertinent data based on the experiences of the key informants. This was transcribed verbatim and was deeply analyzed. These were encoded and synthesized for validation of the content. The next phase was coding to identify the major themes through reading and listening from the recorded interviews. After identifying and assigning of descriptive codes, these were transcribed, re-evaluated, and underwent refinement. A particular time was scheduled with the key informants for validation of their responses.

After reflectively analyzing the meaning of the experiences this was combined and was organized into clusters of themes, representing the second level of reflection, the thematic interlace. Again, re-validation was done to deepen and to make the themes valid.

The third reflection was thematic embodiment, wherein the researcher utilized the themes that were formed through the second step and incorporated these final descriptions of the phenomenon. Finally, these were validated through peer review together with the adviser, who possessed an extensive knowledge in qualitative research and counter-validated by the researcher who performed the interviews. Expert validation was also accomplished.

Furthermore, the key informants' responses were validated through a *critical friend,* expert's validation, and peer check. In addition, the researcher returned to the key informants after the actual interview to validate and counter-check the accuracy of their responses.

Results and Discussion

Three themes surfaced during the data analysis of interviews from six key informants. The themes captured the lived experiences of foreign nursing students from levels II, III, and IV enrolled in different schools in the National Capital Region and Region IV-A as to their transcultural nursing competency experiences. The three themes developed were transformational acculturation, transitional acculturation, and transpersonal acculturation.

From the experiences of the key informants, four themes emerged that described the eidetic insights of foreign nursing students namely: transformational acculturation, transitional acculturation, and transpersonal acculturation. They are depicted in a triangular plane surrounded by the sources of their experiences – theoretical and clinical settings.

Figure 2. *Triad of Transcultural Adaptation in Nursing Education*

The figure depicts the transcultural adaptation of the foreign nursing students as they studied in their respective institutions. As portrayed, engulfed within the circle were theoretical and clinical settings, the areas where the key informants had their experiences in nursing.

Theme 1: Transformational acculturation

The theme transformational acculturation embraced the key informants' experiences both in the theoretical and clinical settings, highlighting those that have changed them when they entered the nursing school. Enhancement of a nurse's cultural competency is through being thoughtful and mindful of the many cultural aspects that may impact the behaviors of clients, kinfolks, and other health care providers (Al-Mutair, Plummer, O'Brien & Clerehan, 2014). Whereas, the key informants stated:

> *"Transcultural nursing is nursing based on different types of cultures. It is a way of understanding the different sides of the world. The importance of transcultural competencies is that it is a mind opener." (KI-1)*

The key informants' experiences deepened their understanding as to what nursing is all about with regards to viewpoints coming from all sides of the world, which pointed to believing in one's culture.

> *"Transcultural nursing is an area focusing on different cultures, values, and beliefs of patients that brings about vast understanding on certain diseases, healing, and how people's way of life affects health. Transcultural competencies have made me appreciate cultural differences. They contribute to giving care that best fit the patient's way of life." (KI-4)*
>
> *"Transcultural nursing is involving, encompassing or extending across two or more cultures. It is important to me because as we get along with different people with characters, you have to behave like them so that you can know how to treat them or to deal with them without conflicts." (KI-6)*
>
> *"I try to humble myself since my culture is different. Teachers show us that though we have differences, we can still be the same in caring for our patients." (KI-6)*

Theme 2: Transitional acculturation

The theme transitional acculturation pointed to what the key informants were able to learn theoretically in the classroom and practically experienced adaptation to such by its application in the clinical setting.

The key informants claimed that there was a continuity of their learning experiences from the theoretical setting to the clinical setting, which was proven by the following responses:

> *"The thing that helps me is actually what we learn in the classroom is seen in the clinical setting. Sometimes the nurses you are working with do not always have time to teach you, but usually when the CI is with us, then they're able to remind us, 'Oh, remember, you learned about this in the class, so you can do this.' When they show us in the classroom then we learn fast. There is comparison of what is seen and done in the classroom and in the clinical area." (KI-2)*

Cultural competence is a lifelong learning process and is believed to be one of the major potentials for developing better cultural competence during students' working lives (Repo, et al., 2017).

> *"Day-to-day classes are so educative and I learn a new thing each day. They have contributed to my knowledge growth. Clinical exposure has made me think out of the box. Attending to different patients and encountering different new*

cases has made me to do more research and not to depend on what is written on the books. Some cases are not found in the book, so I thrive to be challenged and this is one way leading to success." (KI-4)

"My expectation is to know and apply what I am learning, above all to understand more, but then I do not know what will happen as I go further with my studies, but I keep on praying harder so God can help me through." (KI-6)

These statements were further upheld by another key informant. She stated:

"One thing I learned here is that Filipinos are very resourceful, even they have a lack of supplies, they will find ways to make things work, not just in the clinical setting but even outside. For example, in the US, we don't have certain supplies. Then we will try to get that exact supply because like for patient safety, you cannot compromise by giving another product, but here, they do everything that they can in order to keep the patient safe. But even though they have limited resources, even though they don't have much, they have ways to survive." (KI-2)

Theme 3: Transpersonal acculturation

The third theme was directed to the key informants' experiences both in the theoretical and clinical settings where they emphasized their involvements that went beyond their sense of self, pointing to sublime experiences in nursing education. This is in congruence with the study of Cruz, et al. (2017) which revealed the importance of cultural diversity and cultural competence to be intertwined in both classroom and clinical settings throughout the nursing program to safeguard an incessant growth of the students' cultural competence.

In the clinical setting, one of the good things experienced by the key informants was how they were guided by their clinical instructors as manifested by the following verbalizations:

"For the related learning experience, our clinical instructors take us to procedures, meaning, they walk us through it…They tell us what is expected of us. In everything we do, they guide and correct us respectively." (KI-1)

Clinical supervision is the key to transform. For other cultural or foreign groups, supervising them in the clinical setting is already an effective way of helping them to personally adjust to a new environment. This is supported by one of the key informants' verbalizations of their feelings and emotions:

"They're always around us when we are doing something and keep demonstrating how to do it." (KI-5)

"Every day classes are new days of learning skills or lecture and new experiences. In the clinical area, I came to know different cultures and characters. These made me know how to deal with different people and behaviors." (KI-6)

"I have learned that someone with a different cultural and academic background can show a different level of assertiveness. The smallest things can be seen and understood in different ways by different people. This contributes to more understanding and gives a different perspective of another culture." (KI-4)

The experiences of the key informants both in the theoretical and clinical settings did not only help them in personally knowing, but also in personally understanding themselves and others.

"Since I've been here two years ago, I got to know about the different cultures. I try my best to understand them even if we have different cultures. I try to behave like them to humble myself in front of them like bowing my head when I greet them and many more things..." (KI-6)

Personal adaptation is not only knowing others but also knowing what is within – it is also a personal knowing, adopting, and embracing the meaning of spirituality. As the key informants said:

> *"Before we do anything else, we had to pray so that the Lord our God can help us through. I really like it and they tell us that if we do not know what to do, we can ask them. This helped us to learn more skills. They really push us and if something is wrong with us, they will feel bad as well." (KI 6)*
>
> *"They first start with devotionals and sometimes they can relate it to the current topic that we are studying about…" (KI-2)*

Cultural encounters ensue when nurses go through a process to engage in cross-cultural interactions with clients from diverse cultural backgrounds (Neese, 2016). Likewise, Bauce, et al. (2014) believe that since every client possesses an exceptional experience on health and affliction, all encounters amongst clients and nurses are regarded as multicultural encounters.

Moreover, the emergence of the interrelationship of the three themes, namely, transformational acculturation, transitional acculturation and transpersonal acculturation portrayed that they are intertwined to one another, and one has to go through this triad of transcultural adaptation in nursing education and at the same time go through the dynamic and unending cyclic experience of lifelong learning in both theoretical and clinical settings.

Conclusion

The respondents have adequate experiences in nursing education in terms of their exposures in the classroom and clinical settings. As a whole, they were able to acquire transcultural nursing competency experiences which made them aware, knowledgeable, skillful that made them realized their desire to adapt to multi-cultures as they encounter clients from distinct backgrounds.

Also, this study emphasized the importance of understanding how student nurses were able to adapt to their new environment as foreign students. Three themes were developed namely: transformational acculturation, transitional acculturation, and transpersonal acculturation. On a personal note, student nurses whether local or foreign should go through the process of being and becoming culturally adaptable, so that quality nursing care is tailor-fit to clients of distinct backgrounds.

In essence, a quote from a published article says it all: *"Clinicals are an exciting time in nursing school. It gives one the ability to experience lots of different branches of nursing. I suggest you be open and excited to be there and learn. Let your preceptor know that you're there to learn and you're excited to be there. Nurses are teachers by nature; we love to teach! Be excited and ask a lot of questions. Above all, treat your patients as you would if you were already their nurse… because a good nurse starts with kindness and goodness".*

Recommendations

Grounded on the findings and conclusions drawn from this study, the researcher offers the following recommendations.

1. Nurse educators need to continuously improve and strengthen their students' knowledge, skills, and attitude, which can be done by assimilating transcultural nursing competencies both in their theoretical and clinical experiences.
    a. Students should be given the opportunity to give their views on minority cultural issues and include them in group discussions, drills, exercises, assignments, or tasks.
    b. Students should also have meaningful interactions with individuals from diverse cultures.
    c. Students should be encouraged to understand and develop knowledge on the awareness of cultures among different types of patients and in administering patient care per specific group.

d. Students should be well taught on the recognition of different specific diseases that commonly affect diverse cultures within the classroom or in the clinical setting.
e. Students should be properly trained on the different cultural assessment tools for evaluating patients and their importance to different cultural groups.

2. Development of a cultural competence program should be taken into consideration during educational planning.
3. The inclusion of transcultural nursing in the current curriculum is a positive approach for students to develop transcultural caring. Moreover, cultural adaptation on the part of foreign nursing students should also be included because of their increasing numbers in some colleges/universities. As such, evaluation of cultural awareness and competency curriculum should be done.
4. The study could be replicated to other nursing institutions to get a wider scope of data among students coming from diverse cultural backgrounds to measure students' perceptions of transcultural nursing competence and cultural awareness.
5. The study could also be duplicated to other nursing institutions with the respondents coming from other allied health professions.

References

Al-Mutair, A.S., Plummer, V., Clerehan, R., & O'Brien, A. (2014). Needs and Experiences of Intensive Care Patients' Families: A Saudi Qualitative Study. *PubMed (nih.gov). 19*(3):135-44. doi:10.1111/nicc.12040.

Bauce, K., Kridli, S.A., & Fitzpatrick, J.J. (2014). Cultural competence and psychological empowerment among acute care nurses. *Online Journal of Cultural Competence in Nursing and Healthcare, 4*(2), 27-38. doi:10.9730/ojccnh.org/v4n2a3 https://www.researchgate.net/profile/Karen_Bauce/publication/272760844_Cultural_Competence_and_Psychological_Empowerment_Among_Acute_Care_Nurses/links/5

Bednarz, H., Schim, S., & Doorenbos, A. (2010). Cultural Diversity in Nursing Education: Perils, Pitfalls, and Pearls. *J Nurs Educ. Author manuscript; available in PMC* 2010 Aug 13. Published in final edited form as: *J Nurs Educ*. 2010 May; 49(5): 253–260. doi: 10.3928/01484834-20100115-02 https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2921036/

Cruz, J.P., Colet, P.C., Estacio, J.C., Shaji, H. & Cecily, J. (2017). https://www.researchgate.net/publication/319812393_Cultural_Competence_Among_Nursing_Students_in_Three_Countries_A_Cross-Sectional_Study

Giger, J. (2017). Transcultural Nursing Assessment and Intervention. (7th Ed.) USA. Elsevier, Inc.

Mitchelson E. & Latham L. (2000) The Development of A Maori Nursing Conceptual Model: Exploratory Research Phase. Health Research Council of New Zealand, Wellington.

Mixer, S.J., Lasater, K.M., Jenkins, K.M., Burk, R.C., Oliver, M.K., Meyer, M., Cruz, C., & Mills, J. (2013). Preparing a culturally competent nursing workforce. *Online Journal of Cultural Competence in Nursing and Healthcare, 3*(4), 1-14. doi:10.9730/ojccnh.org/v3n4a1 http://www.ojccnh.org/pdf/v3n4a1.pdf

Neese, Bryan. A Guide to Culturally Competent Nursing Care Posted July 22, 2016. https://online.alvernia.edu/culturally-competent-nursing-care/

Repo, H., Vahlberg, T., Salminen, L., Papadopoulos, I., & Leino-Kilpi, H. (2017). The Cultural Competence of Graduating Nursing Students. *PubMed. Volume: 28 issue: 1*, page(s): 98-107. https://doi.org/10.1177/1043659616632046.

Ruddock, H., & Turner, D. (2007). Developing cultural sensitivity: Nursing students' experiences of a study abroad programme. *Journal of Advanced Nursing, 59*(4), 361-9. https://www.ucviden.dk/ws/files/9569860/journal_article_cs.pdf

Shattell, M. M., Nemitz, E. A., Crosson, N., Zackeru, A. R., Starr, S., Hu, J., & Gonzales, C. (2013). Culturally Competent Practice in a Pre-Licensure Baccalaureate Nursing Program in the United States: A Mixed-Methods Study. *Nursing Education Perspectives (National League For Nursing), 34*(6), 383-389. doi:10.5480/11-574.1

(2017). Over 100,000 Resident Foreigners Report to BI. http://www.sunstar.com.ph/manila/local-news/2017/03/10/over-100000-resident-foreigners-report-bi-530207

Von Ah, D. & Cassara, N. (2013). Perceptions of cultural competency of undergraduate nursing students. *Open Journal of Nursing, 3*, 182-185 OJN http://dx.doi.org/10.4236/ojn.2013.32024 Published Online June 2013 (http://www.scirp.org/journal/ojn/) https://file.scirp.org/pdf/OJN_2013053116564391.pdf

Personality Type and Perceived Quality of Life of Selected College Students

Grace Ann M. Babao, Pavel Kolesnikov, Kheirn Karren V. Pajarito, Susy A. Jael, Beryl Ben Mergal, Angel Grace F. Bingcang, Joyosthie B. Orbe, Kristel Anne M. Rey
Adventist University of the Philippines
graceannbabao@gmail.com
Pavelkolesnikov03@yahoo.com
kkvpajarito@aup.edu.ph
cgmalabat@aup.edu.ph
ruiz_fb@yahoo.com

Abstract

The World Health Organization declared COVID-19 outbreak as a global pandemic, in which many countries began implementing restrictions to control the virus. As a result, it began to disrupt the normal activities of people around the world including college students. Limited studies have been done in relation to this topic, thus this study aimed to determine the significant difference in the perceived quality of life of selected college students across personality type during pandemic. This study utilized a Descriptive-Evaluative and Descriptive-Comparative research designs. Researchers purposively-sampled 123 respondents from eight colleges in a selected university in Silang, Cavite. Respondents answered a self-reported online questionnaire including personality temperament test and perceived quality of life. Data were analyzed using statistical tests of Mean, Standard Deviation and ANOVA. Results revealed that choleric has the highest frequency of 51 (41.5%) among the four-personality types. The overall perceived quality of life was fairly high with a mean of 4.62 (SD = 1.19). Level of satisfaction that the respondents get from receiving help from friends and family was high with the highest mean score of 5.30 (SD = 1.53). Moreover, result showed that there is a significant difference in the perceived quality of life across personality type (p = .30). Choleric has significantly higher perceived quality of life than Sanguine (p = .051). Among the moderating variables, none had significant difference on the perceived quality of life of the respondents. For future studies, quality of life and personality type among college students comparing both remote learning and in-person learning can be done.

Keywords: *Personality, Quality of Life, College Students*

On March 11, 2020, the World Health Organization (WHO) declared the COVID-19 outbreak a global pandemic. WHO is concerned with the increasing rates of the virus spreading, thus asking countries to act in order to contain the virus (Cucinotta & Vanelli, 2020). On March 16, 2020, the whole island of Luzon was placed under enhanced community quarantine wherein the citizens are to stay at home, only leaving to meet essential needs to survive (Dancel, 2020). Thus, face-to-face classes were canceled (Esguerra, 2020), and as a result, universities implemented emergency remote teaching that allows students to be in a virtual world of learning (Toquero, 2020). Restrictive measures were implemented to contain the virus; however, done with good purpose, disrupted people's daily activities and may affect their perceived quality of life (Samlani et al., 2020).

There are several definitions of quality of life. Some definition refers to the person involved whereas others specify multiple domains or refer to global judgment. Another definition is more function-oriented, but a different one refers to cultural and societal norms. There is no true definition of quality of life, but researchers sought a more practical approach to describing aspects of quality of life (Post, 2014).

A study by Samlani et al. (2020) focused on the effect of the COVID-19 pandemic on Morocco's quality of life and well-being. The result showed that the quality of life among the respondents was moderately disrupted during the COVID-19 pandemic. On the other hand, the study on the COVID-19 pandemic's impact on Chinese residents' mental health and quality of life produced results revealing that the COVID-19 pandemic has a mild stressful impact on the Chinese residents (Zhang & Ma, 2020).

Personality was given a profound definition by the American Psychological Association as the individual's thinking, feeling, and behaving (American Psychological Association, 2020). According to Britannica, temperament is an aspect of personality. Temperament refers to the prevailing mood or mood pattern of an individual. It originated from 2nd century AD by a Greek physician named Galen that developed it from an earlier physiological theory based on the four primary body fluids: blood, phlegm, black bile, and yellow bile. A person with a sanguine temperament is warm and pleasant, whereas a person with a choleric temperament is hot-tempered and quick to react. An individual with a melancholic temperament is considered as easily depressed and sad whereas, an individual with a phlegmatic temperament is slow-moving and apathetic.

A study by Lin et al. (2012) about the impact of personal character on patients' quality of life with esophageal cancer in North Henan Province showed that the quality of life of the respondents was significantly affected by personal character. Huang et al. (2017) did a systemic review to answer if personality affects health-related quality of life. The results revealed that personality characteristics are related to health-related quality of life.

Limited studies looked into this topic, especially in the Philippines; thus, the researchers take this on to determine the significant difference in college students' perceived quality of life across personality types. Further, the researchers considered if the moderating variables, such as age, gender, nationality, degree program, or year level, will have a significant difference on the perceived quality of life among the college students.

Introduction

On March 11, 2020, the World Health Organization (WHO) declared the COVID-19 outbreak a global pandemic. WHO is concerned with the increasing rates of the virus spreading, thus asking countries to act in order to contain the virus (Cucinotta & Vanelli, 2020). On March 16, 2020, the whole island of Luzon was placed under enhanced community quarantine wherein the citizens are to stay at home, only leaving to meet essential needs to survive (Dancel, 2020). Thus, face-to-face classes were canceled (Esguerra, 2020), and as a result, universities implemented emergency remote teaching that allows students to be in a virtual world of learning (Toquero, 2020). Restrictive measures were implemented to contain the virus; however, done with good purpose, disrupted people's daily activities and may affect their perceived quality of life (Samlani et al., 2020).

There are several definitions of quality of life. Some definition refers to the person involved whereas others specify multiple domains or refer to global judgment. Another definition is more function-oriented, but a different one refers to cultural and societal norms. There is no true definition of quality of life, but researchers sought a more practical approach to describing aspects of quality of life (Post, 2014).

A study by Samlani et al. (2020) focused on the effect of the COVID-19 pandemic on Morocco's quality of life and well-being. The result showed that the quality of life among the respondents was moderately disrupted during the COVID-19 pandemic. On the other hand, the study on the COVID-19 pandemic's impact on Chinese residents' mental health and quality of life produced results revealing that the COVID-19 pandemic has a mild stressful impact on the Chinese residents (Zhang & Ma, 2020).

Personality was given a profound definition by the American Psychological Association as the individual's thinking, feeling, and behaving (American Psychological Association, 2020). According to Britannica, temperament is an aspect of personality. Temperament refers to the prevailing mood or mood pattern of an individual. It originated from 2nd century AD by a Greek physician named Galen that developed it from an earlier physiological theory based on the four primary body fluids: blood, phlegm, black bile, and yellow bile. A person with a sanguine temperament is warm and pleasant, whereas a person with a choleric temperament is hot-tempered and quick to react. An individual with a melancholic temperament is considered as easily depressed and sad whereas, an individual with a phlegmatic temperament is slow-moving and apathetic.

A study by Lin et al. (2012) about the impact of personal character on patients' quality of life with esophageal cancer in North Henan Province showed that the quality of life of the respondents was significantly affected by personal character. Huang et al. (2017) did a systemic review to answer if personality affects health-related quality of life. The results revealed that personality characteristics are related to health-related quality of life.

Limited studies looked into this topic, especially in the Philippines; thus, the researchers take this on to determine the significant difference in college students' perceived quality of life across personality types. Further, the researchers considered if the moderating variables, such as age, gender, nationality, degree program, or year level, will have a significant difference on the perceived quality of life among the college students.

Methods

The researchers used a quantitative, descriptive, and comparative research design in determining the mean difference of the respondents' perceived quality of life across personality types during a pandemic. McLeod (2019) explained that quantitative research collects information in a statistical form that can be put into categories, rank order, or measured in units of measurement. This type of data can be used to create graphs and tables of the raw data. Descriptive research describes the characteristics of interest in the study population (Ranganathan P., 2019). A comparative analysis compares one or more datasets to determine their consistency with one another (Comparative Analysis of Scientific Data: Definition & Example, 2017). In this study, the researchers used a survey questionnaire. It allows the researchers to determine the difference in the personality type and perceived quality of life among college students and determine the difference of the moderating factors on the quality of life.

The study took place in one of the universities in Silang, Cavite. The study's target population included 140 college students who were actively enrolled in the university, regardless of their age, gender, nationality, degree program, and year level. Only students enrolled during the second semester and inter-semester of the class year 2019-2020 were included. Out of the 140 students who answered the survey, 17 were discarded due to incomplete data given. Only 123 respondents answered the data entirely and were included in the study.

Table 1. *Number of Male and Female Respondents*

	Frequency	Percent
Male	52	42.3
Female	71	57.7
Total	123	100.0

The researchers utilized purposive sampling as a method of gathering data. According to Crossman (2020), purposive sampling is a non-probability sample selected centered on the qualities of a population and the study's objective. This type of sampling is needed to reach a targeted sample, and sampling for proportionality is not the primary concern.

The researchers used an online survey questionnaire to gather the data, divided into three different sections that the respondents need to answer. For section 1 of the questionnaire, the respondents were asked to provide information about their demographic data such as age, gender, nationality, degree program, and year level.

For section 2, a personality test adapted from *"Why You Act The Way You Do"* by Tim LaHaye is used. There were four different sections in this questionnaire with descriptive words that correspond with a specific personality type. The respondents were asked to read each descriptive word and placed a number next to it according to how well it described themselves. The scoring criteria of the personality test was a scale of 1-5 where 1 states, *"That is definitely NOT me!"*; 2 states, *"That is usually NOT me!"*; 3 states, *"That is usually me!"*; 4 states, *"That is mostly me!"*; and 5 states, *"That IS definitely me!"*. The respondent would score each descriptive word in all four sections until all the words in each section have a score. To know the personality type of the respondent, the researchers would add up only scores of 3's, 4's, and 5's of each section, disregarding scores of 1's and 2's. The section with the highest score is the primary temperament.

For section 3, the Perceived Quality of Life questionnaire was adapted and utilized. The questionnaire was started by a group of researchers at the University of North Carolina, Chapel Hill, including Dr. Donald Patrick and Dr. Marion Danis. Later, the study was scaled up and further established by another group of researchers under the leadership of Dr. Donald Patrick from the University of Washington, Seattle. An extensive test of the PQoL has been performed in collaboration with Group Health Cooperative of Puget Sound (Patrick & Danis, 2008). For the reliability or internal consistency of the questionnaire, the Cronbach's Alpha is 0.88.

This questionnaire measures based on a model defining quality of life as an evaluation of significant categories of fundamental life needs. The respondents were asked 20-items that measure the level of satisfaction and a supplementary item focusing on happiness. The 19-items covered the physical, social, and cognitive health of the respondents. The last item covered the level of happiness of the respondents in evaluating the respondents' perceived quality of life using a 7-point scale in Table 2.

Table 2. *Criteria for Interpreting the Perceived Quality of Life*

Scale	Degree of Responses	Range Value	Indicators
0	Extremely Dissatisfied/Unhappy	1.00-1.86	Very Low
1	Somewhat Dissatisfied/Unhappy	1.87-2.72	Low
2	A Little Dissatisfied/Unhappy	2.73-3.57	Fairly Low
3	Neither Satisfied/Dissatisfied	3.58-4.42	Neither High or Low
4	A Little Satisfied/Happy	4.43-5.27	Fairly High
5	Somewhat Satisfied/Happy	5.28-6.12	High
6	Extremely Satisfied/Happy	6.13-7.00	Very High

After the approval of the study, the researchers wrote a letter to the Dean of College of Nursing and other colleges, asking permission to conduct the study to their students that would qualify in the inclusion and exclusion criteria. The researchers created the questionnaire via Google forms.

An explanatory cover letter stated the purpose of the study and its importance and guidelines to be followed strictly before the respondents answered the questionnaires. The respondents were instructed to complete the questions honestly.

During the data gathering, the questionnaires were distributed through Facebook messenger by directly messaging the respondents or asking them to send the questionnaire to their various college group chats. Once the respondents' responses get encoded in the Google forms, the researchers will access this information for analysis. The researchers kept a record of the number of respondents that answered the questionnaire under Google forms. Once they collected the total number of respondents needed, the next step for the researchers was to download the data analytics done by the Google forms. The researchers encountered a few limitations during data gathering. One of the limitations was meeting the correct number of respondents needed for the study. Another limitation was the respondents' responses; some of the responses did not fill out every survey question. After they downloaded the data, the final step for the researchers was to translate the data in which would be used for treatment, analysis, and interpretation by the statistician.

The data gathered were encoded utilizing the Statistical Package for Social Sciences Software (SPSS). The method used to determine each respondent's personality type was descriptive statistics with frequency distribution. Frequency distribution summarized all values in variables and how many times the variables occur (van den Berg, n.d.). Descriptive statistics were used to calculate the overall perceived quality of life scores, including the mean and standard deviation results. Descriptive statistics utilization has two functions: presenting basic information about the variables in the dataset and highlighting the possible relationship between variables (Research Connections, n.d.).

The method utilized in problem 3 was the ANOVA test, which is a way to figure out if there is a need to reject the null hypothesis or accept the alternate hypothesis. The method utilized in problem 4a was Mann Whitney U test. The non-parametric Mann-Whitney U test is the equivalent of the two-sample t-test where no assumptions are made. The method utilized in problem 4b was independent samples t-test. The t-test is to compare the means of two sets of data. The method utilized in both problems 4c-e was the Kruskal-Wallis H test, a non-parametric alternative to the One-Way ANOVA. Kruskal-Wallis H test verifies whether the medians of two or more groups are separate.

Results and Discussion

Personality Types among College Students

Table 3 presented the study results on the personality type among the respondents. The result shows that choleric has the highest frequency of 51 (41.5%) among the four personality types, whereas the lowest frequency of 22 (17.9%) are both sanguine and phlegmatic.

Table 3. *Personality Types among College Students*

	Frequency	Percent
Sanguine	22	17.9
Choleric	51	41.5
Melancholy	28	22.8
Phlegmatic	22	17.9
Total	123	100.0

Choleric types are the leaders of the group. They are known to be quick-thinkers, independent, effective influencers, but on the other side, they are can also be competitive, easily annoyed, and prideful. They can become highly engaged in whatever they do, such as working or conversing with other people.

Like extroverts, choleric people receive social satisfaction and energy from people; they need to be social and express their beliefs and opinions on others. In addition, choleric types are natural problem solvers due to being direct and detailed-oriented and working to the end to reach the goal (Jaehnig, J., 2018).

According to Embalzado H. and Varma, P. (2018), well-being, academic performance, and college adjustment of the university students could influence temperament types. In this study, the four temperament types had different influences on the three variables: well-being, academic performance, and college adjustment. The study results would find that choleric types displayed higher well-being and college adjustment due to their goal-oriented motivated behaviors. However, there was no significance towards their academic performance, which seems to correspond with the results shown above since choleric type was the highest out of the four temperament types. On the other hand, sanguine types also displayed higher well-being and college adjustment due to their extraversion and sociability, but there was a lower academic performance level which seems to contradict the results shown above since sanguine type was one of the lowest out of the four temperament types.

Perceived Quality of Life among College Students

Table 4 presents the result of the study on the perceived quality of life among college students. The result showed that perceived quality of life had an overall mean score of 4.6211 (*SD* = 1.18854), which was indicated as *fairly high*. As indicated in Table 3, it showed that question number 9 describes the level of satisfaction that the respondents get from receiving help from their friends and family, with a mean score of 5.301 (*SD* = 1.5254) was indicated as high. It was followed by question number 10, which describes the respondents' satisfaction in helping their friends and family, with a mean score of 4.959 (*SD* = 1.6216), which indicated as fairly high.

Table 4. *Perceived Quality of Life among College Students*

	N	Mean	Std. Deviation	Indicator
PQOL1	123	4.260	1.6881	Neither High or Low
PQOL2	123	4.943	1.7097	Fairly High
PQOL3	123	4.553	1.6753	Fairly High
PQOL4	123	3.992	1.8532	Neither High or Low
PQOL5	123	3.919	1.9901	Neither High or Low
PQOL6	123	4.740	1.7641	Fairly High
PQOL7	123	4.935	1.7070	Fairly High
PQOL8	123	4.862	1.7756	Fairly High
PQOL9	123	5.301	1.5254	High
PQOL10	123	4.959	1.6216	Fairly High
PQOL11	123	4.667	1.6430	Fairly High
PQOL12	123	4.301	1.6293	Neither High or Low
PQOL13	123	4.520	1.8078	Fairly High
PQOL14	123	4.244	1.8347	Neither High or Low
PQOL15	123	4.325	1.8084	Neither High or Low

{table continues on the next page}

PQOL16	123	4.886	1.5052	Fairly High
PQOL17	123	4.943	1.8523	Fairly High
PQOL18	123	4.780	1.8222	Fairly High
PQOL19	123	4.390	1.8582	Neither High or Low
PQOL20	123	4.902	1.6517	Fairly High
PQOL	123	4.6211	1.18854	Fairly High

Valid N (listwise) 123

Question number 5 describes the level of satisfaction in how often the respondents get outside the house, with a mean score of 3.919 (SD = 1.9901), which was indicated as neither high nor low. The second to the lowest question was number 4, which describes the respondents' satisfaction with the amount of walking they do, with a mean score of 3.992 (SD=1.8532), indicated as neither high nor low. Both of these questions were indicated as neither high nor low.

Sirgy et al. (2006) conducted research that measured the quality of college life of students. The quality of college life was influenced by the satisfaction of academic and social facets of the college; the satisfaction of facilities and services influenced the satisfaction of the academic and social aspects. The results revealed that the greater satisfaction with college's social and academic aspects, the higher the quality of college life of the students. It was also revealed that the greater satisfaction with facilities and services, the higher satisfaction of students is with the social and academic aspects of college. The results have similarities since the overall perceived quality of life is relatively high amongst the college students, but, on the other hand, specific domains of these students' lives were indicated as neither high nor low due to the current situation that is happening worldwide.

A study done on the COVID-19 pandemic and its impact on the mental health and quality of life of Chinese residents revealed that the COVID-19 pandemic has a mild stressful impact on the Chinese residents, but despite the stressful impact, the residents received increased support, shared feelings and caring from friends and family members (Zhang & Ma, 2020).

In addition, a study conducted on the mental health and quality of life during the SARS epidemic in Hong Kong revealed enhanced social and family support and helpful mental health-related lifestyle changes. Another possible explanation for these outcomes was that the pace of the whole society slowed down during the time of the pandemic and generated more opportunities and time among the community members to assist and care for one another (Lau et al., 2005).

Mean Difference in Perceived Quality of Life Across Personality Type

Table 5 presents the difference in the perceived quality of life considering personality types. The data shows 22 - Sanguine, 51 - Choleric, 28 - Melancholy, and 22 - Phlegmatic. The testing resulted in the assumption of homogeneity of variances that satisfied via Levene's F test (123) = 3.090. The result showed a mean difference in the perceived quality of life across personality types with a p-value of p=.030. Thus, the null hypothesis that stated there was no mean difference in the perceived quality of life across personality types was rejected.

Table 5. *Difference in Perceived Quality of Life Considering Personality Type*

Personality Type	N	Mean	Standard Deviation	F	pvalues	Verbal Interpretation
Sanguine	22	4.1507	1.424556	3.090	.030	Significant
Choleric	51	4.9391	1.09192			
Melancholy	28	4.2914	1.30176			
Phlegmatic	22	4.6914	0.99588			

Table 6 presents the comparison of perceived quality of life across personality types. The result showed a significant difference across personality types as demonstrated by one-way *ANOVA* F (4, 123) = 3.090, p = .030. A Tukey post hoc test revealed that Choleric has a significantly higher perceived quality of life than Sanguine (p = .051). Otherwise, there was no statistically significant difference in the perceived quality of life between Sanguine and Melancholy (p = .976) or between Sanguine and Phlegmatic (p = .437).

Table 6. *Comparison of Perceived Quality of Life Across Personality Type*

(I) Personality Type	(J) Personality Type	Mean Difference (I-J)	Std. Error	pvalues
Sanguine	Choleric	-.78839	.30380*	.051
	Melancholy	-.14064	.33933	.976
	Phlegmatic	-.54067	.35911	.437
Choleric	Sanguine	.78839	.30380*	.051
	Melancholy	.64776	.28014	.101
	Phlegmatic	.24772	.30380	.847
Melancholy	Sanguine	.14064	.33933	.976
	Choleric	-.64776	.28014	.101
	Phlegmatic	-.40003	.33933	.641
Phlegmatic	Sanguine	.54067	.35911	.437
	Choleric	-.24772	.30380	.847
	Melancholy	.40003	.33933	.641

**The mean difference is significant at the 0.05 level*

A study conducted by Embalzado and Varma (2018) determined the effects of the temperament types on well-being, academic performance, and college adjustment of university students. The results revealed that students should better grasp their temperament types and work suitably on the positive and negative sides to achieve better well-being and adjustment. It was found that both sanguine and choleric types displayed higher levels of well-being and college adjustment, whereas melancholic types reported lower levels of well-being and college adjustment. On the other hand, phlegmatic types did not affect any of the three variables.

Lin et al. (2012) revealed that among the patients with esophageal cancer, the choleric groups had the highest QOL among all the groups, whereas the melancholic groups had more inferior QOL groups.

The result implied that there was a significant difference in the perceived quality of life across personality types. Furthermore, choleric groups had a significantly higher perceived quality of life than Sanguine. This study result can be related to choleric types as natural problem solvers due to being direct and detailed-oriented and working to the end to reach the goal.

The Difference in the Perceived Quality of Life Considering Age

Table 7 presents the difference age has on perceived quality of life with a p-value of 0.150. The data revealed that the null hypothesis that stated there was no significant difference in the perceived quality of life considering age was accepted.

Table 7. *Difference in the Perceived Quality of Life Considering Age*

	PQoL
Mann-Whitney U	1431.000
Wilcoxon W	2334.000
Z	-1.440
Asymp. Sig. (2-tailed)	.150

Significant at p ≤ 0.05

	Age Group	N	Mean Rank	Sum of Ranks
PQoL	<=20	42	55.57	2334.00
	21<=	81	65.33	5292.00
	Total	123		

Demographic variables, like age, gender, nationality, etc., were considered in examining the correlation between levels of life quality and leisure satisfaction of university students (Yaşartürk, Akyüz, & Gönülateş, 2019). This study revealed no significant association between age and the quality of life scale, which correlates with the result shown above.

The Difference in Perceived Quality of Life Considering Gender

Table 8 presents the difference gender has on perceived quality of life with a p-value of 0.295. Thus, the null hypothesis stated there was no significant difference in the perceived quality of life considering gender was accepted.

Table 8. *Difference in Perceived Quality of Life Considering Gender*

		t-test for Equality of Means		
		t	df	p-value
PQoL	Equal variances assumed	1.052	121	.295

Significant at p ≤ 0.05

	Gender	N	Mean
PQoL	Female	71	4.7176
	Male	52	4.4894

A study conducted by Dubrovina, N. et al. (2016) determines the relationship between social and demographic factors and health and life satisfaction. In this study, the various factors had different influences on health and life satisfaction. The results revealed that gender, one of the demographic factors, significantly influenced health and life satisfaction, which contradicts the result shown above in the table.

The Difference in Perceived Quality of Life Considering Nationality

Table 9 presents the difference nationality has on perceived quality of life with a p=value of 0.827. Thus, the null hypothesis stated there was no significant difference in perceived quality of life considering nationality was accepted.

Table 9. *Difference in Perceived Quality of Life Considering Nationality*

	PQoL	
Chi-Square	.894	
df	3	
Asymp. Sig.	.827	
Significant at p ≤ 0.05		
Nationality	N	Mean
American	3	4.9833
Filipino	58	4.5440
Fil-Am	16	4.7625
Other Nationalities	46	4.6457
Total	123	4.6211

Spiers and Walker (2008) examine an individual's happiness, peacefulness, and quality of life-based on ethnicity and leisure satisfaction. In this study, British/Canadian and Chinese/ Canadian were used in the research. The results revealed that ethnicity has a significant impact on the standard of living, achieving in life, and life as a whole, which contradicts the result shown above in the table.

The Difference in Perceived Quality of Life Considering Degree Program

Table 10 presents the difference degree programs has on perceived quality of life with a p=value of 0.917. Thus, the null hypothesis stated there was no significant difference in perceived quality of life considering the degree program was accepted.

Table 10. *Difference in Perceived Quality of Life Considering Degree Programs*

	PQoL	
Chi-Square	.894	
df	3	
Asymp. Sig.	.827	
Significant at p≤0.05		
College	N	Mean
CAH	13	4.8192
COB	10	4.2250
COD	23	4.3239
COE	3	4.6333
COH	17	4.6412
CON	48	4.7448
CST	6	4.9333
COT	3	4.6333
Total	123	4.6211

A study was done by Singh et al. (2016) assessed the quality of life, sleepiness, and mood disorders among first-year undergraduate students of medical, engineering, and arts. The results revealed that quality of life was reported as good or very good among most students, except for eight medical, four engineering, and two fine arts students who reported their quality of life as inferior or neither poor nor good.

The Difference in Perceived Quality of Life Considering Year Level

Table 11 presents the difference year level has on perceived quality of life with a p=value of 0.727. Thus, the null hypothesis stated there was no significant difference in perceived quality of life considering the year level was accepted.

Table 11. *Difference in Perceived Quality of Life Considering Year Level*

	PQoL	
Chi-Square	.894	
df	3	
Asymp. Sig.	.827	
Significant at p≤0.05		
Year Level	N	Mean
1st Year	7	4.6643
2nd Year	40	4.7675
3rd Year	35	4.6171
4th Year	34	4.5221
Beyond 4th Year	7	4.2429
Total	123	4.6211

Payakachat et al. (2014) assessed health-related quality of life among student pharmacists. The results revealed that first-year through third-year student pharmacists had lower HRQoL than four-year students, which could be due to high levels of stress associated with low mental health.

Conclusion

Based on the study's findings, the researchers concluded that many of the selected college students' primary personality temperament type is choleric, and the perceived quality of life among the respondents during the pandemic is fairly high. The result also showed a mean difference in the perceived quality of life across personality types. Among the personality types, choleric has a significantly higher perceived quality of life than Sanguine. The results revealed that the moderating variables such as age, gender, nationality, degree program, and year level had no significant difference on the perceived quality of life among the college students when considered.

Thus, since most of the respondents' personality type is choleric, the respondents' perceived quality of life is still fairly high despite the circumstances during the school year. The results illustrated the mean difference of personality type on the perceived quality of life and indicated the importance of how specific characteristics can affect the satisfaction and happiness of students, especially in exceptional circumstances such as a pandemic. The results also support and confirm both the theories, Proto Psychological Theory and Maslow's Hierarchy of Needs.

References

"TEST: Personality Temperament Test - Questionnaire." Accessed May 14, 2020. http://www.goingthedistance.org/pages.asp?pageid=18151.

Abbaszadeh, A., Borhani, F., & Mohsenpour, M. (2010). Compatibility of personality and major among freshman undergraduate nursing students of the Kerman University of Medical Sciences. *Iranian Journal of Nursing and Midwifery Research, 15*(2), 90–95.

Antaramian, S. (2017). The importance of very high life satisfaction for students' academic success. *Cogent Education, 4*(1). doi:10.1080/2331186x.2017.1307622

Crossman, Ashley. (2020, March 19). *Understanding Purposive Sampling*. https://www.thoughtco.com/purposive-sampling-3026727

Comparative Analysis of Scientific Data: Definition & Example. (2017, August 31). https://study.com/academy/lesson/comparative-analysis-of-scientific-data-definition-example.html.

Cucinotta, D., & Vanelli, M. (2020). WHO Declares COVID-19 a Pandemic. *Acta bio-medica: Atenei Parmensis, 91*(1), 157–160. https://doi.org/10.23750/abm.v91i1.9397

Dancel, Raul. (2020, March 16). Coronavirus: Duterte places a third of the Philippines on sweeping lockdown [Text]. *The Straits Times*. https://www.straitstimes.com/asia/se-asia/coronavirus-massive-cracks-in-manila-lockdown-luzon-under-enhanced-community-quarantin

Descriptive Statistics. (n.d). https://www.researchconnections.org/childcare/datamethods/descriptivestats.jsp

Dubrovina, N., Siwiec, A., Ornowski, M., Boyko, V., Zamiatin, P., Zamiatin, D., & Gerrard, R. (2016). Social and demographic determinants of the health state and life satisfaction of population in Poland. In 959064058 746506798 G. Torres (Author), *Life Satisfaction: Determinants, Psychological Implications and Impact on Quality-of-Life* (pp. 1-54).

Embalzado, H., & Varma, P. (2018, January 03). *Influences of Temperament Types on University Students' Well-Being, Academic Performance and College Adjustment*. http://www.assumptionjournal.au.edu/index.php/Scholar/article/view/2996

Esguerra, D. (2020, March 10). NCR classes canceled March 10-14 due to coronavirus threat. https://newsinfo.inquirer.net/1239010/ncr-classes-canceled-from-march-10-to-14-due-to-coronavirus-threat

Four Temperaments: Sanguine, Phlegmatic, Choleric, and Melancholic Personality Types. https://psychologia.co/four-temperaments/

Glen, S. (2020, September 17). *ANOVA Test: Definition, Types, Examples*. https://www.statisticshowto.com/probability-and-statistics/hypothesis-testing/anova/

Glen, S. (2020, July 30). *Independent Samples T Test (Unpaired Samples): Definition, Running*. https://www.statisticshowto.com/independent-samples-t-test/

Glen, S. (2020, September 16). *Kruskal Wallis H Test: Definition, Examples & Assumptions. Statistics How To*. https://www.statisticshowto.com/kruskal-wallis/

Glen, S. (2021, April 26). *Mann Whitney U Test: Definition, How to Run*. Statistics How To. https://www.statisticshowto.com/mann-whitney-u-test/

Harris, M. A., Brett, C. E., Johnson, W., & Deary, I. J. (2016). Personality stability from age 14 to age 77 years. *Psychology and Aging, 31*(8), 862–874. https://doi.org/10.1037/pag0000133

Hassel, S., & Ridout, N. (2018). An Investigation of First-Year Students' and Lecturers' Expectations of University Education. *Frontiers in Psychology, 8*, 2218. https://doi.org/10.3389/fpsyg.2017.02218

Huang, I. C., Lee, J. L., Ketheeswaran, P., Jones, C. M., Revicki, D. A., & Wu, A. W. (2017). Does personality affect health-related quality of life? A systematic review. *PloS One, 12*(3), e0173806. https://doi.org/10.1371/journal.pone.0173806

Ingrand, I., Paccalin, M., Liuu, E., Gil, R., & Ingrand, P. (2018). Positive perception of aging is a key predictor of quality-of-life in aging people. *PloS One, 13*(10), e0204044. https://doi.org/10.1371/journal.pone.0204044

Jacobs J. E. (2009). Quality of life: what does it mean for general practice?. *The British Journal of General Practice: The Journal of the Royal College of General Practitioners, 59*(568), 807–808. https://doi.org/10.3399/bjgp09X472854

Jaehnig, J. (2018, October 13). *What Is The Choleric Temperament?* https://www.betterhelp.com/advice/temperament/what-is-the-choleric-temperament/

Janjhua, Y., & Chandrakanta (2012). Behavior of personality type toward stress and job performance: a study of healthcare professionals. *Journal of Family Medicine and Primary Care, 1*(2), 109–113. https://doi.org/10.4103/2249-4863.104969

Kajonius, P., & Mac Giolla, E. (2017). Personality traits across countries: Support for similarities rather than differences. *PloS One, 12*(6), e0179646. https://doi.org/10.1371/journal.pone.0179646

Lau, J. T., Yang, X., Pang, E., Tsui, H. Y., Wong, E., & Wing, Y. K. (2005). SARS-related perceptions in Hong Kong. *Emerging Infectious Diseases, 11*(3), 417–424. https://doi.org/10.3201/eid1103.040675

Lin, J.-Y., Wang, M.-S., Dong, L.-P., Xu, D.-W., Wang, Y., Li, X.-L., & Li, X.-M. (2012). Influence of personal character on quality of life of patients with esophageal cancer in North Henan province and influencing factors. *Asian Pacific Journal of Cancer Prevention, 13*(11), 5415–5420. https://doi.org/10.7314/apjcp.2012.13.11.5415

Maslow, A. H. (1943). A theory of human motivation. *Psychological Review, 50*(4), 370–396. https:// https://doi.org/10.1037/h0054346

Merenda, P. F. (1987). "Toward a Four-Factor Theory of Temperament and/or Personality". *Journal of Personality Assessment, 51*(3): 367–374.

McLeod, S. A. (2019, July 20). Qualitative vs. quantitative research. *Simply Psychology*. https://www.simplypsychology.org/qualitative-quantitative.html

Mendes-Rodrigues, C., Ranal, M. A., & Carvalho, D. V. (2019). Postgraduate Students: An Alert about Quality of Life. *World Journal of Education, 9*(1), 135. https://doi.org/10.5430/wje.v9n1p135

Patrick, D.L. (2014) Perceived Quality of Life Scale. In: Michalos A.C. (eds) *Encyclopedia of Quality of Life and Well-Being Research*. Springer, Dordrecht. https://doi.org/10.1007/978-94-007-0753-5_2130

Patrick, D.L, Kinne, S., Engelberg, R.A., Pearlman, R.A. (2000). Functional status and perceived quality of life in adults with and without chronic conditions. *Journal of Clinical Epidemiology, 53*(8), 779-785.

Payakachat, N., Gubbins, P. O., Ragland, D., Flowers, S. K., & Stowe, C. D. (2014). Factors associated with health-related quality of life of student pharmacists. *American Journal of Pharmaceutical Education, 78*(1), 7. https://doi.org/10.5688/ajpe7817

Personality. (2020). https://www.apa.org/topics/personality.

Post M. W. (2014). Definitions of quality of life: what has happened and how to move on. *Topics in Spinal Cord Injury Rehabilitation, 20*(3), 167–180. https://doi.org/10.1310/sci2003-167

Purposive Sampling 101 | SurveyGizmo Blog. (2018, March 22). SurveyGizmo. https://www.surveygizmo.com/resources/blog/purposive-sampling-101/

Ranganathan P. (2019). Understanding Research Study Designs. *Indian Journal of Critical Care Medicine: Peer-reviewed, Official Publication of Indian Society of Critical Care Medicine, 23*(Suppl 4), S305–S307. https://doi.org/10.5005/jp-journals-10071-23314

Samlani, Z., Lemfadli, Y., Errami, A. A., Oubaha, S., & Krati, K. (2020). *The Impact of the COVID-19 Pandemic on Quality of Life and Well-Being in Morocco*. https://doi.org/10.20944/preprints202006.0287.v1

Short, S. E., Yang, Y. C., & Jenkins, T. M. (2013). Sex, gender, genetics, and health. *American Journal of Public Health, 103* Suppl 1(Suppl 1), S93–S101. https://doi.org/10.2105/AJPH.2013.301229

Singh, R., Shriyan, R., Sharma, R., & Das, S. (2016). Pilot Study to Assess the Quality of Life, Sleepiness and Mood Disorders among First Year Undergraduate Students of Medical, Engineering and Arts. *Journal of Clinical and Diagnostic Research: JCDR, 10*(5), JC01–JC5. https://doi.org/10.7860/JCDR/2016/19140.7878

Sirgy, M. J., Grzeskowiak, S., & Rahtz, D. (2006). Quality of College Life (QCL) of students: developing and validating a measure of well-being. *Social Indicators Research, 80*(2), 343-360. https://doi.org/10.1007/s11205-005-5921-9

Spiers, A., & Walker, G. J. (2008). The effects of ethnicity and leisure satisfaction on happiness, peacefulness, and quality of life. *Leisure Sciences, 31*(1), 84-99. https://doi.org/10.1080/01490400802558277

Temperament. (2020, April 18). https://www.britannica.com/topic/temperament

Toquero, C. M. D. (2020). Emergency remote teaching amid COVID-19: The turning point. *Asian Journal of Distance Education, 15*(1), 185-188. https://doi.org/10.5281/zenodo.3881748

van den Berg, R. (n.d.). *What is a Frequency Distribution?* https://www.spss-tutorials.com/frequency-distribution-what-is-it/

Weisberg, Y. J., Deyoung, C. G., & Hirsh, J. B. (2011). Gender differences in personality across the ten aspects of the big five. *Frontiers in Psychology, 2*, 178. https://doi.org/10.3389/fpsyg.2011.00178

Yang, C., Richard, G., & Durkin, M. (2016). The association between Myers-Briggs Type Indicator and Psychiatry as the specialty choice. *International Journal of Medical Education, 7*, 48–51. https://doi.org/10.5116/ijme.5698.e2cd

Yaşartürk, F., Akyüz, H., & Gönülateş, S. (2019). The investigation of the relationship between university students' levels of life quality and leisure satisfaction. *Universal Journal of Educational Research, 7*(3), 739-745. https://doi.org/10.13189/ujer.2019.070313

Zhang, J., Zhao, S., Lester, D., & Zhou, C. (2014). Life satisfaction and its correlates among college students in China: a test of social reference theory. Asian journal of psychiatry, 10, 17–20. https://doi.org/10.1016/j.ajp.2013.06.014

Zhang, Y., & Ma, Z. F. (2020). Impact of the COVID-19 Pandemic on Mental Health and Quality of Life among Local Residents in Liaoning Province, China: A Cross-Sectional Study. International journal of environmental research and public health, 17(7), 2381. https://doi.org/10.3390/ijerph1707238

Hypertension Prevalence, Knowledge, Attitude and Health Practices among Employees of a Wellness Village: Basis for a Proposed Hypertension-Prevention Program

Joraleen Dion G. Yabut
Adventist University of the Philippines
iamdiooon@gmail.com

Abstract

Hypertension is known as a silent killer because some people who suffer from it do not know that they have the disease. Globally, approximately 7.5 million deaths occur due to high blood pressure. In the Philippines, hypertension is ranked as number eight and is the leading cause of death among Filipinos. Moreover, 41.3 million employed Filipinos are suffering from this disease. This study aimed to determine the knowledge, attitude and health practices to prevent hypertension among the employees of a Wellness Village. The study used a quantitative type of research where 30 respondents were surveyed utilizing purposive sampling method in the selection of the appropriate respondents. The data was treated statistically with the utilization of frequency-percentage distribution and mean. The results showed that the respondents have very good knowledge (overall % = 72.99%), fair attitude (mean=2.76), and fair practice (mean=2.37) on hypertension and its lifestyle management. As a result of this study, the researcher created a proposed intervention program for the risk reduction of hypertension among workplace employees.

Keywords: *hypertension, employees, knowledge, attitude, practice*

Blood pressure is important to life. It moves blood, which supplies nutrients and oxygen through our body. Blood pressure is the force of blood circulating against the artery walls. Although a rise and fall in blood pressure is normal, frequent abnormal variations for a long time can be dangerous or even fatal. According to the World Health Organization (2018), hypertension, or high blood pressure, is a persistent blood pressure of systolic >140mmHg and/or diastolic >90 mmHg. It is a serious medical condition that can increase the risk of heart, brain, kidney and other diseases.

Hypertension is known as a silent killer because many people are suffering from it without knowing it. A population of 108 million or 45% of adults in the United States have hypertension and only about 24% with hypertension have their condition under control (Kochanek et al., 2019). Hypertension ranks third, after smoking and diet, as the biggest risk factor for premature death in the UK and its prevalence continues to rise as the population ages (Harding, 2020).

Globally, approximately 7.5 million deaths occur due to high blood pressure. It is predicted that in 2025, the number of adults with hypertension will shoot up to 1.56 billion (Singh et al., 2017).

For the past decade, hypertension prevalence in the Philippines has progressively increased and continues to be a major health problem.

The Philippine Health Statistics from the Department of Health (2018) presented the ten leading causes of morbidity. Hypertension was second on the list with 637,078 cases and a rate of 602.4 cases per 100,000 population. In the survey of the Philippine Heart Association, hypertension showed to be the highest in the incidence of cardiovascular diseases (CVD) among hospital-based populations (Sison et al., 2020). Data source from the World Health Organization (2018) shows that hypertension is ranked number 8 in the leading causes of death in the Philippines with coronary heart disease and stroke as number 1 and 2.

With about 41.3 million Filipinos who are employed in the Philippines (Philippine Statistics Authority, 2020), the workplace offers a good audience for wellness programs for hypertension. Workplace health promotion (WHP) can be an effective means to reduce lifestyle related health risk factors and promote healthy behaviors among employees focusing on healthy diet, regular physical activity, stress management and other lifestyle choices.

Hence, this study was conducted to determine the knowledge, attitude and health practices to prevent hypertension among the employees of a wellness village. The study results were used to create a proposed intervention program for the risk reduction of hypertension among workplace employees.

Methods

Research Design

According to the National Institutes of Health (Glasgow et al., 2012), implementation research is "the scientific study of the use of strategies to adopt and integrate evidence-based health interventions into clinical and community settings in order to improve patient outcomes and benefit population health. Implementation research is a multi-method inquiry that uses both quantitative and qualitative data to assess the programs (Hwang et al., 2020). The study will be conducted in two phases and will utilize quantitative and qualitative case study research design. For the first phase, also known as the needs assessment, the study used a self-constructed research questionnaire design to determine the respondents' demographics, their level of knowledge, attitude and practice in hypertension and its lifestyle management. Second phase will be based on the results of the questionnaire. The proposed program intervention will focus on qualified participants who are at risk of hypertension and will undergo and attend the 8-week intervention wellness program.

Study Respondents

The respondents of this study were randomly sampled from employees of a wellness village in Tagaytay, Philippines. These employees work eight hours a day, sitting in their office chairs (administrators, accountant, sales marketing, reservations) and/or exposed in a stressful

environment because of the fast pace of coming in and out of guests and customers (waiters, front desk officers, housekeeping, spa therapists). Table 1 shows the demographics of the respondents.

The demographic profile of the respondents plays a significant part in their knowledge, attitude and practice. These are the factors that affect how they understand hypertension, its risk and management. It guided the researcher to formulate and develop an accurate program intervention for the respondents. Table 1 presents this data.

Table 1. *Demographic of the respondents*

	N	Mean
Age	30	2.16
Gender	30	0.36
Educational Attainment	30	3.8
Monthly income	30	1.2

Table 1 shows the demographic profile of the respondents according to their age, gender, educational attainment and monthly income. Majority of the respondents were between 26-35 years old, female. Most of the respondents were high school graduates and are earning below 10,000 pesos per month, their jobs are mostly gardeners, waiters and spa therapists in the wellness village.

From the results of the questionnaires, qualified participants will be chosen to participate in the wellness prevention program.

Research Instrument

A needs assessment questionnaire was used as a survey form for the respondents. The questionnaire has three parts. Part I was designed for the respondent's demographic profiles in terms of age, sex, educational attainment, and monthly income. Part II is for health history questions. Respondents are asked if they have hypertension and how they are managing it and also, if they have access to nearby clinics, gyms and recreational areas. They were also asked if they have ever participated in a wellness program in their community and if they are willing to participate if ever there will be a program. The last part was composed of 27 research questions which incorporated the concept of knowledge, attitude and practice with different scale parameters on hypertension among employees of the wellness village. The first scale for knowledge is answerable by true or false, the second has a 4 point Likert- scale answerable by (4) strongly agree, (3) Agree, (2) Disagree and (1) Strongly disagree to determine the response of the respondents in terms of attitude, the third part has also a 4 point Likert-scale answerable by (4) always, (3) often, (2) sometimes, (1) never on questions about their practices when it comes to their lifestyle habits related to hypertension.

Data Gathering Procedure

A letter of request was sent to the wellness village's HR department to ask permission to conduct a survey with their employees. Once the HR department approved, a face-to-face survey was conducted with the employees. A cover letter and consent letter was attached together with the questionnaires introducing the researcher and explaining the objective of the study. The researcher made sure that all the respondents gave their consent to participate in the research and explained the parts of the tool. After which, the employees answered the questionnaire. All employees who answered are those that have their duty on the day the questionnaires are given. A total of 30 questionnaires were gathered and results were analyzed as a basis for the wellness program proposal.

Data Analysis

After the data were encoded, the researcher analyzed the data using SPSS 23 and MS Excel 2016. The data was treated statistically with the utilization of frequency-percentage distribution and mean.

Results and Discussion

Health History of the Employees

Table 2 presents the health history of the employees in relation to hypertension and their access to clinic, gym and wellness programs in their community. Nineteen (63.3%) of the respondents said that they do not have hypertension, and the 36.7% who said that they have hypertension have stated that they manage their hypertension through diet (20%), exercise (10%), and medication (6.7%). Most of the respondents (73.3%) have nearby clinics in their area while only 16.7 % have access to gyms and/or any recreational area. Only 3 out of the 30 respondents said that they have participated in a wellness program in their community. When asked if they will be willing to participate in a wellness program, 86.7% of the respondents stated that they are willing to participate.

Table 2. *Health History of the Respondents*

	Yes Frequency	%	No Frequency	%
Do you have hypertension	11	36.7	19	63.3
Hypertension management				
● Diet	6	20		
● Exercise	3	10		
● Medication	2	6.7		
● None				
Are there any nearby clinics in your area?	22	73.3	8	26.7
Do you have access to gyms or any recreational area?	5	16.7	25	83.3
Have you participated in a wellness program in your community?	3	10	27	90
If ever there will be a wellness program in your workplace are you willing to participate?	26	86.7	4	13.3

Employees' Knowledge on Hypertension

To determine the level of knowledge towards hypertension, Table 3 showed that overall, 72.99 of the respondents have very good knowledge on hypertension. Results showed that there are more respondents with less knowledge on items 8 (High blood pressure usually does not have any symptoms.) and 10 (Individuals with increased blood pressure can eat salty foods as long as they take their medication regularly). For the rest of the items (1,2,3,4,5,6,7, and 9,) most respondents showed that they have knowledge.

Table 3. *Knowledge on Hypertension*

	TRUE Frequency	%	FALSE Frequency	%	Scale
1. A person is considered to have hypertension if either their systolic blood pressure is 140 or higher or their diastolic is 90 or higher on two separate occasions.	30	100	0	0.00	With knowledge
2. High blood pressure can lead to death.	27	90	3	10	With knowledge
3. The older you are, the less likely you are to have high blood pressure.	3	10	27	90	With knowledge
4. People with hypertension do not need to take medicine if they exercise regularly.	9	30	21	70	With knowledge
5. Uncontrolled high blood pressure puts you at a higher risk for stroke, heart disease, heart attack, and kidney failure.	27	90	3	10	With knowledge
6. Most people with hypertension need more than one kind of medication to control their blood pressure.	18	60	12	40	With knowledge
7. Young people can have high blood pressure too.	23	76.7	7	23.3	With knowledge
8. High blood pressure usually does not have any symptoms.	15	50	15	50	Less knowledgeable
9. Individuals with increased blood pressure must take their medication only when they feel ill	11	36.7	19	63.3	With knowledge
10. Individuals with increased blood pressure can eat salty foods as long as they take their medication regularly.	17	56.7	12	40	Less knowledgeable

Overall: 72.99 Very Good

Legend of Scale: 0%-50.99% = Less knowledgeable; 51%-100% = With Knowledge

Legend of VI: 0%-50.99% = Poor; 51%-100% = Very Good

Employees' Attitude on Hypertension

Table 4 shows the attitude of the respondents on hypertension and its management. Overall, respondents have a fair attitude (mean 2.76) in hypertension. According to a study (Guidi, 2021), having a positive attitude also inclines us towards taking on new challenges and learning new skills. This means we are more likely to get involved in activities where we are not immediately successful. An individual with a negative attitude generally gives up at the first unsuccessful attempt – making it difficult to master a new skill. This is important for the wellness program to be successful and to have positive results on the respondents.

Table 4. *Attitude of the respondents on hypertension and management*

	Strongly Agree (%)	Agree (%)	Disagree (%)	Strongly Disagree (%)
Blood pressure check is important for the prevention of hypertension.	50.0	30.0	6.7	13.3
It is important to pay attention to the BP measurement when under stress.	43.3	23.3	20.0	13.3
Healthy lifestyle practices are important to manage my blood pressure	40.0	30.0	13.3	16.7
Blood pressure pills should be taken only when prescribed by a doctor	0	50.0	43.3	6.7
Being physically inactive will increase my risk of having hypertension.	6.7	46.7	46.7	
Not smoking and limiting alcohol use can lower the risk of hypertension	13.3	50	33.3	3.3
It is important to watch out for my body weight.	50	20	6.7	23.3

Total Mean Score 2.76 Fair

Legend of Scale: 1-1.74 – Strongly Disagree; 1.75-2.49 – Disagree; 2.50-3.24 – Agree; 3.25-4.00 –Strongly Agree

Legend of VI: 1-1.74 – Poor; 1.75-2.49 Fair; 2.50-3.24 – Good; 3.25-4.00 – Very Good

Employees' Practice on Hypertension

Table 5 showed the computed mean of 2.37, which pointed out that the respondents have fair practice towards hypertension. Many researchers (Akbarpour et al., 2018) believe that major changes in lifestyle behaviors play an important role in the prevalence of hypertension. Several studies showed that low levels of physical activity, being overweight, malnutrition, and being smoker could be associated with increased risk for hypertension even in early adulthood prediction of hypertension during adolescence.

Table 5. *Lifestyle Practices of the respondents for the past 4 weeks*

	Mean	Standard Deviation	
I eat meals cooked at home	2.66	1.12	Often
I eat fruits with my meal.	2.13	0.77	Sometimes
I eat vegetables with my meal	2.90	0.84	Often
I eat processed foods like chips, canned goods, and/ or processed meats.	2.50	0.90	Often
I eat meat (beef, pork, lamb, chicken, turkey)	2.63	0.76	Often
I drink coffee and/or other caffeinated beverages like sodas and energy drinks	2.80	0.88	Often
I smoke cigarettes.	1.66	1.02	Never
I drink alcoholic beverages.	1.46	0.81	Never
I walk around every 2 hours of sitting.	2.76	0.67	Often
I engage myself in aerobic physical activity and other exercises.	2.36	0.61	Sometimes
I get enough sleep (6-8 hours)	2.63	0.85	Often
I monitor my blood pressure.	2.00	0.94	Sometimes

Total Mean Score: 2.37 Fair

Legend of Scale: 1-1.74 – Never; 1.75-2.49 – Sometimes; 2.50-3.24 – Often; 3.25-4.00 – Always

Legend of VI: 1-1.74 – Poor; 1.75-2.49 Fair; 2.50-3.24 – Good; 3.25-4.00 – Very Good

Proposed Wellness Prevention Program

The proposed wellness prevention program was created based on the results of the survey among the wellness village employees. The wellness program aims to reduce the risk of hypertension among the employees and raise the awareness of the employees regarding the risks of hypertension, increase their knowledge, attitude, and skills in the prevention, management and intervention of hypertension and reduce the risk of hypertension with the use of lifestyle interventions focusing on nutrition and exercise. Employees that would want to participate in this program should at least have one of these lifestyle risk factors of hypertension: overweight, eating an unhealthy diet, and having low physical activity. A health assessment questionnaire will be given to the employees to answer as a screening before the wellness intervention begins.

Table 6. *WorkWell Intervention Program: a proposed wellness-prevention program*

Goal: To reduce the risk of hypertension among the employees				
Objectives	Activities/ Intervention	Persons Involved	Duration	Expected Outputs
Determine their lifestyle risk factors to hypertension	Health Assessment Questionnaire Blood pressure and BMI check	Researcher, participants	2 days	Participants will be able to identify their lifestyle risk factors to hypertension
Monitor their blood pressure regularly	Use of sphygmomanometer demonstration Blood pressure record book	Researcher, participants	8 weeks (whole program duration)	Keep a record of their blood pressure. Participants will be knowledgeable in using a sphygmomanometer.
Replace workplace pantry with at least 80% healthy foods	Lecture on heart healthy eating and cooking Pantry inspection	Researcher, participants	2 days	Transformed pantry, promoting healthy foods only.
Create, prepare, and cook a 3-day heart healthy meal plan	Lesson on Meal Planning and heart-friendly cooking with cooking demonstrations Participants will have a return-demo	Researcher, participants	3 days	Meal Plan Cooking demonstrations of 3 day heart-friendly meals by employees.
Achieve or atleast commit to achieving their healthy goal	Daily exercise, 10,000 steps monitoring Food Journal Monitoring	Researcher, participants	8 weeks (whole program duration)	Maintained healthy weight and/or weight loss
Promote healthy lifestyle in the workplace and also to their household		Researcher, participants	lifetime commitment	Practice of a healthy lifestyle both in workplace and household.

Conclusion

Based on the results of the needs assessment, the knowledge, attitude and practice of the respondents on hypertension and management through lifestyle are very good in terms of knowledge but only fair in terms of their attitude and practice. The WorkWell program aims to provide an intervention for the at risk participants where they will commit to changes and practice in action the knowledge they have.

Although the results provide insight into the knowledge, practices, and attitude (KAP) of the employees, there are limitations in this study. The survey was limited to one workplace, thus further research may be conducted to include other workplace areas for better generalizability. Future studies should also employ qualitative research tools to have an in-depth description of the employee's KAP on hypertension.

References

Akbarpour, S., Khalili, D., Zeraati, H., Mansournia, M. A., Ramezankhani, A., & Fotouhi, A. (2018). Healthy lifestyle behaviors and control of hypertension among adult hypertensive patients. *Scientific Reports, 8*(1). https://doi.org/10.1038/s41598-018-26823-5

Department of Health Philippines. (2018). *The 2018 Philippine Health Statistics.* Department of Health Gov PH. https://doh.gov.ph/node/24432

Glasgow, R. E., Vinson, C., Chambers, D., Khoury, M. J., Kaplan, R. M., & Hunter, C. (2012). National Institutes of Health Approaches to Dissemination and Implementation Science: Current and Future Directions. *American Journal of Public Health, 102*(7), 1274–1281. https://doi.org/10.2105/ajph.2012.300755

Guidi, M. (2021, February 7). *5 Scientific Studies that Prove the Power of Positive Thinking*. LinkedIn.https://www.linkedin.com/pulse/5-scientific-studies-prove-power-positive-thinking-mark-guidi

Harding, M. (2020, February 27). *Hypertension*. Patient. Info. https://patient.info/doctor/hypertension

Hwang, S., Birken, S. A., Melvin, C. L., Rohweder, C. L., & Smith, J. D. (2020). Designs and methods for implementation research: Advancing the mission of the CTSA program. *Journal of Clinical and Translational Science, 4*(3), 159–167. https://doi.org/10.1017/cts.2020.16

Kochanek, K. D., Murphy, S. L., Xu, J., & Arias, E. (2019, June). *Deaths: Final Data for 2017* (Vol. 68 No. 9). National vital statistics reports: From the Centers for Disease Control and Prevention, National Center for Health Statistics, National Vital Statistics System. https://www.cdc.gov/nchs/data/nvsr/nvsr68/nvsr68_09-508.pdf

Philippine Statistics Authority. (2020). *Employment Situation in July 2020 | Philippine Statistics Authority*. https://psa.gov.ph/content/employment-situation-july-2020

Singh, S., Shankar, R., & Singh, G. P. (2017). Prevalence and Associated Risk Factors of Hypertension: A Cross-Sectional Study in Urban Varanasi. *International Journal of Hypertension*, 2017, 1–10. https://doi.org/10.1155/2017/5491838

Sison, J., Divinagracia, R., & Nailes, J. (2020). Asian management of hypertension: Current status, home blood pressure, and specific concerns in the Philippines (a country report). *The Journal of Clinical Hypertension, 22*(3), 504–507. https://doi.org/10.1111/jch.13802

World Health Organization. (2018). *Hypertension in Philippines*. World Life Expectancy. https://www.worldlifeexpectancy.com/philippines-hypertension

A Correlational Study of the Dental Care Delivery and Patient Satisfaction at a Selected Dental Clinic

Richelle C. Esmillo, Rogemille Joy C. Arquiza,
Joyce Isaiahlyn U. Buñug, Mariela Faye H. Dela Cena, Vicky C. Mergal
Adventist University of the Philippines

Abstract

Patients have their expectations in the quality of treatment and dental care being rendered to them. With this, the continued existence of a dental institution mostly relies on the number of satisfied clients it retains. It is deemed essential for a dental institution e to determine patient demands through their evaluation of dental services. A selected dental clinic in a private sectarian university in Cavite evaluated the satisfaction level of patients back in 2008 when it was considered a young college and had areas where patients were dissatisfied. Over the years, these areas of concern have already been addressed with a more organized system and upgraded college facilities, but the question remains whether patient satisfaction increased in conjunction with the improvements made. This research study was conducted to determine and to re-evaluate patients' satisfaction regarding the delivery of dental care offered at the said dental clinic. The research study included 200 previously treated patients from the Oral Surgery and Operative Department ages 18-55 years. This quantitative study utilized the descriptive correlational research design to determine the extent of dental care delivery and satisfaction of the patients and to find out the relationship of these two variables. A five-point Likert scale was used in rating the validated, close-ended self-constructed questionnaires. Patient satisfaction was measured in terms of convenience, treatment quality, social environment, and physical environment. Descriptive results showed that the delivery of dental care was good and patients were satisfied in terms of the indicators of satisfaction. Correlation result showed that delivery of dental care had a *significant positive relationship* with satisfaction. existing. The study confirmed the Healthcare quality theory that patient satisfaction of clinicians and their positive discernment with regards to the entire facets of the quality care. It is recommended that to replicate the study in a wider perspective to validate the results of the study.

Keywords: *dental care delivery, patient satisfaction, treatment quality*

The oral health of an individual can be regarded as a fundamental factor to one's well-being and general health. A healthy oral cavity allows a person to eat, speak, and interact with others without having to experience or undergo pain, discomfort, or embarrassment. The development of a wholesome personality and healthy well-being is related at a reasonable level to the oral cavity of a person. Therefore, if the dental health of an individual is compromised, the dental health provider is accountable for the restoration of the oral health of the patient to achieve those (Bansal et al., 2018).

Dental treatment is being pursued by patients for several reasons, either to ease distress and discomfort, to maintain a good state of their oral health, to amend their looks and esthetics, or in most situations to acquire their needed treatment for oral rehabilitation to restore their normal function. Dental clinics are established to abide in delivering solution to those dental problems. However, most patients would still go to a dental school in providing the treatment they need and anticipate quality dental care although scheduling patients for an appointment may be a difficult thing and even though clinical sitting is extended. For an all-inclusive and comprehensive dental treatment, a dental school setting is preferred because it is free at all or not costly. Also, the delivery of hands-on treatment and dental care is supervised by a clinical instructor thus, a high standard of quality care of service is expected (Habib et al., 2014; Balhaddad et al., 2018).

Dental schools are future dentists' training ground to develop not just a good clinical outcome, but the overall quality dental care. Student clinicians are able to deliver dental care under the supervision of competent mentors and faculty. The role of clinical training faculty in mentoring student clinicians about providing good quality dental treatment is something that must be placed into the matter. Thus, it is imperative to instill high standards of professional conduct among student clinicians. But a major concern for students and faculties are the anxiety and stress they face among patients with complaints (Iqbal et. al., 2018; Habib et al., 2014).

Over the years, the delivery of dental services has improved, and the number of health care providers has increased concurrently. With this, the continued existence of a dental institution mostly relies on the number of satisfied clients it retains. Hence, a dental institute needs to determine patient demands through their evaluation of dental services. Patients' satisfaction feedback as to dental care is important to expand the improvement of the outcome and services being delivered throughout the process of the treatment. It is a necessity that the concerns of the patients are dealt with appropriately, for high-quality deliverance of oral health care can lead to good rapport to patients as well as having a partnership with them. Observing how patients are satisfied when rendering dental services is crucial to meet patient demands, attain improved patient compliance, and uphold the standing of such institutions. This could benefit the students to complete their clinical requirements on time as satisfied patients have better compliance and lesser missed schedules (Balhaddad et al., 2018).

Patients nowadays, locally and globally, have their expectations in the quality of treatment and dental care being rendered to them. Increased quality of dental care leads to improved patient satisfaction. The state to which a thing or service yielded had catered and satisfied the needs of an individual may be defined as the quality of work done. To attain quality dental care for patients is always appropriate (Adebayo et al., 2014).

The dental clinic in a private sectarian institution in Silang, Cavite is an established educational and training program in 2003 and offers a range of free dental services to all who voluntarily sought treatment from near and far areas. The give-and-take relationship among student clinicians and patients is attained in the same way as other dental educational institutions in the Philippines. That is, allowing students to train and enhance their dexterity and clinical skills alongside fulfilling their requirements, and at the same time permitting patients to meet their treatment needs for free (Balhaddad et al., 2018).

The satisfaction level of patients in the College of Dentistry was last evaluated by Mekette (2008) when it was considered a young college which at that time still has a lot of room for improvement. The results presented the areas where patients were dissatisfied. After almost 13 years of operation from the last study, these areas of concern have already been addressed. The

upgraded college facilities and a more organized system plus the transition of different batches of student clinicians entailed major changes in the college. Alongside these improvements, the number of clinicians increased and, a greater number of patients from various places came having needs to be catered.

However, over the years, there has not been a paper published that focused on scrutinizing the status of dental services based on the regular patrons of the services themselves. The question remains whether patient satisfaction increased in conjunction with the improvements made.

The goal of this study was to determine and to re-evaluate patients' satisfaction on the delivery of dental care offered at the dental clinic in a specific university in Cavite.

This study specifically answered the following questions:

1. How do respondents perceive the extent of delivery of dental care by clinicians?
2. What is the level of satisfaction of the patients in the delivery of dental care of the clinicians in terms of:
   a. Convenience
   b. Treatment Quality
   c. Social Environment
   d. Physical Environment
3. Is there a significant relationship between the delivery of dental care and the satisfaction level of the patients?

Hypothesis of the study:

1. There is no significant relationship between the delivery of dental care and the satisfaction level of patients.

Dental Care

Oral health is a key indicator of health and quality of life. Dental care is medical care and hygiene relating to one's teeth. Nowadays, dental awareness has encouraged patients' attitudes towards their dental wellbeing. Every patient's dental care is a top priority inside and outside the clinic. Hence, it is the duty of the dental specialist to improve the quality of dental treatment and to fulfil and increase their satisfaction in several aspects emotionally, professionally, and medically (Bhat et al., 2017; McGoldrick, 2019).

Delivery of Dental Care

Throughout the world, the quality of the service and dental care provided to patients is a thorough and wide-ranging responsibility of dental clinicians. Hence, it is an important component to be able to value the needs of every patient and to deliver the care they need (Bhat et al., 2017). However, throughout the years, the awareness of patients on delivery of healthcare expanded alongside the improvement in their quality of life. The perspectives of the patients were modified since they became more knowledgeable on the delivery of dental care. Consequently, their idea and expectations of quality services when it comes to medical or dental care heightened as well (Habib et al., 2014; Iqbal et al., 2018). Dental care providers are continually subjected to accumulating pressures when the quality of dental care is assessed since the dental health care itself is turning to be more complicated with an upgrade of the latest treatment options and various methods on the delivery of care (Singh et al., 2015).

The key element in evaluating quality health care is patient satisfaction hence, good dental service and clinical outcome start with excellent care. When it comes to the delivery of dental care, the clinicians play a vital role in increasing the quality of dental administration and expanding the satisfaction of the patients to a better level. Determining the factors that affect the level of fulfilment of patients and carrying out their wishes and expectations can improve the dental care given by the

clinician. Courteous and appropriate terms to the patient and positive response in settling their fears and anxiety will produce satisfied patients and ensure their compliance and future returns (Bhat et al., 2017; Bansal et al., 2018; Patel, 2014). However, variation in expectation of the treatment between patients who regularly visit the dentist and patients who only visit the dentist when they experience discomfort should be noted and considered by the clinician (Iqbal et al., 2018).

Building a good dentist-patient relationship has a significant impact on the consistency of patient's compliance with appointments. Minimizing the waiting time by completing the treatment as fast as possible should be one aspect to be given attention to. The clinicians must also prioritize explaining the treatment the patient will undergo, as well as the treatment options they can choose from. Presenting detailed information about the patient's oral health condition and necessary treatment procedures in simplified terms or layman's terms the patient could comprehend or writing oral care instructions contribute to a good dentist-patient relationship. If improperly informed, it can further influence patient dissatisfaction despite the treatment being satisfactory (Bhat et al., 2017; Balhaddad et at., 2018; Patel, 2014).

Enhancing the service quality also includes the knowledge of the attending clinician about the needs and condition of the patients, and the way the clinicians handle every case they would encounter (Patel, 2014). However, a specific degree of satisfaction may vary on the dental procedure being undertaken by a patient. Other studies stated that, less invasive procedures have a higher degree of satisfaction (Mitchell et al., 2017).

Aside from the dental treatment being done, there are also other factors that can enhance the overall dental care itself. Such factors include the free or low-cost service and the environment where the treatment is being done (Bhat et al., 2017).

The main goal is to secure healthy, satisfied, and loyal patients through establishing a positive experience in our practice by rendering the desired service they need, and for them to be well-served (McGoldrick, 2019).

Patient Satisfaction

The definition of satisfaction by patients when it comes to healthcare presents as a broad matter and studies have not shown a single view or notion to such (Al-Abri & Al-Balushi, 2014). Satisfaction is the degree of contentment or distress resulting from contrasting a product's perceived outcome with one's expectations (Bhat et al., 2017). That is when the outcome of the received service and the work done itself is compared to and met the expectations anticipated by the individual, he or she is satisfied. Several factors implicate satisfaction including one's knowledge, feelings, rationality, past experiences, and the anticipation yielded prior to any experience (Patel, 2014).

Constantly evaluating the satisfaction of patients with the services and the treatment provided to them is an important basis for the improvement in the delivery of dental health care (Bansal et al., 2018). The success of dental treatment is directly proportional to the level of satisfaction a patient has, which implies the level of quality of dental care rendered as well.

Measures of Patient Satisfaction

A successful dental service can be best measured through the satisfaction degree and feedback of the patients being treated. Structured questionnaires are common instruments used to assess patient satisfaction as a response to dental services provided on them (Habib et al., 2014). Studies also mentioned that the opinions and suggestions of patients imparted valuable information about issues important to them and means to deal with them. With that, to reduce and eliminate any source of disappointment, several measures ought to be taken (Bhat et al., 2017; Nagappan & John, 2014).

A study by Luo et al. (2018) consisted of focus groups who were able to propose a potentially improved dental satisfaction questionnaire (DSQ) with themes and items from patients' perspectives that are believed to encompass multi-structural schemes of satisfaction and recommend a reliable,

legitimate and coherent model which will aid future assessments of the dental care system. They were categorized into six fundamental scales namely access, availability or convenience, cost, pain, quality, and continuity including a global access scale, general satisfaction.

Meanwhile, in another study, the questionnaire comprised of sections that included patient's satisfaction based on several disciplines such as patients' satisfaction according to their knowledge, patient-dentist interaction (PDI), technical competency (TC), administrative efficiency (AE) and dental school set-up environment (DS) (Bhat et al., 2017).

Convenience

A study revealed that the most notable and influencing aspect for patient satisfaction is the convenience or ease in obtaining dental schedules. Patients would mostly go for dentists who can suggest convenient time arrangements with systematic progressions that coincide with their availability. As a result, patient compliance is better (Bhat et al., 2017; Balhaddad et al., 2018).

In the study of Luo et al. (2018), the theme "convenience" invoked a negative factor to the respondents. In their study, convenience does not refer to a single entity but to a broad range of concepts including accessibility which refers to opening hours, location, appointment reservation, admission, emergency services and the time spent waiting for appointment scheduling. One respondent noted that he had to request for work leave to be able to consult with the dental intern during weekdays since the teaching hospital was closed on weekends. Another significant area of concern associated with convenience was the struggle of getting called back for admission as a patient in that teaching institution, that is due to the required cases that are only needed by the clinician wherein not all patients would be called back for an appointment and be catered of their needs. A participant narrated his experience of waiting for a year for his first schedule and even shared that some of his friends were never called back for admission. Usually, after oral check-ups, waiting for one's case to be handled by a dentist or dental clinician could be too tedious and lengthy. These instances may be a source of dissatisfaction for patients.

Long waiting time for treatment is one of the causes of stress in patients that can lead to dissatisfaction. A study suggested that a relationship exists between the length of waiting time of the patients with the satisfaction they would have in medical settings, and even an aspect that is used by the patient to determine the enthusiasm of the clinician with their work that can surpass more so the knowledge and the skills they have as a healthcare provider. However, the problem in dental settings was minimal as it also concluded that there is no overall significant effect of the waiting time in the satisfaction of patients and the relationship between dentists and the latter. Those who came for the first time with a late clinician have worse satisfaction and relationship with their healthcare provider unlike those with clinicians who were early comers are satisfied better, but there was no significant difference. Even patients who continuously sought treatment several times remained satisfied despite having been waiting for so long. Waiting time in this study is a subtheme inclusive of the theme Convenience (Akbar et al., 2019).

For Patel (2014), the challenge posed by long waiting time for patients is a huge concern that must be resolved by either regulating the number of patients catered or adding more dental personnel and dental chairs. This is similar to a study stating that patients are very grateful for speedy service delivery irrespective of the procedure (Adebayo et al., 2014).

Luo et al. (2018) defined waiting time as the multiple manners of anticipation which involved time spent waiting at the clinic, duration of the entire treatment proper and the time spent for travel for every dental visit. One participant recounted of experience when the dental intern needed the dentist (clinical teacher) at some stages in the treatment to evaluate a step prior to proceeding to the next one which kept the patient to open her mouth and wait as well especially when the dentist was mentoring the other interns.

Waiting time was under the Administrative efficiency category in the study of Bhat et al. (2017) where patients' total satisfaction with regard to waiting for the procedure was satisfactory in

contrast to most studies available. It can be noted that the time agreed upon in dental arrangements is fundamental as it equates with the success of a dental institution and the satisfaction of its customers (Akbar et al., 2019).

Treatment Quality

The most crucial factor why patients seek dental services rendered by students from dental schools are free or low-cost, perceived high-quality treatment, and limited access to treatment from other dental venues. However, treatment quality is not only the basis of patient satisfaction. Other components such as facilities, staff behavior, and basic environmental needs are also considered (Balhaddad et al., 2018).

Various studies measure quality in two separate types including the technical aspect which defines quality based on scientific criterions by health specialists and precision of diagnosis with appropriate treatment methods, and the functional aspect which defines quality based on the approaches done to deliver care. However, patients are struggling in assessing the technical dimension, thus they utilize the functional property alone in evaluating service quality (Adebayo et al., 2014; Singh et al., 2015).

Studies revealed the view of patients on the quality of dental care depending on an array of measures consisting of the dentist's way of interacting, their technical abilities, cost, duration of waiting and treatment proper, and by what means their problems and anxiety were attended (Singh et al., 2015).

Quality is the recognizable expertise of the dentist, adequate staff, improvement in the status of oral health following treatment, also the availability of technological advances, materials and equipment, and strict infection control in the dental department. In this study, respondents were displeased with the skillfulness of the clinician while some conveyed assurance with the clinician who handled them. Meanwhile, the additional matter of concerns influencing the quality of care were the lacking number of dentists and the incapability of getting a follow-up. Another factor was the post-treatment status and the remarkable progress of the oral health where one participant recounted receiving treatment from a dental institute ten years ago and had been unbothered by any dental trouble since then, conveying to her a fact that the dental institute renders quality services (Luo et al., 2018).

During the treatment procedure, the technique of pain management (e.g., intra-operative medications) and the prescription of postoperative pain relievers create an effect in the satisfaction with the dental care provider. Pain management is under the category of Technical competency in the study by Bhat et al. (2017).

In the study of Adebayo et al (2014), the most crucial standard of a good clinical practice rated by patients is the capability of the dental clinician to provide painless treatment. Even though patients are incapable and less familiar with evaluating the technical expertise of dental clinical personnel, patients have high regard for a clinician who can give pain-free dental services.

In some studies, a high number of patients were satisfied with the delivery of treatment and stated that the student clinician was able to successfully regulate the pain involved in the treatment (Nagappan & John, 2014; Bhat et al., 2017).

Environment

The success of dental treatment is not just based on the dental manpower in an institution; hence, basing the satisfaction of patients in the procedure alone is not enough to measure the satisfaction itself. The environment in which the patient will engage in for the experience has a part in which satisfaction can be affected (Nagappan and John, 2014). Such environment is comprised of the facilities, equipment, cleanliness, and other physical attributes that influence patient's judgement and satisfaction. Others include the relationship and rapport established between the clinician and the patients and the care and concern given through socialization (Balhaddad et al., 2018).

Social Environment

One of the essential components to attain patient satisfaction and encourage patients to proceed with their treatment is good dentist-patient interaction. This conveys that the dentist gives importance in recognizing the patient's chief complaint, and thus, can carry out the most appropriate treatment. With this, patients select a thoughtful and pleasant dentist than just a trained one to attend to their needs (Bhat et al., 2017, Balhaddad et al., 2018).

Numerous studies support that a positive relationship between dentist and patient equates to a higher satisfaction level of patients; hence, higher satisfaction means higher compliance of patients in post-operative instructions and patient education (Mitchell et al., 2017).

Satisfactory dental services are characterized by several key features of the dental care provider which includes the degree of explanation of the condition or disease, treatment process and possible complications provided to the patient, the comforting words, compassion and reassurance during the procedure itself, the attention and care imparted all over the treatment (Luo et al., 2018). Included in this section are categories that were commonly used in numerous literature to describe dental clinicians.

The first element often identified by the participants when questioned about their satisfaction concerning dental services was the attitude of the dental clinician, as well as the other dental personnel such as assistants (Luo et al., 2018).

In the study of Adebayo et al. (2014), dental clinicians were evaluated based on some dimensions. First includes reliability which refers to complete execution of treatment vowed to the patient. Second is responsiveness referring to the correct timeliness of treatment and preparedness of staff. Third is assurance pertaining to the protection of patients and good mannerism and expertise of the staff. The last is empathy which refers to the level of care and interest in patient's feelings. Nevertheless, compliance of patients is more evident to dental clinicians who display affection and notice their needs (Balhaddad et al., 2018).

Communicating with patients is indeed a vital thing to be done since it is the source of creating a good connection with the patients (Patel, 2014). McGoldrick (2019) concluded that communication between the clinician and the patients should be the priority and is best executed by educating them and providing information with regards to the treatment they need, in that sense, patients would acknowledge that they are part of the practice.

An emphasis must be given when explaining treatment options and procedures to succeed in acquiring highly satisfied patients. Focusing on completing the treatment procedures in just a matter of time is beneficial to lessen waiting time. Moreover, giving importance in explaining the treatment procedure is also helpful and suitable for their satisfaction. It was also revealed that the most insisted requirements to improve the quality of services are the knowledge on the needs and requests of patients during procedure and the necessary communication, whereby most dissatisfaction from patients in this study was observed. That is attributed to the challenges faced by non-nationals in communicating with patients due to the language barrier as foreign students were non-conversant using the local language (Patel, 2014). However, in another study, patients were satisfied with the post-operative oral hygiene instructions provided by the student clinicians (Nagappan & John, 2014).

Physical Environment

As reiterated from a study by Luo et al. (2018), the participants considered the availability of technological advances, materials and equipment, and strict infection control in the dental department of the hospital as indicators of "quality" service. The patients felt that the equipment used on them in this study was more sophisticated than in private clinics. The availability of the apparatuses, modern armamentarium, satisfactory facilities, and sterile instruments needed for a certain procedure can influence the satisfaction of patients (Bhat et al., 2017; Balhaddad et al., 2018).

Apparently, most patients are not eligible enough to critic the quality of treatment rendered to them thus they opt to use the tangibles or the surrounding environment and the condition of the materials and facilities that they observe. The tangibles described in the study of Adebayo et al. (2014) included the visual impression of the care facility as well and the neat appearance of the personnel. These factors impact the view on delivery of dental care of several patients. Even the presence of entertainment devices such as television contributes largely to patients' judgment (Balhaddad et al., 2018).

In numerous studies, the majority of the respondents specified that waiting areas were relaxing and tidy and treatment venues were clean, including the washrooms. A lot of patients also observed armamentarium used were clean and were handled properly. A small percentage of individuals underwent difficulty in looking for a parking space and finding the college or hospital, but a significant number said that they readily accessed the department (Balhaddad et al., 2018; Bhat et al., 2017; Nagappan & John, 2014). However, in a similar study, difficulty with directions was the main obstacle met by some (Iqbal et al., 2018). With regards to the accessibility of drinking water, only half of the respondents said that drinking water facilities were adequate in the treatment venue (Nagappan & John, 2014).

In addition, several individuals in the study by Iqbal et al. (2018) were dissatisfied with the lack of an organized patient calling system, while most of the respondents showed appreciation to dental hospital amenities such as quality radiography section, satisfactory emergency facility, notable insurance and billing services.

With these results, dental establishments should endeavor to reach or maintain the maximum satisfaction level with sanitation and orderliness of facilities as well as equipment, instruments, and materials to guarantee asepsis in the clinics. Moreover, further explanation for dissatisfaction in facilities must be determined from patients to be addressed well by the management of the clinic or college institution (Balhaddad et al., 2018).

Theoretical Framework

This study is based on the "Healthcare Quality Theory" which discussed that the result of interpersonal care is the satisfaction of the patients according to its author. In addition to that, satisfaction of the patients also refers to their positive discernment with regards to the entire facets of the quality care the dentists give (Batbaatar, 2015). The theory suggests that the emotional aspect of an individual associated with any medical procedure must be considered in the healthcare satisfaction, for it is remarkable in the health of the patients. To comprehend all dimensions and components of patient satisfaction is vital to enhance the quality of healthcare. "Patient satisfaction construct" must be evaluated using a multidimensional approach, since several determinants such as the clinical profile of the patients and the social and physical environment of the health service can be regarded as keys to measure patient satisfaction. On top of that, when it comes to the assessment of the quality of care, it is significant to accentuate the necessity to perceive the importance of the experience and satisfaction of patients (Almeida et al., 2015).

Methodology

This quantitative study utilized the descriptive-correlational design to illustrate the level of satisfaction of the respondents and to assess how dental care was delivered. The descriptive design focused on describing items as they are. This type of research conveyed a direct picture of the current status of the matter (Cook & Cook, 2016; Rahi, 2017).

The correlation research design measured two variables, in which statistical relationship between the two was assessed without manipulating the independent variable (Bhat, 2019).

Population and Sampling Technique

A convenience sampling technique was utilized in the study among 200 male and female patients, between the ages of 18 to 55 who have previously visited and have been treated in the clinics and willingly participated in the study. Treated patients from the two semesters in the year 2019 until March 2020 were conveniently selected as respondents.

The questionnaire utilized in the study was self-constructed and a five-point Likert scale was used (Strongly Agree, Agree, Moderately Agree/Disagree, Disagree, Strongly Disagree) to rate or evaluate the delivery of dental care and the level of patient satisfaction. Patient satisfaction was measured in terms of convenience, treatment quality, social environment, and physical environment of which were taken from the review of literature.

The validity of the questionnaire was checked by seven experts and three laypersons. A pilot study was conducted to determine the reliability of the questionnaire. Cronbach alpha was also acquired as shown in the tables below. Based on the results of the pilot study, delivery of dental care had a Cronbach's Alpha of 0.853, satisfaction in terms of convenience had a Cronbach's Alpha of 0.776, treatment quality had a Cronbach's Alpha of 0.892, social environment had a Cronbach's Alpha of 0.859, and physical environment had a Cronbach's Alpha of 0.881.

The scoring system and verbal interpretation for the variables are reflected in the following tables:

Table 1. *Delivery of Dental Care*

Mean Interval	Scaled Response	Verbal Interpretation
4.50-5.00	Strongly Agree	Very good
3.50-4.49	Agree	Good
2.50-3.49	Moderately Agree/ Disagree	Fair
1.50-2.49	Disagree	Poor
1.00-1.49	Strongly Disagree	Very Poor

Table 2. *Satisfaction*

Mean Interval	Scaled Response	Verbal Interpretation
4.50-5.00	Strongly Agree	Very Satisfied
3.50-4.49	Agree	Satisfied
2.50-3.49	Moderately Agree/ Disagree	Moderately Satisfied
1.50-2.49	Disagree	Dissatisfied
1.00-1.49	Strongly Disagree	Very Dissatisfied

Table 3. *Convenience*

Mean Interval	Scaled Response	Verbal Interpretation
4.50-5.00	Strongly Agree	Very Convenient
3.50-4.49	Agree	Convenient
2.50-3.49	Moderately Agree/ Disagree	Moderately
1.50-2.49	Disagree	Convenient
1.00-1.49	Strongly Disagree	Inconvenient

Table 4. *Treatment Quality, Physical and Social Environment*

Mean Interval	Scaled Response	Verbal Interpretation
4.50-5.00	Strongly Agree	Very good
3.50-4.49	Agree	Good
2.50-3.49	Moderately Agree/ Disagree	Fair
1.50-2.49	Disagree	Poor
1.00-1.49	Strongly Disagree	Very Poor

Previously treated patients were contacted via Facebook Messenger or text message, and voluntary participation of the patients was the basis for choosing the participants during the data gathering of the study. Respondents were given virtual informed consent forms prior to the online survey questionnaire, and discomfort in participating in the study entitled a patient the right to refuse to partake in the study.

Result and Discussion

The extent of delivery of dental care rendered by clinicians had a grand mean of 4.42 (SD 0.60) which is interpreted as *good*. They perceived dental care delivery as good in several aspects such as acquiring appointments on their availability, clinician's positive response in settling their fears and anxiety, use of simple and appropriate terms in presenting information and answering questions concerning the patient's oral health condition and necessary treatment procedures.

Moreover, a relatively higher mean score of 4.55 (SD: 0.728) interpreted as very good was acquired for question number #1 as patients strongly agree that they were provided with clean head caps and bibs. This tells us that clinicians consistently follow proper decorum with regard to patient preparation as part of the asepsis protocols in the clinics. Meanwhile, obtaining an appointment right away after assessment and diagnosis received a relatively lower mean score of 4.33 (SD: 0.715) which is acceptable but not to a great extent. This implies that patients do not easily get an appointment schedule after an oral checkup and have to wait for a period of time before getting contacted.

Patient satisfaction was measured in terms of convenience, treatment quality, social environment, and physical environment. Level of satisfaction in terms of convenience had a mean score of 4.13 (SD: 0.665) interpreted as convenient. Mean scores for all items were on the convenient levels wherein patients find the time they spent on travel to the clinic, waiting before and during the treatment itself was practical and tolerable enough. This confirms various studies wherein patients are very grateful for having a reasonable treatment duration regardless of the procedure (Adebayo et al., 2014). There is also convenience among the patients shown in terms of time spent waiting at the clinic which agrees as well with the study of Bhat et al. (2017) where a majority of respondents showed to affirm having a short waiting time for the treatment.

The level of satisfaction in terms of treatment quality had a mean score of 4.35 (SD: 0.611) which is interpreted as *good*. The mean scores for all items were interpreted as good. The result is consistent with several studies also conveying that treatment rendered by the clinician is perceived as satisfactory in various aspects such as patient assurance and education (Singh, 2015), pain regulation or a painless treatment (Nagappan & John, 2014; Bhat et al., 2017), skillfulness and expertise of the clinician, treatment outcomes and the remarkable progress of the oral health (Luo et al., 2018).

Results also reveal that clinicians conduct a thorough dental examination on their patients and perform the imperative pre-operative procedures carefully including thorough case history taking. Meanwhile, patients agree that clinicians explain the risk of every procedure but not much in detail or to a level they understand and did not feel very much assured that possible risks would be dealt with properly.

Satisfaction of the patients in terms of social environment rendered by clinicians with a mean score of 4.40 (SD: 0.580) which interpreted as *good*. This implies that the overall attitude that student clinicians project to patients is someone pleasing and sociable. Patients strongly agree that the clinicians were friendly, thoughtful, respectful, compassionate, and reassuring throughout the treatment. This implies that patients are delighted with how the clinicians behave towards them. This also shows that they portray professionalism in their work of providing dental care with the patients they handle and not merely neglecting these aspects for the completion of the requirements. The results agree with the study by Luo et al. (2018), where participants' satisfaction is affected by the attitude of clinicians. This includes words of comfort, encouragement, and the attention and concern given to the patients throughout the treatment process.

On the other hand, patients mentioned that not every clinician prays before and after the procedure. This indicates that the clinician starts the procedures immediately without praying, then dismisses the patients right after delivery of dental care.

Satisfaction in terms of the physical environment had a mean score of 4.25 (SD: 0. 0.578) which is interpreted as *good*. This implies that patients are generally comfortable with the available facilities and overall cleanliness of the dental clinic.

A tidy and organized workplace, a clean and well-wrapped dental chair, and sterilized instruments newly-opened from the pack are the concrete aspects where most participants strongly agree on with mean scores of 4.50 (SD: 0.634), 4.52 (SD: 0.634) and 4.53 (SD: 0.687), respectively. This implies that patients are assured that the treatment facility, instruments, and materials used on them are clean. This also shows that the clinicians religiously follow infection control protocols for the safety of their patients. The results were similar to a study done by (Bhat et al., 2017; Balhaddad et al., 2018) as majority of the respondents specified that waiting areas were relaxing and tidy. Also, treatment venues were clean, including the washrooms. A lot of patients also observed that the armamentarium used was clean and were handled properly. The influence on the satisfaction of patients from satisfactory facilities and sterile instruments needed for a certain procedure is integral (Bhat et al., 2017; Balhaddad et al., 2018). On the other hand, patients look for other activities that piques their interests in the waiting area and the facility lacks further options of entertainment that may allow patients to be distracted while waiting.

The overall satisfaction of the respondents in the delivery of dental care by the clinicians shows that the respondents were satisfied in terms of all the indicators of satisfaction used. Comparatively, social environment has the highest mean score of 4.40 (SD: 0.580) interpreted as *satisfied*. Treatment quality follows as second highest with a mean score of 4.35 (SD: 0.611) interpreted as *satisfied*, followed by physical environment with a mean score of 4.25 (SD: 0.578) interpreted as *satisfied*, and convenience with a mean score of 4.13 (SD: 0.665) interpreted as *satisfied*.

Overall correlation of delivery of dental care and the satisfaction level of patients in terms of the indicators used showed a p-value of <0.001. This indicates a *significant positive* relationship between the two variables.

The results imply a *directly proportional* relationship between the delivery of dental care and satisfaction. That is, the better the delivery of dental care, the higher the satisfaction level of the respondents in terms of convenience (p-value: <0.001), treatment quality (p-value: <0.001), social environment (p-value: <0.001), and physical environment (p-value: <0.001).

Conclusion

The respondents perceived that delivery of dental care in both Oral Surgery and Operative Dentistry departments was good hence the respondents were satisfied in terms of convenience, treatment quality, social environment and physical environment. Furthermore, delivery of dental care delivery was significantly related to patient satisfaction.

This study confirmed the Healthcare quality theory that patient satisfaction refers to their positive discernment with regards to the entire facets of the quality care we give, hence all

components of patient satisfaction ae vital to enhance quality healthcare. It is recommended that while delivery if dental care is good and patients are satisfied, clinicians can strive to do better to reach a higher level. Also, another study may be conducted on a larger population and on areas requiring long procedures such as endodontics and prosthodontics.

References

Adebayo, E., Adesina, B., Ahaji, L., & Hussein, N. (2014). Patient assessment of the quality of dental care services in a Nigerian hospital. *Journal of Hospital Administration, 3*(6), p20. https://doi.org/10.5430/jha.v3n6p20

Afzal, M., Rizvi, F., Azad, A. H., Rajput, A. M., Khan, A., & Tariq, N. (2014). *Effect of demographic characteristics on patient's satisfaction with health care facility, 28*(2), 7.

Akbar, F. H., Samad, R., Pasiga, B. D., Pratiwi, R., Anwar, A. I., Djamaluddin, N., & Meilana, A. N. T. (2019). *Influence of waiting times in dental offices towards patient satisfaction and evaluations of patient/provider relationships in bantaeng district, south sulawesi, indonesia, 12*(2), 2018, 682–687.

Al-Abri, R., & Al-Balushi, A. (2014). Patient satisfaction survey as a tool towards quality improvement. *Oman Medical Journal, 29*(1), 3–7. https://doi.org/10.5001/omj.2014.02

Almeida R., Bourliataux-Lajoinie, S., Martins, M. (2015). Satisfaction measurement instruments for healthcare service users: a systematic review. *Cad. Saúde Pública, Rio de Janeiro, 31*(1):11-25. http://dx.doi.org/10.1590/0102-311X00027014

ArRejaie, A., Nawasrah, A., Khan, S., Farooqi, F., Somali, R., Al-Mudani, W., (2014). Patients' perception toward various dental treatments provided in the internship program. *Saudi Med J 2014; Vol. 35* (12), www.smj.org.sa

Balhaddad, A., Alshammari, A., Alqadi, A., & Nazir, M. A. (2018). *Patient satisfaction with dental services and associated factors in a saudi dental institution, 12*(12), 36–39. https://doi.org/10.7860/JCDR/2018/38358.12399

Bansal, M., Gupta, N., Saini, G. K., & Sharma, N. (2018). Satisfaction level among patients visiting a rural dental institution toward rendered dental treatment in haryana, north india. *Journal of Education and Health Promotion, 7*, 5.

Batbaatar, E. (2015). Conceptualisation of patient satisfaction: a systematic narrative literature review. *Perspectives in Public Health, 135*(5) ISSN 1757-9139 DOI: 10.1177/1757913915594196

Bhat, N., Sultane, P., Chhabra, S., Choudhary, S., Sen, N., Thakker, J., Patel, D., & Joshi, R. (2017). Assessment of Patient Satisfaction toward Dental Care Services of Patients visiting Dental Schools in Udaipur, Rajasthan, India. *International Journal of Oral Care & Research, 5*(1), 34–41. https://doi.org/10.5005/jp-journals-10051-0079

Bhat, A. (2019). Research Design: Definition, Characteristics and Types. *Question Pro.* [accessed 5 April 2019] Available at: https://www.questionpro.com/blog/research-design/

Cabbar, F., Burdurlu, M, Tomruk, C., Bank, B. & Atalay, B. (2019). Students' perspectives on undergraduate oral surgery education. *BMC Medical Education 19*:265. https://doi.org/10.1186/s12909-019-1703-y

Cook, B. G., & Cook, L. (2016). Research designs and special education research: Different designs address different questions: Cook and cook: Research designs and special education research. *Learning Disabilities Research & Practice, 31*(4), 190–198. https://doi.org/10.1111/ldrp.12110

Esser, F., & Vliegenthart, R. (2017). Comparative Research Methods. *The International Encyclopedia Of Communication Research Methods*, 1-22. https://doi.org/10.1002/9781118901731.iecrm0035

Habib, S. R., Ramalingam, S., Beladi, A. A., & Habib, A. A. (2014). Patients' satisfaction with the dental care provided by dental students. *J Ayub Med Coll Abbottabad, 4*.

Henríquez-Tejo, R. & Cartes Velásquez, R. (2016). Patients' perceptions about dentists. A literature review. *Odontoestomatología, 18*. 15-22.

Iqbal, W., Farooq, F., Bari, Y. A., & Nazir, S. F. (2018). Evaluation of Dental Care through Patient Satisfaction Feedback – A Cross Sectional Study at Dental Institute of OJHA Hospital, Karachi, Pakistan. *Advances in Dentistry & Oral Health, 8*(4). https://doi.org/10.19080/ADOH.2018.08.555743

Khan, AA, Siddiqui, AZ, Mohsin, SF, Mohamed, BA. (2018). Sociodemographic characteristics as predictors of satisfaction in public and private dental clinics. *Pak J Med Sci*. 2018;34(5):1152-1157. doi: https://doi.org/10.12669/pjms.345.15519

Luo, J. Y. N., Liu, P. P., & Wong, M. C. M. (2018). Patients' satisfaction with dental care: A qualitative study to develop a satisfaction instrument. *BMC Oral Health, 18*(1), 15. https://doi.org/10.1186/s12903-018-0477-7

Mekette, D. (2008). *Patient satisfaction in the Adventist University of the Philippines College of Dentistry Clinic*.

McGoldrick, G. (2019). Still think you need new patients? Well, perhaps you don't. *Dental Economics, 109*(5), 42–43. http://search.ebscohost.com/login.aspx?direct=true&db=ddh&AN=136467400&site=ehost-live

Mitchell, S. T., Gordan, V. V., Riley, J. L., Makhija, S. K., Litaker, M. S., & Gilbert, G. H. (2017). Satisfaction with dental care among patients who receive invasive or non-invasive treatment for non-cavitated early dental caries: Findings from one region of the National Dental PBRN. *BMC Oral Health, 17*(1), 70. https://doi.org/10.1186/s12903-017-0363-8

Nagappan, N., & John, J. (2014). Patient satisfaction with the dental services offered by a dental Hospital in India. *Journal of Indian Association of Public Health Dentistry, 12*(4), 297. https://doi.org/10.4103/2319-5932.147669

Narayanan, A., & Greco, M. (2014). The Dental Practice Questionnaire: A patient feedback tool for improving the quality of dental practices. *Australian Dental Journal, 59*(3), 334–348. https://doi.org/10.1111/adj.12200

Patel, J. Y. (2014). *A study on Evaluation of Patient Satisfaction with Dental Health Care Services. 4*(8), 4.

Rahi, S. (2017). Research Design and Methods: A Systematic Review of Research Paradigms, Sampling Issues and Instruments Development. *International Journal of Economics & Management Sciences, 06*(02). https://doi.org/10.4172/2162-6359.1000403

Rajeev A, Patthi B, Janakiram C, Singla A, Malhi R, Kumari M. (2020). Influence of the previous dental visit experience in seeking dental care among young adults. *J Family Med Prim Care* 2020;9:609-13.

Samohyl, M., Nadazdyova, A., Hirjak, M., Argalasova, L., Hirosova, K., & Jurkovicova, J. (2018). Gender and Age Differences in Patients' Satisfaction with Dental Care in the Slovak Republic: A Cross-sectional Questionnaire Study. *Pesquisa Brasileira Em Odontopediatria e Clínica Integrada, 18*(1), 1–5. https://doi.org/10.4034/PBOCI.2018.181.11

Schneider, A., Andrade, J, Tanja-Dijkstra, K, White, M, Moles, DR. (2016). The psychological cycle behind dental appointment attendance: a cross-sectional study of experiences, anticipations, and behavioral intentions. *Community Dent Oral Epidemiol* 2016

Singh, A., Menon, I., Aggarwal, V., Kukreja, B. J., & Kukreja, P. (2015). *Evaluation of quality of dental care and patient's perception for treatment received in dental institution in ghaziabad, uttar pradesh, 3*(4), 5.

Singh, H., Kaur, M., Dhillon, J., Mann, J., & Kumar, A. (2017). Evolution of Restorative Dentistry from Past to Present. *Indian J Dent Sci* 2017; 9:38-43.

Subait AA, Ali A, Alsammahi O, Aleesa M, Alkashan S, Alsalem M, Aldahash A, Alfayez W, and Metwally AE. (2016). Perception and Level of Satisfaction of Patients Seeking Dental Care; A Cross-Sectional Study in a Major Healthcare Center in Saudi Arabia. *J Dent & Oral Disord, 2*(4), 2016: 1021.

Red cabbage (*Brassica oleracea var. capitata*) as an Alternative pH Indicator for Carbohydrate Fermentation in Select Gram Negative Bacilli

Winona Shenani Martino, Rebekah Sengkey, Jasper Ken Conferido, Sharon Gabriel, Philip Joekolo, Lorcelie Taclan
Adventist University of the Philippines
winonashenani@gmail.com, 2049273@aup.edu.ph, jasperconferido@gmail.com, 2049999@aup.edu.ph, 2050494@aup.edu.ph

Abstract

Red cabbage (*Brassica oleraceae*) is used as a pH indicator in carbohydrate fermentation for two *Enterobacteriaceae* species (*E. coli and K. pneumoniae*) incorporated in nutrient agar of four concentrations (25%, 50%, 75% and 100%) together with a different carbohydrate the microorganism ferments. These carbohydrates are mannitol for *E. coli* and lactose for *K. pneumoniae*. A non-fermenter, *P. mirabilis*, the control, is also used to show how to color change differs between carbohydrate fermenters and non-fermenters. *S. aureus*, a gram-positive bacteria, is used to test the effectivity of red cabbage as a pH indicator in carbohydrate fermentation. The goal is to determine the concentration at which the red cabbage extract will show carbohydrate fermentation in nutrient agar after incubation at 35°C for 24 hours. To ensure the reliability of results, the rate of reproducibility is measured by noting similarities in ten plates inoculated with the microorganisms. A non-selective media is made.

Keywords: *Carbohydrate fermentation, Gram Negative Bacilli, red cabbage, pH indicator*

Microbiologic testing in the medical laboratory is dependent on the isolation and identification of microorganism. It involves a step-by-step process, one of which is carbohydrate fermentation testing. If an organism can ferment sugars like glucose, lactose, sucrose, maltose and xylose, the color of the pH indicator changes to show reduced pH, turning the agar from one color to another. One of the most used indicators in the laboratory is phenol red. According to Pathan and Farooqui (2011), the current trend is for researchers to shift from chemical materials to natural resources in taking steps toward a less hazardous laboratory environment for both students and workers. An ideal replacement for the phenol red is the red cabbage (family *Brassica oleracea var. capitata*). It is most commonly found throughout the Americas, China, Europe and Africa. The colorful fresh cut crop is easily available and is usually added to packaged salads. Red cabbage contains a flavonoids called anthocyanin that give it its red color. This same flavonoid is also found in blueberries and grapes. However, it is yet to be employed in microbiologic studies.

The aim of the study is to determine whether red cabbage extract can be used as a pH indicator in carbohydrate fermentation testing for select *Enterobacteriaeae*. The study focuses on what concentration the red cabbage extract best shows carbohydrate fermentation in nutrient agar using *Escherichia coli* and *Klebsiella pneumoniae* and how reproducible the results are when the optimum concentration is used on ten plates.

Nutrient agar containing red cabbage extract and a carbohydrate with varying concentrations of 25%, 50%, 75% and 100% were inoculated with microorganisms that ferment certain carbohydrates. The growth rate and the color change of the culture media was determined at the end of the study. With most of the *Enterobacteriaeae* being carbohydrate fermenters, *Escherichia coli* and *Klebsiella pneumoniae* were used to show carbohydrate fermentation in plates with mannitol and lactose respectively. The control used, *Proteus mirabilis*, was also a member of the family *Enterobacteriaceae*, but is a non-fermenter of lactose and mannitol. A gram-positive bacteria, Staphylococcus aureus, a non-*Enterobacteriaceae* and a non-fermenter, was also employed to show evidence that a non-selective culture media was created. All microorganisms were inoculated on ten culture plates of each concentration for every carbohydrate and incubated at 35°C for 24 hours.

Results show that for *E. coli, all* concentrations would facilitate carbohydrate fermentation while for *K. pneumoniae*, 25% and 50% showed similar results and increasing the concentration of the nutrient agar to 75% and 100% would give results that are not reproducible. The control showed an alkaline pH color and the gram-positive bacteria employed grew on the nutrient agar plate but showed no color change solidifying evidence that the culture media produced did not inhibit the growth of gram-positive bacteria and is therefore a non-selective media.

Literature Review

Red Cabbage

The red cabbage is a cruciferous vegetable that belongs to the family Brassicaceae together with other vegetables like broccoli, Chinese cabbage and radish. As one of the most important vegetables grown worldwide, it can be found almost everywhere. The red cabbage has a high content of polyphenols that play significant roles in its plant physiology and has potential health benefits as an antioxidant, and-inflammatory and anti-bacterial.

Anthocyanin

Red cabbage has a high yield of anthocyanins. Anthocyanins are the color pigment found in plants, especially flowers, fruits and tubers. The color pigments of Anthocyanins are usually blue, red and purple. Belonging to the phenolic group, these pigments are water soluble and they are usually the results of the colors in fruits and vegetables like grapes, berries, currants etc.

The pigment of anthocyanins appeared blue in a basic and red in an acidic condition. Anthocyanin's color and intensity is dependent on the number of its hydroxy and methoxy group. If more hydroxy groups are present, it will give off a blue color while an increase in the methoxy

group will impart a red color. Anthocyanins are amphoteric forming salts with either an acid or a base. They are an excellent compound because their aglycone parts are involved in a series of balances which are dependent on the pH, giving rise to several forms.

For this study, the storage of anthocyanin is needed for future use. A storage of 280 days at 25°C showed a higher loss of anthocyanin compared to the extract stored at 5°C. After the same duration, the anthocyanin stored at 5°C showed a reduced content of 40% and 86% in the extract stored at 25°C. The extract stored at 35°C had almost 100% of its content (Muche, Speers & Rupasinghe, 2018). To maintain the stability of anthocyanin in the red cabbage extract, it will be kept at 35°C to determine its shelf life.

Reports on their potential as a competitive colorant for industrial usage as well as in promoting healthy food and supplements have been made. Anthocyanins also possess antioxidative and antimicrobial activities that can shield us in diverse non-communicable diseases. It helps shield the human skin from UV exposure by inhibiting the death keratinocytes, an epidermal cell producing keratin. Anthocyanins in potatoes also showed a decreased incidence rate of breast cancer in rodents as well as red cell leukemia, stomach and prostate cancer.

Natural and synthetic pH indicator

A good pH indicator will change its color at different pH. Although most pH indicators like phenol red are synthetic, natural resources can be used. Natural pH indicators have proven to be less hazardous, easily available and eco-friendly. Plants and vegetables have pigments that are responsible for producing color such as anthocyanins, carotene and flavonoid (Kapilraj, 2019).

Both synthetic and natural pH indicators show color at different pH which makes the natural pH indicator an alternative for laboratory experiments. The pH of the solution affects both color and intensity. In an acidic environment, it maintains its original color, red, while in the basic environment, its color changes to deep blue. An increase in pH and temperature or exposure to light can destabilize the anthocyanin molecule. (Rakkimuthu, Palmurugan & Shanmugapriya, 2016)

Carbohydrate Fermentation

The carbohydrate fermentation tests are done to classify which sugars can the bacteria ferment. The end product of a carbohydrate fermentation testing is acid. When a bacteria ferments sugar, it produces acid, which then can change the pH of the medium it is embedded on (Reiner, 2012). The change in pH is normally detected by noting the color change that the pH indicator underwent. Therefore, pH indicators are vital in bacterial identification (Held, 2018). Tests also come with hydrogen gas production and is notable with the blackening of the medium to indicate its presence (Tille, 2014 & Mahon, Lehman & Manuselis, 2011).

Methods for testing CHO fermentation.

To test for carbohydrate fermentation in aiding bacterial identification, laboratory scientists can use several methods such as the TSI test and Carbohydrate Utilization test (Hemraj, Diksha & Avneet, 2013).

In the TSI test, TSI agar contains 3 fermentative sugars which are glucose, lactose and sucrose, in different concentrations. The agar will be inoculated with the unknown microorganism and phenol red is incorporated. After incubation for twenty-four hours, color change is noted. A color change from orange to yellow indicates an acidic pH due to the bacteria fermenting the carbohydrate in the agar. Another color change that can be noted is from orange red to a deeper red, indicating an alkaline concentration from the oxidative decarboxylation of peptone.

In the Carbohydrate Utilization test, fermentation tubes, more commonly called Durham tubes are utilized. It is a small, thin tube placed upside down inside a bigger test tube and is filled with the media. If an aerobic organism is present, the production of air bubbles indicates gas production (Mahon, Lehman & Manuselis, 2011). Acidic medium would result in a change of

color from red to yellow, while a basic medium will cause the end product's color to be red or pink. (Reiner, 2012) Both utilizes phenol red as their pH indicator as it is one the most commonly used pH indicator. (Held, 2018)

Viability of Extract

In order to determine what temperature is appropriate for storage, the viability of red cabbage extract is required in this study. In a recent study done on heating purple maize extract, anthocyanins were found to be stable in temperature range of 80°C to 120°C for 120 minutes (Slavu et al, 2020). Like red cabbage, purple maize also has high anthocyanin content. To maintain its stability, the extracts are kept in 35°C.

This literature exemplifies the great effect of Red Cabbage extract, specifically Anthocyanin pigment, as natural pH indicator on carbohydrate fermentation test for select members of *Enterobacteriaceae* family.

Reviewing literature leads back to the questions: What is the optimum concentration of the red cabbage extract that will best show carbohydrate fermentation in nutrient agar using the test organisms, *Escherichia coli* and *Klebsiella pneumoniae*? And what is the rate of reproducibility of the results when optimum concentration is used for the two *Enterobacteriaceae* species?

Methods

The research design of the study was intervention study (True Experimental Studies) in which the cabbage extract used as a pH indicator to facilitate carbohydrate fermentation was tested against selected microorganisms. The nutrient agar contained red cabbage extract with different concentrations. The growth rate and the change color of the culture was determined at the end of the experiment. Sampling the red cabbage was purchased from the market and the capability of the red cabbage extract as pH indicator was tested against different organisms particularly a few members of the family *Enterobacteriaceae*. Most of the *Enterobacteriaceae* species are known as carbohydrate fermenters. Those organisms that are carbohydrate fermenters are: *E. coli* and *K. pneumoniae*, etc. *P. mirabilis* is also used to show the difference in color between fermenters and non-fermenters and serves as the control. A gram-positive bacteria, S. aureus was also employed in the study. The organisms were sub-cultured from patient specimens in the Bacteriology section of a hospital in Lipa City, Batangas. These microorganisms were chosen because they are easily available and accessible. The carbohydrate that the organisms fermented are lactose and mannitol. The carbohydrates and nutrient agar were purchased from Yana Chemodities, Inc.

Preparation

Instrumentation

The main tool used for the study was testing, specifically experimentation. Before testing, the four microorganisms were sub-cultured on blood agar and MacConkey plates and incubated at 35ºC for 24 hours to produce colonies used for further inoculation in the plates produced in the study. To produce a non-selective culture media, carbohydrates and the red cabbage were incorporated into a nutrient agar. The goal of the study was that at the end of the incubation period, the red cabbage culture media would change in color to signify that carbohydrate fermentation has taken place with the use of the anthocyanin extracted from the red cabbage, as an indicator. A positive carbohydrate fermentation would result in a lower pH, and therefore the plates should change color from the original blue to pink/purple after incubation.

Determination of color of fermentation reaction.

To be able to determine whether carbohydrate fermentation has taken place, the pH was first established. Acid alcohol (2 mL concentrated HCl and 98 mL 95% ethyl alcohol) and 4% sodium hydroxide were used to determine the pH of the plates the colors are compared against it.

The pH was quantitatively determined using a pH meter. This was the basis of the determination of the pH of the carbohydrate fermentation of microorganisms in the nutrient agar made.

Data collection

200 g of thinly cut red cabbage in a beaker was filled up to the 1000mL mark with distilled water. This beaker was then placed in boiling water for 15 minutes, then set aside to cool. Discarding the red cabbage, the solution inside the beaker now yields the 100% red cabbage extract.

50 mL of the extract added to 150mL of distilled water makes up the 25% concentration, 100mL of the extract added to 100mL of distilled water makes up 50% concentration, and 150ml of extract added to 50 mL of distilled water makes up 75% concentration. 5.6 grams of nutrient agar powder with 4 grams of corresponding sugar is then added to each flasks that contains 75, 50, and 25mL distilled water. After letting the flasks boil for around 15 minutes and cooling it off for a bit, corresponding amount of the red cabbage extract can only now be mixed into the flask to avoid destroying the heat labile anthocyanin.

Preparation of the 100% red cabbage culture media was a bit different than the rest since it consists 200mL of pure red cabbage extract with no distilled water. After mixing 200mL of red cabbage extract with the nutrient agar powder and sugar inside a flask, the flask would then be directly boiled, but would have to be taken off the heat once it reaches its boiling point.

After pouring into 10 plates for each of the sugar, instead of autoclaving the mixture, it was placed under UV light in the biosafety cabinet for sterilization. This 4 concentration procedure is done for each corresponding microorganism/sugar. Once all the agar had solidified, the three different organisms were inoculated into the 10 respective culture media based on the carbohydrates present and the concentration of the extract. All plates were incubated at 35°C for 24 hours, after which checking and documentation of results were done.

The basis of the result was dependent on growth rate and change of color of the nutrient agar. The researchers, in consultation with their research adviser and evaluators, read the results of the fermentation and recorded the results accordingly.

Measures

Pearson Chi-square

To compare concentrations (25%, 50%, 75% and 100%) of red cabbage extract that best showed carbohydrate fermentation. This statistical tool aided the determination of the optimum concentration.

Reproducibility

Reproducibility was measured through the consistent color change of the plates and colony growth at the optimum concentration. This was done through direct observation in all inoculated plates.

Results

Acid alcohol and sodium hydroxide were used to determine the pH of the media in relation to its color change. A drop of both acid and base were placed in a plate with 25% concentration and 100% and the pH of both were determined using a pH meter. Both colors correlated to the colors produced in the media inoculated with carbohydrate fermenters and non-fermenters. Under certain pH levels, the chemical configuration of anthocyanins are rearranged, causing different colors to be seen. The results showed that the red cabbage extract, under different pH levels, was capable of producing a range of colors to aid in the determination of carbohydrate fermentation.

The basis of reproducibility lies in the colony growth and color change for every nutrient agar plate for each of the microorganism. In the study, we used 10 plates for each selected microorganism and the sugar it ferments. It was incubated at 37°C for 24 hours after which it

was checked and documented. The rubric for the grading of color change denoting carbohydrate fermentation was used to obtain the data.

Table 1.

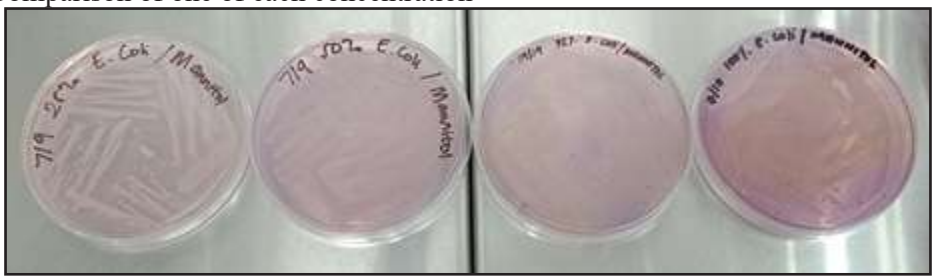
Grading	Description	Color produced
5	The color of entire media became acidic	From blue to pink
4	Tinge of alkaline pH is present in the media	Tinge of blue in a pink medium
3	Half of the media is alkaline	50% of the media is blue and 50% is pink
2	More than 75% of the color of the media is alkaline	More than 75% of the color of the media is blue and only 25% is pink
1	No color change in the entire media or the entire media is alkaline	The entire media is blue/entire media is green or yellow

Different concentrations of plates before inoculation

Escherichia coli

The first member of the family Enterobacteriaceae the researchers have utilized was *Escherichia coli*.

Comparison of one of each concentration



Pearson Chi-square: Comparison between the different concentrations of the red cabbage extract for E. coli.

Concentration of Red Cabbage Extract	Grading the carbohydrate fermentation (color change)		PSC	CC	p-value	Decision	Remark
	Tbpm.	Fbp.					
25%	0.0%	100.0%	5.018	-	0.17	Retain Ho	Not Significant
50%	20.0%	80.0%					
75%	30.0%	70.0%					
100%	40.0%	60.0%					

Note: Tbpm. = Tinge of blue in a pink medium; Fbp. = From blue to pink; PSC = Pearson Chi-square; CC = Contingency Coefficient

The table shows the comparison for each concentration of red cabbage extract on their grading on carbohydrate fermentation (color change) on E. coli. The Pearson Chi-square test was used to identify the differences in concetration that affects the grading on carbohydrate fermentation.

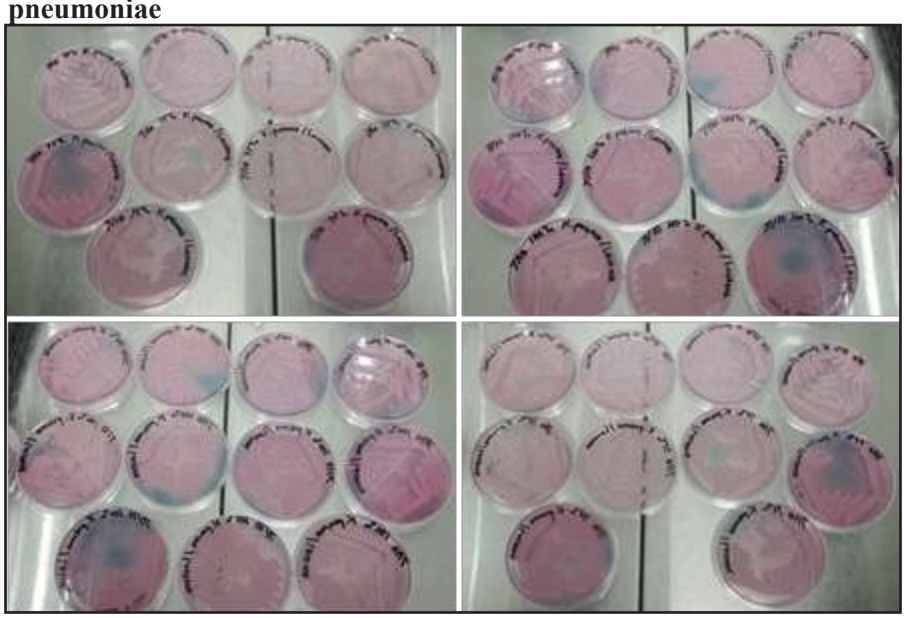
It shows that there is no significant differences between the concentration of 25%, 50%, 75% and 100% of the red cabbage extract because the p-value is greater than 0.05 level of significance, indicating that the null hypothesis will be kept; that there is no difference in the concentration that best shows carbohydrate fermentation. This implies that it is similar to all given concentration of red cabbage extract for *E. coli*.

Grading for colony growth on *E. coli.*

Growth Rate	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
25%	+	+	+	+	+	+	+	+	+	+
50%	+	+	+	+	+	+	+	+	+	+
75%	+	+	+	+	+	+	+	+	+	+
100%	+	+	+	+	+	+	+	+	+	+

All plates for all concentrations showed colony growth.

Klebsiella pneumoniae



Pearson Chi-square: Comparison between the different concentrations of the red cabbage extract for K. pneumoniae.

Concentration of Red Cabbage Extract	Grading the carbohydrate fermentation (color change)		PSC	CC	p-value	Decision	Remark
	Tbpm.	Fbp.					
25%	0.0%	100.0%	11.25	0.469	0.01	Reject Ho	Significant
50%	0.0%	100.0%					
75%	30.0%	70.0%					
100%	50.0%	50.0%					

The table displays the comparison for concentrations 25%, 50%, 75% and 100% of red cabbage extract on their grading on color change on *K. pneumoniae*. It shows that there is significant differences between the four concentrations because the p-value is less than 0.05 and therefore rejects the null hypothesis that there is no difference between the concentrations. The value indicates that at least one concentration gives different results on carbohydrate fermentation.

The Contingency Coefficient measures the strength of association between concentration of red cabbage to the carbohydrate fermentation. It shows that a contingency coefficient with a value of 0.469 signifies a moderate association between the different percentage concentration and categories of grading for carbohydrate fermentation. This implies that concentration of red cabbage affects the grading of fermentation of *K. pneumoniae*.

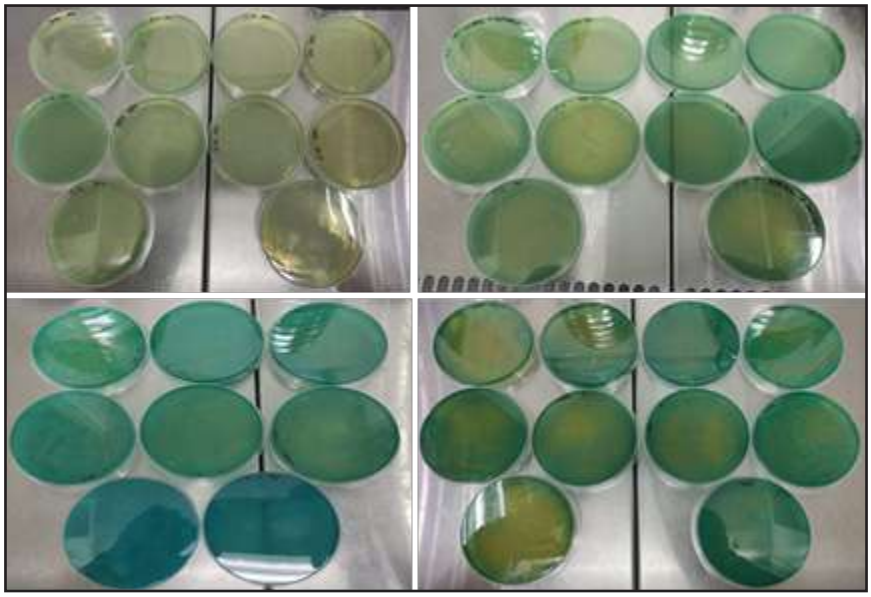
Cross tabulation of percentages show that concentration at 25% and 50% were of similar grading but significantly differs in concentration at 75% and 100%. It also shows that increasing the concentration to 75% and 100% of the extract will give a balanced result of fermentation grading between tine of alkaline pH present in the media and the entire media becoming acidic. The overall finding that based on the collected data, increasing the concentration of red cabbage extract to 75% and 100% will decrease the carbohydrate fermentation of *K. pneumoniae*.

Grading for colony growth on K. pneumoniae

Growth Rate	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
25%	+	+	+	+	+	+	+	+	+	+
50%	+	+	+	+	+	+	+	+	+	+
75%	+	+	+	+	+	+	+	+	+	+
100%	+	+	+	+	+	+	+	+	+	+

The table shows the results of the grading of color growth on *K. pneumoniae* plates. All plates for all concentrations showed colony growth.

Proteus mirabilis



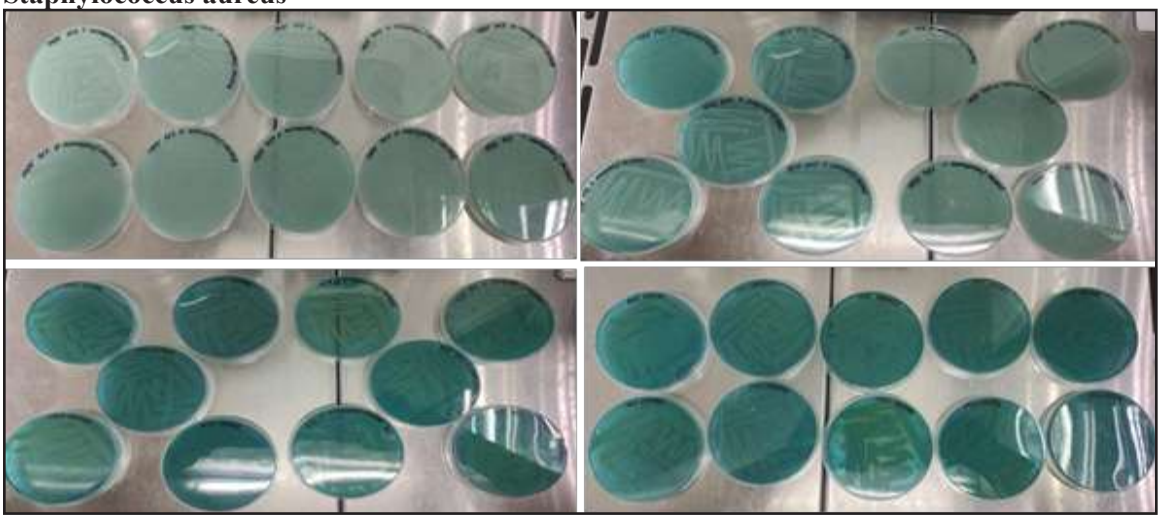
The control used is a non-lactose and non-mannitol fermenter. The color of the media turned completely alkaline (pH 11 and 12), a sign that there was no carbohydrate fermentation that took place. *Proteus mirabilis* is also a urease producing organism, which means it will raise the pH of the media to the alkaline level.

Grading of colony growth on *P. mirabilis*

Growth Rate	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
25%	+	+	+	+	+	+	+	+	+	+
50%	+	+	+	+	+	+	+	+	+	+
75%	+	+	+	+	+	+	+	+	+	+
100%	+	+	+	+	+	+	+	+	+	+

The table shows the results of the grading of colony growth on P. mirabilis plates. All plates for all concentrations showed colony growth. This proves that the nutrient agar will facilitate the growth of non-fermenters.

Staphylococcus aureus



Gram positive bacteria like Staphylococcus aureus do not require carbohydrate fermentation test in the laboratory. The researchers have included this bacteria to show that the nutrient agar is a growth media that allows the differentiation of closely related microorganisms. In this study, members of the family Enterobacteriaceae were used.

Grading of colony growth on S. aureus

Growth Rate	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
25%	+	+	+	+	+	+	+	+	+	+
50%	+	+	+	+	+	+	+	+	+	+
75%	+	+	+	+	+	+	+	+	+	+
100%	+	+	+	+	+	+	+	+	+	+

The table shows the results of the grading of colony growth on *S. aureus* plates. All plates for all concentrations showed colony growth. Although *S. aureus* is a gram-positive bacteria, it was able to grow on the nutrient agar. This goes to show that the culture media created as a non-selective plate.

Concentration that best shows consistent rate of reproducibility

In comparing the results of the Pearson Chi-square test for both E. coli and K. pneumoniae, it shows that 25% and 50% concentration work well with both microorganisms. However, increasing the concentration to 75% and 100% for *K. pneumoniae* shows that its results will not be reproducible.

Statistics show that 25% red cabbage concentration is to be used for further studies since it shows consistent rate of reproducibility throughout the study.

How to make 25% red cabbage extract concentration

To make 10 plates, weigh 5.6g nutrient agar and 4g carbohydrate in a 250mL Erlenmeyer flask and add 150mL distilled water. Place it in boiling water bath for 15 minutes with constant stirring to dissolve the agar powder. Take out of the boiling water bath and put the flask under running water to cool it just enough that its heat is bearable to touch. Pour 50mL of red cabbage extract and stir before pouring the mixture on 10 plates, allowing them to cool to solidify and place it under UV light for 30 minutes to sterilize it. After sterilization, it can now be inoculated with the bacteria and incubated or placed in the refrigerator for storage.

Discussion

The main purpose of the study is to evaluate if red cabbage extract would work as an alternative pH indicator for carbohydrate fermentation in select Gram Negative Bacilli. This study can help laboratories to shift from using chemical materials that is hazardous to the environment, to natural resources. Red cabbage is mostly used in school experiments as a pH indicator, but it has not been used in the clinical laboratory. Advantage for medical schools is it may be used as an alternative to any medium that facilitates carbohydrate fermentation then in laboratories, it may be used in microbiological studies without altering the reliability of results and for manufacturers, an alternative for pH indicator instead of using chemicals that may be harmful to the environment. Lastly, this research can be used as a point of reference if further studies about red cabbage or natural pH indicators would be done.

Red cabbage, as a pH indicator, produced different colors at different pH levels. Its chemical arrangement was rearranged at particular pH levels, resulting in various colors. In comparison to other fruits and vegetables that contain anthocyanins, the red cabbage extract showed better coloring properties. The results demonstrated that the red cabbage extract could produce a variety of colors at different pH levels, assisting in the assessment of carbohydrate fermentation.

Our goal is to determine the concentration at which the red cabbage will show the best carbohydrate fermentation in nutrient agar. After using 25%, 50%, 75% and 100% concentration of red cabbage in our agar with inoculated *E. coli*, it shows that there is no difference in the concentration that best shows carbohydrate fermentation which denotes that the carbohydrate fermentation is similar to all the concentration of red cabbage for *E.coli*, but, when it comes to color change, 25% concentration shows 100% change, 50% concentration shows, 20% tinge of blue shown in the medium and 80% from blue to pink. 75% concentration shows 30% tinge of blue shown in the medium and 70% from blue to pink and 100% concentration 40% tinge of blue shown in the medium and 60% from blue to pink. While *K. pneumoniae* shows that there is significant difference between the four concentration because the p-value is less than 0.05.

When differentiating the results of the Pearson Chi-Square test for E. coli and K. pneumoniae, it is clear that concentrations of 25% and 50% are effective against both pathogens. Increasing the concentration to 75% and 100% for *K. pneumoniae*, on the other hand, reveals that the results will not be reproducible.

The researchers have utilized patient samples coming into the Bacteriology section of a tertiary laboratory in Lipa, Batangas. All materials used were readily available in the laboratory.

Conclusion

Based on the finding of the study, red cabbage extract is a widely available, feasible and a potential pH indicator for the detection of carbohydrate fermentation for Enterobacteriaceae with the optimum concentration of 25%.

With it being an affordable and well-known pH indicator in home and experiments and now with evidence of it being of use in microbiologic testing to show carbohydrate fermentation, future studies should still be done using it. It shows a wide range of colors depending on the pH that works just as well as its synthetic counterparts with less hazards that would make laboratory staff safer in their environment. We recommend that a study be done solely on the extraction of pure anthocyanins from the red cabbage and its highest temperature tolerable before it is inactivated as well as for it to be used as a pH indicator for other tests in the clinical laboratory and employing more members of the family Enterobacteriaceae to further solidify its claim of being a non-selective plate.

References

Abiola, C. & Oyetayo, V.O. (2016) Isolation and Biochemical Characterization of Microorganisms Associated with the Fermentation of Kersting's Groundnut (Macrotyloma geocarpum). *Research Journal of Microbiology.* Volume 11, Issue: 2-3, Page No.: 47-55, DOI: 10.3923/jm.2016.47.55

Bishop, M. L. (2017) Clinical Chemistry: Principles, Techniques, Correlations. *Jones & Bartlett Learning* ISBN-13: 978-1496335586, ISBN-10: 9781496335586

Chavan, H., Shirodkar, P., Dhake, A. S., & Jadhav, A. G. (2017). Natural Indicators As Alternative To Synthetic Acid Base Indicators. *Indo American Journal Of Pharmaceutical Sciences, 4*(11), 4078–4082.

Daglia, M. (2012). Polyphenols as antimicrobial agents. *Current Opinion in Biotechnology, 23*(2), 174–181. doi: https://doi.org/10.1016/j.copbio.2011.08.007

Eichenseher, J. (n.d.). *Integrative Medicine* (4th ed.). Retrieved from https://www.sciencedirect.com/science/article/pii/B9780323358682000438

Förster, Andreas H. & Johannes Gescher (2014). "Metabolic engineering of Escherichia coli for production of mixed-acid fermentation end products". *Frontiers in Bioengineering and Biotechnology, 2*: 506–508. doi:10.3389/fbioe.2014.00016. PMC 4126452. PMID 25152889.

Held, P. (2018) *Using Phenol Red to Assess pH in Tissue Culture Media.* https://www.biotek.com/resources/application-notes/using-phenol-red-to-assess-ph-in-tissue-culture-media/

Hemraj, V., Diksha, S. & Avneet, G. (2013) A review on commonly used biochemical testing for bacteria. *Innovare Journal of Life Science*. Vol 1, Issue 1, 2013.

Jadhav, P., Sonne, M., Kadam, A., Patil, S., Dahigaonkar, K., & Oberoi, J. K. (2018). Formulation of Cost Effective Alternative Bacterial Culture Media Using Fruit and Vegetables Waste. *International Journal of Current Research and Review, 10*(2), 6–15. doi: 10.7324/IJCRR.2018.1022

Kadam, S., Yadav, A., Raje, V., & Waghmare, K. (n.d.). Comparative study of natural and synthetic indicators. Gourishankar Institute of Pharmaceutical Education and Research Limb, Satara , 5(1), 296–299.

Keseler, Ingrid M.; et al. (2011). "EcoCyc: a comprehensive database of Escherichia coli biology". *Nucleic Acids Research, 39* (Database issue): D583–D590. doi:10.1093/nar/gkq1143. PMC 3013716. PMID 21097882.

Khoo, H. E., Azlan, A., Tang, S. T., & Lim, S. M. (2017). Anthocyanidins and anthocyanins: colored pigments as food, pharmaceutical ingredients, and the potential health benefits. *Food & Nutrition Research, 61*(1), 1361779. https://doi.org/10.1080/16546628.2017.1361779

Liu, Y., Tikunov, Y., Schouten, R. E., Marcelis, L., Visser, R., & Bovy, A. (2018). Anthocyanin Biosynthesis and Degradation Mechanisms in Solanaceous Vegetables: A Review. *Frontiers in Chemistry, 6*, 52. https://doi.org/10.3389/fchem.2018.00052

Mahon CR, Lehman DC, Manuselis G. (2011). *Textbook of diagnostic microbiology*, 4th ed. W. B. Saunders Co., Philadelphia, PA.

Martin, J., Navas, M. J., Jimenez-Moreno, A. M., & Asuero, A. G. (2017). Anthocyanin Pigments: Importance, Sample Preparation and Extraction. *Phenolic Compounds - Natural Sources, Importance and Applications*, 117–152. doi: 10.5772/66892

Moorthi Sivasankar., V., Kannan, S., & Devi, P.S. (2016). *Anthocyanin, and its antioxidant properties in selected fruits*.

Muche, B. M., Speers, R. A., & Rupasinghe, H. (2018). Storage Temperature Impacts on Anthocyanins Degradation, Color Changes and Haze Development in Juice of "Merlot" and "Ruby" Grapes (Vitis vinifera). *Frontiers in Nutrition, 5*, 100. https://doi.org/10.3389/fnut.2018.00100

Paul, C., Chakraborty, D. D., Ghosh, A., & Chakraborty, P. (2014). Natural Indicator as a substitute to Synthetic indicator-A Developmental Approach. *Journal of Applied Pharmaceutical Science, 4*, 120–122. doi: 10.7324/JAPS.2014.40921

Rakkimuthu, R., Palmurugan, S., & Shanmugapriya, A. (2016). Effect of Temperature, Light, pH on the Stability of Anthocyanin Pigments in Cocculus Hirsutus Fruits. *International Journal of Multidisciplinary Research and Modern Education (IJMRME), 2*(2), 91–96.

Sadilova, Eva & Carle, Reinhold & Stintzing, Florian. (2007). Thermal degradation of anthocyanin and impact on color and in vitro antioxidant capacity. *Molecular Nutrition & Food Research, 51*. 1461-71. 10.1002/mnfr.200700179.

Saluk, J. S., Bijak, M., Kolodzijczyk-Czepas, J., Posmyk, M. M., Janas, K. M., & Wachowics, B. (2012). Anthocyanins from red cabbage extract — evidence of protective effects on blood platelets. *Central European Journal of Biology*, 655–663. doi: 10.2478/s11535-012-0057-9

Sami, Rokayya & Li, Chun-Juan & Zhao, Yan & Li, Ying & Sun, Chang-Hao. (2013). Cabbage (Brassica oleracea L. var. capitata) Phytochemicals with Antioxidant and Anti-inflammatory Potential. *Asian Pacific Journal of Cancer Prevention: APJCP, 14*. 6657-62. doi: 10.7314/APJCP.2013.14.11.6657

Silva, Sara & Costa, Eduardo & Calhau, Conceição & Morais, Rui & Pintado, Manuela. (2015). Anthocyanin Extraction from Plant Tissues: A Review. Critical reviews in food science and nutrition. 57. 10.1080/10408398.2015.1087963.

Slavu, Mioara, Aprodu, Iuliana, Milea, Stefania Adelina, Enachi, Elena, Paneanu, Gabriela, Bahrim, Gabriela Elena & Stanciuc, Nicoleta. (2020). The Thermal Degradation Kinetics of Anthocyanins Extracted from Purple Maize Flour Extract and the Effect of Heating on Selected Biological Functionality. MDPI, Foods. doi: 10.3390/foods9111593

Thakker, Chandresh; et al. (2012). "Succinate production in Escherichia coli". *Biotechnology Journal, 7* (2): 213–224. doi:10.1002/biot 201100061. PMC 3517001. PMID 21932253.

Tille, Patricia. 2014. Bailey and Scott's diagnostic microbiology. Thirteen edition. Mosby, Inc., an affiliate of Elsevier Inc. 3251 Riverport Lane. St. Louis. Missouri 63043

RESEARCH OFFICE
Adventist University of the Philippines
www.aup.edu.ph/urc/health-sciences