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Effects of a 30-day Nutrition and Physical Activity Wellness Program on the Knowledge, Attitude, and Practices of Hospital Office Workers

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Abstract

Office workers are mostly confined to their desks, often in a seated position, for the duration of their work. Many spend their lunch breaks tied to their desks and often consume sugary and high-calorie snacks. Limited movement and poor nutritional practices in the workplace can lead to obesity. A one group, pre-test and post-test study design was used to determine the effects of a 30-day nutrition and physical activity wellness program on the knowledge, attitude, and practices of office workers. Convenience sampling was used to recruit 20 office workers employed at a nearby hospital. A total of 20 participants (80% women) enrolled in the program with ages ranging from 27-54 years old. Descriptive and inferential statistics were used to treat the data. A paired t-test analysis was used to analyze the difference of KAP levels before and after the program intervention. Results show overall improvement in wellness for all participants in the aspect of nutrition and physical activity. Pre-test results showed moderate knowledge, negative attitude and good practices on nutrition and physical activity. Post-test results showed a significant increase on the knowledge and practices of participants. Changes in attitude levels are found to be insignificant. T-test analysis revealed significant positive linear correlations between knowledge-practice ($r = 0.32, p < 0.01$) and attitude-practice ($r = 0.282, p < 0.01$). Cohen's d effect size of the wellness program indicates a large effect on KAP (1.047, 3.221, and 1.704, respectively). The positive correlations between knowledge-practice and attitude-practice affirms that higher nutrition knowledge is associated with positive attitude, thus resulting in good practices. Educational sessions alone does not necessarily bring attitude changes to food choices because the problem in itself is multifactorial. Integration of nutritional counselling into the program may help. Inability to influence the attitude of participants may also be attributed to the short time frame of the intervention program. Lengthening the program duration and increasing the sample size is recommended for future studies to strengthen the validity of results.

Keywords: *nutrition, physical activity, wellness, knowledge, attitude, and practices.*

Obesity was declared as a global epidemic by the World Health Organization in 2003. It is associated with increased mortality and increased economic expenditure. Annual health costs for obese individuals are 42% higher than those of healthy people (Finkelstein et al., 2009). In the Philippines alone, three out of 10 adult Filipinos are overweight and obese (National Nutrition Council, 2017). Major contributors to obesity include unhealthy diet and physical inactivity.

Unhealthy diet practices and sedentary behavior is accumulated in settings, such as in the home and workplace (Yang et al, 2014). A raised Body Mass index (BMI) is linked to a diet that is too high in calories, saturated fat, sodium, and sugar. Low intake of fruits, vegetables and even drinking water can lead to poor health. Overconsumption of salt, sugar and fat are common in office and managerial workplaces. Office nutrition is mostly sourced from vending machines, coffee carts, and empty-calories snack bars (Facilities Show, 2019). Most office workers depend on sugary snacks and caffeine-based drink to keep them alert, focused and awake on the job (Institute for Scientific Information on Coffee, 2017). Work-related stress and fast paced schedules of office workers are some of the key reasons why they find it difficult to maintain a healthy diet at work.

Office workers are also one of the most sedentary occupational groups (Parry et al., 2013). Workplace sitting and sedentary occupation increased by 83% since the 1950s, and physically active jobs today are down to less than 20% (American Health Association, 2015). Those employed in administrative and managerial professions are said to be confined to their desks, often in a seated position, for more than 3 quarters of their total time at work (Miller & Brown, 2004). According to a survey spearheaded by Herbalife (2015), nine of 10 Filipino workers spend at least 6 hours a day at their work desk. They survey also said that 86% of Filipinos are exercising less than three times per week, with five of 10 getting less than 30 minutes of movement during their time at work. Prolonged sitting throughout the day increases sedentary behavior time, which is an independent risk factor for obesity.

Out of concern for the risk of obesity and poor health outcomes among employees, employers nowadays are implementing health promotion and disease prevention strategies, frequently referred to as workplace wellness programs (Mattke et al. 2013). Workplace wellness programs are focused on the primary prevention of health concerns like obesity. Wellness programs help to increase productivity, reduce absenteeism and job disability-related costs in the workplace (Yeung & Johnston, 2019). Workplace health promotion program make it their goal to foster improved health and wellness through behavior and lifestyle changes.

In response to the problem of obesity among office workers, a workplace intervention program, entitled – *ADMIN-WOWOWIN: WalkathOn and Weight-loss Office Wellness IN PMC-Admin* was developed to improve the overall wellness of PMC-Admin by health promotion of physical activity and nutrition. This employer-sponsored program emphasizes the promotion of four healthy lifestyle components to combat obesity, namely: healthy diet & nutrition, physical activity in the workplace, ergonomic exercises, and water hydration. The present study aimed to evaluate the effectiveness of *ADMIN-WOWOWIN* program on the knowledge, attitude, and practices (KAP) that supports a healthy lifestyle and its impact on weight loss.

The research goal of the study is to improve the overall wellness of PMC-ADMIN through physical activity and nutrition. The specific objectives of this study are as follows:

- (1) Determine the primary profile of *ADMIN-WOWOWIN* participants in terms of age, sex, BMI, occupation, and level of physical activity.
- (2) Assess the level of Knowledge, Attitude, Practice (KAP) on nutrition and physical activity of *ADMIN-WOWOWIN* participants during pre-test and post-test.
- (3) Determine the effect of *ADMIN-WOWOWIN* intervention program on the Knowledge, Attitude, Practice (KAP) of participants.
- (4) Determine the effect of *ADMIN-WOWOWIN* intervention program on the weight loss efforts of participants.

ADMIN-WOWOWIN is a health promotion and education program on physical activity and nutrition. The chosen audience, Paredes Medical Center – Administrative department (PMC-ADMIN) employees, will greatly benefit from this program by learning more about diet and exercise. Wellness programs potentially improve employee engagement, efficiency, and morale. The PMC management will also find this program beneficial by investing in a healthier and more productive workforce. Wellness initiatives in the workplace provides opportunities for companies to secure the health of its constituents, as well as to improve the financial health of the company by reducing work-related healthcare costs. Studies show that workers who participate in wellness programs are observed to be more proactive in work, more satisfied with their job, and more loyal to the company (Wilson, 2019).

Furthermore, results of this study may be of interest to another workplace that is interested to conduct or expand their wellness program. Those working in human resources, in wellness organizations or in the field of health promotion and education may find this study useful when conceptualizing health programs.

Methodology

Study design

A quasi-experimental design was used for this community interventional study. It involves a one group pretest-posttest study design carried out in a primary care hospital in the province of Cavite. The setting was primarily chosen because of its proximity to the researcher's place of residence. The administrative department of the hospital was chosen due to the nature of occupational sitting in their line of work and due to the request of the sponsoring employer to address the obesity concern in the department.

Sampling technique

Convenience sampling was used to recruit 25 office workers working under the administrative department of the primary care hospital. Those enrolled in the program met the following inclusion criteria: (1) employed either full-time or part-time in PMC-ADMIN, and (2) must be actively working for the duration of the program. Workers of PMC-ADMIN were offered to participate in a 30-day program with a 90-minute health education session conducted every Monday of the week for four weeks. Participation in the interventional program is optional and a consent form is to be signed prior to joining the program. A total of 20 employees consented to participate in this program study.

Instrumentation

A self-administered pretest-posttest questionnaire was used to collect participant data before and after the program. The questionnaire consisted of three parts: (1) demographic information, (2) level of physical activity, and a (3) KAP questionnaire, that was developed by the research team before data collection. Demographic questions included age, sex, height, weight, and occupation/position. A modified version of the Global Physical Activity Questionnaire (GPAQ) by the World Health Organization was used to determine the level of physical activity.

The KAP questionnaire consisted of questions regarding diet and weight loss, physical activity, ergonomics, and nutrition. The questionnaire was adapted from literature reviews and previously published questionnaires from similar studies. Questions were reviewed, revised and removed based on the feedback of a health education facilitator. A total of 10 questions was removed during data analysis because of reasons like poor sentence construction and inconclusive responses in the results.

Knowledge was measured using 10 true or false questions and 3 multiple choice questions. Attitude was assessed using 3-item questions using 5-point Likert scale. Scale is rated as: 5 as excellent, 4 as very good, 3 as good, 2 as fair and 1 as poor. This is further simplified by using

positive (for excellent and very good), neutral (good) and negative (for fair and poor) later. Moreover, practice about healthy lifestyle was measured using 4 questions answerable by yes and no. The ranges of the possible total scores were as follows: knowledge (0-10), attitude (3-9), and practice (4-8). High scores would signify good KAP on healthy diet and physical activity.

Data gathering procedure

The researchers made initial contact with the head of the administrative department prior to field exposure. The management gave a master list of employees who would be good study candidates, and they asked for a brief program overview prior to data collection. After securing a go signal and sponsorship approval from the management, the first assembly in the workplace was scheduled. The researchers personally handed the questionnaires to the employees, which they accomplished within 30-45 minutes. From then on, the researchers are in regular contact with participants and the management. Posttest data was taken exactly 30-days after the program launch. A token of appreciation was provided to all participants at the end of the program, which consists of healthy grocery items to thank them and award them for their involvement.

Statistical Analysis

Descriptive statistics was used to illustrate respondent's demographic characteristics. Categorical variables were measured as percentages while continuous variables were expressed as mean \pm standard deviation. Pearson's correlation coefficient was used to evaluate the relationship between the study variables. A p value of <0.05 was taken as significant. A paired t-test analysis was performed to analyze the difference of the level of physical activity and KAP before and after the weight loss program. The Statistical Package for Social Sciences (SPSS) version 23 was used for data analysis.

Theoretical framework

The ADMIN-WOWOWIN program study is patterned according to the framework show in Figure 1. This research aims to evaluate the impact of health education on the KAP of office workers and determine if the weight loss incentive challenges contribute to the weight loss efforts of the participants. Health education sessions are conducted every Monday of the week during regular work hours and is delivered through the online platform used. All four sessions are made available for playback to make learning more flexible. Demographic characteristics like age, sex, BMI, occupation, and level of physical activity is labeled as a moderating variable in the proposed relationship.

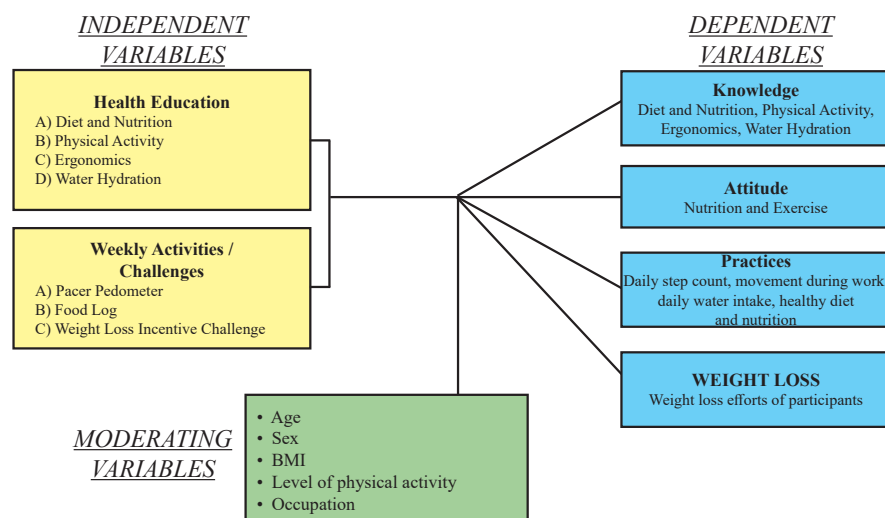


Figure 1. Theoretical framework of ADMIN-WOWOWIN program

Results and discussion

A total of 25 employees were invited to participate in the study, but only 20 employees fully consented to participate in the program. A significant objective of the study was to develop a wellness program for the benefit of the office workers and to examine its impact on the knowledge, attitudes and practices of workers as well as their weight and overall health status. A hypothesis was set for verification stating that the program will have a significant impact on men and women respondents with regards to KAP on nutrition and physical activity. The pre and post test data of the sample were compared for this purpose. The 't' values for significance of difference between the mean score of pretest and posttest suggest that their differences are statistically significant. The post test scores on KAP were higher than the pretest scores and individual differences in the scores were also reduced considerably during the posttest both for men and women.

Sample Characteristics

Using the statistical tools such as frequency and percentage, socio-demographic information is presented in Table 1.

Table 1. *Socio-demographic profile of ADMIN-WOWOWIN participants*

Characteristics	Frequency	Percent (%)
<i>Sex</i>		
Female	4	20.0
Male	16	80.0
<i>Age</i>		
26-30	3	15.0
31-35	3	15.0
36-40	5	25.0
41-45	4	20.0
46-50	2	10.0
51 and above	3	15.0
<i>Occupation</i>		
Cashier	4	20.0
Records	2	10.0
Billing	3	15.0
Liaison Officer	3	15.0
OHU	4	20.0
HMO	2	10.0
Administrative Officer	2	10.0
<i>BMI Classification</i>		
Underweight	0	0.0
Normal	6	30.0
Overweight	11	55.0
Obese	3	15.0
<i>Level of Physical Activity</i>		
Adequate (≥ 600 MET min)	3	15.0
Inadequate (< 600 MET min)	17	85.0
OHU = Occupational health unit		
HMO = Health maintenance organization		
BMI = Body mass index		

Among 20 participants, 20% were male and 80% were female. Most of the participants were between 36 years old (25%). All the participants were Admin Employees, and majority of them belong to Cashier Department (20%) and OHU (20%). Among the participants, 55% were

classified as overweight and 15% were classified as obese. Regarding their level of physical activity, 85% of the participants (<600 MET min) have inadequate physical activity. Those who can reach the WHO recommended physical activity (15% of the total participants) are said to male. This may be attributed to the fact that globally, women are less active than men (Gutfold et al., 2018). Job positions belonging to women are also said to have lower activity compared to men.

Healthy Diet and Exercise Knowledge

The mean scores and SD of scores on KAP regarding healthy diet and physical activity for men and women are given in Table 2. Knowledge was assessed by questions focusing on BMI, weight, diet, and physical activity. The 10-item test comprises multiple-choice with a scoring range from 0 (minimum) to 10 (maximum). A cut-off level of 1-3 was considered low, 4-6 as moderate, and >7 was considered high knowledge. Knowledge scores for individuals were calculated and summed up to give the total knowledge score. Before the program, pretest results show that out of 20 participants, 12 (60%) were within moderate knowledge range followed by 6 (30%) who showed high knowledge, and 2 (10%) resulted in low knowledge about nutrition and exercise, respectively. The mean knowledge pretest score was 5.55 ± 1.504 . On the other hand, post-test results show that out of 20 participants, 12 (60%) were within the high knowledge range, whereas 8 (40%) moderate knowledge. The mean knowledge post-test score was 7.05 ± 1.356 . Increasing epidemic of obesity and chronic diseases is associated to unhealthy dietary habits worldwide (Naja et al., 2015). Raising people's awareness for healthy dietary habits is a complex task and a better knowledge of these pattern is required (Saeidlou et al., 2016).

Healthy Diet and Exercise Attitude

Attitude towards nutrition and exercise was assessed by asking three questions for pretest and two questions for post-test, as shown in Tables 2 and 4. Each question was rated by a 5-scale Likert Scale as 5 (excellent), 4 (very good), 3 (good), 2 (fair), and 1 (poor). The result was summarized and categorized as 1 (negative) and 2 (positive) later. Before the program, most of the participants 10 (50%) were considered negative, 10 (50%) considered positive. The mean attitude pretest score was 7.65 ± 1.225 . On the other hand; the post-test result shows that out of 20 participants, 19 (95%) showed a positive attitude toward proper nutrition and exercise; however, 1 (5%) were considered negative attitude. The mean attitude post-test score was 3.90 ± 0.307 . The questions used to measure the participants' attitudes before and after the program are inconsistent. Therefore, researchers considered this inconclusive data, and more research must be done to conclude that the participants' attitudes will significantly change after a wellness program. According to the study of Sharif and colleagues (2020), educational sessions on promoting healthy eating does not necessarily bring positive changes to food choices because the problem is multifactorial. Inability to influence the attitude of participants may also be attributed to the short time frame of the intervention program. Time is a valuable factor in bringing positive changes in attitude on food choices and eating habits. Though many employers use education to encourage behavior change, education alone will not lead to widespread employee health improvement that includes behavior change (Milliken, 2017).

Healthy Diet and Exercise Practice

Practice toward a healthy diet and exercise was assessed by asking four questions answerable by yes or no. The results were summarized and categorized as 1 (poor practice), 2 (good practice), and 3 (best practice) found in Tables 2 and 4. The scale classified practice as inferior with scores <6, 6 as moderate, and >6 as best. Before the program, most of the respondents, 11 (55%), were considered moderate, and 9 (45%) were considered poor in practicing a healthy diet and exercise. The mean score for the pretest was 5.70 ± 0.923 , revealing moderate practice among the study participants. Moreover, the mean score for the post-test was 7.50 ± 0.606 , revealing best practices among the study participants.

Table 2. Pretest and posttest level of KAP of program participants.

	N	Min	Max	Mean	Sd	Interpretation*
Knowledge- Pretest	20	3	8	5.55	1.504	Moderate
Knowledge-Posttest	20	5	9	7.05	1.356	High
Attitude-Pretest	20	5	9	7.65	1.225	Negative
Attitude-Posttest	20	3	4	3.90	0.307	Positive
Practice-Pretest	20	4	8	5.70	0.923	Good
Practice-Posttest	20	6	8	7.50	0.606	Best

*Criteria - Knowledge: 1-3 (low), 4-6 (moderate), >7 (high); Attitude: 1 (negative) and 2 (positive); Practice: 1 (poor), 2 (good), 3 (best)

Table 3. Pretest and posttest paired sample t-test and paired sample effect size of KAP.

	Pre-test and Post-test Difference		t	df	Sig (2-tailed)	Interpretation	Cohen's d	Effect size**
	Mean	SD						
K	-1.50	1.433	-4.682	19	<0.001	Significant	-1.047	Large effect
A	3.75	1.164	14.406	19	0.001	Significant	3.221	Large effect
P	-1.80	1.056	-7.621	19	<0.001	Significant	-1.704	Large effect

**d = 0.20, weak effect, d = 0.40, medium effect, d = 0.80, large effect

Correlation between knowledge, attitude, and practice

The paired sample t-test analysis of the participant's KAP is presented in Table 3 and the Pearson correlation in Table 4.

Table 4. Pearson Correlation between Knowledge, Attitude, and Practice of participants

Correlation	Interpretation
Knowledge-Practice	$r = 0.32$ ($p < 0.01$)
Attitude- Practice	$R = 0.28$ ($p < 0.01$)

The 't' values for significance of difference between the mean score of pre and posttest suggest that these differences are statistically significant. The paired sample t-test analysis of the participant's KAP is presented in Table 3. The 't' values for significance of difference between the mean score of pre and posttest suggest that these differences are statistically significant. The post test scores on KAP were higher than the pre test scores and individual differences in the scores were also reduced considerably during posttest. Cohen's d was used to compare the change of the pre-test and post-test KAP. Correlations were interpreted using the following criteria: 0.20 = weak effect, 0.40 = medium effect, 0.80 = large effect (Cohen, 1988). Results show that cohen's d effect size of KAP is all greater than >0.8, indicating a large effect on both pre-test and post-test.

The correlation revealed significant positive linear correlations between knowledge-practice ($r = 0.32$, $p < 0.01$) and attitude-practice ($r = 0.282$, $p < 0.01$). The correlation revealed significant positive linear correlations between knowledge-practice ($r = 0.32$, $p < 0.01$) and attitude-practice ($r = 0.282$, $p < 0.01$). The result shows positive relationship between knowledge, attitude and practice about healthy diet and exercise. The positive correlations between knowledge-practice and attitude-practice in this study affirms the relationship between nutrition knowledge attitude and

practice about proper diet and exercise. It is concluded the higher nutrition knowledge is associated with positive attitude resulting in good practices (Saeidlou et al. 2016).

The current study sought to evaluate KAP towards healthy eating and exercise among the participants. The mean knowledge score was 5.55 ± 1.504 indicating moderate level of knowledge. A small percentage of the participants actually knowledgeable about proper nutrition, BMI standards, ergonomics and adequate physical activity. Factors that are well known to influence nutrition knowledge include age, sex, level of education and socioeconomic status. Only 30% of the participant knew about proper nutrition and lifestyle diseases are related to each other. These results are in line with the findings from the studies reported from Texas showed that higher score of nutrition knowledge was significantly associated with higher odds of engaging in healthy weight loss behaviors and vice versa (Tabassum et al. 2015). Furthermore, greater understanding of the relationship between nutrition knowledge and dietary intake is important as emerging evidence supports a strong link between low health literacy, poor management of chronic disease and increased health costs (Spronk et al., 2014). On the contrary, the empirical results in China indicate that changes in dietary knowledge among adults has no significant influence on adult overweight and obesity (Zhou et al. 2017). Possible reasons that can be attributed to this difference of response are the dietary knowledge of Chinese is unsystematic and thus lacks practical guidelines. Even individuals with a relatively higher level of “fragmented dietary knowledge” cannot effectively combine dietary information with their eating and exercise behavior, let alone significantly improve BMI.

Weight loss after the program intervention

Figure 2 shows the weight loss summary after the 30-day wellness program of PMC admin. It is shown that 8 out of 20 participants (40%) showed significant improvement on their weight after participating in the program. Although the concept can be a bit opportunistic, financial incentives may be a key driver for the weight loss observed from some of the participants. During post-program interview, participants who exhibited weight loss was motivated by the financial gain from the employer. This is aligned with a Mayo Clinic research study spearheaded by Miller (2013), wherein monetary rewards were used to promote healthier lifestyles. Financial incentives are said to help participants lose weight most especially under the terms of competition. In contrast, research findings of Finkelstein et al. (2007) and Kullgren et al. (2013) showed no significant weight loss resulted from a six-month long weight-loss program with financial incentives. This may be related to the results of Cawley & Price (2013) wherein they concluded that small pilot programs have more promising results than longer interventional programs like the latter. The biggest weight loss change in the present research study is 3.6-kilogram weight loss, followed by 3 kilograms and 2.1 kilograms' losses. This change may be temporary and is highly subjected to weight regain (Paloyo et al., 2013). It is recommended that a careful modification of the program duration be done to yield better results.



Figure 2. Weight loss summary of ADMIN-WOWOWIN participants

Results of Program Evaluation

The program evaluation was conducted anonymously by the participants after the 30-day wellness program. The summary resulted that 45% of participants agreed that the virtual platform was adequate; 45% agreed that the materials given were useful; 45% agreed that the program is well organized; 45% agreed that the sessions delivered the information they expected to receive; 45% strongly agreed and 45% agreed that the pace of the program was satisfactory; 55% agreed that they gained new knowledge applicable to them; and 50% agreed that they plan to apply what they have learned in this program.

Table 4. *Program Evaluation of ADMIN-WOWOWIN*

Statements	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1. Virtual platform was adequate.	-	-	20%	45%	35%
2. The materials given were useful.	-	-	20%	45%	35%
3. The program is well organized.	-	-	15%	45%	40%
4. The sessions delivered the information I expected to receive.	-	-	15%	45%	40%
5. The pace of the program was satisfactory.	-	-	10%	45%	45%
6. The duration of the program was satisfactory.	-	-	10%	35%	55%
7. I gained new knowledge applicable to me	-	-	5%	55%	40%
8. I plan to apply what I learned in this program.	-	-	10%	50%	40%

Even with the limited time and resources, the program was deemed as a success because of the positive responses from the target audience. The employer is also open to the idea of this being a pilot wellness program and a prospect of the program continuing in the futures is highly likely. A hospital-wide program is set to be patterned after ADMIN-WOWOWIN.

Conclusions and Recommendations

Summarizing the results of this study, the participants showed a positive change in the KAP of participants after the 30-day nutrition and physical activity program. Results show improvement in wellness for all the participants. The interventional study also succeeded to attain the specific research objectives. Health education on diet and nutrition, physical activity, ergonomics, water hydration proved to affect the knowledge, attitude, and practices of office workers on nutrition and physical activity. The participants showed positive change through KAP and weight loss efforts quickly.

These findings indicate a lack of understanding of the direct correlation of nutrition knowledge to the weight loss effort of an individual. The study also contained a small sample population with a short duration; however, areas of positive change with statistical significance were found. These changes indicate that providing health education on nutrition and physical activity may improve nutrition and physical activity. A larger sample population will strengthen the validity of the results. When conducted for a longer duration, much of the research fails to tease out the influence of specific aspects of nutrition knowledge on relevant dietary outcomes (e.g., knowledge of fat sources and fat intake) correlated to weight loss. The lack of well-validated instruments to measure nutrition knowledge is a significant limitation and somewhat of a challenge to resolve since instruments need to reflect current nutrition knowledge and guidelines that are constantly evolving.

Nutrition knowledge is an integral component of health literacy. As low health literacy is associated with poor health outcomes, contemporary, high-quality research is needed to inform community nutrition education and public health policy. Since many working individuals spend up to half our waking hours at work, the working environment (both physical and social) can profoundly influence our lifestyle and health behaviors. However, our workplaces play an essential role in supporting or hindering this personal endeavor. Companies should improve workplaces and workspaces to promote employee wellness and encourage healthy choices and behaviors. These include a variety of design features and amenities, such as ergonomic workstation and equipment, standing and treadmill desks, private spaces (ex., lactation, or meditation room), cafeterias with healthy food options, on-site fitness facilities, bike-sharing, outdoor walking path or other features which help employees to be active, exercise better, expose to nature and do other positive things for their wellness during the workday. Moreover, researchers recommend having a more extended and more comprehensive wellness program that touches all areas of health to see more significant effects.

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Promotion of Breastfeeding and Human Milk Donation Among Mothers in Quezon

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Abstract

Globally, one in every ten babies is born prematurely. Collectively, sick, low-birth-weight babies and premature babies can be considered as the most sensitive patients requiring exceptional attention, including nutrition. Without apprehension, the preferred choice to feed a baby is their own mother's milk; but when not applicable, milk from a donor is the next best solution. The goal of this correlational study is to determine the relationship between knowledge, attitude, and practices on breastfeeding and milk donation among mothers in the province of Quezon. The study utilized random sampling in selecting 145 respondents. Data was gathered through a structured and validated questionnaire. Data were encoded to SPSS 23 for the analysis. The mean and the Pearson's Correlation Coefficient were the statistical treatment used. The findings revealed that the respondents have a *High Knowledge, Positive Overall Attitude and Good Overall Practice* on Breastfeeding and Milk Donation. The study found that there is a *low positive significant* relationship between knowledge and practice. This means that mothers with high knowledge of breastfeeding are more likely to have better practices regarding breastfeeding and milk donation. However, the attitude of a mother is not significantly related to breastfeeding. Theory of Planned Behavior and Self-Efficacy Theory were the theoretical frameworks used in this study.

Keywords: *breastfeeding, milk donation*

Breastfeeding boosts the health of the people and minimizes inequity (Brown, 2016); improving this strategy can help reduce health disparity among the rich and the poor (Mangasaryan et al., 2012). Breast milk is a special source of early-life nourishment fundamental for the improvement of the child (Victora et al., 2016). Breastfed babies are given “the best possible start in life” (WHO, 2017). Breastfeeding is the most effective plan of action which could lower mortality in infants (Heymann et al., 2013); around 800,000 neonatal losses are associated with a delay in breastfeeding and inadequacy of breastfeeding (Woldeamanuel, 2020), it can potentially prevent deaths in children who are below five years old (Silva et al., 2018). Babies deprived of breast milk are predisposed to greater risk (Marinelli et al., 2019). The hazard of dying in the first 28 days of life is increased by 80% after 24 hours or more of delay (Arts et al., 2017).

Optimal breastfeeding of children below 24 months can prevent 1.4 million annual mortalities of children in developing countries (Cai et al., 2012). Breastfeeding has been noted to decrease malnutrition, and growth retardation (Lee and Binns, 2020). Despite the well-known benefits of exclusive breastfeeding, its global prevalence remains low (Ulep et al., 2021), some neonates cannot breastfeed (Doshmangir et al., 2019), and some women do not breastfeed (Gonzales 2020). The government has been unsuccessful in establishing a setting where optimal breastfeeding is the general rule, hence rates persist well beneath targets (Walters et al., 2016). It became less established in high-income nations, where breastfeeding is no longer a common practice; accomplished and well-off womenfolk living in cities of low-income and middle-income nations also had lower breastfeeding rates (Rollins et al., 2016). Only 38% of babies from zero to six months are fully breastfed worldwide, which is much lower than the 50% Exclusive Breastfeeding (EBF) target of the World Health Assembly 2025 (Mohamed et al., 2020).

Globally, there are one in every ten babies born prematurely; in Europe, there is an average incidence of 8.7% preterm birth. Problems associated with this birth were the main cause of fatality in children younger than five years old. Of the 14.84 million preterm births, more than 80% were from South Asia and sub-Saharan Africa in 2014 (Chawanpaiboon et al., 2019). Collectively, sick, low-birth weight babies and premature babies can be considered the most sensitive patients requiring exceptional attention, including nutrition. Without apprehension, the preferred choice to feed a baby is their own mother’s milk (Doshmangir et al., 2019); but when not applicable, milk from a donor is the next best solution (Kostenzer et al., 2021). The World Health Organization endorsed sterilized donor human milk (DHM) as the primary nutrition option if the mother’s milk of babies with very low birth weight are inaccessible to minimize complications (Shenker et al., 2021), related to prematurity (Liu et al., 2016; Weaver et al., 2019).

In the Philippines, the Rooming-in and Breastfeeding Act of 1992 recognizes breast milk as “nature’s first vaccine”, enabling infants to fight potentially serious diseases as it contains growth factors and essential nutrients suitable for the infant’s needs- to improve child health, maturation of their organs and neurocognitive development (Republic Act 7600, 1992). Only 48.8 percent of infants from 0 to 5 months were wholly breastfed, with rates waning from 68.0 percent from a baby’s first day to 24.7 percent on the fifth month, and only 15.5 percent of 6 to 23 months infants had a “minimally adequate diet” in 2015 (Sen et al., 2020). According to UNICEF (2019), the 27% exclusive breastfeeding prevalence in the Philippines when compared globally is much lower than the 40% average and it was at least 50% off-track from the 2025 Global Nutrition Target (WHO, 2014) with that data, the nation can expect that its 18.2 percent target can only happen after another 80 years (Sen et al., 2020).

The Philippines was one of the early adopters of breastfeeding policies and the national breastfeeding promotion initiator in the 1980s; however, the exclusive breastfeeding rate went down with the decline of breastfeeding promotion and the intensified company marketing campaign for infant milk formula (Mangasaryan et al., 2012).

This study aims to know the knowledge, attitudes, and practice of breastfeeding and lactating mothers of the chosen municipalities in the Province of Quezon to promote breastfeeding and Human milk donation. It seeks to answer these:

1. What is the knowledge level of the respondents with regards to breastfeeding and human milk donation?
2. What is the attitude level of the respondents with regards to breastfeeding and human milk donation?
3. What is the respondents' extent of the practice in breastfeeding and human milk donation?
4. Is there a significant relationship among the participants' knowledge, attitudes, and practice on breastfeeding and milk donation?
5. Is there a significant difference in breastfeeding and human milk donation practices considering the respondents' demographic profile?

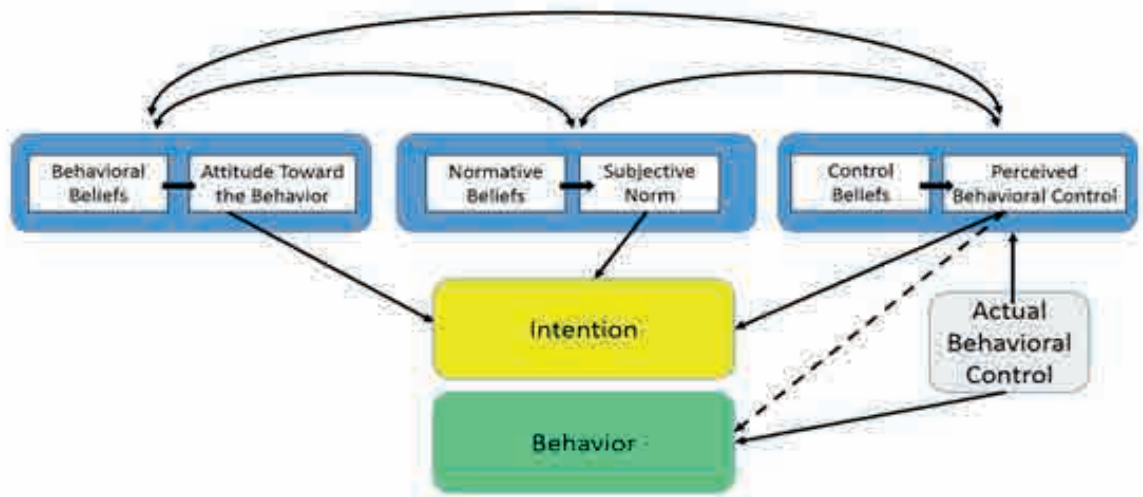


Figure 1. Theory of Planned Behavior

Intention to breastfeed and self-efficacy in breastfeeding was established to be great influencers on the extent of breastfeeding span (Lau and Tarrant, 2018). Even though many women initiate early breastfeeding, many of them discontinue earlier due to dilemmas experienced like “feeling of low milk quantity” (Chang et al., 2019).

Using the Self Efficacy Theory derived from the Social Learning Theory of Bandura, as shown in Fig. 2. Self-Efficacy Theory is a cognizable measure of an individual’s trust in the anticipated ability to regulate their driving force, through the process, emotional states, and society in doing a definitive action; thence, an individual’s self-efficacy prospect is based on a specific situation and diversified.

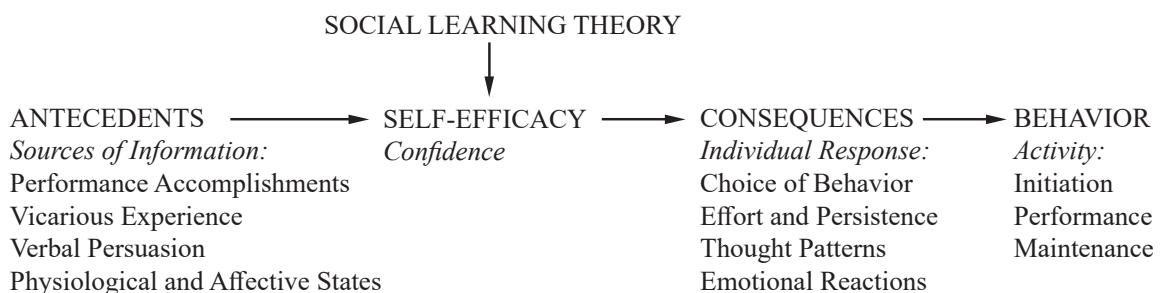


Figure 2. Self-Efficacy Theory

Ethical Consideration

A Memorandum of Agreement was signed before data gathering. A short introduction about the importance of the study and the main objectives were explained to the respondents before the questionnaire distribution. Written consent was secured and countersigned by the respondents who were willing to join the study, accomplished questionnaires were given codes to provide anonymity and security. The information given by the respondents was collected with absolute confidentiality. Incompletely filled-up questionnaires were excluded from the study analysis.

Results and Discussions

Socio-demographic Data

There was a total of 145 respondents who joined the study. Table 1 details the socio-demographic data of the sample group, the distribution according to their age, marital state, number of children, educational status, and employment detail.

Table 1. *Demographic profile of the Participants*
Profile of Participants (N = 145)

Demographic Profile	Frequency	Percent
Age		
19 and below	12	8.3
20-30	90	62.1
31 and above	43	29.7
Marital Status		
Single	41	28.3
Married	101	69.7
Separated	3	2.1
Number of Children		
1-2 children	85	58.6
3-5 children	48	33.1
6 children and above	12	8.3
Educational Attainment		
No formal education	1	.7
Some Elementary	6	4.1
Elementary graduate	27	18.6
Some High school	30	20.7
High school graduate	52	35.9
Some College	14	9.7
College graduate	1	.7
Some vocational	8	5.5
Vocational graduate	6	4.1
Employment Status		
Unemployed	117	80.7
Self-employed	21	14.5
Contractual	6	4.1
Permanent	1	.7

Of the surveyed mothers, the majority belong to the 20-30's age group (62.1%), followed by the 31 and above group (29.7%) and a few of them from the 19 and below age group (8.3%). They were mostly married (69.7%), some were single moms (28.3%), and a few of them were separated (2.1%). More than half of them have 1-2 children (58.6%), a third already have 3-5 children (33.1%) and several have 6 or more children (8.3%). Some respondents graduated high school (35.9%), several finished elementary (18.6%), there was one who had no formal education (.7%), and there was 1 who was a college graduate (.7%). Plenty of them was unemployed (80.7%), several were self-employed (14.5%), and only one has a permanent employment position.

Table 2 shows the breastfeeding profile of the participants and their plans to breastfeed. Most of the respondents experienced breastfeeding (91.7%), and almost all of them intend to breastfeed their baby (99.3%). When the participant's previous breastfeeding experience was asked if it can influence their intention to breastfeed, statistical analysis cannot be done because almost all of them tried to breastfeed and intend to breastfeed; also, the analysis of the relationship between the respondents- their demographic data and their intention to breastfeed and donate their milk cannot also be done because the participants have positive intention to breastfeed.

Table 2. *Breastfeeding Profile of the Participants*
Breastfeeding profile of the Participants (N=145)

	Frequency	Percent
<i>Have you tried to breastfeed the last time you had a baby?</i>		
Yes	133	91.7
No	12	8.3
<i>Do you intend to breastfeed your baby after giving birth?</i>		
Yes	144	99.3
No	1	0.7

Table 3 shows the participant's level of knowledge about breastfeeding and human milk donation. This shows the respondents' response to various knowledge questions, as compared to the correct response- the frequencies and percentage. Low knowledge is mostly on milk expression, temporary breastfeeding cessation, re-lactation, and proper storage of pasteurized donor milk. The respondents thought that expressed milk or pumped milk must be consumed immediately because it would spoil easily and would be unsafe.

Table 3. *Knowledge level of the participants with regards to breastfeeding and human milk donation*
Distribution of Correct Responses (N=145)

Knowledge Items	Correct Responses	
	Frequency	Percent
Breastfeeding provides a complete and ideal source of nutrition for newborns and infants.	145	100
Breast milk is enough to satisfy the needs of a growing newborn and infant.	145	100
Breast milk helps protect newborns from some diseases and illnesses.	144	99
Breastfeeding should be continued up to two years and beyond.	137	94
Breast milk is not nutritious because it lacks iron.*	135	93
Your body increases its milk production based on how much babies removes from your breast.	134	92
Expressed milk by pumping is efficient to maintain and establish milk supply.	131	90
Donation of expressed milk is possible if you are healthy.	128	88

{table continues on the next page}

Donor milk has to be pasteurized to be safe.	118	81
Pumped milk can sit at room temperature longer than an infant formula before becoming unsafe.	106	73
When mothers are unable to breastfeed owing to illness, donor milk may be used.	104	72
Re-initiation of lactation is possible.	100	69
Expressed milk can be stored to maintain its quality and integrity.	97	67
Sterilized donor milk can be stored frozen for 6 months or longer.	73	50

** False Statements*

Aside from the mothers, other members of the community may have to be invited to the promotion of breastfeeding so that they can contribute the right information to the mothers about feeding newborns and babies (Tarkwen, 2020).

Table 4 displays the Knowledge Level of the Participants. Knowledge score was calculated for all mothers on the issues of breastfeeding. This table shows the difference in their knowledge on breastfeeding and milk donation; more than half of them have a “very high knowledge” (56.5%), followed by those with High knowledge (40.7%) and only a few have Low knowledge (2.8%). This reflects the educational status of the respondents, where some of them graduated from elementary, more than half reached the secondary level, and even graduated high school. And others even had reached college. With this, we can say that better educated mothers choose breastfeeding over infant formula milk because they know of its importance and benefits, and that it is the best gift they can provide for their babies.

Table 4. *Knowledge Level of the Participants*
Knowledge Level of the Participants (n=145)

Level	Frequency	%
Very High Knowledge (12-14)	82	56.5
High Knowledge (9-11)	59	40.7
Low Knowledge (5-8)	4	2.8
Overall Mean: M = 11.70, s = 1.70 (High Knowledge)		

Table 5 shows the participant’s scale response to various questions and its verbal interpretation related to their Attitude toward breastfeeding and human milk donation. The only Negative issue noted are from delaying breastfeeding until they hear the baby cries, the choice to formula feed when they plan to go back to work, and breastfeeding on demand. Overall, their attitude with a Mean of 3.14 and an SD of 0.38 is Positive.

Table 5. *Level of Attitude*
Level of Attitude (n=145)

Items	M	SD	Scale Response	VI
A good breastfeeding position encourages proper latch which is necessary for breastfeeding success.	3.67	0.62	Strongly Agree	Very Positive
Breastfed babies are healthier than formula-fed babies.	3.59	0.77	Strongly Agree	Very Positive
Breastfeeding mothers needs to stay hydrated and well-rested.	3.56	0.73	Strongly Agree	Very Positive

{table continues on the next page}

Breast milk is the best choice of nutrition for pre-term, low birth weight, and sick babies.	3.54	0.84	Strongly Agree	Very Positive
Breastfeeding provides emotional support and a feeling of security.	3.54	0.74	Strongly Agree	Very Positive
Every woman can breastfeed and donate her milk if she is healthy.	3.52	0.77	Strongly Agree	Very Positive
Early initiation of breastfeeding will prompt your body to make more milk.	3.48	0.76	Agree	Positive
Regularly expressing milk can stimulate an increase in milk production.	3.48	0.77	Agree	Positive
Babies must be exclusively breastfed for the first six months.	3.41	0.89	Agree	Positive
Expressed milk for premature or hospitalized babies should be used within one hour or refrigerated.	3.12	0.84	Agree	Positive
The food you consume while breastfeeding will impact the composition and volume of breast milk.	3.12	0.95	Agree	Positive
Formula feeding reduces baby's demand for breast milk.	2.93	2.67	Agree	Positive
Breastfeeding can be delayed until you hear your babies' cries. (R)	2.28	0.98	Disagree	Negative
Formula feeding is the better choice if the mother plans to go back to work. (R)	2.06	0.86	Disagree	Negative
Breastfeeding can be done on demand. (R)	1.87	0.99	Disagree	Negative
Overall Attitude	3.14	0.38	Positive	

Verbal Interpretation Legend: 1.00-1.50 Very Negative (Strongly Disagree); 1.51-2.50 Negative (Disagree); 2.51- 3.50- Positive (Agree); 3.51-4.00 Very Positive (Strongly Agree)- (R) – Reverse Coded Item

Table 6 is about the participants' Breastfeeding and Milk Donation Practice. The table shows the respondents' responses to every question on practice, their scale response, and their verbal interpretation. Even if there were some issues on practice- particularly on milk expression and milk donation, mothers who were surveyed have an overall good breastfeeding practice (mean = 2.84, SD = 0.47).

Table 6. *Extent of Practice on Breastfeeding and Milk Donation*
Extent of Practice on Breastfeeding and Milk Donation (n=145)

Items	M	SD	Scale Response	Verbal Interpretation
I practice good hygiene; wash my hands before breastfeeding and milk expression/ donation.	3.68	0.73	Always	Very Good
I eat plenty of fruits and vegetables and drink plenty of fluids whenever I am breastfeeding.	3.61	0.74	Always	Very Good
I exclusively breastfeed for six months.	3.52	0.86	Always	Very Good
I spend a long time breastfeeding at night.	3.52	0.76	Always	Very Good
I delay breastfeeding until I hear my baby cry. (R)	3.10	1.06	Often	Good

{table continues on the next page}

I do not drink alcoholic drinks whenever I am breastfeeding.	3.01	1.26	Often	Good
I breastfeed my baby even in public.	3.01	1.01	Often	Good
I pump milk whenever I cannot breastfeed my baby.	2.28	1.24	Rarely	Poor
I regularly pump milk to increase my milk supply.	2.23	1.19	Rarely	Poor
When my milk is sufficient, I donate my milk.	2.20	1.25	Rarely	Poor
My baby is drinking my stored expressed milk.	2.14	1.25	Rarely	Poor
I donate milk.	1.74	1.08	Rarely	Poor
Overall Practice	2.84	0.47	Often	Good

Verbal Interpretation Legend: 1.00-1.50 Very Poor (Never); 1.51-2.50 Poor (Rarely); 2.51- 3.50- Good (Often); 3.51-4.00 Very Good (Always)

(R) – Reverse Coded Item

NOTE: #6 (Exclusive breastfeeding means you can only give the baby breast milk, not even water), #13 (The milk donation procedure is very easy), and #14 (Screening for any infection is needed before milk donation) are not practices, and was removed from the analysis

Table 7 is about the Knowledge, Attitude, and Practice of the participants in relation to Breastfeeding and Milk Donation. Analysis of data for their association reveals that there is a significant linear relationship between knowledge and practice ($p = 0.001$) and that the association is low and positive ($r = 0.268$). This means that mothers with high knowledge of breastfeeding are more likely to have better practices regarding breastfeeding and milk donation. It also shows that the Attitude of mothers of mothers is not significantly related to breastfeeding ($p = .779$), this finding is consistent with the study done by Tadele et al (2016) and Tarkwen (2020).

Tadele et al (2016) on their study noted that the difference in the knowledge, attitude, and exclusive breastfeeding practice may be due to differences in socio-demographic attributes of respondents, diversity in ethnical background, financial condition, jobs, schooling, and variations in time and location when the study was conducted.

However, Khasawneh et al (2020), concluded in their study that women who are highly knowledgeable about the perks of breastfeeding show confident positive attitude, and very likely will breastfeed.

Table 7. Relationship Between Knowledge, Attitude, and Practice of Breastfeeding and Milk Donation
Relationship Between Knowledge, Attitude and Practice of Breastfeeding and Milk Donation

	Test Statistics		
	<i>r</i>	<i>p</i>	VI
Knowledge – Practices	.268	.001	Significant
Attitude – Practice	.024	.779	Not Significant

Table 8 is about the difference in practice considering the demographic profile of the respondents. Kruskal-Wallis Test (χ^2) is a non-parametric test that has no assumption that data from a distribution can only be described by two parameters- Mean and SD. Mann-Whitney U test, however, analyzes if there is a difference in the dependent variable for two independent groups. It calculates whether the distribution of the dependent variable is alike for the groups of interest and therefore from an equal population.

Table 8. Differences in Breastfeeding and Milk Donation Practice considering Demographic Profile

The table shows that there is no remarkable difference in breastfeeding and milk donation practice across age ($p = .672$), marital status ($p = .740$), number of children ($p = .226$), and educational status ($p = .426$), and employment ($p = 0.84$). Results imply that participants' overall practice of

breastfeeding and milk donation is the same considering the demography of the respondents. The result of this study are similar to the one conducted by Wuryanti and Marsiati (2021) where the relationship between a woman's educational status and exclusive breastfeeding rate ($p = 0.860$), and a mother's knowledge level relative to exclusive breastfeeding practice ($p = 0.558$) were both insignificant.

Conclusion and Recommendation

Although this study shows that the respondents have high knowledge on breastfeeding, and plans to breastfeed, it might not be what will happen after delivery; hindrances, gaps, and hurdles affecting successful breastfeeding should be identified, and an action plan should therefore be pushed subsequently.

This study has several limitations due to the narrow time frame needed to complete it. It comprises its sample size; it will be better if the next study will have a bigger number to reflect the actual representation of the pregnant and lactating women in Mauban and Sampaloc, Quezon. Limitation in age; the next study can have a broader age group to include girls below 18 years old, as Mauban has a high number of teenage pregnancies. And to really check if high knowledge on breastfeeding would translate to attitude and practice; find highly educated and working women to be a part of the next study because most of the respondents from this survey were unemployed. Further study will have to be done in collaboration with the Local Government Unit to facilitate a comprehensive report that would focus on the milk donation part from willing donors of human milk.

It is essential to equip mothers with information and regular breastfeeding counseling, prior to delivery to enhance their knowledge and attitude about breastfeeding practices (Dukuzumuremyi et al., 2020), it can encourage and strongly give value to breastfeeding and milk donation. The biggest issue that came out from the study of Wray and Garside (2018), was that participants decidedly conveyed that the absence of support was the reason for the early cessation of breastfeeding. Mothers have blatantly reiterated the importance of enlightened counselling received from health professionals with regards to breastfeeding... experiencing presumed milk insufficiency. Engaging the whole community is indispensable to improving breastfeeding duration (Habibi et al., 2018). Consequently, husbands and in-laws are also recommended to attend a lactating seminar/ workshop to fully understand issues concerning mothers who are pregnant and lactating.

If more people would know and be educated on the effect of breast milk- with regards to neurological improvement that is mostly affirmative... where they believe that the indication of breastfeeding is broader than merely looking at its composition (Paduraru, 2018), many will be an advocate of breastfeeding and human milk donation, it is therefore recommended to include a training session exclusive for health workers so they will be more skilled in helping address issues of first-time mothers, women with perceived low milk volume and guide mothers in re-initiation of lactation.

Research clearly shows that with the increasing number of premature births, pasteurized human donor milk (PHDM) usage has increased exponentially (Ellsworth et al., 2021) in the last 20 years- by not providing (PHDM) or not giving PHDM to premature or low birth-weight infants puts them at risk for complications. (Wambach et al., 2019). Thus, it is important to spend time attracting milk donors; households manifest an important part in supporting mothers to donate their milk. The primary reasons why women donate their milk were: individual and social factors- strong conviction in the importance of breastfeeding, selflessness- social responsibility, trusting somebody else will do the same for them if needed, and too much milk; boosts from a health professional can also be a big factor for human milk donation. The major hurdle to milk donation were systemic and social-religious beliefs in Islamic countries and insufficient awareness about the procedures and processes of human milk donation (Doshmangir et al., 2019).

Hence, it is strongly recommended that policymakers be informed also of the importance of breast milk especially to the premature, sick, and low birth weight babies so that a milk donation hub be put up in the municipality to start the donation process of milk for those mothers and babies in need. Where a Human Milk Bank (HMB) system can provide all infants with fair access to human milk. Implementation of an integrated HMB will help to preserve, build up and uphold breastfeeding practices which eventually will help to reduce infant mortality, among underweight and frail newborns (Mansen et al., 2021).

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Predictors of Interdependent Happiness Among Health Science Students During the COVID-19 Pandemic

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Abstract

The COVID-19 pandemic has brought an unprecedented global health burden. However, there remains a dearth of local studies on the impact of the pandemic on student mental health, mainly studies correlating a unique culturally related construct such as interdependent happiness to physiologic, health, and psychosocial factors. Cross-sectional data were collected from July to August 2020 to examine the factors predicting the interdependent happiness of health science students of a private university during the COVID-19 pandemic. Utilizing convenience sampling, 180 respondents completed a 7-part online survey. Variance inflation factor found no evidence of multicollinearity issues among all independent variables. Results showed that 100% of respondents had poor quality of sleep, a morning chronotype, and better eating habits. The majority had low physical activity (81%), below-average social support (60%), and average levels of interdependent happiness (36.1%). Bivariate associations showed that sleep quality and chronotype were negatively associated with interdependent happiness, with each physiologic factor showing a medium and small correlation, respectively. Dietary habits and social support showed a significant moderate positive association with interdependent happiness. Physical activity was not significantly associated with interdependent happiness. Regression analysis identified three variables significantly predicting interdependent happiness: quality of sleep, dietary habits, and social support. Interaction analysis found no significant differences in the interdependent happiness of health science students when factoring in age, sex, college, year level, family income, body mass index, and grade point average. This study demonstrates that sleep quality, dietary habits, and social support significantly predict interdependent happiness and should be considered in managing the psychological impact of COVID-19 or any future pandemics among students.

Keywords: *Sleep quality, dietary habits, social support, interdependent happiness, COVID-19*

A growing interest is emerging in happiness research. Previous studies explored and measured happiness through the eyes of Western-derived construals, where individual achievement and self-esteem are factors primarily associated with happiness (Hitokoto, 2014). While in Asian countries, like the Philippines, happiness is often correlated in the context of a collectivist setting, where one's happiness considers relational harmony or interdependence (Hitokoto & Uchida, 2014).

Various empirical research studied the correlation between happiness and factors such as quality of sleep (Shubha & Rashmi, 2016), chronotype (Gulec et al., 2012), physical activity (Zhang & Chen, 2018), dietary habits (Veenhoven, 2019), and social support (Moeini et al., 2018). These physiologic, health and social factors influence an individual's happiness. However, these studies were conducted before the COVID-19 pandemic, utilizing tools that did not measure interdependent happiness.

The COVID-19 pandemic spurred a heavy toll on public health and threatened to create a psychological disturbance that may overwhelm a population's ability to adapt and function. Wang et al. (2020) reported moderate-to-severe depression and anxiety among the general public during the pandemic. These effects were also observed among university students, a particular subset of the population affected by the COVID-19 pandemic but received little attention. Regrettably, the academic disruptions brought about by strict shelter in place measures have heightened pre-existing stress levels among students (Grubic et al., 2020).

Recent studies reported increased anxiety levels among students brought about by academic delays, school closures, changes in daily routine, and the economic effects of limited social connections (Cao et al., 2020; Young Minds, 2020). These factors created an unprecedented mental health burden which led the researchers to ask the following questions: What is the socio-demographic, anthropometric, and academic profile of health science students during the pandemic? Is happiness that considers interdependent social relationships possible in a time of crisis like the COVID-19 pandemic? What factors influence the interdependent happiness of health science students during a global health crisis?

The dearth of local studies that answer these questions warrants further investigation and intervention. Taking into consideration the research mentioned earlier, the aims of this study are: (1) To describe the socio-demographic, anthropometric, and academic profile of health science students; (2) To describe how the respondents perceive their quality of sleep (QoS), chronotype (CT), physical activity (PA), dietary habits (DH), social support (SS), and interdependent happiness (IDH); (3) To determine if a relationship exists between the above factors and interdependent happiness; (4) To identify which factors significantly predict interdependent happiness; and (5) To determine if a significant difference in the interdependent happiness is present among the respondents when the moderator variables age, sex, college, year level, body mass index (BMI), combined family income (CFI), and grade point average (GPA) are considered.

Methodology

Participants

This cross-sectional study was conducted online among Medicine and Dentistry students of a private university in the Southern Tagalog Region (Region IV-A) in Silang, Cavite. The collection of informed consent was done by checking a box in the online survey. Data collection followed Republic Act 10173 – Data Privacy Act of 2012 and was approved by the Adventist University of the Philippines Ethics Review Board (2020-ERB-AUP-064).

A convenience sample of 225 students was determined using a 5% margin of error with a 95% confidence level and a population of 540 health science students. The online survey ran from July to August 2020.

Measures

The researchers constructed the online survey questionnaire using Survey Monkey. It consisted of seven parts and was measured using the following validated questionnaires: respondents' profile, Shortened Pittsburg Quality of Sleep Index (sPQSI) by Famodu et al. (2017), reduced Morningness-Eveningness Questionnaire (rMEQ) by Adan and Almirall (1991), International Physical Activity Questionnaire - Short Form (IPAQ-SF), Dietary Habits and Nutrition Knowledge Questionnaire (DHNKQ) by Paugh (2005), Social Support Questionnaire (SSQ) by Mediente et al. (2019) and the Interdependent Happiness Scale (IHS) developed by Hitokoto & Uchida (2014). Except for the respondents' profile, pilot testing of the survey instrument showed Cronbach's alpha for sPQSI, rMEQ, SSQ, and IHS at 0.81, 0.74, 0.91, and 0.90, while the test-retest reliability for DHNKQ and IPAQ-SF was 0.95 and 0.76, respectively.

Statistical Analysis

Data analysis utilized descriptive and inferential statistics. Data were encoded, processed, analyzed, and presented using SPSS version 26, GraphPad Prism 8, and Microsoft Excel 2013. Statistical tests for pilot testing and the actual survey used a 0.05 significance level.

Results and Discussion

Respondent's Profile

The analytical sample included only 180 (37%) out of the 491 respondents who expressed consent and participated in the online survey. The reasons for excluding other responses included incomplete or inappropriate answers and being classified as outliers by the questionnaire guidelines (e.g., IPAQ tool), comprising 35% and 28%. Table 1 shows that majority of the respondents were under 27 years old, having an average age of 22.7 (SD = 2.97), with 74% being females; 61% of the participants were from the College of Dentistry, while 28% were second-year students. A mean BMI of 22.64 (SD = 4.68) was observed, with 55% being predominantly underweight based on WHO criteria. In terms of income, 44% reported a monthly CFI of Php 31,000 – 80,000, an amount near the forecasted average monthly wage of Php 50,600 for 2019 (Philippine Statistics Authority, 2018). The analytic sample had a “very good” GPA with an average of 3.12 (SD = 0.42) based on the approved university grading system.

Table 1. *Respondent's Profile*

Variable	Categories	Frequency	Percentage
Age	18-22	95	52.8
	23-27	72	40.0
	28-32	12	6.7
	33-37	1	0.6
Sex	Male	47	26
	Female	133	74
College	Medicine	71	39
	Dentistry	109	61
Year level	First	48	27
	Second	50	28
	Third	38	21
	Fourth	44	24
BMI	<18.5 (Underweight)	99	55
	18.5-22.9 (Normal)	66	37
	23-24.9 (Overweight)	12	7
	30-40 (Obese 1)	3	1

{table continues on the next page}

CFI	<15,000	7	4
	15-30k	33	18
	31-90k	79	44
	81-120k	28	16
	121-160k	16	9
	>160,000	17	9
GPA	3.76 - 4.00 (Excellent)	11	6
	3.51 - 3.75 (Very Outstanding)	29	16
	3.26 - 3.50 (Outstanding)	20	11
	3.01 - 3.25 (Very Good)	49	27
	2.76 - 3.00 (Good)	37	21
	2.51 - 2.75 (Very Satisfactory)	15	8
	2.26 - 2.50 (Satisfactory)	18	10
	2.01 - 2.25 (Passing)	1	1

Student's Perception of Physiologic and Health Factors, Sources of Support, and Interdependent Happiness

Table 2 revealed that all the participants had poor QoS, a morning CT, and a 'better' DH, while the majority had low PA (81%) and below-average (41%) SS. Finally, 36% of respondents scored their IDH as 'average.'

Table 2. *Physiologic and health factors, sources of support, and interdependent happiness of respondents*

Variable	Category	Frequency	Percentage
Physiologic factors			
Quality of Sleep	Poor Sleep Quality	180	100
Chronotype	Definitely Morning Type	170	94
	Moderately Morning Type	10	6
Health factors			
Dietary Habits	Better Eating Habits	180	100
Physical Activity	Low	146	81
	Moderate	34	19
Social Support	Very Low	36	20
	Below Average	73	41
	Average	51	28
	Above Average	16	9
	Very High	4	2
Interdependent Happiness	Very Low	9	5
	Below Average	25	14
	Average	65	36
	Above Average	53	29
	Very High	28	16

The analysis of sPQSI components, as shown in Table 3, determined that the sleep latency, sleep efficiency, and daytime dysfunction components of the sPQSI contributed to the poor sleep quality of the respondents.

Table 3. *Analysis of PQSI components*

Component	Mean	Standard Deviation (SD)
Sleep latency	2.32	1.76
Sleep duration	0.91	0.89
Sleep efficiency	3.00	0.00
Sleep disturbances	0.99	0.61
Daytime dysfunction	1.44	0.91
Global PSQI score:	8.66	2.89

The above results confirm that health science students had poor QoS (Luciano et al., 2020), similar to the general population (Blume et al., 2020). Furthermore, poor sleep latency, sleep efficiency, and daytime dysfunction are consistent with studies done by Benham (2020) and Marelli et al. (2020). Possible factors contributing to these observations included increased screen time resulting in prolonged exposure to blue light, which suppressed melatonin release and promoted alertness in the evening (Shechter et al., 2018), and stress-related to self-perceived worries for the health and safety of significant others (Majumdar et al., 2020).

The low PA and below-average SS were comparable to the studies of Rogowska et al. (2020) and Labrague and De Los Santos (2020). In addition to the heavy academic demands, the extraordinary disruptions brought about by the strict quarantine measures and travel restrictions imposed to mitigate the spread of the novel virus may have occurred so abruptly that students were left adjusting to changes in their daily routine, physical activities, family, and work conditions. These changes may have affected their overall QoS, PA, and SS.

In terms of DH, compared to the studies of Brunt et al. (2008) and Acampado and Valenzuela (2018), this study showed that all participants had better DH during the pandemic. A possible explanation for this could be that health science students may have applied prior knowledge regarding good nutrition as an essential factor in preventing COVID-19 by boosting the body's immune system (Jayawardena et al., 2020). For the first time, this study provides data on dietary habits in a subset of the Filipino population during the COVID-19 pandemic.

Leone et al. (2020) and Staller and Randler (2020) observed an evening CT in Argentinian and German samples during COVID-19 lockdown periods. In contrast, this study found that most students had a definite morning CT. One could speculate that the discrepancy between the study findings and literature resulted from more robust social zeitgebers among the study participants. A "flexible learning" strategy implemented during the pandemic still necessitated that students wake up early to make personal preparations and help with the household chores before joining online activities.

Another possibility is the influence of age on CT as it exhibits developmental changes. The adolescent CT shifts towards morningness around 20 years old (Roenneberg et al., 2004). The morning preference observed among the respondents might reflect the emerging chronotype for their age since none of the participants were younger than 20 years of age.

The 'average' to 'very high levels of IDH among the respondents differs from the results of the study by Cao et al., (2020). This suggests that negative emotions such as depression, anxiety, and stress individually experienced by students could shift to more positive emotions when consideration is given to the individual's association and interdependent social relationships. Furthermore, Gardiner et.al. (2020) argues that the contrasting results may also be explained by the use of different measures of happiness. The result supports the findings of Pieh et al. (2020) that good interpersonal relationships improved mental health during COVID-19 lockdown.

Relationship of Physiologic Factors, Health Factors, and Social Support to Interdependent Happiness

Pearson correlation scatterplots in Figure 1 show that poor QoS designated as a high score ($p < 0.001$) and high rMEQ scores ($p < 0.001$) have an inverse (negative) relationship with IDH (level of association: QoS – medium, CT – small). Meanwhile, increasing levels of DH ($p < 0.001$) and SS ($p < 0.001$) positively correlate with the level of IDH (level of association: DH – medium, SS – medium). However, a change in PA, whether increased or decreased, does not affect the IDH of the respondents or vice versa ($p = 0.376$).

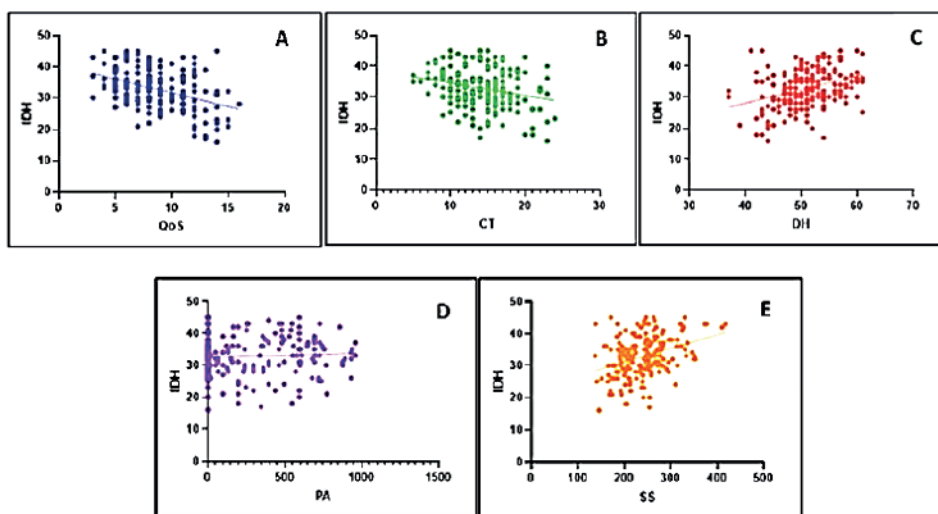


Figure 1. Scatterplots for the relationship of each physiologic factor, health factor, and social support to independent happiness (IDH)

Note: Scatterplots color corresponds to A. Quality of sleep, QoS, and Interdependent happiness, IDH (blue), B. Chronotype, CT, and IDH (green), C. Dietary habits, DH, and IDH, D. Physical activity, PA, and IDH (purple) and E. Social support, SS, and IDH (orange).

The relationship between the independent variables QoS, DH and SS, and IDH in the study, support the findings of previous studies that as the QoS worsened (indicated by higher sPQSI scores), the level of IDH decreased (Kitazawa et al., 2019; Ness and Saksvik-Lehouillier, 2018), and as DH improved and SS increased, the higher the levels of IDH is observed (Holder, 2019; Moeini et al., 2018; Veenhoven, 2018). The decrease in IDH observed as QoS decline may be related to poor QoS influencing brain regions involved in emotions (Lai, 2018). This influence may occur by suppressing positive emotions while magnifying negative emotions via altering dopamine and serotonin levels (Jones et al., 2019). On the other hand, the positive influence of good DH and SS on IDH might be related to the intake of certain food elements that modulate brain chemistry (Mujcic and Oswald, 2016), and adequate social support helps relieve emotional stress. It ensures that one has adequate necessities to help an individual throughout the pandemic (Kaneekar and Sharma, 2020).

The finding of an inverse association between CT scores and IDH, though small, is inconsistent with the literature indicating that morning preference is related to greater subjective well-being (Randler, 2008) and better mood compared to other chronotypes (Diaz-Morales et al., 2015). This discrepancy may be related to COVID-19 induced quarantine measures decreasing the student's exposure to natural light while increasing light pollution via exposure to indoor electrical lighting and blue light from electronic screen media use. All of which may alter daytime and nighttime melatonin and cortisol levels. Harb et al. (2014) suggested that the abnormal levels of these hormones are linked to depressive symptomatology and mood changes and may serve as subtle indicators of chronodisruption.

The finding on PA not significantly associated with IDH was similar to a recent cross-sectional study done by Fisher et al. (2019) among a small sample of first-year medical students in Cyprus. Both the study results and Fisher et al. (2019) contradict the consistent significant positive relationship between the two variables (Zhang & Chen, 2018). A possible explanation could be the non-establishment of a sequential relationship between the two variables through repeated PA and IDH measures. Repeated measures might have determined whether PA patterns were changing, showing significant association when the effect of PA on IDH occurred with an extended period of evaluation.

One could not discount the possibility of a relatively small sample size and participant demographics, e.g., health science students, affecting the variability of the sample, leading to a difficulty in detecting an association. However, there is still much evidence to suggest that being physically active is beneficial to both the physical and psychological aspects of health, more so during a health crisis such as the COVID-19 pandemic.

Predictors of Interdependent Happiness

Table 4 shows that a positive change in the scores of QoS ($p < 0.001$) and CT ($p < 0.001$) both tend to decrease the level of interdependent happiness while increasing DH and SS scores tend to correspond positively to IDH ($p < 0.001$). These factors, therefore, are predictors of the level of interdependent happiness of the respondents, except for PA ($p = 0.376$).

Table 4. *Simple linear regression analysis summary for predicting interdependent happiness of respondents*

Predictor	Coefficient R^2	B Coefficient
Quality of Sleep	0.160	-0.882*
Chronotype	0.063	-0.408*
Dietary Habits	0.118	0.440*
Physical Activity	-0.001	0.001
Social Support	0.120	0.043*

Note. Level of significance at 0.05

Multiple linear regression test in Table 5 shows that QoS ($p < 0.001$), DH ($p = 0.003$), and SS ($p < 0.001$) significantly predicted IDH, however, CT ($p = 0.317$) and PA ($p = 0.211$) did not, after adjusting for the other predictors. The values of the variance inflation factor (VIF) in Table 5 reveal no evidence of multicollinearity issues among all independent variables, making the results of the multiple linear regression valid.

Table 5. *Variance inflation factor (VIF) and regression coefficients for predictors of interdependent happiness*

Predictor	Variance Inflation Factor (VIF)	B coefficient
Quality of Sleep	1.123	-0.650*
Chronotype	1.273	-0.111
Dietary Habits	1.230	0.266*
Physical Activity	1.087	0.002
Sources of Support	1.058	0.030*

Note: Adjusted $R^2 = 28.9\%$

VIF interpretation: No multicollinearity problem (0-4),

Moderate multicollinearity problem (5-10), Serious multicollinearity problem (>10)

*Level of significance at 0.05

Additionally, the stepwise regression analysis in Table 6 demonstrates that the value of adjusted R² increases upon adding more independent variables to the model, showing that these factors are substantial in predicting respondents' level of interdependent happiness.

As far as the researchers know, this is the first study that has carried out predictive analyses specific for interdependent happiness utilizing physiologic and health factors and social support because supporting literature is limited. The above findings confirm the reports in the current literature, which found that physiologic factors such as QoS (Kitazawa et al., 2019; Mushtaq et al., 2014; Stoica, 2015) and CT (Miller et al., 2014), health factors like DH (Mujcic & Oswald, 2016) and SS (Moeini et al., 2018) predict happiness. Moreover, the findings suggest that subjective physiologic measures like self-reported questionnaires on QoS and CT may predict variables such as IDH.

Table 6. *Stepwise regression analysis summary for predicting interdependent happiness of respondents*

Predictor	B coefficient				
	Step 1	Step 2	Step 3	Step 4	Step 5
Quality of Sleep	-0.882	-0.797	-0.816	0.149	-0.650
Chronotype	-	-0.285	-0.261	0.115	-0.111
Dietary Habits	-	-	-	0.001	0.002
Sources of Support	-	-	-	-	0.030
No. of variable(s)	1	2	3	4	5
Adjusted R ² (%)	16.4	18.7	18.6	23.2	28.9

The relationship between CT and IDH no longer being statistically significant after adjusting for the other variables could suggest a mediating variable. For instance, Howell et al. (2008) found a similar non-significant effect between morning preference and mindfulness after controlling for QoS. Likewise, PA did not predict IDH significantly. This finding may suggest that using subjective PA measures alone may not predict IDH.

Effects of Moderating Variables in the Interdependent Happiness of Respondents

Another novelty of this study is the result of the interaction analysis on linear regression. Table 7 shows that age, sex, combined family income (CFI), grade point average (GPA), body mass index (BMI), college, and year level do not moderate the relationship between physiological, health factors, and source of support to the interdependent happiness of the respondents ($p > 0.05$).

The matter of age and sex not moderating the relationship between QoS, CT, and interdependent happiness may result from a relatively young non-clinical study sample with comparable societal obligations and access to educational structures. João et al. (2018) found that the relationship between these variables becomes more evident when compared across age groups.

Table 7. *Regression coefficients of interaction terms for the effects of moderating variables in the interdependent happiness of respondents*

Moderating variable	B coefficient (Interaction terms)				
	Quality of Sleep	Chronotype	Dietary habits	Physical activity	Social support
Age	0.004	-0.037	0.008	0.000	0.000
Sex	-0.386	-0.149	0.274	-0.005	0.024
FI	0.124	0.081	-0.089	0.001	-0.010
GPA	-0.510	0.099	0.231	-0.003	0.005
BMI	-0.034	0.039	-0.015	0.000	0.001
College	-0.393	0.060	0.277	-0.001	0.014
Year level	0.138	0.103	0.077	0.001	0.007

Note: Level of significance at 0.05

Furthermore, a universal influence of age and sex may explain the absence of a moderating effect between dietary habits, social support, and interdependent happiness (Veenhoven, 2019). The finding that age and sex did not moderate the relationship between physical activity and interdependent happiness was not surprising since the study found that interdependent happiness was not significantly associated with physical activity.

This study showed that BMI, GPA, CFI, year level, and type of college did not moderate the relationship between the independent variables and interdependent happiness. A possible explanation may be that the moderating variables correlated with individual happiness rather than interdependent happiness; Jeon et al. (2014) described these demographic factors as individually oriented determinants of happiness. Since these demographic factors primarily characterize the independent self, they will influence individual happiness rather than interdependent happiness. Consequently, it is reasonable to obtain no significant differences in the level of interdependent happiness of the respondents after moderating the relationship by the said factors.

Conclusions and Recommendations

This study has demonstrated that happiness in a crisis like the COVID-19 pandemic is possible and predicted by sleep quality, dietary habits, and social support. By investigating the factors influencing the interdependent happiness of health science students during the COVID-19 pandemic, this study contributed to the growing body of knowledge on the mental health of an important sector of society. Using the results of this study as a take-off point, stakeholders should make a concerted effort to develop policies or design intervention programs to promote and raise the levels of interdependent happiness among students to mitigate the psychological impact associated with the current pandemic or any future pandemics.

The results of this study need interpretation in the context of the following limitations. First, concerns about generalizability are apparent as this work only examined a sample of students in a university. Second, the timing of data collection from July to August 2020 may have affected the responses since the government started to ease up on lockdown restrictions and allowed more mobility in some parts of the country. Thirdly, the web-based survey may have affected respondent survey completion leading to a low response rate overall in areas where internet connectivity was unstable or weak. Finally, because of the cross-sectional design of this research, causality was not established.

Future studies could examine a larger, more representative study population to understand the implications of the results better. Interdependent happiness is culturally unique among Asian communities; it would be interesting to replicate this study among other student populations, whether locally or abroad.

Another area of interest would be to investigate the relationship between quality of sleep, physical activity, and interdependent happiness through additional methods of observation besides self-report such as the use of wrist actigraphy and polysomnography for sleep, accelerometry for physical activity, and measurement of biomarkers such as neurotransmitter levels for interdependent happiness. Using both subjective and objective measures would complement and strengthen future studies.

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Knowledge, Attitude and Practices towards the Determinants of Urinary Tract Infections Among Pregnant Women in a Selected City in Quezon Province

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Abstract

During pregnancy, UTI is one of the infections that can have serious consequences for both the fetus and the mother. Early screening and management of UTIs during pregnancy are essential to impede its complications. This descriptive-correlational study aims to determine the incidence of UTIs among pregnant women and evaluate the demographic profile of the respondents. It measures the KAP as determinants of UTIs. The study utilized random sampling method in the selection of 69 pregnant respondents. The data were gathered using a structured and validated questionnaire coded and exported to SPSS 23 for analysis. Frequency, Percentage, Mean, and Pearson correlation were used as statistical treatments. Out of the 69 respondents, 20.3% have current UTI problem and 30.4% had previous UTIs. The findings also revealed that with regards to their KAP, the respondents have *good* knowledge ($M= 8.12$), *positive* attitude ($M=3.35$), and *good* practice ($M= 3.38$). It was found that there is no significant relationship between KAP and UTIs during pregnancy. However, the respondents were least knowledgeable about symptoms of UTIs (47.8%) and the prevention in the diet was the least practiced ($M=2.84$). The result was a health program to enhance the knowledge, attitude, and practices of pregnant women toward UTIs.

Keywords: *Urinary Tract Infection (UTI), pregnant women, KAP*

According to the Annals of Internal Medicine (2017), UTI denotes the number of clinical entities such as asymptomatic bacteriuria, catheter-associated asymptomatic bacteriuria, catheter-associated UTI, and acute uncomplicated cystitis, recurrent cystitis, prostatitis, and pyelonephritis. Annually, roughly 150 million people died from urinary tract infections and their consequences (Azami et al., 2019). Since women's urethras are shorter, UTIs are more common in them. During pregnancy, numerous hormonal and anatomical transformations favor either asymptomatic or symptomatic UTIs. It complicates up to 30% of pregnancies and produces enormous antepartum admissions to obstetric wards. The clinical, social, and economic costs of these infections are substantial (Onyango, 2018). 20–40% of untreated asymptomatic bacteriuria can develop into an acute UTI, like pyelonephritis, that causes pregnancy problems for instance premature birth in 20–50% of cases (Kalinderi et al., 2018). The additional long-term impediments of UTIs during pregnancy are preterm labor, low birth weight, anemia, kidney failure, hypertension, and systemic infections (Szweda & Jóźwik, 2016).

In total, approximately 70 pregnant or recently-pregnant women per 1000 live births were discovered to have a maternal infection that entailed hospitalization, and when compared to rich countries, the low- and middle-income nations bear the greatest burden (WHO, 2020). In the Philippines, the Department of Health (2014) accounted for Urinary Tract Infection as the top four leading grounds of hospitalization in the country (Cano et al., 2020). According to the Philippine Clinical Practice Guidelines on Diagnosis and Management of UTI in Adults (2013), asymptomatic bacteriuria during pregnancy has an overall prevalence rate of 4.3% with frequent isolates of *E. coli* (63%), *K. pneumonia* (12%), *Enterococcus* (12%), *S. saprophyticus* (7%), *S. aureus* (4%), and *K. ozanae* (2%).

Urinary tract infection is one of the most predominant types of infections in pregnant women that is associated with several risk factors. The perils of pregnancy in terms of physiology, history of UTI, age and gestational level as well as socioeconomic status are considered in acquiring UTIs. Thus, this study aims to determine the incidence of UTIs among pregnant women in one of the cities in Quezon province and analyze their knowledge, attitude, and practice as contributing factors. The results will be the basis to create a program that will help in UTI prevention, minimize complications of pregnancy, and reduce adverse effects on newborn babies.

The research questions that this study sought to find answers to are:

1. What are the characteristics of the respondents in terms of age, occupation, educational attainment, household income, and gestational age.
2. What is the incidence rate of UTIs among the respondents.
3. What is the level of perceived knowledge about Urinary Tract Infections of the respondents.
4. What is the level of attitudes toward UTI prevention during pregnancy.
5. What is the level of practice in UTI prevention during pregnancy.
6. Is there a significant relationship between KAP and UTIs in pregnancy.

Methodology

The study used a descriptive-correlational research design that identified the relationships between knowledge, attitude, practices about UTI, and incidence of UTIs during pregnancy.

Study Population

This study was carried out among pregnant women who were randomly selected from the three government lying-ins in a city in Quezon province. The study area is a vastly developed city in Quezon province with a prominent increasing population, fast expansion, and rising economic activities. It included 33 barangays with 11 urban, 6 Suburbans, 11 rural, and five are coastal barangays. It has four private hospitals and one government hospital which actively caters to the health needs of the community.

Data Gathering

A correlational quantitative research design was carried out from December 2021 to January 2022. Data was collected using a validated self-constructed survey questionnaire. It contained four categories: (i) socio-demographic profile, (ii) knowledge, (iii) attitude, and, (iv) practices on UTI prevention. It was administered to 69 pregnant women through a cluster random sampling technique.

Before data collection, permission letters and informed consent were passed to the lying-in centers through the midwife in charge. Consent was also given to all the respondents before they answered the survey questionnaire. The survey questionnaire instrument used in this research was developed, adapting significant items from the previous studies, validated, and translated to the Tagalog version for easy understanding of the target respondents.

Statistical Analysis

The statistical package for social science (SPSS) version 23 was used for analyses of data. Frequency, Percentage, Mean, and Pearson correlation were used as statistical treatments. Mean scores of responses were converted into percentages for easy interpretation of results. The significant relationship between knowledge, attitude, and practice with the incidence of UTIs is determined by the Pearson correlation. The difference in means was considered statistically significant at $p < 0.05$.

Theoretical Framework

This research was guided by the Community Health Improvement Process (CHIP) in the planning, implementation, and evaluation of the study. The process was classified into problem identification and prioritization cycle; and analysis and implementation cycle. This identifies the critical issues, organizes a coordinating body that will help in achieving the goals, and prepares and analyzes the community profile. Moreover, in the analysis and implementation cycle, gathered information and analyzed issues go hand in hand with the inventory of resources, developing strategy, identification of accountability, establishing performance indicators, implementation of the intervention, and monitoring the process and outcomes. This framework takes a community perspective and gives a comprehensive view of health.

Ethical consideration

Adventist University of the Philippines Ethical Review Board approved to conduct of the study. The explanation of the objectives and the importance of the research were expounded to the respondents before the distribution of the questionnaire. The voluntary participation was warranted through available written consent. An ethical issue that may have arisen from the results of this study was further avoided by ensuring that the names of the partakers were not mentioned.

Results and Discussion

There were a total of 69 respondents participated in this study, conducted via cluster random sampling. Their socio-demographic profile was checked and the level of KAP of the pregnant women was analyzed regarding UTIs.

Table 1 shows the characteristics of the respondents in terms of age, occupation, educational attainment, household income, and gestational age. The majority of the respondents were 20-29 years old (60.9%), followed by 30-39 years old (26.1%) and the rest were 15-19 years old (13%). They were categorized according to the nature of their work. Most of them were housewives (84.1%), businesswomen (8.7%), office employees (1.4%), and the remaining 5.8% were from other fields of work. In terms of their educational attainment, 68.1% were high school graduates, 23.2% finished elementary and college graduates were 8.7%. Majority of the respondents (73.9%) received less than 10,957 monthly-income, followed by 20.3% income range from 10,958-21,914 and remaining 5.8% had 21,915- 43,828 income bracket. Moreover, 61.0% of the respondents were 25-40weeks gestational age, 32.2% were in the 13-24th week of pregnancy, and 6.8% of respondents were 1-12weeks gestational age.

Table 1. *Demographic profile of the respondents*

Profile	Frequency	Percent (%)
Age		
15-19	9	13.0
20-29	42	60.9
30-39	18	26.1
Work		
Housewife	58	84.1
Business	6	8.7
Office	1	1.4
Others	4	5.8
Education		
Elementary	16	23.2
High school	47	68.1
College	6	8.7
Income		
<10957	51	73.9
10958-21914	14	20.3
21915-43828	4	5.8
Gestational Age		
1-12 weeks	4	6.8
13-24 weeks	19	32.2
25-40 weeks	36	61.0

Profile of the Participants (N=69)

Table 2 reveals the incidence rate of UTIs observed among pregnant women. Out of 69 respondents, 20.3% have a current UTI while 30.4% of pregnant mothers had a previous UTI.

Table 2. *Incidence of Urinary Tract Infection*

	Frequency	Percent
Previous UTI	21	30.4
Current UTI	14	20.3

Table 3 presents the level of KAP for Urinary Tract Infections of the respondents. The overall mean level of knowledge was good with a score of 8.12. On the other hand, the level of attitude towards UTI during pregnancy revealed positive with an overall mean of 3.35 indicating respondents agreed with the UTI prevention strategies. Furthermore, pregnant women showed good practice in UTI prevention with a 3.38 overall mean that implies often the practice of satisfactory preventive guidelines on UTIs during pregnancy.

In spite of this, it was seen that 47.8% of the pregnant respondents had incorrect answer in symptoms of UTI such as the pain when passing urine. Whereas, the least agreed and practice UTI prevention was connected to diet. They believed that they can eat any food they crave during their pregnancy ($M=2.57$). Also, they were not avoiding eating red meat and other animal protein that might cause UTI ($M=2.84$).

Table 3. *Knowledge, Attitude, and Practices of Pregnant Women about Urinary Tract Infection*

Variables	Mean	SD	Verbal Interpretation
Knowledge about UTI	8.12	1.59	Good Knowledge
Attitude towards UTI	3.35	0.56	Positive Attitude
Practices in UTI prevention	3.38	0.56	Good Practice

Table 4 displays the significant relationship between KAP and UTIs in pregnancy. The findings concluded that there is no significant relationship between knowledge, attitude, and practice and UTIs during pregnancy ($p > 0.05$).

Table 4. *Correlation between KAP and UTIs in pregnancy*

	Previous UTI			Current UTI		
	r_{PB}	p	VI	r_{PB}	p	VI
Knowledge	.031	.798	Not Significant	-.014	.907	Not Significant
Attitude	-.010	.936	Not Significant	-.198	.103	Not Significant
Practice	-.078	.522	Not Significant	-.066	.588	Not Significant

Discussion

This public health study focuses on the assessment of UTI incidence among pregnant women in one of the cities of Quezon province. The frequency of current UTIs among the respondents was 20.3% and for those with previous UTIs was 30.4%. These research findings were high considering the rates of pregnancy-related UTIs from previous studies of up to 20% (Navarro et al., 2019). Pregnant women had a prevalence rate of 2-11% asymptomatic bacteriuria (Lakshmi et al., 2019) and 1-18% was symptomatic urinary tract infections (Ranjan et al., 2017).

The study depicted the demographical profile of the respondents according to age, occupation, educational attainment, household income, and gestational age. Results revealed that partakers have mostly belonged to low socioeconomic status with the educational attainment of high school graduates and low household monthly income of <10,957 pesos. They were 20-29 years old, housewives, and in their 3rd trimester. The respondent's profile is somewhat related to the risk factor of acquiring UTIs during pregnancy which includes lower socioeconomic status. Additionally, a previous study in India showed the prevalence of UTIs based on the trimester was seen in the third trimester which was the same as the results (Ranjan et al., 2017). This may relate to increased mechanical obstruction due to the gravid uterus triggering stasis of urine flow.

According to literature, an increased risk of having UTIs during pregnancy is due to poor knowledge, negative attitude, and unsatisfactory practices. The outcomes of this study did not support their indications. UTIs during pregnancy had no association with knowledge, attitude, and practice (with a p -value of >0.05). The incidence of UTIs among the respondents was usually due to anatomical and hormonal changes during their pregnancies. Nevertheless, the limited number of respondents, travel restrictions, and restrained face-to-face contact during the time of assessment due to the COVID-19 pandemic were contributing factors to the no significant relationship.

However, the results with the least knowledge, attitude, and practice were related to the symptoms and causes of UTIs during pregnancy. The symptom of pain when urinating was not recognized by more than half of the respondents while almost half of the pregnant women got incorrect answers on the diet as one of the causes that influence the occurrence of UTI. Some pregnant women also doubted that sexual activity and food intake are culprits of UTIs in pregnancy. They were less likely to practice avoiding foods like red meat and caffeinated drinks that may irritate the urinary tract system and cause infections.

Conclusions and Recommendations

In conclusion, the incidence of UTIs during pregnancy is still high despite good knowledge, positive attitude, and good practices. UTIs among pregnant women might cause severe complications which arise with negative repercussions for the mother's life and the fetus. The augmented risks of miscarriage complications, premature birth, pyelonephritis, sepsis, pre-eclampsia, and temporary renal failure were reported. Therefore, UTI prevention that focuses on the causes and symptoms is necessary to provide effective maternal and childcare. Enhancing knowledge, developing a positive attitude and satisfactory practices are ways to impede the development of UTIs during pregnancy. The data from this study may help for the continuous implementation of health education and promotion programs among pregnant women to drop the risk of perinatal morbidity and mortality.

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Assessing the Turnaround Time of Laboratory Tests of an Infirmary Facility: A Basis for Establishing a Laboratory Information System

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Abstract

One of the parameters that can be used to evaluate the quality of laboratory services is the turnaround time (TAT) between specimen collection and the release of the official results. By providing timely results of laboratory tests, the rest of the medical team is better equipped to provide the necessary health care for patients. To assess the TATs of a laboratory in an infirmary facility, data was gathered from 635 consecutive laboratory tests performed within a period of 1 month. The TATs were grouped according to the type of tests performed and evaluated based on the recommended TATs as stated in the facility's operations manual. Results showed that 93.2% of tests results were available within the recommended TATs. The average TATs were longer during the morning shifts likely to be delayed due to a heavier workload. A laboratory information system may cut down on the turnaround times by providing a workflow with less clerical work and more efficient transfer of information to and from the laboratory.

Keywords:

Quality is defined as the capacity of a product or service to fulfill the needs or expectations of the customer. In the diagnostic laboratory setting where life and death may hang on the results, accuracy, precision, and the timely manner by which these results are made available reflect the quality of laboratory services. Thus, quality results play a critical role on medical diagnosis, clinical decisions, and patient prognosis. Some have suggested that up to 80% of medical decisions by clinicians rely on laboratory results (Plebani, et. al, 2014; Pati, 2012).

Turnaround time (TAT) is defined as the time it takes between the receipt of the clinical specimen in the laboratory and the official communication of results to the physician or requesting party. Poor performance of a laboratory in terms of test TATs has a major effect on patient care. Delayed test reports and TAT outliers can also affect the efficiency of diagnosis and management of patients. World Health Organization (WHO) recommendations specify that establishing turnaround time for each laboratory helps monitor and evaluate the performance of the laboratory. In practice, test requisitions may be classified as routine or STAT. STAT, which stands for shortened turnaround time, refer to test results that are requested for emergency care or those that measure parameters that are needed for urgent care of patients. The laboratory should indicate appropriate turnaround time for each test and evaluate whether the established target is being met as part of the regular assessment of the quality of laboratory results. It is essential to mitigate errors and identify causes affecting the turnaround time. However, turnaround time varies on the type of tests, analytic and institution. Different laboratories have distinct problems that each encounter on their own workplace. Therefore, monitoring time can determine the quality services of a laboratory in company with accuracy, precision, and reliability of reports (Gebreyes et. al., 2020).

Almost 80% of hospital-based laboratories have issues of complaints regarding delayed TATs. The factors that contribute to prolonged TATs may be seen during pre-analytical, analytical and post-analytical phases of laboratory testing. Previous studies have identified several causes which range from delays in requisition or order processing, bulk of samples leading to excessive queuing, inefficient protocols, and machine breakdowns (Wongkrajang, et al., 2019; Fernandes, et al., 2015). The lack of automation in the laboratory is also a common factor. Automation increases the efficiency of specimen transportation and releasing of results. The reasons for delayed TAT could differ from hospital to another and so it is preferable for each laboratory to not only establish its own recommended TATs, but to determine the specific factors that cause delays. This way, each laboratory can address problems that may be unique to its situation. (Bhatt et.al., 2019; Bhattarai & Manandhar, 2018; Dey, et al., 2013).

Methodology

Data was gathered from the logbook records of a laboratory of an infirmary facility of the Adventist University of the Philippines Health Service Laboratory. All tests ordered and performed in the period of November 2019 were included in the study. Pre-pandemic data was selected for the study as it is more reflective of the normal operations of the laboratory.

The gathered data were encoded data in Microsoft Excel software to determine the frequencies, distribution, and percentage. TATs were computed based on the sample time-in record and time-out entries for the official results. Individual TATs for each test and sample were recorded. Average TATs were also determined according to the specific tests, type of test (according to the laboratory sections), and work shifts when the tests were performed.

The tests were also categorized based on TAT requirement as either STAT or Routine. The results were compared against the predetermined expected turnaround time as stated in the institution's operations manual. STAT tests are considered on time when results are released within 30 mins to 1 hour, while a routine test is considered on time when results are released within 2 hours. An interview of the chief medical technologist was also made to help interpret the results. The conduct of the study was submitted and approved by the Ethics Review Board of the Adventist University of the Philippines.

Results and Discussion

STAT tests require results to be relayed within 30 minutes to 1 hour and should be considered separately from routine tests. Table 1 presents all the instances of STAT laboratory orders and the average TAT.

Table 1. *Average Turnaround Time of STAT Tests*

Name of the Test	Total number of Tests	Average TAT in minutes
Complete Blood Count	58	18.35
Urinalysis	46	16.41
Fecalysis	4	19
Dengue Duo	1	43
HGT	8	18
Sodium	6	25.5
Potassium	5	29.4
HBA1C	1	51

The results above show that on average, STAT test results are released within 30 minutes of specimen collection. The same can be said of routine tests as shown in Table 2. The results of routine tests are expected to be relayed within 2 hours of specimen collection.

Table 2. *Average Turnaround Time of Routine Tests*

Name of the Test	Total number of Tests	Average TAT in minutes
Complete Blood Count	155	41.71
Urinalysis	119	45.47
Fecalysis	23	33.22
Malarial Rapid Test	5	36.2
HBsAg (SC)	54	82.09
Anti-HAV(SC)	2	60
Anti-HBs	5	59
ABO/Rh	1	10
Typhidot	1	27
Dengue Duo	11	28.90
VDRL/RPR	5	43
TSH	2	70
FBS	14	108.92
OGTT	2	197.5
HGT	2	34.5
Lipid profile	13	118.07
BUN	8	103.75
Creatinine	19	94.42
Uric Acid	16	101.62
SGOT/AST	5	104.2
SGOT/ALT	14	100.42
Sodium	7	58.23

{table continues on the next page}

Potassium	7	61.41
Chloride	2	75.5
Ionized Calcium	3	83.66
HBA1C	7	67.57
PSA	3	105
Troponin – I	1	66
CK-MB	1	66

The above results suggest that while there may be cases of delayed TATs, as will be seen in the later section, this is not the norm, and that the vast majority of tests are performed promptly, and results are made available on time. The average TATs were also compared according to the time of day the tests were ordered or performed. Table 3 presents the average turnaround time between the three work shifts.

Table 3. *Average Turnaround Time Based on Work Shifts*

Work shift	Total number of Tests	Average TAT in minutes
Morning	417	36.89
Afternoon	192	32.71
Night	26	18.69

The results above show that TATs are generally longer during the morning shift and shortest during the night shift. According to an interview with the medical technologists on duty, this is due to the larger work volume during the morning shift when there are outpatient consultations, and most of the tests are performed. Specific instances where the recommended TATs were not met were then grouped according to the type of tests and TAT recommendations. Table 4 presents a comparison of the frequency of delayed TATs according to the type of tests performed.

Table 4. *Tests Released Beyond the Recommended Turnaround Time*

Type of Test	STAT	Routine	Share of all tests performed (%)
Hematology	7	6	2.05%
Microscopy	2	4	0.94%
Immunology and Serology	1	2	0.47%
Chemistry	4	17	3.31%
		Total	6.77%

The comparison of tests beyond recommended TATs shows that delays in the TAT of routine tests occur mostly in the chemistry section. This is not surprising because there is a wider variety of tests performed in the chemistry section. These test also typically involve more complex procedures. In contrast delays in the turn-around time of STAT orders occur more frequently in the hematology section. This observation may be due to more frequent STAT requests for complete blood counts than those requested for chemistry tests. Table 5 presents a similar comparison made according to work shifts.

Table 5. *Percentage of Tests Released Beyond the Recommended Turnaround Time Based on Work Shifts*

Work Shifts	STAT	Routine	Share of all tests performed (%)
Morning	8	27	5.51%
Afternoon	3	2	0.79%
Night	3	0	0.47%
		Total	6.77%

Delays in the TAT occur most frequently when there is a large volume of tests to be performed. As seen in Table 4 and 5, less than 7% of the tests performed go beyond the recommended turnaround times. While this may be considered a small fraction of the overall tests, with 93.3% of test results reported on time, there is room for improvement. Meeting expected turnaround times is very important in delivering quality service for the consumers. The daily process of monitoring the TAT within the laboratory can help to mitigate the errors that can possibly be encountered. The data gathered in the laboratory of an infirmary facility showed that morning shifts have longer turnaround times. In the same period, most of the delays occur. The higher demand of tests coupled with the manual method by which lab orders are received, processed, and reported are probable explanations. This is not unexpected as previous studies have identified similar factors (Bhatt et al., 2019; Fernandes, et al., 2015). Such factors may be mitigated by a review of hospital and laboratory protocols and the introduction of automation such as a laboratory information system.

Conclusion

Delivering results with precision and accuracy is an important goal of a laboratory. However, without timeliness, accurate results may lose its value. Although the AUP Health Service Laboratory deliver timely results most of the time, delays have also been reported when the workload demand increases. Changes that allow the laboratory staff to focus on actual laboratory testing by minimizing clerical work will help improve the TATs and in turn help physicians deliver proper diagnosis and treatment in a timely manner.

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Effects of Superhydrophobic Coating on the Water Uptake, Droplet Dispersion and Bacterial Adhesion in Cotton Masks

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Abstract

Numerous microorganisms can be transmitted via coughing, sneezing, and even talking, and since oral and respiratory droplets are water-based, it is necessary for a mask, especially on its external layer, to have some degree of water repellency. Surgical mask is the standard mask against respiratory droplets. However, due to the increased demand for surgical mask, shortage and possible environmental implications my urge the public to use an alternative with efficacy against water-based droplets close to surgical mask. In this study, cotton masks were coated with superhydrophobic coating (SHC) and evaluated for its efficacy to prevent water uptake, block dispersed droplets, and reduce bacterial adhesion, using uncoated cotton mask and surgical mask for comparisons. The experiment results revealed that the water uptake of cotton mask with SHC (6.45%) was significantly lower than the uncoated cotton masks (109.14%) but significantly higher than the surgical mask (3.26%), both at $p < 0.001$. After coating with SHC, the mean difference in the water uptake between cotton mask and surgical mask was reduced, from 105.88% to 3.19%. Significantly (at $p = 0.001$) lower number of adhered bacteria (from 5666.67 CFU/cm² to 2166.67 CFU/cm²) was collected from cotton masks after the addition of SHC. Moreover, there was no significant difference in the bacterial adhesion between cotton mask with SHC and surgical mask, $p = 0.238$. In droplet dispersion, no significant difference among the three types of masks was observed, $p = 128$. Overall, superhydrophobic coating can make cotton masks produce efficacy against respiratory droplets that is almost similar to surgical masks. When opting to use a substitute for surgical mask, it is recommended to use two-layer cotton mask coated with superhydrophobic material.

Keywords: *cotton mask, superhydrophobic coating, water uptake, droplet dispersion, bacterial adhesion*

The importance of masks has become apparent, especially to the public, due to the global outbreak of coronavirus disease-2019 (COVID-19) (Cook, 2020). Mask is one of the personal protective equipment (PPE) required by Occupational Safety and Health Administration [OSHA] (n.d.) to be worn by people, particularly by workers, when exposure to hazardous materials is a possibility. In the field of medicine and public health, wearing the appropriate mask may reduce the risk of disease transmission by reducing the number of microorganisms expelled or inhaled by the wearer (Liang et al., 2020). Surgical mask is the recommended type of mask in the healthcare practice, however, shortage of surgical masks due to the COVID-19 pandemic allows the usage of masks made from materials that have lower efficacy against disease transmission (Center for Disease Control and Prevention [CDC], 2020; Cook, 2020).

Masks are designed to protect the wearer from respiratory droplets, blood spills, and splashes of other body fluids that may contain infectious agents such as bacteria, fungi, and viruses (Kilinc, 2015; Hilbert et al., 2016; MacIntyre et al., 2017; Long et al., 2020). However, considering their purpose, some masks are still not able to provide absolute protection. For example, there are studies showing evidence that both sides of surgical masks can be a source of contamination (Luksamijarulkul, Aiempadit, & Vatanasomboon, 2014; Zhiqing et al., 2018). In comparison, cloth masks provide lower filtration efficacy against respiratory droplets and absorb moist from the surrounding air, which may induce microorganism growth and accumulation (Jang & Kim, 2015; Bae et al., 2020; Verma et al., 2020). Furthermore, studies have shown that the textiles, when exposed to high-risk environment, can carry microorganisms (Nordstrom et al., 2012; Sanon & Watkins, 2012; Mitchell et al., 2015).

To increase the protective efficacy of some masks, manufacturers designed the mask with an outer layer made of hydrophobic material. As in the case of surgical mask, its hydrophobic property makes it repel body fluids, prevent droplet dispersion, and minimize bacterial and fungal contamination (Li et al., 2005; U.S. Food and Drug Administration [US FDA] 2020a; US FDA 2020b). Body fluids, which are mostly made up of water and organic substances, are considered biohazardous because they are a rich source of nutrients that are needed by infectious agents. Because of that, any garments that are contaminated with or used near body fluids are also considered biohazardous (Strasinger & Di Lorenzo, 2014).

Moreover, the causative agents of respiratory and oral infectious diseases are usually carried by water-based droplets. When an infected person sneezes, coughs, or talks, that person expel saliva and respiratory droplets that contain viruses. Expelled respiratory droplets can also contaminate surfaces and objects, thus, indirectly transmitting the microorganisms to the persons who will touch the surface (World Health Organization [WHO], 2020b). Hydrophobic technology can reduce the amount of fluid retained on the surface, thus, reducing the risk of contamination and disease transmission (US FDA, 2020a; US FDA, 2020b). Unfortunately, the same technology is not applied on most cloth masks.

In addition, there are several studies comparing the efficacy of cloth mask to surgical mask. However, many of those studies are focused on the efficacy of masks on filtration and droplet dispersion (Aydin et al., 2020; Ho et al., 2020; Rodriguez-Palacios et al., 2020a; Zhao et al., 2020). There was a study that evaluated the efficacy of superhydrophobic coating (SHC) but only on surgical masks (Melayil and Mitra 2021). To the extent of the researcher's knowledge, there is no sufficient evidence on the effects of SHC on the preventive functions of cloth masks.

There was an innovation showing that the hydrophobic properties of superhydrophobic coating can be applied on masks that are not made of hydrophobic materials (Nasiol, 2020). To prove that claim, this study determined the efficacy of superhydrophobic coating in the efficacy of cloth masks in the prevention of contaminant transmission. Specifically, this study determined the efficacy of superhydrophobic coating in reducing water uptake, in preventing droplet dispersion, and in preventing bacterial retention on cotton masks.

Literature Review

This chapter presents information from literatures and researches that can inform the readers about the hydrophobic characteristics of superhydrophobic coating and its application in the preventive functions of cotton mask. Methods, such as water uptake rate, droplet dispersion prevention test, and bacterial adhesion test, that will measure the preventive applications of superhydrophobic coating will also be discussed.

Superhydrophobic Coating

Hydrophobicity refers to the ability of certain materials to repel water, causing droplets to stick on a horizontal surface or slide down on a slanted or vertical surface. The degree of hydrophobicity is proportional to the contact angle between the edge of the droplet and the surface underneath it. A contact angle of more than 90° characterizes hydrophobic materials, and the higher the contact angle, the greater the repellency. Surfaces that can form a contact angle with a droplet of more than 160° is considered superhydrophobic (Chandler, 2013; Ahmad et al., 2018).

Besides contact angle, hydrophobicity can also be characterized by contact angle hysteresis, which describes the surface adhesion to the liquid droplet, and surface roughness. Contact angle hysteresis determines the ability of the droplet to slide down the surface of a hydrophobic material. Materials with small hysteresis allows droplets to slide down its surface. Whereas surface roughness is what determines the contact angle and the contact angle hysteresis. On superhydrophobic materials, the surface has finer nanoscale pillars (Ahmad et. al, 2018). Hydrophobic surfaces can be fabricated using several techniques including layer-by-layer assembly, laser process, solution-immersion method, chemical etching, Hummer's method, and sol-gel technique. Layer-by-layer assembly is done by stacking several layers of silica on the surface of a material. Laser process creates hydrophobic surface by increasing the surface roughness. In solution-immersion method, the material is immersed in a series of chemical with different properties until its surface becomes very rough. Chemical etching, which is often used on metals, involves exposing the surface of the metal to an aqueous solution with copper and modified with silica-containing solution. Hummer's method makes the surface of the material rough through oxidation. In sol-gel technique, the surface of the material is made superhydrophobic by immersing the material in a sol solution and covering it with silica (Ahmad et al., 2018).

Modifications in the sol-gel technique and combining it with spraying technologies have become one of the recent developments in superhydrophobic coating (Mahadik, et al., 2012; Li et al., 2016; Liu et al., 2017; Feng et al., 2018; Zhang et al., 2018). Because of its transparency, durability, and cost-effectiveness, silicon-based nanoparticle is one of the most commonly used bases for superhydrophobic coating spray (Mahadik et al., 2012; Li et al., 2016; Mahadik et al., 2016). Besides silica nanoparticle, superhydrophobic coating can also be made of zirconia (Das & De, 2015), manganese oxide polystyrene nanocomposite (Xu et al., 2012), zinc oxide polystyrene nanocomposite (Faraz et al., 2018), calcium carbonate nanoparticle (Barhoum et al., 2014), carbon nanotube (De Nicola et al., 2015; Zhang et al., 2018), and fluorine-based superhydrophobic coating (Brassard et al., 2012). Advancement in the techniques of and innovating the technology of nanoparticle in superhydrophobic coating contribute to the increase in the number of its application.

Superhydrophobic coating has been applied in several industries including petroleum, construction, plastic, metal, glass, ceramic, medicine, electronics, heating, ventilation, and air conditioning, and textile (Ahmed et al., 2018). By applying it on mesh, superhydrophobic coating can be used to clean oil spills (Patowary et al., 2015; Ahmed et al., 2018). It is also being used on cellulose fibers, the materials used to make paper, improving the printing quality of paper and expanding its use in packaging industries (Barhoum et al., 2014; Bian et al, 2014). In addition, the self-cleaning and dust- and water-resistance properties of superhydrophobic coating improve the functions of paints, glasses, ceramics, wood, and textiles (Ahmed et al., 2018; Latthe et al.,

2019). A literature review has discussed that superhydrophobic coating, if applied using the proper techniques, can also be used to protect materials from corrosion (Vazirinasab et al., 2018; Barati Darband et al., 2020).

In the textile industry, superhydrophobic coating can be considered a recent development. Superhydrophobic coating gives the textiles water repellency, oil resistance, self-cleaning performance, reduced laundering requirements, and self-healing, UV-blocking, photocatalytic, anti-bacterial, and flame-retardant performances (S. Park et al., 2015; Wei et al., 2020). There are several techniques in fabricating superhydrophobic textiles and that include coating the surface with spherical materials such as silica nanoparticles, or with pillar type particles such as nanotubes, etching the surface with laser, plasma, or chemicals, electrospinning nanofibers on the textile fibers (Park et al., 2015), chemical vapor deposition, allowing the gas or liquid superhydrophobic particles to assemble on the fibers, and polymerization technique (Wei et al., 2020). One of the problems, however, with textile hydrophobic coating is the durability of the coating against physical and chemical damage (Li et al., 2017). Incidentally, self-healing functions and resistance against laundering-related damages is being studied by researchers (Chen et al., 2015; Wu et al., 2016; Wei et al., 2020).

The advantages of superhydrophobic coating expanded the applications of textiles. A study (Zou et al., 2015) has found out that textiles coated with superhydrophobic carbon nanotube can protect the wearer from electromagnetic interference. Superhydrophobic textiles can also be used to separate oil and water, which can make it feasible for textiles to be used in petroleum spills (Gao et al., 2017; Sobhana et al., 2017; He et al., 2018). Moreover, the self-cleaning property of superhydrophobic coating can make the textile resistant to physical, chemical, and biological contaminants. With superhydrophobic coating, textiles will be able to repel fluids, the physical contaminant, to avoid stains and degradation of color, which are caused by chemical reactions, and to reduce bacterial adhesion and protect the wearer from microorganisms, the biological contaminant (Xue et al., 2012; Lu et al., 2015; Schlaich, 2018).

Masks

Mask is one of the garments in personal protective equipment worn by an individual as protection against hazards (OSHA, n.d.). In healthcare and in public, mask is worn to minimize disease transmission (WHO 2020a). Surgical mask and N95 respirator are the commonly used masks in healthcare setting. Comparing the two masks, N95 respirator offers greater protection. However, in terms of practical usage, it is more recommended to use surgical mask for daily use and N95 masks for extreme cases (US FDA, 2020a).

N95 respirator is a tight-fitting mask that offers high protection against airborne particles. It was designed to cover the nose and mouth area and seal the possible entry of air around the cheek area. On the other hand, surgical mask is loose-fitting and offers lower protection against airborne particles. Nonetheless, surgical mask is effective enough to protect the wearer from respiratory droplets and splashes of fluids that may contain infectious microorganisms. Surgical mask is also designed to contain the saliva and respiratory droplets expelled by the wearer. The protective function of the surgical mask is performed by its three-layer design. The inner fabric of surgical mask is hydrophilic that absorbs the droplets from the wearer, the middle layer gives extra filtration effects, and the outer layer is hydrophobic that repels fluid from the external environment (US FDA, 2020a).

The self-cleaning property of superhydrophobic fabrics is also one of the features of surgical masks and other healthcare garments, and that gives them the preventive functions against contaminants and infectious microorganisms. The outer surfaces of modern surgical masks are required to be woven from hydrophobic fabrics (US FDA, 2020a; US FDA, 2020b). According to the standards set by US FDA (2004), surgical masks should be able to resist blood and other fluids and prevent passage of aerosolized bacteria. For medical gowns, the level of protection that

it should provide is based on the health risk of the situation or environment: level 1 gowns are for minimal risk and level 4 for high-risk situations. Nevertheless, all types of gowns should be able to provide certain degrees of barrier for fluid penetration, and level 4 gowns should be able to protect the wearer for all types of fluid and from most viruses (US FDA, 2020b).

Despite the protection given by PPE, healthcare workers are still at risk of acquiring infectious diseases. That is because hospitals are a major source of pathogenic microorganisms and healthcare workers are in contact with people, not just patients, more frequent than most community-based workers (Jiang et al., 2018). According to a study that was conducted in United Kingdom and United States on the recent COVID-19 pandemic (Nguyen et al., 2020), healthcare workers are 3.4-times more likely to acquire the infection than the public. It was also proven that the garments worn by healthcare workers can carry microorganism and bring them into the public (Sanon & Watkins, 2012).

Furthermore, due to the shortage of surgical masks caused by the recent outbreak of COVID-19, and since healthcare workers are prioritized in the distribution of surgical masks, health authorities (CDC, 2020; WHO, 2020a) are allowing the public to use cloth masks against COVID-19. In the recommendations of CDC, cloth masks must have at least two layers of washable, breathable fabric, it must cover the nose and mouth area of the wearer, and it should fit snugly against the side of the wearer's face (CDC, 2020). In contrast, surgical masks are required to have three or four layers of fabrics made of very fine fibers with a hydrophobic external layer. In addition, surgical masks should be able to filter out microparticles (0.1 micrometers in size) and should be used once only (WHO, 2020a).

There is a study showing that common household textiles can protect mice from droplets containing aerosolized bacteria (Rodriguez-Palacios et al., 2020b). However, in that study, the household textiles were used as barriers separating the chamber of the mice from the source of droplets and not worn by the mice. Whereas studies on human subjects have proven that cloth masks are less effective than surgical masks (Jang & Kim, 2015; McIntyre et al., 2015; Shakya et al., 2017; Zhao et al., 2020). One of the factors that can improve the protective functions of cloth mask is by constructing the mask with a hydrophilic internal layer and a hydrophobic external layer (WHO, 2020b).

The efficacy of the hydrophobicity of masks can be determined by measuring droplet dispersion (Hui et al., 2012; Davies et al., 2013; Dbouk & Drikakis, 2020), water uptake, (FDA, 2004; FDA, 2020a; WHO, 2020a), and bacterial adhesion (Zhang et al., 2013). Determining the extent of the ability of the mask to repel fluid will also determine its capacity to prevent, or at least reduce, the contamination and the transmission of microorganism (FDA, 2020a; WHO, 2020a).

Water Uptake Rate

Because of their ability to absorb fluids, textiles are easily contaminated by body fluids and, consequently, by microorganisms (Sanon & Watkins, 2012; Mitchell et al., 2015). According to health institutions, coating textiles with superhydrophobic material will make them repellent to water and body fluids, thus, reducing the risk of contamination (FDA, 2003; FDA, 2020b; WHO, 2020a).

Body fluids, which are mostly made up of water and organic substances, are considered biohazardous because they are a rich source of nutrients that are needed by infectious agents. Because of that, any garments that are contaminated with or used near body fluids are also considered biohazardous (Strasinger & Di Lorenzo, 2014).

Moreover, the causative agent of the current pandemic, severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), is carried by respiratory droplets and other body fluids. When an infected person sneezes, coughs, or talks, that person expel saliva and respiratory droplets that contain viruses. Expelled respiratory droplets can also contaminate surfaces and objects, thus, indirectly transmitting the microorganisms to the persons who will touch the surface (WHO, 2020b).

To improve the protective functions of surgical masks against body fluids, manufacturers designed the outer fabrics of the mask with hydrophobic surfaces. The hydrophobic property of surgical masks allows them to repel body fluids, prevent droplet dispersion, and minimize bacterial and fungal contamination (Li et al., 2005; US FDA 2020a).

The amount of water that can be absorbed by a textile correlates to its ability to repel water. The ability of hydrophobic textile to resist water uptake can be measured by exposing the textile to water, either by dipping or by spraying, and comparing its weight to its previous dry-state weight. The rate of increase in the weight of the textile represents the degree of hydrophobicity of the textile (Mahltig & Bottcher, 2003).

Droplet Dispersion Test

Properly worn masks are designed to reduce the amount of expelled droplet by around 91% (Dbouk & Drikakis, 2020) and the distance travelled by the droplet to less than 30 cm (Hui et al., 2012). To serve that purpose, a surgical mask is constructed to have a hydrophilic or absorbent inner layer and a hydrophobic or water-repellent external layer. The absorbent inner layer of surgical mask absorbs the respiratory and oral droplets expelled by the wearer. Whereas the hydrophobic external layer, other than repelling fluid from the external environment, helps contain the droplets in the mask (WHO, 2020a).

In a study comparing the efficacy of surgical masks and cloth masks (Davies et al, 2013), droplet dispersion can be measured by counting the number of bacteria collected on sample plates. In the study, volunteers were asked to wear the masks and in a sampling chamber, they simulate coughing to induce the expulsion of respiratory and oral droplets. Afterwards, the expelled droplets that were able to pass through the masks were allowed to settle on bacterial culture plates. The number of bacterial colonies that grew on the culture media represents the number of droplets that escaped the masks.

Bacterial Adhesion Test

Bacterial contamination is common in healthcare setting. Several studies have shown that the garments worn by healthcare workers are common carriers of microorganisms (Sanon & Watkins, 2012; Luksamijarulkul et al., 2014; Mitchell et al., 2015; Zhiqing et al, 2018). In a study that was conducted on surgical masks, it was proven that the quality of air in the hospitals increases the number of bacterial contaminants on the external surface of the masks (Luksamijarulkul et al, 2014). In another study, researchers found out that surgical masks can carry microorganisms from surgeons to patients (Zhiqing et al, 2018). Furthermore, the uniforms of healthcare workers can bring microorganisms inside and outside the hospital (Sanon & Watkins, 2012; Nyoni & Komboro, 2018).

Coating the fabrics with superhydrophobic materials helps in reducing the number of bacterial contaminations on textiles. In one study, it was proven that silver-based superhydrophobic coating can give the textile antimicrobial properties (Xue et al., 2012). Moreover, a literature review has discussed the ability of some superhydrophobic coating materials to prevent, or at least reduce, the adhesion of bacteria on the surface of textiles (Zhang et al., 2013).

The adhesion of bacteria on the surface of fabrics can be measured by counting the bacteria that can be isolated from the fabric. In the experiment conducted by Zhiqing et al. (2018) regarding the bacterial contamination on surgical masks, surgical masks were cut into three pieces and an impression was made on the surface of culture medial plates. The number of colony-forming units isolated from the masks reflects the bacterial adhesion and contamination.

Methods

This chapter presents the research design, the population and sampling techniques, the instrumentation, the data gathering procedure, and the data analysis of this study.

Research Design

This research used a quantitative research design that utilizes objective measurements and statistical analyses of data to explain a phenomenon that is observed in a specific population. To be more precise, posttest only control group experimental research design was used in this study. Experimental research design is useful in determining a causal relationship between two or more variables, especially if the magnitude of the correlation is observable in a certain group. Posttest only control group design is an experimental approach that can be used to statistically analyze the degree of change produced by the experiment or intervention conducted by the researcher (Mertler, 2016). Using this approach, the researcher was able to determine the effects of superhydrophobic coating on the ability of cotton mask to reduce water uptake, droplet dispersion, and bacterial adhesion.

In this study, there were an experimental group and two control groups. The experimental group was comprised of cotton masks treated with superhydrophobic coating. On the other hand, the control groups were comprised of surgical masks and untreated cotton masks. The effects of the treatment on the experimental group were determined and statistically analyzed and compared to the control groups. The research design of this study is summarized in the Figure 1.

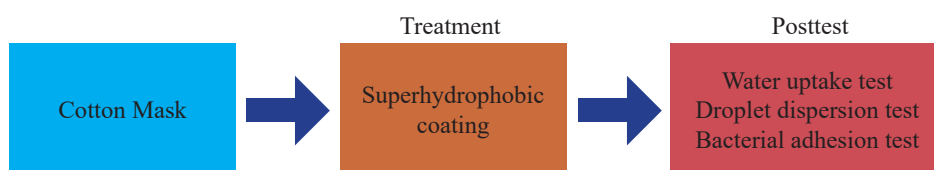


Figure 1. Posttest Only Control Group Research Design of the Study

Population and Sampling Techniques

This research experimented on cotton masks and surgical masks. All cotton masks and cotton fabrics were purchased from a tailor in Imus, Cavite. The specifications of the cotton masks were determined based on the recommendations given by CDC. Center for Disease Control and Prevention (2020) recommends that cloth masks must have two or more layers of washable and breathable fabric, should completely cover nose and mouth area, and should fit snugly against the sides of the wearer's face. It is also recommended that the inner fabric of the mask is made of a hydrophilic material to absorb the droplets expelled by the wearer (WHO, 2020a).

Sample Size

Purposive sampling method was used in this research. It is a non-probability sampling method that allows the researcher to choose the sample based on the purpose of the research and the criteria for the object that was tested. In each experiment that was conducted, 90 masks or mask fabrics were evaluated, specifically, 30 surgical masks, 30 cotton masks with SHC, and 30 untreated cotton masks. Overall, in three experiments, 270 masks were used in this research.

Inclusion Criteria. The type of cotton fabric and the number of layers of the cotton mask used in this study were based on the characteristics determined in previous studies (Davies et al., 2013; Rodriguez-Polacios et al., 2020a) that evaluated the efficacy of different types of household fabrics as masks and from the recommendation of WHO (2020a). The cotton fabric must be made of 100% cotton since this type of fabric has good absorptive capability and is readily available in most households. The fabric must also have a thread count of more than 100 per inch for an effective filtration. The mask that was fabricated must have two layers to further improve its filtration efficacy.

In this study, the cotton fabric that was selected was identified by the tailor as Canadian cotton fabric. It was made of 100% cotton and had a thread count of 115 per inch. The tailor was instructed to construct the cotton masks with two layers and with a design that was similar to the surgical mask.

For surgical masks, the researcher selected one of the brands approved by the Food and Drug Administration of the Philippines. The FDA provides the list of all approved brands and manufacturers of surgical masks that can be used by healthcare workers, by patients, and by the public. The selected surgical mask was made of three layers of nonwoven polypropylene fabrics. The outer layer had hydrophobic surface, the middle layer added to the filter function, and the inner layer is absorbent (Indoplas, n.d.).

Instrumentation

This research used laboratory experiments to determine the effectiveness of cotton mask coated with SHC in reducing water uptake, droplet dispersion, and bacterial adhesion. The methods used were adopted from previous studies (Hoborn and Nystrom, 1985; Mahltig and Bottcher, 2003; Rodriguez-Polacios et al., 2020a) that evaluated the efficacy of masks against respiratory droplets and microorganisms.

In water uptake experiment, a standard tabletop balance (Sartorius, Germany) with an increment of 0.01 gram was used to measure the weight of mask fabric. Water uptake rate was measured by calculating the change in percentage weight of the mask fabric before and after exposure to water (Mahltig and Bottcher, 2003). The entire experiment as well as the documentation of the gathered data was performed by the researcher.

In droplet dispersion experiment, settle plate method was used to evaluate the efficacy of the masks against dispersed droplets. Settle plate method is an inoculation method wherein particles suspended in air is allowed to drop on culture media plates. In this experiment, the suspended particles were the droplets that were able to pass through the mask when bacterial suspension was sprayed towards the mask (Rodriguez-Polacios et al., 2020a). The experiment was performed by the researcher.

In bacterial adhesion experiment, vortex mixing, and quantitative streaking culture method were used. Vortex mixing uses an equipment that vigorously agitates a liquid solution. On the other hand, quantitative streaking method is an inoculation method wherein a measured aliquot of fluid specimen is inoculated on a culture media plate for a quantitative determination of bacteria present in the specimen. In this method, the specimen aliquot is streaked in a single line in the middle of the plate using an inoculated needle or loop. Afterwards, a repeated streaking is made across the initial streak. Then, the number of bacteria grown in the media is counted. The experiment was performed by the researcher and two medical technologist research assistants.

In this study, inoculated culture media were incubated in an incubator (Thermo Scientific, USA) at 37°C for 24 hours. In both droplet dispersion and bacterial adhesion experiments, the number of colony-forming unit (CFU) of bacterial that had grown on the culture media was counted by a medical technologist.

Data Gathering Procedure

The flow chart of the general data gathering is presented in Figure 2. All experiments in this study were performed in the laboratory of the Medical Laboratory Science Department of a university in Silang, Cavite. Permission to conduct this study was obtained from the Ethics Review Board. In addition, approval from the University through the College Dean to conduct the experiments was obtained. After given permission, the experiments commenced.

After the approval by AUP ERB, the materials and the sample masks were purchased from respective suppliers. The cotton masks had specifications that follows the recommendations of the CDC. For the surgical mask, a brand that is approved the FDA Philippines was selected.

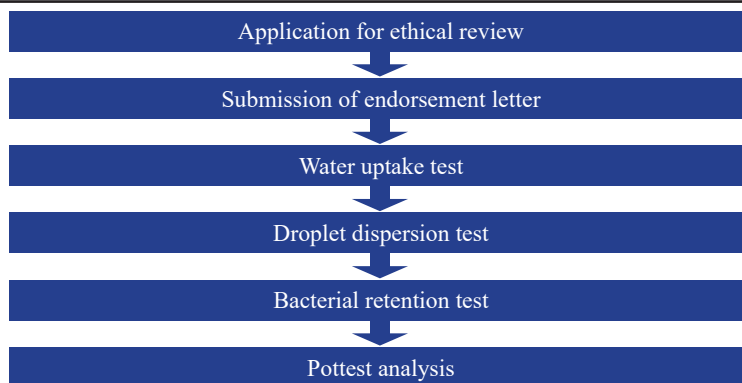


Figure 2. Flowchart of the General Data Gathering Procedure

Superhydrophobic Coating of Cotton Masks

For the coating of cotton masks with the superhydrophobic material (Figure 3), the researcher followed the instruction provided by the manufacturer of the product. For water uptake and bacterial adhesion experiments, single layer of mask fabrics was coated, while two-layer masks with no ear loop were coated for droplet dispersion experiment. Masks and fabrics were lint and dirt free before coating. To apply the superhydrophobic coating, the product bottle was held 30-40 cm away from the surface of the mask. The superhydrophobic material was sprayed twice, once on the upper half and once on the lower half, on the outer surface of the masks and fabrics. After the application, the coating was allowed to dry for 24 hours (Rust-Oleum, 2014). The flow chart of the application of the superhydrophobic coating is presented in Figure 4.

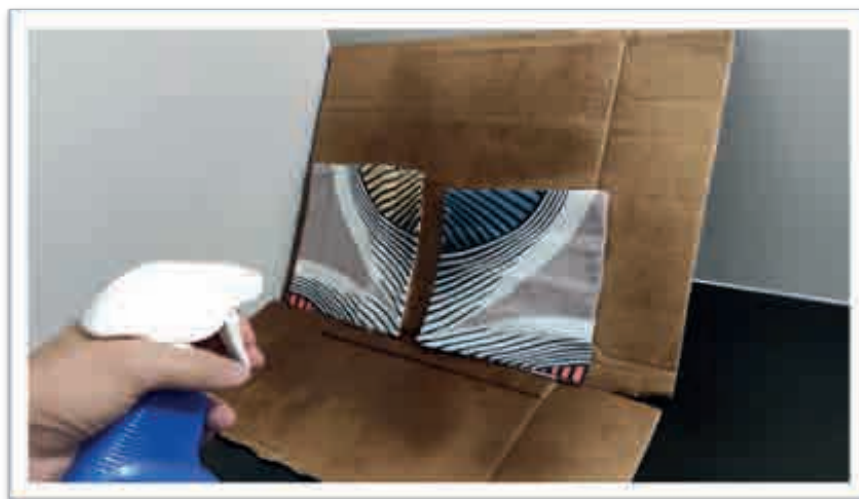


Figure 3. Spraying Cotton Mask with Superhydrophobic Material

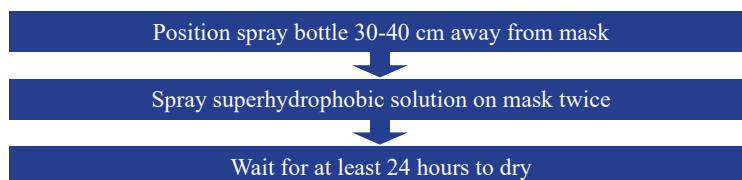


Figure 4. Flowchart of the Application of Superhydrophobic Coating on Masks

Culture Media Preparation

This study used tryptic soy agar (TSA) media in droplet dispersion and bacterial adhesion experiments. A total of 270 and 90 TSA media was prepared for droplet dispersion and bacterial adhesion, respectively. The preparation of TSA media is summarized in Figure 5. For each plate of TSA medium, 4 grams of TSA powder was dissolved in 100 mL of distilled water. To make sure that the powder was completely dissolved, the solution was boiled until it was homogenous, meaning no powder particles are present in the solution. Afterwards, the TSA solution was sterilized using an autoclave for 20 minutes under 20 psi pressure. After sterilization, the TSA solution was cooled until easy to touch and the solution was transferred to plates. The agar was cooled until it solidified and was stored in the refrigerator at 2-8°C until use.

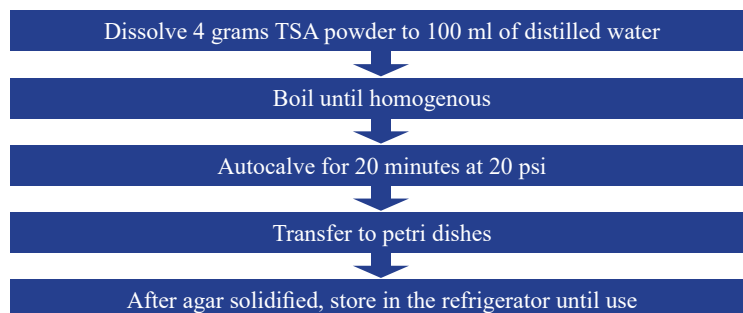


Figure 5. Flowchart of the Tryptic Soy Agar Medium Preparation

Water Uptake Test

To investigate the water uptake of the mask, this research used the spray test method used by Mahltig and Bottcher (2003) in their experiment on water repellent fabrics. The procedure of the test is summarized in Figure 6. In this experiment, water was sprayed on the fabric and the increase in water uptake was measured by calculating the water uptake rate. This experiment was repeated 30 times for each type of mask.

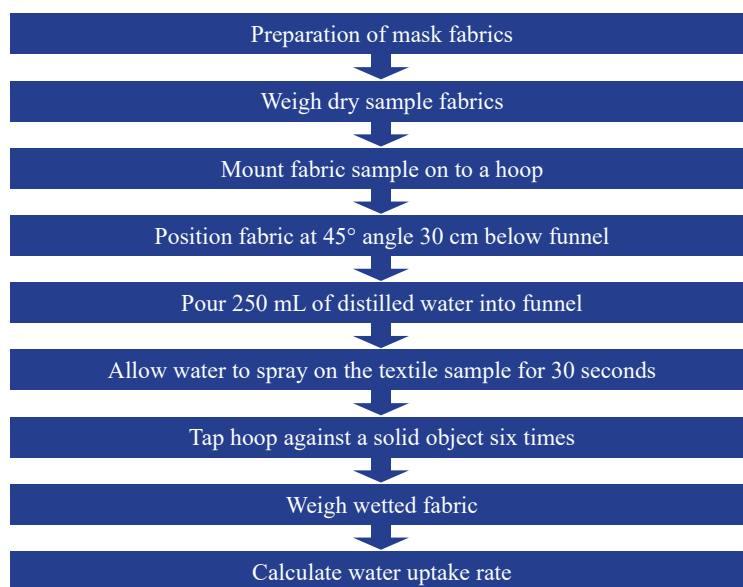


Figure 6. Flowchart of the Water Uptake Experiment

Test Procedure. This experiment was performed by the researcher. In this experiment, single-layer cotton mask fabrics were tested as the cotton mask samples. For surgical masks, the entire masks, except for ear loops, served as the samples. Ear loops were removed to prevent

interference during the weighing. Before the exposure to water, the fabric samples were weighed using a tabletop balance (Figure 7A).

The fabric sample was mounted on a hoop with a diameter of 8 cm (Figure 7B) and positioned at 45° angle under the spray test apparatus. The spray test apparatus was a setup of a funnel with a spray nozzle positioned 16 cm above the middle part of the fabric sample. Distilled water (250 mL) was poured into the funnel and allowed to spray on the fabric sample for around 30 seconds (Figure 7C). Afterwards, the hoop with the wetted fabric sample was tapped six times against a solid object with the fabric facing the object (Figure 7D). To ensure uniformity on the tapping step, a ruler that can be attached to the hoop was used. The ruler was set up on top a sink. One of the rulers was fixed on the sink surface while the other end rested on metal rods placed on top of the sink. During the tapping step, the hoop was placed on the rested end of the ruler and that end of the ruler was raised to 5 cm and released. Afterwards, the wetted fabric gently removed from the hoop and weighed using the same tabletop balance (Figure 7E) and the water uptake rate was calculated using the formula: $\text{water uptake rate} = \frac{((\text{wet weight} - \text{dry weight}))}{(\text{dry weight})} \times 100$ (1)

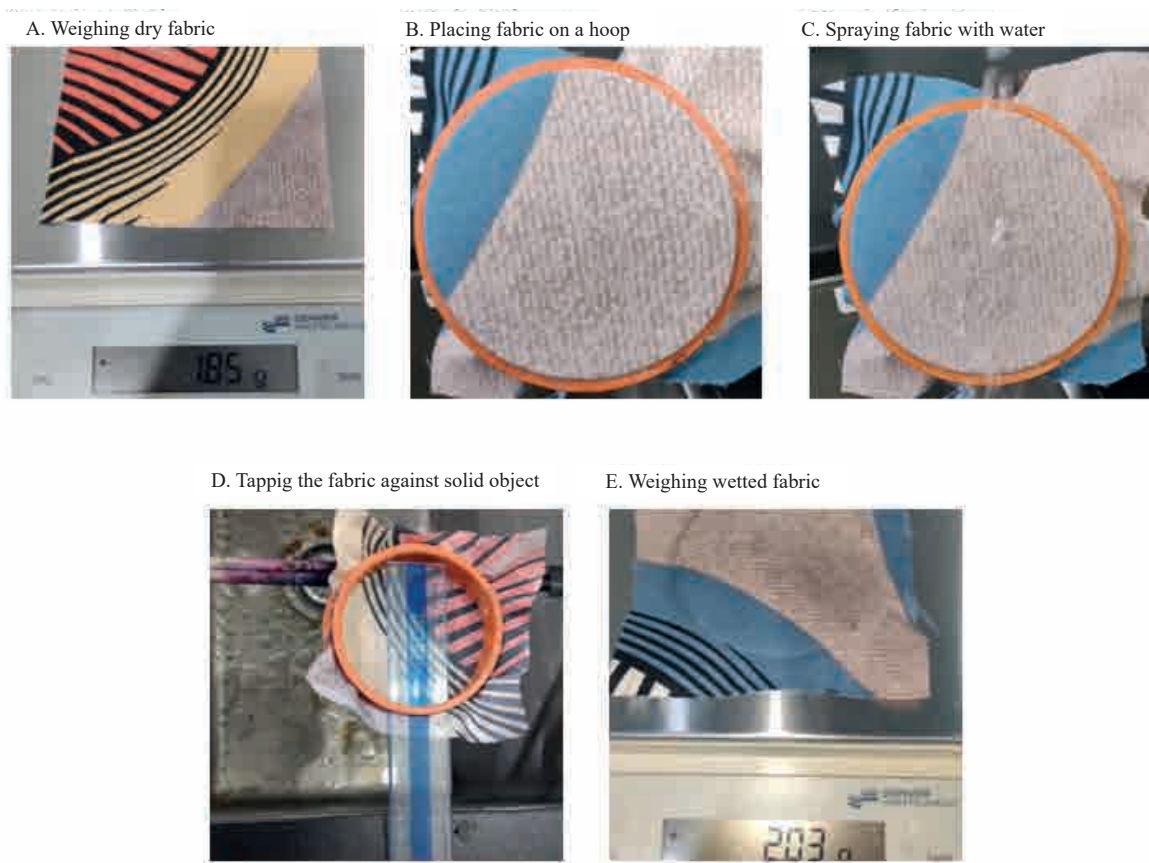


Figure 7. Water Uptake Experiment

The procedure was repeated in each sample until all 30 samples from each group of masks were tested. The water uptake rate of each sample was calculated and the cumulative mean of each group of masks was obtained. Excluding the preparation of materials, the water uptake experiment took 3 days to finish. It was ensured that equal number masks from each group was evaluated. The weighing dry and wetted fabrics and the calculation water uptake rate were performed by researcher.

Droplet Dispersion Test

The droplet dispersion test determined the ability of the mask to prevent passage of droplets through the fabrics of the masks. This study used the method developed by Rodriguez-Palacios et al. (2020a) in their quantification of droplet retention by household fabrics experiment. In their method, the act of sneezing was simulated by using a household trigger spray bottle. The content of the spray bottle, which is a bacterial suspension, was sprayed towards the fabric and the droplets that passed through the fabric were caught by a line of culture media plates and quantified by counting the bacterial growth. The procedure of this experiment is presented in Figure 8.

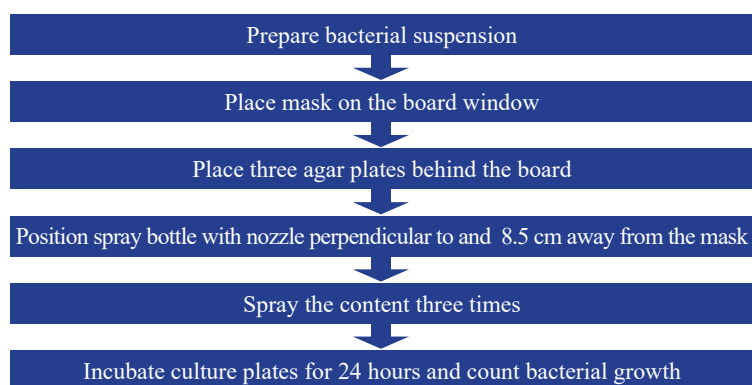


Figure 8. Flowchart of the Droplet Dispersion Test

Test Procedure. The testing procedure of this experiment was performed in a biosafety cabinet. All masks and materials used in this study were sterilized under ultraviolet light for 15 minutes before use. To prepare for this experiment, the bacterial suspension that simulated the respiratory droplet was made. The bacterial sample was obtained from a cheek swab specimen. The swab specimen was inoculated on a blood agar culture medium and incubated at 37°C for 24 hours. From the bacterial growth, one colony-forming unit of bacterial was isolated, subcultured at 37°C for 24 hours, and stored in the refrigerator at 2-8°C for a maximum of 7 days until use. It was ensured that fresh bacterial samples, which means 24 hours old, subcultured bacteria, was used in each batch of experiment. Using Gram staining method, the bacterial isolate was identified as Gram-negative cocci. Preparation of bacterial isolates was performed at least two days before the experiment.

The bacterial solution that was sprayed on the mask fabric was a 1:10 dilution of 0.5 McFarland (an estimated 10 CFU of bacterial sample) bacterial suspension with distilled water. For every 100 mL of bacterial solution, 10 mL of 0.5 McFarland bacterial suspension was added to 90 mL of distilled water (Figure 9A). The bacterial solution was transferred to a spray bottle with 1 mL/stroke output.

To simulate the barrier function of mask, the mask was placed over a window (8.5 cm x 11 cm) carved on an acrylic board (30 cm x 30 cm) (Figure 9B). The outer surface of the mask was facing the window of the board while the inner surface was facing the spray bottle. A line of three culture media plates of tryptic soy agar was placed behind the board (Figure 9C). The lowest point of the window was 8.5 cm above the surface of the culture medial plate. The first plate covered the distance of 0-8.5 cm from the board, the second plate covered 8.5-17 cm, and the third plate covered 17-25.5 cm. The spray nozzle was placed perpendicular to and 8.5 cm (Figure 9D), which is half of the distance between the nostrils and the vocal cords (Han et al., 2005) or one-third of the distance between lips and the lower end of the trachea (Varshney et al., 2011), away from the mask. The content of the bottle was sprayed three times towards the mask (Figure 9E). Droplets that were able to pass through the mask was caught by the culture plates. Then, the culture plates were incubated at 37°C for 24 hours (Figure 9F).

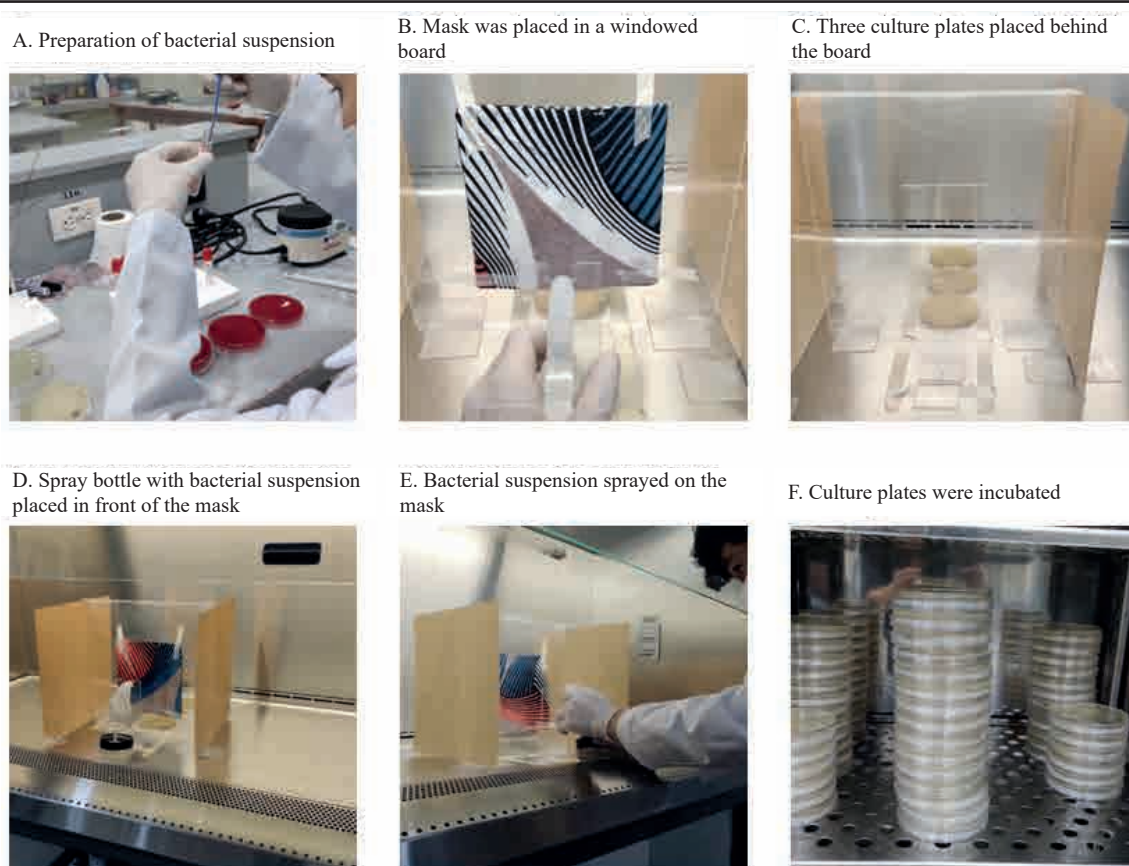


Figure 9. Droplet Dispersion Experiment

After incubation, the number of grown CFU of bacteria in three plates was counted and documented. The procedure was repeated until 30 samples from each group of masks were evaluated. The droplet dispersion, which was represented by the total CFU counted, of each sample was determined and the mean was obtained for each group of masks.

The droplet dispersion experiment was completed in three days. It was ensured that equal number of masks from each group was experimented each day. The droplet dispersion experiment, specifically the spraying of bacterial suspension on the mask, was performed by the researcher. A research assistant was asked to decontaminate the acrylic board every before the spraying step. The number of CFU on the culture plates was counted by a medical technologist.

Bacterial Adhesion Test

In bacterial adhesion test, the ability of superhydrophobic coating to prevent the adhesion of bacteria on the surface of cotton mask was determined. This experiment had two phases, the inoculation of masks fabrics with bacteria and the transfer of bacteria from the masks to culture media. In the inoculation phase, this experiment used the spray method used by Rodriguez-Palacios et al. (2020a) on their experiment on droplet retention by household fabrics. To transfer the bacteria from masks to culture medial plates, a method adopted from the experiment of Hoborn and Nystrom (1985) was used. In this method, a piece of fabric was cut from the sample and placed in a test tube with distilled water. The tube was agitated using vortex mixer to detach and isolate the bacteria from the fabric. In Hoborn and Nystrom experiment, thy use a homogenizer to separate the bacteria from the fabric. After agitation, T-streak plate method was used to culture the bacteria on TSA culture medium. The procedure of bacterial adhesion test is presented in Figure 10.



Figure 10. Flowchart of Bacterial Adhesion Test

Test Procedure. The experiment of bacterial adhesion test was performed in a microbiology laboratory. All masks and materials that were used in this study were sterilized before use. The preparation of bacterial solution used in this experiment was similar to the method used in droplet dispersion test. While for the preparation of masks' fabrics, the method used in water uptake was followed. Prepared mask fabrics were sterilized under ultraviolet light for 15 minutes. After sterilization, each fabric was mounted to a hoop (Figure 11A) and was held suspended by an iron stand and iron clamp and was positioned perpendicular to the work surface (Figure 11B).

The spray bottle with bacterial suspension was placed in front of the fabric with its nozzle positioned 30 cm away from the fabric. The bacterial solution was sprayed on the mask fabric three times, delivering 3 mL of the solution (Figure 11C). After spraying, the hoop with the fabric was tapped six times against a solid object with the fabric facing the object. The tapping procedure was the similar setup used in water uptake experiment.

The fabric was removed from the hoop and 1 cm² of fabric was cut from the center of the fabric (Figure 11D) and placed in a test tube with distilled water (Figure 11E). The cut fabric was only held by forceps until placed in a test tube. The forceps and scissors were flame-sterilized sample, and the hoop was decontaminated with 70% isopropyl alcohol in between each sample. To isolate the bacteria from the fabric, vortex mixer and centrifuge was used to agitate the solution (Figure 11F). The solution was vortex mixed for 30 second followed by centrifugation for 1 minute and vortex mixed again for another minute to ensure maximum displacement of bacterial cells from the fabric.

Using 10 µL inoculating loop, the resuspended bacteria was inoculated in a TSA culture media using T-streak plate technique. The culture medium was incubated for 24 hours. After incubation, the number of CFU was counted and the number of CFU per square centimeter of fabric was calculated using the formula:

$$\frac{CFU}{cm^2} = \frac{CFU \text{ counted}}{10\mu L} \times \frac{1000\mu L}{1mL} \times \frac{5mL}{1cm^2} \quad (2)$$

This experiment was repeated, and the formula was used in each sample until 30 samples from each group was tested. The bacterial adhesion, represented by counted CFU/cm², of each sample was determined and the mean was obtained for each group of masks.

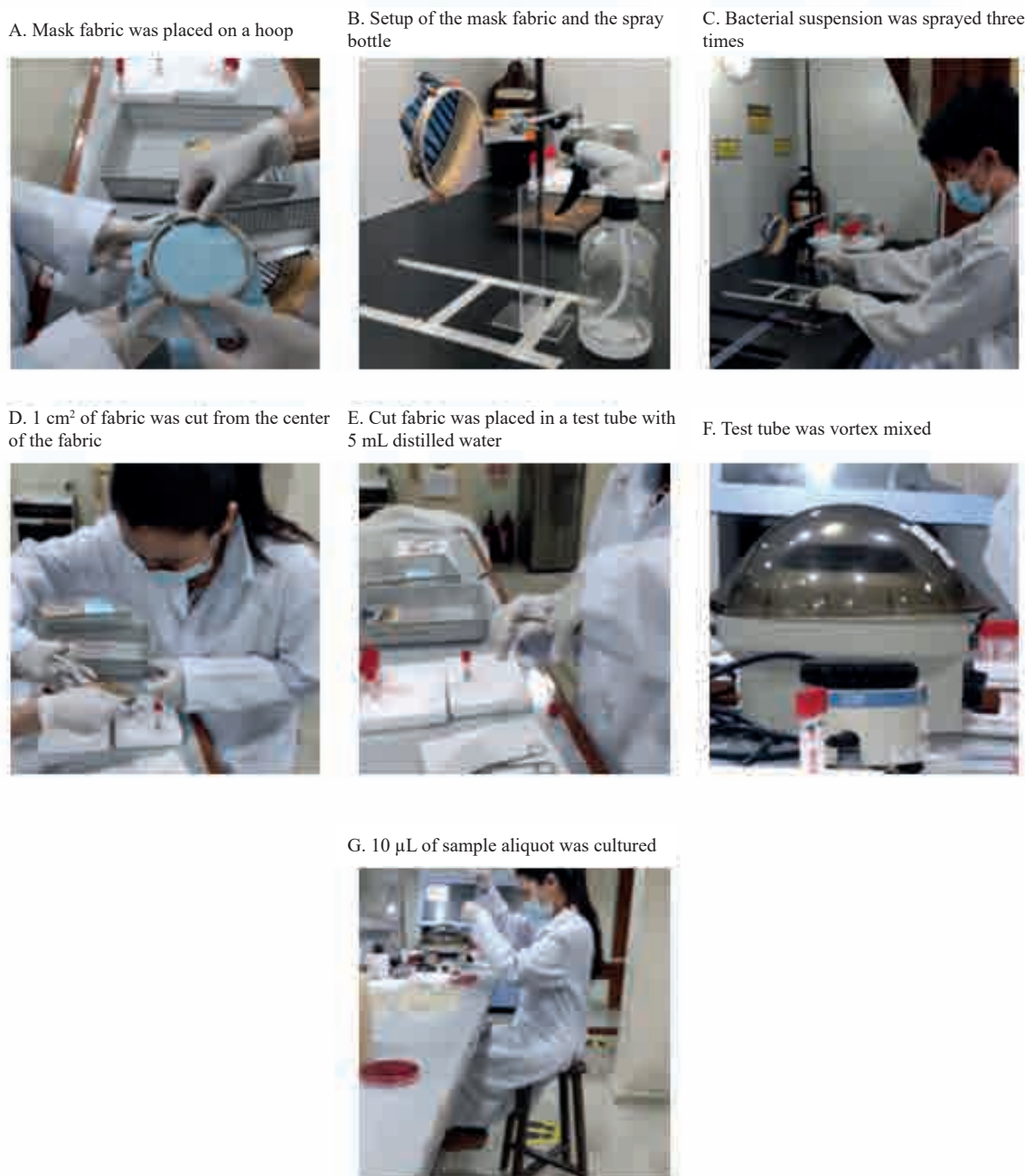


Figure 11. Bacterial Adhesion Experiment

The bacterial experiment was completed in three days. It was ensured that equal number of samples from each group was experimented each day. The experiment was performed by four individuals. The spraying of bacterial adhesion was done by the researcher. The cutting of fabric samples was performed by a research assistant assisted by the researcher. The vortex and inoculation procedures were performed by one medical technologist. The number of CFU on the culture plates was counted by another medical technologist.

Ethical Considerations

This paper was approved by an Ethics Review Board. The researcher followed the National Ethical Guidelines for Health and Health-related Research (2017). The researcher of this study declared no conflict of interest exist.

Analysis of Data

All data gathered in this study were analyzed using International Business Machine Corporation Statistical Package for Social Sciences (IBM SPSS) version 25 software. Frequencies, means, percentage, standard deviations, and 95% confidence interval of means were used in the descriptive analysis. In the inferential analysis, Levene's test was used to determine the assumption of homogeneity of variances in the mean. Analysis of variances (ANOVA) ($p < 0.05$) was used to compare the means of cotton masks with SHC to cotton masks without SHC and surgical mask. One-way ANOVA was used when assumption of homogeneity of variances was met, and Welch's ANOVA was used when assumption of homogeneity of variances was violated. Moreover, post hoc tests, Tukey's test for assumed homogeneity of variances and Games-Howell's test when homogeneity was violated, were used to determine which group of masks is significantly different from other groups. Welch's ANOVA and Games-Howell's post hoc test are considered more stable for samples with unequal variances and unequal sample sizes (Glen, 2015; how2stat, 2015; Delacre et al., 2019).

Tukey's Hinges 1.5 interquartile range (IQR), presented in boxplots, was used to identify outliers in the data. On the boxplot of water uptake results of the three masks (Figure C4), two samples from cotton mask with SHC, one from cotton mask without SHC, and four from surgical mask were considered outliers and were excluded from the data. In droplet dispersion experiment, no outliers were identified. On the boxplot of bacterial adhesion results of the three groups of masks (Figure C12), three outliers from cotton masks with SHC and three from surgical masks were identified and excluded.

Results

Water Uptake Rate

Water uptake rates of 28 cotton masks with SHC, 29 cotton masks without SHC, and 26 surgical masks were used for the computation of mean and analysis of data. The water uptake rates of cotton masks with SHC were between 3.72% to 11.17%, with a mean of $6.45 \pm 1.78\%$ (Table 1). On the other hand, cotton masks without SHC had mean water uptake rates of $109.14 \pm 11.93\%$. Lastly, surgical masks had mean water uptake rates of $3.26 \pm 1.92\%$.

Table 1. *Descriptive Statistics of the Water Uptake Rate of Masks*

	N	Mean (%) ^a	Std. Deviation	95% CI* for Mean		Min.	Max.
				Lower Bound	Upper Bound		
Cotton mask with SHC	28	6.45	1.78	5.76	7.13	3.72	11.17
Cotton mask w/o SHC	29	109.14	11.93	104.60	113.68	82.72	128.73
Surgical mask	26	3.26	1.92	2.48	4.03	.83	8.64

CI: Confidence Interval

^aIncreased in water uptake of the masks measured in percentage

Welch's ANOVA (Table 2) revealed that there was a significant difference in the water uptake rates among the three masks ($p < 0.001$), hence, the null hypothesis was rejected. Games-Howell post hoc test (Table 3) revealed that the water uptake rate of cotton mask fabrics with SHC was significantly lower than cotton mask without SHC ($p < 0.001$). In contrast, the water

uptake of cotton mask with SHC was significantly higher than surgical mask ($p < 0.001$). The mean difference between cotton mask with SHC and cotton mask without SHC was 102.69%, while the mean difference between cotton mask with SHC and surgical mask was 3.19%. Between cotton mask without SHC and surgical mask, the water uptake rate was also significantly different, $p < 0.001$, with a mean difference of 105.88%.

Table 2. *Welch's Analysis of Variances in Water Uptake of Masks*

	F	df1	df2	Sig.
Welch	1094.63	2	48.49	.000

$\alpha = 0.05$

Table 3. *Games-Howell Post Hoc Analysis of Water Uptake of Masks*

(I) Type of mask	(J) Type of mask	Mean Difference (I-J) (%) ^a	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Cotton mask with SHC	Cotton mask w/o SHC	-102.69*	2.24	.000	-108.22	-97.16
	Surgical mask	3.19*	.50	.000	1.97	4.41
Cotton mask w/o SHC	Cotton mask with SHC	102.69*	2.24	.000	97.16	108.22
	Surgical mask	105.88*	2.25	.000	100.34	111.42
Surgical mask	Cotton mask with SHC	-3.19*	.50	.000	-4.41	-1.97
	Cotton mask w/o SHC	-105.88*	2.24	.000	-111.42	-100.34

$\alpha = 0.05$

*Mean difference is significant at 0.05 level.

^a Mean difference in water uptake rate measured in percentage. Negative value indicates that I < J and positive value indicates that I > J.

Droplet Dispersion

In droplet dispersion experiment, 30 samples from each type of mask were used for the computation and comparison of mean. Table 4 presents the mean CFU that corresponds to the number of droplets that were able to pass through the masks. Overall, the surgical mask has the lowest number of droplets that were able to pass through with a mean of 2.70 ± 1.90 CFU detected. It was followed by the cotton mask with SHC where 3.80 ± 2.41 CFU were detected. The highest number of droplets that were able to pass through was the cotton mask without SHC which was at 3.83 ± 2.89 .

Table 4. *Descriptive Statistics of the Droplet Dispersion of Masks*

	N	Mean (CFU)	Std. Deviation	95% CI* for Mean		Min.	Max.
				Lower Bound	Upper Bound		
Cotton mask with SHC	30	3.80	2.41	2.90	4.70	.00	9.00
Cotton mask w/o SHC	30	3.83	2.89	2.75	4.91	.00	12.00
Surgical mask	30	2.70	1.90	1.99	3.41	.00	7.00

CFU: Colony-forming unit. CFU represents the number of bacteria-containing droplets that were able to pass through the fabrics of masks.

CI: Confidence interval

As shown in Table 5, there was no significant difference in the droplet dispersion among the three types of masks ($p = 0.128$), hence, the null hypothesis was accepted. The result also

showed that the mean difference in the droplet dispersion between cotton mask with SHC and uncoated cotton mask was 0.03 CFU. While the mean difference between cotton mask with SHC and surgical mask was 1.10 CFU. Between cotton mask without SHC and surgical mask, the mean difference was 1.13.

Table 5. Mean Difference and One-way Analysis of Variances in the Droplet Dispersion of Masks

	Mean Difference (CFU)*			One-way ANOVA	
	Cotton mask with SHC	Cotton mask w/o SHC	Surgical mask	F (2,87)	Sig.
Cotton mask with SHC	-	-0.03	1.10		
Cotton mask w/o SHC	0.033	-	1.13	2.107	.128
Surgical mask	-1.10	-1.13	-		

$\alpha = 0.05$

CFU: colony-forming unit. CFU represents the number of bacteria-containing droplets that were able to pass through the fabrics of masks.

*Mask variable on the left column minus mask variable in the table heading. Negative value indicates that the mean of the first variable was higher the second variable, and vice versa for positive value.

Bacterial Adhesion

Bacterial adhesion of 27 cotton masks with SHC, 30 cotton masks without SHC, and 27 surgical masks were used for the computation and comparison of mean. As shown in Table 6, the mean bacterial adhesion of cotton masks with SHC was 2166.67 ± 1770.48 CFU/cm². Without SHC, the bacterial adhesion of cotton masks was 5666.67 ± 4315.84 CFU/cm². While on surgical masks, the bacterial adhesion was 1518.52 ± 1023.58 CFU/cm². The result also shows that two cotton masks with SHC and two surgical masks have no bacterial adhesion.

Table 6
Descriptive Statistics of the Bacterial Adhesion of Masks

	N	Mean (CFU/cm ²)	Std. Deviation	95% CI* for Mean		Min.	Max.
				Lower Bound	Upper Bound		
Cotton mask with SHC	27	2166.67	1770.48	1466.29	2867.05	.00	6500
Cotton mask w/o SHC	30	5666.67	4315.84	4055.10	7278.23	500	16500
Surgical mask	27	1518.52	1023.58	1113.60	1923.43	.00	3500

CFU: colony-forming unit. CFU/cm² represents the number of CFU bacteria present on the 1 cm² of fabric obtained from the fabric of each mask.

CI: Confidence interval

As shown in Table 7, the difference in the bacterial adhesion among the three masks was statistically significant ($p < 0.001$), hence, the null hypothesis was rejected. Games-Howell post hoc test (Table 8) revealed that the bacterial adhesion of cotton mask with SHC was significantly different from cotton mask without SHC ($p < 0.001$). The mean difference between cotton mask with SHC and cotton masks without SHC was 3500 CFU/cm². In contrast, the bacterial adhesion of cotton masks with SHC was not significantly different from the bacterial adhesion of surgical masks ($p = 0.238$). Between cotton mask without SHC and surgical mask, the mean difference was 4148.15, which was statistically significant ($p < 0.001$).

Table 7. *Welch's Analysis of Variances in Bacterial Adhesion of Masks*

	Statistic	df1	df2	Sig.
Welch	13.387	2	46.927	.000

$\alpha = 0.05$

Table 8. *Games-Howell Post Hoc Analysis of Bacterial Adhesion of Masks*

(I) Type of mask	(J) Type of mask	Mean Difference (I-J) (CFU/cm ²) ^a	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Cotton mask with SHC	Cotton mask w/o SHC	-3500.00	858.47	.001	-5590.83	-1409.17
	Surgical mask	648.15	393.58	.238	-308.35	1604.64
Cotton mask w/o SHC	Cotton mask with SHC	3500.00*	858.47	.001	1409.17	5590.83
	Surgical mask	4148.15*	812.21	.000	2154.00	6142.30
Surgical mask	Cotton mask with SHC	-648.15	393.58	.238	-1604.64	308.35
	Cotton mask w/o SHC	-4148.15*	812.21	.000	-6142.30	-2154.00

CFU: Colony-forming unit. CFU/cm² represents the number of CFU bacteria present on the 1 cm² of fabric obtained from the fabric of each mask.

*Mean difference is significant at 0.05 level.

Discussion

According to WHO (2020a), hydrophobicity of the external surface of mask is necessary to limit the contamination from the external environment of the wearer. In this study, the result of the experiment shows that the application of SHC on the external surface of cotton mask reduces the water uptake indicating hydrophobicity. As shown in Figure 12, only visible water droplets and slight wetting on the watered part were observed on the surface of cotton mask fabric with SHC. Similar observations are noted on the surgical mask, but with smaller and rounder droplets. In contrast, the cotton mask fabric without SHC soaked in water formed no droplets on the surface, indicating complete absorption.

The result of this study implies that the addition of SHC on the cotton mask fabric improved its ability to repel water and reduce its water uptake. Moreover, even though the result was statistically significant, the difference between coated cotton mask and surgical mask was lower than the difference between coated and uncoated cotton masks, supporting the efficacy of SHC against water uptake. Among the three masks, surgical mask showed the lowest water uptake probably because it was made of polypropylene fabric, (Indoplas, Philippines) a material that do not easily wet because of its nature as a plastic-based material. This was also the observation of Aydin et al. (2020) when they determined the ability of surgical mask and home-made masks to block droplets.

On the other hand, the hydrophobicity of the coated cotton mask fabrics in this study was attributed to the acrylic nanoparticles in the superhydrophobic solution (Rust-Oleum, USA). It was explained by Ahmad et al. (2018) in their study that the presence of nanoparticles on the surface of the fabric may trap the water droplets, increasing the contact angle with fabric surface to around 160°, and preventing water absorption.



Figure 12. *Samples of Mask Fabrics Before and After Water Exposure*
Note. (A) Cotton mask fabric with SHC. (B) Cotton mask fabric without SHC.
(C) Surgical mask.

Similar observation was also in the findings of Melayil and Mitra (2021). In their study, imaging technology and geometrical observation were used to determine the interaction of water droplets on the surface of surgical mask with and without SHC. They found that SHC further reduce the wettability of mask surface, which is similar to the result of this experiment but on cotton mask. However, they also concluded that with SHC, smaller daughter droplets may form on impact which may contribute to the potential spread of microorganisms. Nonetheless, as stated by Melayil and Mitra, the degree on which the mask is stretched and the way the mask is positioned are considerable factors that may cause the formation of daughter droplets.

Furthermore, Melayil and Mitra observed that fibers sticking out of the uncoated mask fabrics may pin water droplets causing a stronger adhesion to the fabric surface. This feature may also be present in both cotton mask with and without SHC and surgical mask, but the plastic composition of the surgical mask gave it a slight advantage on water repellency. They also found that with the application of SHC on surgical mask, the surface of the mask may become flatter, thus, reducing the adhesion force of droplets on the mask surface. Similar result may also be observed on cotton masks coated with SHC. Other than that, in the surgical masks of this study, as well as with other plastic-based surgical masks, the hydrophobicity was applied on both sides of the fabric and of the mask, which further prevents the absorption of water. In contrast, in the cotton masks with SHC in this study, the hydrophobic solution was applied only on one side of the fabric, allowing the uncoated side to absorb water when exposed.

Nevertheless, after the application of SHC, the difference in the water uptake between cotton mask and surgical mask was still reduced from 105.88% to 3.19%, and the analysis shows that it can be further reduced to 1.97%. Without SHC, the difference in the water uptake of cotton mask and surgical mask can only go as low as 100.34%. This may imply that with SHC, repellency of cotton mask against water-based droplets was almost comparable to the efficacy of surgical mask.

The result of the droplet dispersion experiment showed otherwise. No significant difference was observed among the three groups of masks, implying that SHC did not affect the efficacy of cotton mask against dispersed droplets. Moreover, the mean difference between each group was only about one CFU. However, this result may also imply that regardless of the hydrophobicity of the external surface of the mask, the efficacy of cotton mask to prevent droplet dispersion was almost comparable to surgical mask. Furthermore, there are samples in each group of masks that resulted to zero droplet dispersion, which may imply maximum blocking of the dispersed droplets.

The study of Davies et al. (2013) showed a similar result wherein both cotton mask and surgical mask were able to prevent dispersal of droplets to a certain degree, with surgical mask performing better. In their study, however, the measurement of droplet dispersion was performed with actual volunteers coughing through a mask. Moreover, the cotton masks that they tested did not have hydrophobic external surfaces and the number of layers of the cotton masks were not mentioned in their paper, but it was stated that the masks were constructed based on the design of surgical masks. In this study, droplets were sprayed on to the masks using a spray bottle and the cotton masks have two layers.

Recent studies have also concluded that the efficacy of cloth masks to block droplets depends on the type of fabric and number of layers (Aydin et al., 2020; Ho et al., 2020; Rodriguez-Palacios et al., 2020a). In addition, the weaving pattern and the thread count of the fabric may also contribute to the blocking efficacy of the masks. In the abovementioned studies, the researchers have concluded that masks made of 100% cotton fabric can be a good substitute for surgical mask. Cotton masks with two or more layers can block up to more than 90% of macro-droplets. Moreover, in the experiments of Aydin et al. and Rodriguez-Palacios et al., it was determined that fabrics with more than 100 thread counts per inch are more effective in droplet blocking.

In the present study, the cotton masks were constructed with two layers of 100% cotton fabric that has a thread count of 115 per inch. While the surgical masks were made of three layers of nonwoven polypropylene fabrics. In comparison to the previous studies, the result of the droplet dispersion of cotton mask in this study can be attributed to the fabrication of the mask. According to Aydin et al. (2020), mask with two layers of fabrics is effective in blocking droplets because the first layer of fabric reduces the speed of the droplets allowing the second layer to efficiently halt and block most of the droplets.

Aydin et al. (2020) were also able to determine that both hydrophilicity and hydrophobicity can affect the ability of the masks to block droplets. They were able to evaluate this by spraying water on both hydrophobic and hydrophilic surface of the mask and by observing the passage of droplets through the mask using high speed video. The result of their experiment shows that the hydrophilicity of the fabric allows the absorption of droplets by the mask, hence, reducing the number of droplets that may escape through the mask. In contrast, the hydrophobicity of the fabric was responsible for preventing larger water droplets to break in smaller droplet, thus, reducing the number of droplets that may pass through.

In this study, to simulate the ability of the mask to prevent dispersion of droplets ejected by the wearer, water was sprayed only on the inner surface of the cotton mask, which was the uncoated surface, and not the other way around. Ejected water droplets were caught first by the hydrophilic layer of the masks and the droplets that were able to escape the first layer were blocked by the uncoated surface of the coated layer. This means that the mechanism of droplet blocking by cotton masks with SHC exactly similar to cotton masks without SHC, which explains the closeness in the droplet dispersion result of both types of masks.

In contrast to cotton mask, the inner layer of surgical masks was also made of polypropylene material, which is a material that does not absorb water. Furthermore, the surgical masks have a third middle layer that functions as a filter. The hydrophobicity of the inner layer and number of layers of the surgical masks were the probable reason for its lower droplet dispersion result. Nonetheless, the difference among three types of masks was not statistically nor practically significant.

In bacterial adhesion experiment, the result revealed that the addition of SHC on the surface of cotton mask fabric improved its efficacy against bacterial adhesion. This result supports the findings of Zhang et al. (2013) in their literature review. In their review, it was explained how bacteria adhered to surfaces and how hydrophobicity and hydrophilicity contributed to bacterial adhesion. Surfaces with a contact angle of 40-70°, which indicate moderate hydrophilicity, effectively induces bacterial adhesion. In contrast, the number of bacteria adhered to superhydrophobic surfaces was considerably reduced. Similar observations were determined in the present study. Masks with hydrophobic surface, i.e., cotton masks with SHC and surgical masks, showed a lower number of adhered bacteria than masks with no hydrophobic surface.

Zhang et al. (2013) also mentioned that the bacteria on superhydrophobic surfaces are scattered while on hydrophilic surfaces, the bacteria are clumped together. This is probably due to formation of smaller droplets when a larger droplet impacts on a hydrophobic surface (Aydin et al., 2020). The formation of smaller droplets may also scatter and spread microorganisms present in the droplets, which, according to Aydin et al., may increase the risk of disease transmission.

In the experiment of Melayil and Mitra (2020), it was also explained that the difference in the bacterial adhesion of the two types of surfaces was caused by the interaction of the droplets, which carried the bacteria, to the surfaces. They found that the hydrophobicity of the mask fabric may influence the bacterial adhesion. They were able to determine the adhesion property of masks by manually attaching and detaching a water droplet on the surface of the mask using a cantilever system and imaging method. Afterwards, the adhesion force generated by the mechanism was calculated. The result of their experiment revealed that the adhesion force was lesser in masks coated with SHC, which means better droplet repellency. They mentioned that the droplet repellency of superhydrophobic surface was caused by a flatter surface and increased contact angle.

Melayil and Mitra (2020) also found that, in contrast to masks with SHC, uncoated masks produced stronger adhesion force. The fibers sticking out of the fabric caused the droplet to be pinned on the surface preventing the detachment of the droplet. They also found that droplets laden with bacteria adhered more to the surface compared to pure water droplet. In their study, however, adhesion was only tested on surgical mask.

In this study, bacterial adhesion was tested on both cotton masks and surgical masks, and SHC was only sprayed on cotton masks. The result of this experiment revealed that a number of bacteria remained adhered on all three types of masks. Given that the water uptake rate of all three types of masks increased after water exposure, possible retention of bacteria carried by water droplets on the surface of the masks was to be expected. Moreover, as water uptake rate differs among the three groups, difference in the bacterial adhesion among the three groups of masks was also observed. This result implies that as long as masks can come in contact with water-based droplets, bacteria may contaminate and adhere on the surface of the mask. However, with the addition of the SHC, the number of bacteria that may adhere may be reduced.

As shown in the result, the number of adhered bacteria on cotton mask may be reduced from 5666.67 CFU/cm² to 2166.67 CFU/cm², which is around 61.76% reduction, when it is coated with SHC. Moreover, with SHC, the efficacy of cotton mask in preventing bacterial adhesion was brought closer to the efficacy of surgical mask.

Just like other garments, mask is always exposed to external sources of contamination, especially water droplets that may carry microorganisms. Unlike other garments, however, mask may pose higher risk to the wearer because it is worn closer to the portal entry of infection, i.e., eyes, nose, and mouth, and because of the frequent touching of the worn mask (Liu et al., 2019).

It was already proven that cotton mask that was constructed correctly has a filtration efficacy that is close to surgical mask (Aydin et al., 2020; Rodriguez-Palacios et al., 2020a). It may reduce the number of droplets that may be expelled by the wearer. Hence, it was recommended to be used by the public as a substitute for surgical masks (WHO, 2020b). However, the result of this study revealed that in other factors, ordinary cotton masks may perform significantly (at $p < 0.05$) lower than surgical masks and cotton masks coated with superhydrophobic material. Cotton masks without superhydrophobic coating may still pose a risk especially when it comes to water-based droplets and to microorganisms that may be absorbed by and adhere to the mask, respectively.

Recent studies have shown that proper wearing of mask could have prevented numerous COVID-19 cases in Italy and New York, USA (Zhang et al., 2020) and that non-wearing of mask was considered a predictor of COVID-19 mortality (Miyazawa, 2021). Moreover, in a study conducted among the poor section in the Philippines (Lau et al., 2020), around 89.5% of 2,090 respondents know that COVID-19 can be transmitted by coughing and sneezing but most (around 51%) did not know that masks can protect themselves from COVID-19 and around 70.8% did not wear mask against COVID-19. These studies imply that information about mask is not well-disseminated especially among the poor population. The public must be informed about and be provided with a readily available alternative to surgical masks that may provide a comparable efficacy against water-based droplets that may contain microorganisms.

It is true that health organizations already recommend wearing a mask with hydrophobic external layer (WHO, 2020b). However, masks with such features are usually made of hydrophobic fabrics, wherein superhydrophobic coating was applied before the fabrication of the masks. These pre-coated masks are usually disposable, and when reusable, the hydrophobicity of the mask is removed during laundering. In the present study, the SHC was applied by the researcher to tailor-made masks made of cotton fabrics bought from a local fabric store. The method used in this study to fabricate cotton masks with SHC can be used by the population, especially those in areas with low supply of surgical masks and manufactured cloth masks, to create an alternative mask with efficacy against water-based droplets and microorganisms comparable to surgical masks.

Conclusion

Superhydrophobic coating can improve the efficacy of cotton masks against water uptake and bacterial adhesion. Against droplets sprayed on the internal surface of the masks, coating the external surface may not prevent the dispersion of droplets. Nonetheless, when coated with superhydrophobic material, cotton mask can provide protective efficacy to the community that is almost similar to surgical mask. Furthermore, results of this study showed that a cotton mask, when coated with SHC, may not only reduce the number of bacteria that may escape from the mask but may also prevent the entry of water-base droplets and the microorganisms they contain through the mask.

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Knowledge, Attitudes, and Practices on Oral Health of Children Living in Alternative Care (CLIAC) Ages 6-12 Years Old: A Basis for Dental Health Program

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Abstract

Oral diseases continue to be a serious public health problem in the Philippines, especially Children Living in Alternative Care (CLIAC). This study aims to determine the knowledge, attitudes, and practices on Oral Health of CLIAC ages 6-12 years old as a basis for a dental health program. A descriptive quantitative study was conducted at an institution in Batangas among 38 respondents. Questionnaires were used to collect data which were encoded in SPSS software to generate the mean scores for each of the given questions and their standard deviation. The study found that the CLIAC have high knowledge on oral health but showed *poor* results on replacing toothbrushes, and tooth brushing pressure. The CLIAC have a *neutral* attitude on oral health but showed a negative attitude towards the taste of the toothpaste, perspective towards the dentist, and the effects of nutrition and diet on oral health. The CLIAC have a *fair* practice towards oral health as evidenced by their good practice in performing oral hygiene, nutrition, and diet; fair practices on mouthwash, dental visits, sweet and soft drinks consumption; and *poor* practices on flossing. A dental health program was developed based on the results of this study for these CLIAC. The aim of the program was to maintain and enrich knowledge, enhance attitude, and improve practices on oral health. It is recommended that the same program should be tested for its effectivity in increasing the CLIAC's knowledge, attitude, and practices towards their oral health.

Keywords: *public health, dental health program, children living in alternative care, alternative care, oral health*

Oral health is essential to the general health and well-being of all children and adults. In the Philippines, oral diseases continue to be a serious public health problem that affects their general health, although it is preventable (Monse, et al., 2012). The oral health status of children is in an alarming state, especially among underprivileged groups, in both developed and developing countries. One known high-risk group are known high risk group is known as Children Living in Alternative Care (CLIAC) (Khedekar et al., 2015).

A report stated that orphans or CLIAC is a child under 18 years old who has lost one or both parents to any cause of death. They said nearly 140 million CLIAC globally, including 61 million in Asia. Of the almost 140 million children classified as orphans, 15.1 million have lost both parents and that 95 percent of all orphans are over the age of five (DeLuca, 2019).

About 1.8 million children in the Philippines or more than 1% of its entire population, are abandoned or neglected (Kaiman & De Leon, 2016). A report stated that dental caries and gum diseases affect almost every Filipino in their lifetime, although it is preventable. And its prevalence in dental caries of primary teeth is about 96.8% and 39.7% in permanent teeth (Monse, et al., 2012). In primary dentition ages 7-11 years, the dental caries prevalence was 25.2% (Shah, et al., 2016).

Oral health is the primary concern for the CLIAC. Their oral health status is affected due to their environment, inadequate staffs and dental workforce, financial constraints, lack of oral health knowledge and bad oral habits (Kong, et al., 2017). Oral health education at the right age can help CLIAC develop a healthy oral hygiene practice which will benefit them for lifelong. Implementing good oral health and supervising the CLIAC is an excellent foundation to improve and maintain their oral health. Awareness-raising of the children towards oral hygiene through simple and cost-effective measures will improve their oral health status. (Khedekar, et al., 2015). One of the key factors for oral disease prevention is good oral hygiene. It is better to understand through motivation, practical skills development and involvement of parents. However, CLIAC do not get appropriate information due to absence of parent's guidance (Markeviciute & Narbutaite, 2015).

According to Piaget, the ages between 6-12 years old are in concrete operations, the third major developmental stage of cognition. In this phase, there are numerous sophisticated changes in mental abilities. Mental representations of actions become a part of the cognitive abilities of the child during these years. Also, they grow up cognitively and by the age of 12 years, mind and mental capability have matured and abstract information can be comprehended (Casamassimo, et al., 2013)

In Pakistan, a study conducted about the impact of Multimedia-aided Teaching (MAT) on students' academic achievement and attitude at the elementary level. In this method, the teaching and learning process changed. The lessons became more practical, and comprehended better. The interactive nature of MAT enables teachers to control the content and flow of information. Instead of being passive learners, participants became active in the teaching and learning process. It is more effective for the development of cognitive and attitude of the students than the traditional teaching. The use of the advance technology makes the lessons attractive and effective. (Shah & Khan, 2015).

A study in the Philippines about oral health program planning and evaluation in International Children's Care Orphanage: for pre-test and post-test data, the researcher used OHI-s to record their oral health status and to evaluate the effectiveness of the oral health program. There is a significant difference in the baseline and end-line results after implementing the program. This concludes that the implementation of oral health program is effective because the OHI-s results of the orphans decrease after the program. The researcher stated that having a dental program in an orphanage is highly recommended to avoid having dental problems in the future. It may also promote good overall health and help the institution to save on extra expenses (Gabutero, 2015).

The conducted study at SOS Village Lipa, Batangas determined the extent of knowledge, attitudes and practices on oral health of CLIAC ages 6-12 years old to have a basis for a dental health program since there are no studies found on oral health of CLIAC in the Philippines. They

also developed a dental manual and educational videos about oral health as an outcome of the study and was given to the CLIAC ages 6-12 years old. This study aimed to determine the extent of knowledge, attitudes, and practices on the oral health of CLIAC ages 6-12 years old at SOS Village Lipa, Batangas to have a basis for a dental health program.

This study determined the extent of knowledge, attitudes, and practices on the oral health of CLIAC ages 6-12 years old at SOS Village Lipa, Batangas, with no disabilities. There are a total of 38 respondents participated in this study.

The findings of this survey were limited to specific institutions chosen for the study and within the given age range and was a basis for a dental health program. Due to the Covid-19 Pandemic, the data gathering was online or sending a hard copy of the materials to the institution depending on the institution's preference. Face-to-face interaction with the respondents, especially their age range, is at high risk vulnerable.

Methods

A descriptive quantitative study was conducted in this study among 38 respondents. Purposive sampling was used for the selection of the orphanage to conduct the study. Frequency distribution and cumulative percentage were used to determine the extent of the CLIAC's knowledge on oral health and their demographics profile. Meanwhile, mean, mode, and standard deviation were used to determine the extent of the CLIAC's attitudes and practices on oral health. The study participants are the CLIAC ages 6-12 years old residing at SOS Village Lipa, Batangas.

This study only included those boys and girls CLIAC ages 6-12 years old with no disabilities and ongoing treatment or application of dental appliances (orthodontics and prosthesis) at SOS Village, Lipa, Batangas. Those institutions that have a dental health program that was conducted before, presence of dental services, affected by Taal explosion and exposed by Covid-19 Pandemic were excluded.

The chosen Institution was given an endorsement letter by the Dean of the College of Dentistry Adventist University of the Philippines before participating in this study and acknowledged it. The Administrator of the SOS Village, Lipa, Batangas, and the CLIAC signed the informed assent before participating in this study. The chosen CLIAC were participated voluntarily and not forced to answer the questionnaires. The forms were kept in a sealed envelope by one of the researchers. The College approved the study protocol of the Dentistry and Ethics Review Board of Adventist University of the Philippines. All data collected in this research were presented in summary form. The information of the participants, especially their names, was only known by the researchers and statisticians to protect the participants' identities.

Survey questionnaires were used in this study to determine the demographic profile of the respondents and their knowledge, attitudes and practices on oral health. The questionnaires were delivered to the institution, and caretakers supervised the children in answering them. The forms were gathered and were encoded in SPSS software to generate statistical results for the data analysis.

The questionnaires underwent a pilot study to determine the reliability coefficient since it was adapted to a study with different populations. Ethical consideration, inclusion, and exclusion criteria were also considered to participants. The Institution chose to have the survey online due to the restrictions of the Covid-19 Pandemic. The results were analyzed by a statistician using Alpha Cronbach.

Close-ended questionnaires were distributed to the CLIAC, which assessed the extent of their knowledge, attitudes, and practices on oral health. The questions were based on the CLIAC problems towards dental caries, oral hygiene, oral health, nutrition and diet, and perception on the dentist. The researchers adapted the questions from different studies and modified them to the CLIAC needs (Virgines, 2004) (Senior Class, 2015) (Community Dentistry Class, 2014) (Shanbhog, et al., 2013).

The Adventist University of the Philippines Research center validated and approved the questionnaire, registered statistician, 4 dentists, 4 laypeople and Ethics Review Board. It was translated to Filipino by a Filipino professor from the University's Language Department to understand children better. It was also Back translated to English by a professor to determine the consistency of the questionnaire and there were no deviations from the original version.

The questionnaires have three parts, and the first part was about their knowledge on oral health that was answerable by true or false. There were positive and negative questions. When the question is positive the answer must be 'True,' and if the question is negative, the answer must be 'False'.

Table 1 shows the scoring system used for the knowledge on oral health of CLIAC's answer on the questionnaire based on the statistician. It means that if the CLIAC have correct answer the score was '1', meanwhile, if they have wrong answer the score was '0'.

Table 1. *Knowledge on oral health scoring system*

Scoring	Answer
0	Wrong Answer
1	Correct Answer

Figure 1 shows that the total patient's knowledge score was divided by the total maximum knowledge score, and it was multiplied by 100 to determine the percentage of each CLIAC. Meanwhile, it was computed using frequency distribution and cumulative percentage to determine the overall results of each question and overall results of CLIAC's knowledge extent on oral health.

$$\frac{\text{Total Knowledge Level}}{\text{Total Patient's knowledge score}} \times 100\%$$

$$\frac{\text{Total max. Knowledge score}}{\text{Total max. Knowledge score}} \times 100\%$$

Example:

$$\frac{8}{12} = 0.67 \times 100 = 67\%$$

Figure 1. Computation for the total knowledge on oral health level

In Table 2, if the result is within 0-50%, the CLIAC ages 6-12 years old have poor knowledge of oral health. It means that the extent of their knowledge on oral health is lacking and therefore needs complex lecture for them to have basic knowledge on oral health. If the result is within 51-70%, the CLIAC has an intermediate level of knowledge on oral health; it means that they have basic knowledge on oral health but need to be broadened. Meanwhile, suppose the result is within 71-100%. In that case, the CLIAC have good/high level extent of knowledge on oral health which means that they know the basic knowledge on oral health and therefore need to maintain and enrich their basic knowledge on oral health (Yusof, et al., 2014).

Table 2. *Extent of knowledge on oral health (Interpretation of mean percentage)*

Classification	Mean Percentage
Poor level extent of Knowledge on Oral Health	0-50%
Intermediate level extent of Knowledge on Oral Health	51-70%
Good/ High level extent of Knowledge on Oral Health	71-100%

The second part was about their oral health attitudes that were answerable by Strongly Agree, Neither Agree nor Disagree, and Strongly Disagree. There were positive and negative questions. When the question is positive the answer must be 'Strongly Agree,' and if the question is negative the answer must be 'Strongly Disagree'.

Table 3 shows the scoring system used for the attitudes on the oral health of CLIAC's answer on the questionnaire based on the statistician. It means that if the CLIAC answered 'Strongly Agree', the score was '3'. If they answered 'Neither Agree nor Disagree,' the score was '2'. Meanwhile, if they answered 'Strongly Disagree', the score was '1'. It was analyzed using mean, mode, and standard deviation to determine the extent of CLIAC's attitudes on oral health.

Table 3. *Attitudes on oral health scoring system*

Scale of Response	Score
Strongly Agree	3
Neither Agree nor Disagree	2
Strongly Disagree	1

In Table 4, if the result is within 1.00-2.33, the CLIAC has a low/negative attitude on oral health and needs to be changed. If the result is within 2.34-3.66, the CLIAC have average/neutral extent of attitude on oral health and need enhancement. Meanwhile, If the result is within 3.67-5.00, the CLIAC has a high/positive extent of attitude on oral health, which needs to be maintained (Pallant, 2001).

Table 4. *Extent of attitude on oral health (Interpretation of mean score)*

Interpretation	Mean Score
Low/Negative	1.00 to 2.33
Average/Neutral	2.34 to 3.66
High/Positive	3.67 to 5.00

And the last part was about their practices on oral health and all of the questions were positive that can be answerable by always, sometimes and never.

Table 5 shows the scoring system used for the practices on oral health of CLIAC's answer on the questionnaire based on the statistician. It means that if the CLIAC answered 'Always', the score was '3'. If they answered 'Sometimes', the score was '2'. Meanwhile, if they answered 'Never', the score was '1'. It was analyzed using mean, mode, and standard deviation to determine the extent of CLIAC's practices on oral health.

Table 5. *Practices on oral health scoring system*

Scale of Response	Score
Always	3
Sometimes	2
Never	1

In Table 6, if the result is within 1-1.66, the CLIAC has poor extent of oral health practices, which means that they lack practices on oral health and need to develop the proper oral practice. If the result is within 1.67-2.33, the CLIAC has a fair extent of oral health practices, which means that they perform oral health practice but still need improvement. If the result is within 2.34-3, the CLIAC have a good extent of practices on oral health which means that they perform proper oral health practice and only need maintenance and enhancement (Sa'a, 2012).

Table 6. *Extent of practices on oral health (Interpretation of mean score)*

Scale of Response	Mean Score	Verbal Interpretation
Never	1.00 to 1.66	Poor
Sometimes	1.67 to 2.33	Fair
Always	2.34 to 3.00	Good

Table 7 it shows the interpretation of the Alpha Cronbach Value. Wherein 0.911.00 was excellent, 0.81-0.90 was good, 0.71-0.80 was good and acceptable, 0.61-0.70 was acceptable, and 0.001-0.60 was non-acceptable.

Table 7. *The alpha cronbach value (Konting, Kamaruddin, & Man, 2009)*

Alpha Cronbach Value	Interpretation
0.91- 1.00	Excellent
0.81- 0.90	Good
0.71- 0.80	Good and Acceptable
0.61-0.70	Acceptable
0.01-0.60	Non acceptable

The appropriate dental health program for the CLIAC ages 6-12 years was based on their knowledge, attitudes, and practices on oral health. It is composed of dental health program manual with educational dental video to maintain and enrich their knowledge, enhance their perspectives and improve their practices on oral health. The dental health program entitled 'Road to Healthy Smile' was a detailed basic lecture with activities which is comprised of 5 topics; the importance of primary and permanent teeth, dental caries, nutrition and diet, oral hygiene, and dentist on oral health. This program is the resolution for the questions on the questionnaires, specifically with questions that have poor results. The dental health program manual and educational dental video were developed and edited by the researchers and approved by the researcher's adviser and panel members.

Results

Table 8 shows that only 7 of the respondents chose the wrong answer, meanwhile, 31 of them answered correctly. Which means that 81.6% of CLIAC's knowledge towards the brushing of teeth for two minutes showed a good result and that they have good/high knowledge level extent on oral health based on the interpretation in Table 2.

Table 8. *Brushing of teeth should be 2 minutes.*

K1			
Answer	Frequency	Percent	Verbal Interpretation
Wrong	7	18.4	Good/
Correct	31	81.6	High
Total	38	100.0	Level Extent

This question is a negative question so it means that they must answer 'No'. In Table 9, it shows that 31 answered correctly and only 7 had it wrong. This means that 81.6% of them know that tooth brushing must not be at least once a day to keep their teeth healthy. In agreement, a study conducted in Mysore, India, 71.1% knows the importance of brushing to prevent dental caries (Raju, et al., 2014). This result shows good/high-level extent of knowledge-based from the interpretation in Table 2, which means that the CLIAC knows the basic knowledge on oral health and needs to maintain and enrich more for further learning.

Table 9. *Brushing of teeth once a day is enough to keep the teeth healthy.*

K2			
Answer	Frequency	Percent	Verbal Interpretation
Wrong	7	18.4	Good/
Correct	31	81.6	High
Total	38	100.0	Level Extent

Table 10 shows that 34 out of 38 answered correctly in using a toothpaste with fluoride when tooth brushing to help strengthen the teeth. With a percentage of 89.5, it means that they have good results compared to other studies that have poor knowledge of it, which is 96.7% of their CLIAC are unaware of fluoride, content of toothpaste, and its benefits teeth (Raju, et al., 2014). The interpretation of knowledge level extent in Table 2 shows that the CLIAC's in this present study have good/high level extent of knowledge on it and only need their basic knowledge to be maintained and enriched.

Table 10. *Using of toothpaste with fluoride strengthens the teeth.*

K3			
Answer	Frequency	Percent	Verbal Interpretation
Wrong	4	10.5	Good/
Correct	34	89.5	High Level
Total	38	100.0	Extent

This question is a negative question so it means that they must answer 'No'. Table 11 shows that only 15 out of 38 answered correctly on the proper time of replacing toothbrush. Based from the interpretation in Table 2, 60.5% belong to poor level extent of knowledge on oral health. This means that the CLIAC's in this current study lack the knowledge on the replacement of toothbrush and needs a complex lecture on it.

Table 11. *Toothbrush should be replaced every 2 years.*

K4			
Answer	Frequency	Percent	Verbal Interpretation
Wrong	23	60.5	Poor
Correct	15	39.5	Level
Total	38	100.0	Extent

In Table 12 showed that all of the respondents chose the correct answer in including the tongue when tooth brushing, which means that 100% of CLIAC have good/high-level extent of knowledge towards the proper way of brushing the teeth. Based on Table 2, they have high knowledge about the basic learnings for knowledge on oral health but still need to be maintained and enriched with more learnings.

Table 12. *The tongue should be included when toothbrushing*

K5			
Answer	Frequency	Percent	Verbal Interpretation
Correct	38	100.0	Good/High Level Extent

This question is a negative question so it means that they must answer 'No'. In Table 13, it shows that 21 out of 38 answered correctly. This means that 55.3% know the importance of regular dental visits

and not only when in pain. This means that the CLIAC has the intermediate level of knowledge on it and their basic knowledge needs enhancement. This result is higher compared to a study in India that majority of school going CLIAC felt the need to visit the dentist, however, 53% of them avoided due to fear of pain. And only a few CLIAC had visited a dentist for their oral health problem (Hans, et al, 2014)

Table 13. *Only visit a Dentist when having a toothache*

K6			
Answer	Frequency	Percent	Verbal Interpretation
Wrong	17	44.7	Intermediate
Correct	21	55.3	Level
Total	38	100.0	Extent

Table 14 shows that only 2 of the respondents disagreed that the doctor who takes care of our teeth is called a dentist. This means that 94.7 % of CLIAC have high knowledge on it. CLIAC needs their knowledge to be maintained and needs enrichment to broaden their knowledge towards it, and this is based on Table 2.

Table 14. *A doctor who takes care of the teeth is called a Dentist*

K7			
Answer	Frequency	Percent	Verbal Interpretation
Wrong	2	5.3	Good/High
Correct	36	94.7	Level
Total	38	100.0	Extent

This question is a negative question so it means that they must answer 'No'. Table 15 showed that 31 among the 38 respondents disagreed that eating sweets like chocolates and candies are good for the teeth that showed a good level of knowledge. This means that 81.6% of the CLIAC are aware on the effects of sweets to the teeth, and their basic knowledge towards it needs to be maintained. This result is higher than the results of other studies, whereas only 44.13% of the population were aware that sweets and chocolates lead to dental caries (Zwiri, 2015).

Table 15. *Eating sweets like chocolate and candies are good for the teeth*

K8			
Answer	Frequency	Percent	Verbal Interpretation
Wrong	7	18.4	Good /High
Correct	31	81.6	Level
Total	38	100.0	Extent

In Table 16, all of the respondents chose the correct answer in drinking milk helps strengthen the bones and teeth which means that 100% of CLIAC have good/high level extent of knowledge based from the interpretation in Table 2, CLIAC needs to maintain their knowledge and is recommended to broaden their knowledge on oral health for enrichment (Yusof, et. al. 2014).

Table 16. *Drinking of milk helps strengthen the bone and teeth*

K9			
Answer	Frequency	Percent	Verbal Interpretation
Correct	38	100.0	Good/High Level Extent

In Table 17, 97.4% of CLIAC answered correctly which shows a good result. This means that they have good/high-level extent of knowledge towards the proper way of tooth brushing which they know that all of the teeth should be brushed and not only the front teeth. This result means that their knowledge of it needs to be maintained and enrich their knowledge on it.

Table 17. *Only front teeth should be brushed*

K10			
Answer	Frequency	Percent	Verbal Interpretation
Wrong	1	2.6	Good/High
Correct	37	97.4	Level
Total	38	100.0	Extent

In Table 18, 73.7% answered correctly that showed a good result on having the teeth checked by a dentist twice a year, which means that they know the importance of visiting the dentist for their oral health and it is necessary to have a regular dental checkup every six months. It means that they have a good/high-level extent of knowledge towards it and needs to be maintained and enriched.

Table 18. *Dental check-ups should be done twice a year*

K11			
Answer	Frequency	Percent	Verbal Interpretation
Wrong	10	26.3	Good/High
Correct	28	73.7	Level
Total	38	100.0	Extent

This question is a negative question so it means that they must answer 'No'. Table 19 shows that 78.9% of respondents chose the wrong answer, which showed a poor result. Based from the interpretation in Table 2, the CLIAC had the poor level extent of knowledge towards the hardness of tooth brushing which they pressed it hardly on the teeth. This means that they lack knowledge and needs to have basic learnings towards the oral health.

Table 19. *The toothbrush should be press hard against the teeth to make the teeth clean*

K12			
Answer	Frequency	Percent	Verbal Interpretation
Wrong	30	78.9	Poor
Correct	8	21.1	Level
Total	38	100.0	Extent

The overall mean percentage of the Knowledge on Oral Health of CLIAC ages 6- 12 years old shows that 76.3 % of the answers are correct and 23. 7% are wrong (Figure 2). Based on the interpretation of the extent of knowledge on oral health on Table 5, the CLIAC have good/high knowledge on oral health (Yusof et. al.,2014). A higher level of knowledge was shown among this CLIAC population as compared to previous studies wherein CLIAC have poor knowledge and no CLIAC were found in excellent knowledge category towards oral health (Patil & Dhandarghi, 2018) (Hans, et. al., 2014).

Although CLIAC have a good/high-level extent of their knowledge towards oral health, the researchers would still emphasize the questions where the CLIAC showed poor results, specifically on K4, which is when is the right time to replace the toothbrush and also K12 which is pressing the

toothbrush too hard while brushing. CLIAC have intermediate knowledge in K6 about visiting the Dentist not only when in pain which is needed to be improve.

Lack of knowledge of proper dental treatments leads to poor oral hygiene of the CLIAC (Kubota et. al.,2017). This means that compared to those aforementioned previous studies who have results of poor knowledge and where CLIAC needs more complex dental health programs (Patil & Dhandarghi, 2018) (Hans, et. al., 2014). CLIAC only requires to receive a dental health program that maintains and enriches their knowledge. Exposing them further to topics they previously learned will maintain their knowledge. Giving detailed lecture that discusses on the importance of tooth brushing, toothpaste with fluoride, dental visits, dental caries, nutrition and diet on oral health will enrich their knowledge.

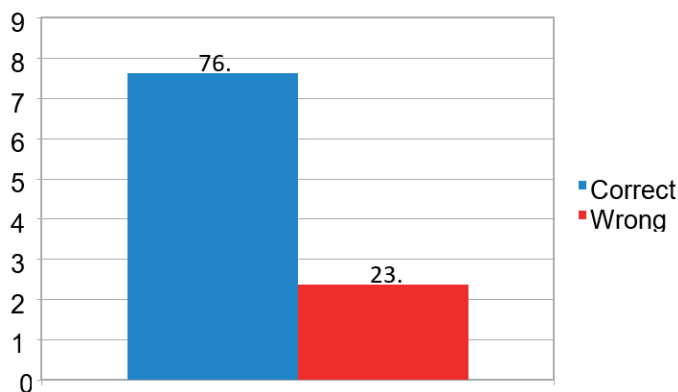


Figure 7. Overall results of the knowledge on oral health of CLIAC ages 6-12 years old

The tables below are the results relating to the research questions, “What is the extent of the knowledge on the oral health of CLIAC ages 6-12 years old at SOS Village Lipa, Batangas?”. The mean, standard deviation, and verbal interpretation for each question are presented.

Table 20 shows 38 respondents that 38 respondents participated in the assessment of the extent of attitudes on the oral health of CLIAC ages 6-12 years old. The interpretation of the mean score of their extent on attitudes on oral health was based on Table 4 (Pallant, 2001).

A1 was a question about CLIAC’s attitudes towards the taste of toothpaste that resulted to a mean score of 1.5789 which means they have a negative attitude towards it.

A2 was about CLIAC’s attitudes towards their frequency of toothbrushing per day that resulted to a mean score of 2.8947 which means they have an average/neutral attitude towards it. This result is lower than the results of other studies where 81.8% of their population know how to keep their oral cavity clean (Shanbhog R et. Al.,2013).

On CLIAC’s attitudes towards the importance of taking care of the teeth as much as taking care of the whole body in A3, it resulted to a mean score of 2.8947 which means they have an average/neutral attitude towards it. Most of them were afraid of the dentist (A4) with a mean score of 1.5263, which is a negative attitude. These results shows that even though they have good knowledge (K11 on Table 18) and practices (P6 on Table 22) on the importance of dental check-up and dentist on oral health, they still have negative attitudes towards it. This means that their attitudes towards it need to be changed by giving more complex lectures about dental visits and further encouragement to attend dental services.

Their attitudes towards dental visits, which they think that they will only visit the dentist if they are in pain (A5) resulted in a mean score of 2.0000, which means they have a negative attitude towards it. This result is lower than the results of another study, which stated that all children agreed that regular dental check-ups were necessary even in the absence of tooth pain. The children that attended dental services helped them maintain positive attitudes towards oral health (Kubota, et al., 2017).

CLIAC have average/neutral attitudes towards toothache in A6 that resulted in a mean score of 2.6842 and their attitudes towards drinking milk that helps to strengthen teeth in A7, resulting in a mean score of 2.8684.

Meanwhile, CLIAC has negative attitudes towards the effects of sweet consumptions like candies and chocolates in A8, resulting in a mean score of 1.3158. Also, their attitudes towards the effects of soft drinks on oral health in A9 resulted in a mean score of 1.3421. Lastly, their attitudes towards the effects of eating fruits and vegetables in A10 resulted in a mean score of 1.5526.

Table 20. *Results of the extent of attitudes on oral health*

	N	Mean	Std. Deviation	Verbal Interpretation
A1	38	1.5789	.82631	Negative
A2	38	2.8947	.45259	Average/ Neutral
A3	38	2.8947	.38831	Average/ Neutral
A4	38	1.5263	.76182	Negative
A5	38	2.0000	.95860	Negative
A6	38	2.6842	.61973	Average/ Neutral
A7	38	2.8684	.47483	Average/ Neutral
A8	38	1.3158	.57447	Negative
A9	38	1.3421	.62715	Negative
A10	38	1.5526	.79517	Negative

The overall results of the extent of attitudes on oral health of CLIAC ages 6-12 years old shows that the mean score is 2.6026 (Table 21). Based on the interpretation in Table 4, the CLIAC ages 6-12 years old has an average/neutral extent of attitudes on oral health. The overall mean score is lower compared to a in Phnom Penh, Cambodia, wherein most the children exhibited high-level attitudes. This study concluded that for the children to maintain positive attitudes toward oral health, they need to be expose to dental services. (Kubota, et al., 2017). However, another study showed poor results towards the attitude of the CLIAC toward oral health care. They concluded that information and guidance were needed to establish a good attitude towards oral health (Shanbhog, 2014).

Even though some research showed poor and high level of attitudes towards oral health, CLIAC in this current study is in average/neutral extent, which means that their attitudes need to be enhanced, especially those that resulted to a negative extent. Dental health programs that focused on those topics that resulted to a negative extent will be the resolution to enhance the extent of their attitudes on oral health to high/ positive.

A study concluded that even though oral hygiene habits, oral health awareness, and knowledge level is fair, attitudes of the children and caretakers need to be improved, and implementation of preventive programs are recommended. A study concluded that better knowledge in taking care of the teeth leads to positive attitude towards oral health. Appropriate oral health education helps cultivate oral health practices and attitudes (Zwiri, 2015).

Table 21. *Overall results of the extent of attitudes on oral health*

	N	Mean	Std. Deviation	Verbal Interpretation
Attitude	38	2.6026	.33490	Average/Neutral

The tables below are the results relating to the research questions, “What is the extent of the knowledge on the oral health of CLIAC ages 6-12 years old at SOS Village Lipa, Batangas?”. The mean, standard deviation and verbal interpretation for each question are presented.

Table 22 shows that 38 respondents participated on the assessment of the extent of the practices on the oral health of CLIAC age 6-12 years old. The interpretation of the mean score of their extent on attitudes on oral health was based on Table 6 (Sa'a, 2012).

CLIAC's practices towards brushing teeth at least two minutes (P1) resulted in a mean score of 2.3421, which means they have good practice.

The practice of CLIACs on the frequency of tooth brushing per day (P2) resulted to a mean score of 2.6842 which means they have a good practice. This result is higher than the study in a girl orphanage in Mexico City. They concluded that CLIAC have poor oral hygiene due to frequency of tooth brushing, which is once a day and only 17.3% clean their teeth (Camacho, et al., 2009).

CLIAC's practices towards the use of mouthwash (P3) have a mean score of 1.8158 which means they have a fair practice. This means it must be improved by giving a detailed dental lecture on the importance of mouthwash on oral health. And distribution of mouthwash to the CLIAC will help them familiarize the use of mouthwash, and supervision of the guardian is also needed for guidance.

The only poor practice result was about floss (P4), which the mean score is 1.5000. This current study has the same result as a study from Mysore, India that concluded that none of the children were aware of the effect of floss in preventing caries. The result of the study is below satisfactory and needs of further information towards proper oral health care (Raju, et al., 2014). With the result of the current study, there is a need for a detailed lecture on the importance of flossing to oral health and how to use floss properly.

In P5, which is about replacing toothbrushes at least every 3 months, the CLIAC's mean score is 2.7105 which means they have good practices on it. Even though they have a poor knowledge(K4 on Table 11) on it, they still replace their tooth brush every six months.

CLIAC also has a fair result on their practices about regular dental check-ups (P6), which has a mean score of 2.2632. The current study result is higher compared to another researcher which showed poor result. Their result is only 11.3% of children visited a dentist before and that only 1.6% had oral care instruction (Zwiri, 2015)(Arora, et al., 2018)(Raju, et al., 2014).

CLIAC's practices towards the regular intake of milk (P7) resulted in good practices with a mean score of 2.7105. This practice can be maintained and enhanced by a dental health program that will discuss proper nutrition and diet for oral health.

The P8 and P9, which is about sweet consumption even though it can cause cavities and drinking soft drinks can cause pain, CLIAC's have a fair practice result. The mean score was 1.9211 and 1.8421, respectively. These results was in line with a study in Phnom Penh, Cambodia wherein they suggested that controlling dietary habit helps in the prevention of dental caries (Kubota, et al., 2017). However, even though CLIAC have good knowledge on the effects of sweets on the oral health (K8 on Table 15), they still have a negative attitude (A8 and A9 on Table 20) and fair practice on it. This shows that their attitudes and practices must be improved by giving a dental health program that has a more detailed lecture on the importance of nutrition and diet on oral health. To prevent this, informing the institution with these results and by controlling CLIAC's dietary habits will help them prevent dental caries and improve their oral health.

In P10, the importance of regular intake of fruits and vegetables to oral health resulted in fair practices with a mean score of 2.8421. This result shows that even though they have good practices on it, they still have a negative attitude towards it. The enhancement can be given by a dental health program that discusses the importance of fruits and vegetables. And for the improvement and support, the CLIAC will be given dental kits with a toothbrush, toothpaste, mouthwash, and floss to practice their learnings.

Table 22. *Results of the extent of practices on oral health*

	N	Mean	Std. Deviation	Verbal Interpretation
P1	38	2.3421	.74530	Good
P2	38	2.6842	.57447	Good
P3	38	1.8158	.89610	Fair
P4	38	1.5000	.60404	Poor
P5	38	2.7105	.56511	Good
P6	38	2.2632	.64449	Fair
P7	38	2.7105	.51506	Good
P8	38	1.9211	.74911	Fair
P9	38	1.8421	.59395	Fair
P10	38	2.8421	.49464	Fair

The overall results of the Practices on Oral Health of CLIAC ages 6-12 years old shows that the mean score is 2.2632 (Table 23). Based on the interpretation, CLIAC has fair practices towards oral health (Sa'a, 2012), which is better than a study that showed CLIAC have poor oral hygiene and need of special care. As a result, it showed a high prevalence of dental caries, gingivitis and dental trauma among the children of orphanages (Hans et. al., 2014). This result indicates that even though the result of CLIAC on this current study is higher than the other study, their practices on oral health are still at a fair level, which means that they still need improvement. A previous study concluded that there is a need to increase knowledge to raise awareness of oral health and better oral hygiene practices (Markeviciute & Narbutaite, 2015). Giving a dental health program that has a detailed lecture about the importance of tooth brushing and toothpaste, nutrition and diet, dental visits, dentist, and the effects of dental caries on oral health can help raise their knowledge on oral health improve their practices on it. They must also have a return demonstration for the proper tooth brushing, flossing and use of mouthwash for them to be improved. Studies have proven that the right amount of education on dental hygiene can help the CLIAC have better oral health practices (Markeviciute & Narbutaite, 2015). The caretakers of the institution should also be provided with oral health education to improve their knowledge and practice levels so that they can influence the CLIAC on the importance of oral health (Kubota et. al., 2017).

Table 23. *Overall results of the extent of practices on oral health*

	N	Mean	Std. Deviation	Verbal Interpretation
Practices	38	2.2632	.23644	Fair

Dental Health Program

Based on the results interpreted and discussed, the appropriate dental health program to the CLIAC ages 6-12 years old is a detailed basic introductory lecture on oral health but focusing more on those topics with poor or negative results. Detailed basic lectures were comprised of 5 topics: the importance of primary and permanent teeth, oral hygiene, dentists, nutrition and diet and effects of dental caries on oral health.

Even though CLIAC resulted with a good/high-level extent of Knowledge on oral health, they still showed poor results on some questions. From these results, the appropriate dental health program emphasized focusing mainly on topics that showed poor results and was given lectures to fulfill their lack of basic knowledge towards it. Aside from the lecture, there were activities like role playing. Each respondent was given a worksheet containing word bank that helped them enjoy learning and helped enhance their level of extent on knowledge on oral health.

Moreover, for the extent of attitudes on oral health of CLIAC, the overall results show that they have average/ neutral extent, but 6 out of 10 questions have the negative extent of attitudes on oral health. This shows that their extent of attitudes on oral health needs to be enhanced, especially to those that resulted negatively. The appropriate dental health program was focused more on topics that have a negative result. Aside from the lecture, they watched an animated video adapted from YouTube that shows those negative attitudes. Moreover, they received reward monitoring with stickers for their oral hygiene and coloring food tracker for their nutrition and diet to enhance the extent of their attitudes towards oral health.

Lastly, for the extent of practices on oral health of CLIAC, the overall results show that they have a fair extent of practices on oral health. There was only one question that resulted to a poor extent of practices on oral health, which was about their practices on the use of floss. Even though they have a good extent of practice on half of the questions, 4 out of 10 questions resulted to a fair extent about their use of mouthwash, regular dental check-ups, sweet consumption, and drinking soft drinks. This shows that their extent of practices on oral health needs improvement, especially to topics with poor and fair results. Teaching CLIAC with a detailed basic lecture on practices on oral health and focusing more on topics with poor and fair results will improve their practices. Aside from the lecture on educational dental video, they watched an animated video regarding proper oral hygiene like proper tooth brushing technique, flossing, and a mouthwash made by one of the researchers.

The following are the activities; return demonstration of the proper oral hygiene, reward monitoring with stickers, coloring food tracker, and a role-playing activity to improve their level of extent on knowledge, attitudes, and practices on oral health. They received dental kits like toothbrushes, toothpaste, mouthwash, and floss for them to use in return demonstration to encourage them to practice their learning.

A dental health program was made to compromise the dental health program manual, dental educational videos, and pamphlet to be distributed to the CLIAC. Encouraging the CLIAC at the right age about their oral hygiene practices will benefit them for a lifetime (Khedekar, et al., 2015). The most effective way to improve children's oral health is by promotion (Sushanth, et al., 2011) (Vasanthakumari, et al., 2017). Various studies have shown that to improve both knowledge and overall oral health, repeated dental health education is needed (Sushanth, et al., 2011) (Hapsari, et al., 2017). There are also different learning styles for different students, and multimedia provides various learning styles (Gilakjani, 2012). Various study concluded that using a video to the awareness of oral health can make significant differences in the knowledge, attitudes, and practices on oral health of the community. It can enhance, dramatizes, and brings a sense of realism that can be a significant impact to today's generation (Shah, et al., 2016) (Nyirahabimana, 2015) (Sopianah, et al., 2017).

These results will be a resolution to this study. Proper education and instructional videos helped the extent of knowledge, attitudes, and practices on oral health of CLIAC ages 6-12 years old to be enhanced and improved. And also, by this dental health program, they were able to repeatedly watch the instructional videos and learn the importance of oral health without the need of face-to-face interaction of a dental practitioner.

Discussion

The results showed that all children got the correct answer in questions about brushing the tongue and the importance of drinking milk to the bone and teeth, which shows that they have good knowledge of it. They have good knowledge of the importance of fluoride in toothpaste which helps to make the teeth stronger, frequency of tooth brushing and its importance on oral health, effects of sweets such as chocolates and candies. They also have intermediate knowledge on visiting the dentist if they are in pain only, which is 55.3% of the population got the correct answer. Even though they have poor knowledge of replacing toothbrush every 3 months and the hardness

of brushing off replacing toothbrush every 3 months and the hardness of brushing the teeth, they still know that tooth brushing is important in our oral health daily lifestyle. The overall mean percentage of the Knowledge on Oral Health of CLIAC ages 6-12 years old shows that 76.3 % of the answers are correct and 23. 7% are wrong. Based on the Knowledge Level Scoring System, the CLIAC has a good/high level of knowledge on oral health. This means that compared to those studies who have poor knowledge and needs more complex dental health programs, this current study, whereas CLIAC got a good/high-level extent of knowledge on oral health will only need to be maintained by giving dental health program that talks about the topics they have already an idea about. To enrich their knowledge, this dental health program will also emphasize the topics where they showed poor results which they were given lectures to fulfill their lack of basic knowledge towards it. Aside from the lecture, there were activities like roleplaying. Each respondent was given a worksheet containing a word bank that helped them enjoy learning and helped enhance their level of extent on knowledge on oral health.

Furthermore, the extent of attitudes on the oral health of CLIAC shows that the overall results were average/ neutral extent, but 6 out of 10 questions have a negative extent of attitudes on oral health. CLIAC has a negative attitude on questions about the taste of toothpaste, being afraid to the dentist, dental visits when they are in pain only, and their perspective on the effects of nutrition and diet on oral health. Meanwhile, they have an average/neutral extent of attitudes towards the frequency of tooth brushing per day, importance of taking care of the teeth, afraid to have a toothache, and drinking milk to strengthen the teeth. This shows that their extent of attitudes on oral health needs to be enhanced, especially to those topics that resulted in negatives to be enhanced, especially those that negatively resulted. The appropriate dental health program comprised a detailed basic lecture on oral health but focused more on topics to a negative extent. Aside from the lecture, they watched an animated video adapted from YouTube that shows those negative attitudes. They also received reward monitoring with stickers for their oral hygiene and a colorful food tracker to enhance the extent of their attitudes towards oral health.

Lastly, for the extent of practices on the oral health of CLIAC, the overall results show that they have a fair extent of practices on oral health. There was only one question that resulted in a poor extent of practices on oral health, which was about their practices on the use of floss. Meanwhile, they have a good extent of practices on the frequency of toothbrushing, that toothbrushing needs to be for two minutes, replacing of toothbrush every three months, milk can strengthen the teeth, importance of fruits and vegetables to the teeth. Even though they have a good extent of practice on half of the questions, 4 out of 10 questions resulted to a fair extent about their use of mouthwash, regular dental check-ups, sweet consumption, and drinking soft drinks. This shows that their extent of practices on oral health needs improvement, especially to topics with poor and fair results. Teaching CLIAC with a detailed basic lecture on practices on oral health and focusing more on topics with poor and fair results will improve their practices. Aside from the lecture on educational dental video, they watched an animated video regarding proper oral hygiene like proper tooth brushing technique, flossing, and a mouthwash made by one of the researchers. Activities like return demonstration of the proper oral hygiene, received reward monitoring with stickers to monitor their oral hygiene practice, coloring food tracker to monitor their nutrition and diet practices, and a role-playing activity that improved their extent of practices on oral health. They were given dental kits like toothbrushes, toothpaste, mouthwash, and floss to use in return demonstration to encourage them to practice their learning.

Due to Covid-19 Pandemic, face-to-face interaction is prohibited, and therefore the dental health program cannot be explained directly. A dental health program manual, educational dental video, and pamphlet were made and to be distributed to the CLIAC. Moreover, through this dental health program, they were able to repeatedly watch the instructional videos and learn the importance of oral health without the need for face-to-face interaction with dental practitioners. These results will be a resolution that with proper education and instructional videos will help the extent of knowledge, attitudes, and practices on the oral health of CLIAC ages 6-12 years old to enhance and improve.

In conclusion, the oral health of the CLIAC ages 6-12 years at SOS Village Lipa, Batangas in terms of the extent of knowledge needs to be maintained and enriched. Maintenance of knowledge may be done by exposing them further to topics they already have an idea about. To enrich their knowledge, this dental health program will also emphasize the topics where they showed poor results, specifically on the hardness of brushing the teeth, replacing the toothbrush every 3 months, and visiting the dentist only when in pain. Giving them more complex lectures specifically focusing on these three topics enhanced their lack of basic knowledge on oral health. Aside from the lecture, there were activities like role-playing. Each respondent was given a worksheet containing a word bank that helped them enjoy learning and helped improve their level of extent on knowledge on oral health.

Moreover, their extent of attitudes needs to be enhanced. Giving oral health education that talks about the importance of tooth brushing, toothpaste with fluoride, dental visits, dental caries, nutrition, and diet on oral health are ways to improve their attitudes towards oral health, but it is essential to focus more on topics with low/negative extent of attitudes which are about the taste of the toothpaste, importance of dental visits and their perspective on the effects of nutrition and diet on oral health. Aside from the lecture, they watched an animated video adapted from YouTube that shows those negative attitudes. In addition, they received reward monitoring for their oral hygiene and coloring food tracker for their nutrition and diet to enhance the extent of their attitudes towards oral health. Guidance of the caretakers is important, and encouragement encouraging the CLIAC on their oral health is needed to create an awareness that helps establish a positive attitude towards their oral health.

Furthermore, their practices need to be improved. Aside from the lecture on educational dental video, they watched an animated video regarding the proper oral hygiene like proper tooth brushing technique, flossing, and a mouthwash made by one of the researchers. There were also activities like return demonstration of the proper oral hygiene, received reward monitoring with stickers to monitor their oral hygiene practice, coloring food tracker to monitor their nutrition and diet practices and a role-playing activity that improved their extent of practices on oral health. They were given dental kits like toothbrushes, toothpaste, mouthwash, and floss to use in return demonstration to encourage them to practice their learning.

Together with the involvement of their caretakers and the institution's managers, this may be done through the increase in the level of knowledge and improvement of attitude that leads better oral hygiene practices and improvement of the management system.

A dental health program is highly recommended and should be appropriately made and designed for the SOS Village Lipa, Batangas. Good educational and instructional videos that they may repeatedly watch will help CLIAC's extent of knowledge, attitudes, and practices on overall oral health be improved, especially during the COVID-19 pandemic wherein face-to-face interaction is limited.

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Sleeping Pattern, Stress Level and Academic Behavior of Students Enrolled in Health Related Programs

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Abstract

The researchers believe that by identifying the different factors that may influence one's academic behavior would enable the learners to be successful in their educational journey. This paper sought to compare the relationship between sleeping pattern, stress level and academic behavior of students enrolled in health-related courses. This descriptive-correlational study was anchored on Johnson's Behavioral Model and Selye's Stress Theory. The study investigated the relationship between sleeping pattern, stress level, and academic behavior among 213 students enrolled in a Health-Related Course. Participants were gathered by the use of convenience sampling. Pearson-product moment correlation coefficient formula was used for data analysis. Results revealed that during week days and weekends, the students have an *adequate sleeping pattern* but during their on-the-job-training days their sleeping pattern was *inadequate*. The stress level that they experienced was *moderate*, while their academic behavior in terms of academic self-management was *satisfactory*, academic motivation was *moderate*, academic activity was high, and overall attitude toward study was *positive*. There was no significant relationship between stress level and academic behavior. Sleeping pattern during weekdays has a negative relationship with academic behavior in terms of academic activity ($p < .05$), self-management ($p < .01$) and over-all attitude towards studies ($p < .05$). The result suggested that there was a significant difference in the academic behavior of students when their age, gender, monthly allowance, and academic program were considered. Students enrolled in Bachelor of Laboratory Science demonstrated a more positive attitude toward studies, engaged more in academic activity and demonstrated better self-management, while those enrolled in Dentistry exhibited better academic motivation as compared to those enrolled in other health related programs. Researchers suggest that a follow-up study involving other institutions should be conducted for the benefit of result comparison.

Keywords: *sleeping pattern, stress level, academic behavior*

Globalization and technological revolution made education the very first step for every human activity. Learning is a continuous process. Age and status in life do not limit an individual's capacity and capability to learn whether it is a new skill or refining an old one. It is defined as an acquired skill from being taught or through the study process. Education is the medium by which an individual achieve success in his or her life.

Sleep, on the other hand, is an integral part of human health and life and plays a vital role in learning, performance and maintaining physical and mental health. Sleep patterns and stress has a major influence on learning, or in this case, academic behavior. The amount of sleep that one gets shows in the way the students study. As stated by Arhberg, Dresler, Genzel, Niedermaier and Steiger (2012), "Sleep quality has significant effects on cognitive performance and is influenced by multiple factors such as stress".

Sleep patterns and stress has a major influence on learning, or in this case, academic behavior. The amount of sleep that one gets shows in the way the students study. If they have gotten enough sleep, students are more awake, able to take notes in class, and able to participate with the lecture and discussions. When one does not have enough sleep, they tend to have daytime drowsiness and are unable to focus.

Stress is the bodies' reactions both neurologically and physiologically to adapt to a new condition. "Students can be stressed due to different stressors such as academic, financial, health related or loss of a close family member or friend, etc." (Siraj et al, 2013). Stress affects academic behaviors in that the more stress one feels, the less likely that individual is able to focus on their work and get requirements done. Students have a tendency to wait till the last minute to finish requirements which leads to a greater pile of work to be done, and thus increasing their stress level due to an overload of work that must be completed in a very short amount of time. This then leads to a decrease in their sleep because of cramming., Studying is the backbone of success in a student's life.

Success in learning is not only about how smart a student is. It is also seen as a result of how they conduct themselves, or their academic behavior. Academic behavior is how students learn in a systematic and efficient manner when given the opportunity or chance. According to Rogel (2012) it is "the devotion of time and attention to acquire information or knowledge, or in other words, it is the pursuit of academic knowledge by a detailed investigation of a subject or situation". In other words, it is anything that pushes students to do well in school.

When students don't have a positive academic behavior, it can lead to academic failures. For example getting low grades, failing the subject, or dropping out of school are examples of negative academic behavior. Stress and impaired sleeping patterns can attribute to negative academic behavior. When a student isn't getting enough rest, they have may have a more difficult time arising for early morning classes during the week and increases sleepiness during the week. Although the main goal of a post-secondary institution is to facilitate education and intellectual function, scholastic achievements can be optimized by supporting the whole student, including their health and well-being. When students are healthy, they are more able to concentrate on their studies and reach their potential" (Versaevel, 2015).

Considering all this existing in the background and how these will somehow predict the future of the students, the researchers will explore on these ideas. Hence, this study was developed to see the effect of sleep pattern and stress on academic behavior.

Literature Review

Sleeping pattern

Rest and sleep are essential components of physical health, mental well-being, and energy restoration. All individuals require certain periods of calm and lesser activity so that their bodies can regain energy and rebuild stamina. The need for rest and sleep varies with age, developmental level, health status, and activity level. (Greive et al., 2014). Not getting enough sleep could cause

sleepiness during the day. It can decrease an individual's ability to function. Young adults need at least 8 ½ to 9 ¼ hours of sleep each night. There is much evidence that reduced sleep quantity and/or quality may adversely affect cognitive abilities, general health, and feeling of well-being. Traditional-age college students are often engaged in the young adult tasks of exploring and extending the boundaries of independence and in determining their own lifestyle rules, particularly concerning sleeping schedules (Buboltz, et al., 2009).

Stress

It is impossible to remove all stress from our everyday lives. "Stress is the body's nonspecific response mechanism towards demands or strains made on itself or the environment. It is a process by which we perceive and cope with environmental threats and challenges" (Siraj et al., 2013). Stress means different things to different people and usually it is linked with negative feeling. College is indeed a stage in student's life where all types of stress are encountered. "The effects of stress can be positive or negative. Positively used, stress can be a motivator for an improved quality of life. Stress can be negative, when it becomes destructive as a result of how an individual negatively perceived it and reacted to it" (Kumari & Radhakanta, 2012). Any stimulus that produces a stress response is called a stressor. A stressor may be almost any disturbance of the human body-heat or cold, environmental poisons, toxins given off by bacteria, heavy bleeding from a wound or surgery, or a strong emotional reaction (Tortora, 2011).

Commonly identified sources of stress for young adults include financial concerns, school or personal life balance, and lack of free time. Additionally, if a student is working full or part-time, while they are pursuing their education, that can further increase stress levels (Versaevel, 2014). Poor time management and if one has a heavy workload which is associated with course requirements may lead to stress with academics, which is seen more often than not.

Academic Behavior

A student's behavior can affect his or her ability to learn. Academic behavior is defined as the regular tendency and manner that one portrays during the process of learning or taking in information (Venturina, 2014). Academic behavior outcomes refer to the changes that student actions can have on the ability to maintain good performance in the classroom. According to Concordia Online Education (2016) as academic behavior outcomes relate to negative situations and poor actions by students, the classroom environment becomes less positive and teachers can struggle to provide the best education to the entire class. Positive changes to the behavior of students can improve the academic outcomes at any grade level. When stress increases it can negatively impact academic performance and poor performance then contributes to increased stress.

Methods

This quantitative study utilized the descriptive-correlation research design to determine the relationship between sleeping pattern, stress level, and academic behavior of students enrolled in health-related programs and was anchored on Johnson's Behavioral Model and Selye's Stress Theory. A quantitative method emphasizes objective measurement and the statistical, mathematical or numerical data collected through polls, questionnaires and surveys or by manipulating pre-existing statistical data using computational techniques. Quantitative research focuses on gathering numerical data and generalizing it across groups of people or to explain a particular phenomenon" (Babbie, 2010). "A correlational research design is the measurement of two or more factors to determine or estimate the extent to which the values for the factors are related or change in an identifiable pattern" (Privitera & Deizell 2016).

Participants were gathered by the use of convenience sampling. Pearson-product moment correlation coefficient formula was used for data analysis. The participants were from the 3rd and 4th levels of the nursing and medical technology programs and 5th and 6th year from the dentistry

program. The respondents were all enrolled during the second semester 2015-2016 at the Adventist University of the Philippines.

There were a total of 213 respondents for this study. Of these 213, 61 were male and 152 were female. From the 213 respondents, 50 were in the 18-19 age group, 109 were found to be in the 20-21 age group, 30 were in the 22-23 age group, and 24 students were in the age group 24 and above. The majority of the population comes from the age group 20-21, which is the common age of third year college students in the Philippines. There were 103 respondents enrolled in medical technology, 90 enrolled in nursing, and 20 in dentistry.

For its instrumentation, this study adapted the Academic Behavior Scale, Sleeping Pattern, and the Perceived Stress Scale. Each participant was given one set of questionnaire consisting of four parts. The first part was the demographic profile which includes the age, gender, program of discipline and the monthly allowance. The second part was the Academic Behavior Scale from the study "Social Engagement and Academic Behavior of Nursing Students." by Indah, Mukamurenzi and Chhun (2016). Third part of the questionnaire was the Perceived Stress Scale consisting of 10 questions to assess the stress level by Cohen (1988). Fourth part was the sleeping pattern questionnaires constructed by the researchers.

Results

Table 1. *Sleeping Patterns of Respondents*

	Mean	Standard Deviation	Verbal interpretation
Weekdays	7.09	1.626	Adequate
Weekends	8.42	1.618	Adequate
OJT Sleep	5.94	1.626	Inadequate

*OJT-On the Job Training

Results of Table 1 shows that most respondents sleeps seven hours during the weekdays with a mean of 7.09 and eight hours during weekends with a mean of 8.42 and five to six hours during their clinical or on the job training with a mean of 5.94. The mean of the hours of sleep during weekdays and weekends is interpreted as adequate, which means that the students have adequate amount of sleep during the week and the weekends. The mean hour of sleep during OJT however is interpreted as inadequate, which means that the students do not have an adequate amount of sleep during OJT.

It is recommended that young adults aim to achieve 7-9 hours of sleep every night. (National Sleep Foundation, 2015). This supports the results of the study that the respondents are receiving enough sleep during weekdays, which is at least 7 hours. Of sleep per night. However, there is an individual variation as some adults may be able to function well with 6 hours of sleep and other may need 10 hours to function normally. Regardless, a person who has adequate sleep and is well rested is mentally alert, energetic, feeling refreshed, energized. (Berman & Snyder, 2012).

Another result is that the respondents are only getting one more hour of sleep during the weekends. This might be due to the fact that they feel like they can make up for hours that they lost during the week. This confirms the findings of Albert as quoted by (Gikunda, Abura, Kiriunguy, & Odilla, 2014) in their study that as they lose sleep on the weekdays, they try to make it up on the weekends and this actually disrupts their sleep cycles even more because the body is not allowed to maintain a consistent sleep pattern. This also goes along with the amount hours of sleep during OJT.

Table 2. Stress Level: Perceived Stress Scale

In the last month, have you...	Mean	Standard Deviation	Verbal Interpretation
1. Been upset because of something that happened unexpectedly?	3.4742	1.01663	Moderate
2. Felt that you were unable to control the important things in your life?	3.2207	1.08730	Moderate
3. Felt nervous and “stressed”?	3.7371	.96953	High
4. Felt confident about your ability to handle your personal problems?	3.5728	.89052	High
5. Felt that things were going your way?	3.1925	.86632	Moderate
6. Found that you could not cope with all the things that you have had to do?	2.8498	.97418	Moderate
7. Been able to control irritations in your life?	3.3568	.90825	Moderate
8. Felt that you were on top of things?	2.8498	.91423	Moderate
9. Been angered because of things that were outside of your control?	3.2019	1.03778	Moderate
10. Felt difficulties were piling up so high that you could not overcome them?	3.0986	1.04369	Moderate
Stress Grand Mean	3.2554	.44946	Moderate

Table 2 shows the Perceived Stress Scale of the respondents in the last month. It presents that students have generally “moderate” stress level, with a grand mean of 3.2554, which means that the respondents experience some stressful situations. They “felt nervous and stressed” with a mean of 3.7371 meaning that the respondents felt nervous and stressed often. The respondents mark high on “felt confident about their ability to handle their personal problems” with a mean of 3.5728 which also means that they often felt confident about their ability to handle their personal problems.

“Many students face stress as they try to mix up busy lives, school and work; while they are trying also to have time with family and friend. For some student, stress becomes almost a way of living. However, it is really dangerous to let stress become student’s way of living in college, because some stress levels can have a terrible effect that changes completely student’s life and it may result to failure.” (Kumar & Bhukar, 2013).

College is indeed a stage in student’s life where all types of stress are encountered. Some stress called eustress, prepare us to meet certain challenges and thus is helpful. Other stress, called distress is harmful. Any stimulus that produces a stress response is called a stressor. A stressor may be almost any disturbance of the human body-heat or cold, environmental poisons, toxins given off by bacteria, heavy bleeding from a wound or surgery, or a strong emotional reaction. (Tortora & Derrickson, 2011).

Table 3. *Academic Behavior of Students in Terms of Academic Self-Management*

Academic Self-Management:	Mean	Standard Deviation	Verbal Interpretation
1. I turn in my requirements on time.	4.0329	.84331	Good
2. I do not evaluate my performances (Ex: reviewing my mistakes in exams or quizzes and keeping track of my standing grades).	3.3756	1.12425	Satisfactory
3. I set goals for my studies.	3.7793	.96307	Good
4. I manage to find ways to study in difficult settings	3.5164	1.10572	Good
5. I do not make necessary changes in my study habit for my academic improvements	3.1362	.96410	Satisfactory
6. I go to the instructor in charge to consult and communicate my academic concerns.	3.0516	1.04257	Satisfactory
7. I see to it that I study at least 30 minutes to 1 hour per day.	2.9859	1.26072	Satisfactory
Self-Management Overall Mean	3.4111	.60201	Satisfactory

Table 3 shows the academic self-management of the respondents. It indicates that students who enrolled in health courses have satisfactory academic self-management as indicated by the grand mean of 3.41111. Majority rate the highest in terms of turning in requirements on time with a mean of 4.0329, which is good. On the other hand, most respondent rated lowest on “I study at least 30 minutes to 1 hour” with a mean of 2.9859 which is Satisfactory. From the results it indicates that generally the students who are enrolled in health courses turn their requirements on time. However on the other hand it shows that average of the students find time to study 30 minutes to 1 hour a day.

Bandura (1986) as quoted by Akomolafe (2013) describes self- management learning as an active and constructive process whereby learner set goals for their learning, plan actions, monitor, regulate and control their cognition, and behavior. It supported the book of Dembo (2013) that successful students are not simply individuals who know more than others. They also have more effective and efficient learning strategies for accessing and using their knowledge, can motivate themselves, can monitor and change their behaviors when learning does not occur. It is also mentioned that the key to success is practicing the learning strategies so they become automatic. As you practice, you will be able to learn more material in less time than prior to using these new strategies. Thus, one will learn how to study “smarter,” not necessarily harder. Students with high GPAs stated that they studied for longer hours during the weekend, where students with low GPAs reported to study for less than 8 hours/day during the weekend (Shawwa, et. at., 2015).

Discussion

This study sought to establish relationship between sleeping pattern, stress level and academic behavior among students enrolled in health-related courses.

National Sleep Foundation (2015) recommended that young adults aim to achieve 7-9 hours of sleep every night. Result showed that the respondents had adequate sleep during weekdays, which is at least 7 hours of sleep per night and an hour more during weekends. This confirms the findings of Albert as quoted by (Gikunda, Abura, Kiriunguy, & Odilla, 2014) in their study that as they lose sleep on the weekdays, they try to make it up on the weekends.

The respondents, on the other hand, have different schedules during OJT and it disrupts the sleep cycles, which might be possible as to why the respondents achieve less sleep during

OJT. A recent study showed that increased weekend catch-up sleep (as an indicator of insufficient weekday sleep) is associated with poor performance on objective attention tasks where the number of omission and commission errors is measured in a computerized system (BaHammam, Alaseem, Alzakri, Almeneessier, & Sharif, 2012).

Having OJT during the school year and the need to attend regular class cause disruption in the regular sleeping and waking-up pattern or cycle for a given time, thus resulting in less hours of sleep during OJT weeks. Inadequate sleep means inadequate time for the body to recover from stressors.

Sleep plays a crucial role in cognitive and emotional functioning, especially during the period of adolescence when the biological sleep-wake cycle changes rapidly. Lifestyle changes brought about by completion of course requirements in college may be accompanied by profound alterations in the timing and duration of sleep.

The academic performance of adolescents is important for their psychosocial development and to prepare them for adulthood. The learning capacity and academic performance of adolescents may be affected by sleep quality or quantity because sleep plays important roles in attention and memory, (Curcio, Ferrara & De Gennaro, 2006).

Conclusion

Based on the findings of the study, the researchers concluded that the students in health-related programs of the Adventist University of the Philippines have “moderate” or normal sleeping patterns and are getting enough rest during the week and on weekends, despite not getting enough rest during clinicals or OJT. However, it should be noted that medical technology students in their OJT do not have any classes to attend, thus giving more time to rest whereas nursing and dentistry students are still required to attend classes and turn in assignments during the clinical duty. The students are also experiencing a “moderate” amount of stress based on the perceived stress scale. The academic behavior of the students in terms of motivation, attitude, self-management, and activity is good, seeing as the results showed that the students range from moderate to high on the four determinants. There is also no significant relationship between stress and academic behavior, suggesting that the students’ stress level does not affect how they study.

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Depression, Anxiety, and Stress Level of College Students during the Covid-19 Pandemic: Basis for Mental Health Education

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Abstract

The current COVID-19 pandemic caused a problem in the mental health of College Students. The objective of the study was to determine the extent of depression, anxiety, and stress of college students in a selected residential university who experienced a localized lockdown. A descriptive and comparative type of quantitative research was used in this study. Convenience sampling technique was used to recruit 150 students. The extent of depression, anxiety, and stress was measured using the DASS21 Questionnaire. The results of the study revealed that the respondents are experiencing a *mild level* of depression and anxiety whereas they have a *normal level of stress*. There was *no significant difference* between the levels of depression and stress considering their gender and age. However, *a significant difference* was found in the anxiety level considering the age of the respondents. Based on the results of the study, a mental health education program was developed. It is advised to collaborate with the government health sector in the dissemination of information with regards to mental health concerns during the Covid-19 pandemic in the Philippines.

Keywords: *depression, anxiety, stress, pandemic, mental health*

Mental health is “a state of well-being in which individuals understand their own abilities, can cope with normal life pressures, can function productively and fruitfully, and can contribute to their society”. Mental health is important to the general health and well-being of all and mental illnesses are common and treatable. It is important to pay attention to mental wellbeing that will help you achieve overall wellness and lead you towards recovery (WHO 2020). The 2019-nCoV outbreak in China has caused public fear and mental health tension. The rising number of patients and reported cases, as well as the increasing number of provinces and countries affected by the epidemic, has caused public concern about infection. The uncertain nature of this epidemic has been exacerbated by misconceptions and disinformation, frequently motivated by misreported news stories and confusion of health messages by the public, creating concern among the population (WHO 2020). In the Philippine context, when the localized transmission of COVID-19 was recorded, the government considered it as a risk to national security (Nicomedes et al., 2020) (Nicomedes, Avila, & Arpia, 2020). Consequently, the government of the Philippines implemented the Enhanced Community Quarantine (ECQ) to contain the spread of COVID-19 on March 16, 2020. However, due to the surge of the COVID-19 cases in the Philippines, the ECQ was extended until April 30, 2020. This health crisis has created emergencies in public health that also impact Filipinos nationally due to increased social isolation and decreased social interaction that causes alienation, anxiety, depression and can even lead to post-traumatic stress disorder (Leite et al., 2020 cited American Psychological Society, 2020; WHO, 2020). The way of life in the Philippines has changed, although the Filipinos are not the only ones whose lives have changed, given that COVID-19 is already a global issue, the lifestyle of all has changed (Pan, 2020). Changes in everyday life have been rapid, with reports of the virus increasing, death toll escalating, and strict efforts to control disease spread increasing across regions of the globe. While considerable attention has been paid to initiatives to recognize people with coronavirus infection, the mental health needs of those affected by this pandemic have been identified to have relatively no attention (Xiang et al., 2020). The current COVID-19 pandemic has resulted in several steps of quarantine and social isolation intended for the near future to keep individuals physically distanced from others. Apart from physical damage, COVID-19 also has a significant effect on public mental health. Although these initiatives are necessary to prevent the spread of the novel coronavirus, they may cause widespread mental health effects, including depression, anxiety, and stress among university students. Therefore, the purpose of this study was to fill a void in the mental health response to this growing public health crisis by developing and evaluating a brief mental health screener that can be used to reliably identify probable cases of dysfunctional anxiety, stress, and depression associated with COVID-19 pandemic.

The study will explore the extent of depression, anxiety, and stress of college students during the Covid-19 pandemic as well as the difference of depression, anxiety, and stress of college students during the Covid-19 pandemic considering the age and gender.

Specifically, the study will answer the following questions:

1. What is the level of depression of the college students during the Covid-19 pandemic?
2. What is the level of anxiety of the college students during the Covid-19 pandemic?
3. What is the level of stress of the college students during the Covid-19 pandemic?
4. Is there a significant difference in the depression of the respondents when age and gender is considered?
5. Is there a significant difference in the anxiety of the respondents when age and gender is considered?
6. Is there a significant difference in the stress of the respondents when age and gender is considered?
7. What health program can be developed based on the result?

Methodology

Research Design

The researchers conducted a descriptive, and quantitative research that is comparative in design to gauge the extent of depression, anxiety, and stress of college students during the Covid-19 pandemic as well as the difference of depression, anxiety, and stress of college students during the Covid-19 pandemic considering the age and gender.

A descriptive study is one that is designed to describe the distribution of one or more variables, without regard to any causal or other hypothesis (Aggarwal, Ranganathan 2019). Data collected from descriptive research is helpful in important decision-making because the data is obtained from a large population. Because using the descriptive survey method, statistical information can be obtained, and analysis of that data can be made to deduce desired results (Bhasin, 2019).

Quantitative research is a method of research that relies on measuring variables using a numerical system, analyzing these measurements using any of a variety of statistical models, and reporting relationships and associations among the studied variables (Lucas-Alfieri, 2015). Quantitative research design can help researchers to access the thoughts and feelings of research participants, which can enable development of an understanding of the meaning that people ascribe to their experiences (Sutton, Austin 2015).

Comparative research essentially compares two groups in an attempt to draw a conclusion about them. Researchers attempt to identify and analyze similarities and differences between groups, and these studies are most often cross-national, comparing two separate people groups (Richardson et al 2018).

Population and Sampling Techniques

The respondents of the study were 139 university resident students who were enrolled in a university in Cavite, Philippines during the COVID-19 pandemic.

The sampling technique used in the study is purposive sampling. This sampling technique is used to focus on particular characteristics of a population that are of interest that will enable answering the research questions.

Instrumentation

The researchers made use of the Depression, Anxiety and Stress Scale - 21 Items (DASS-21) integrated into a Google form format for dissemination, a set of three self-report scales designed to measure the emotional states of depression, anxiety and stress. This questionnaire was used to gauge the extent of depression, anxiety, and stress of college students during the Covid-19 pandemic. Included in this survey are the verbal interpretations of the respondents' answers with regards to the conventional severity labels (normal, moderate, severe).

Analysis

The Statistical Analytics Software (SAP) will be used for the analysis of the data through the Statistic Package for Social Science (SPSS v.23).

The following statistics tools will be used for the research questions:

Mann-Whitney U Test. This is a test that is used for comparing differences between two independent groups, in such a case that the dependent variable is either ordinal or continuous, but not normally distributed.

Median. This is a statistical measure used for determining the middle value of a dataset that is listed in ascending order.

Mean and Standard Deviation. A form of analysis that is used for the measure of the distribution of scores within a data set and thus defines how large or concentrated the data is. In this research, it will be used to gauge the extent of stress, anxiety and depression as determinants of mental health among university students during the COVID-19 pandemic.

Wilcoxon Sign Test. The Wilcoxon rank-sum test is commonly used for the comparison of two groups of nonparametric data, such as those which are not measured exactly but rather as falling within certain limits to assess whether their population means ranks differ.

Z-Test. This is a statistical test to determine whether two population means are different when the variances are known and the sample size is large.

Ethical Consideration

Ethical considerations were observed to ensure confidentiality and anonymity in handling the data in order to protect the privacy, rights and health of research participants.

Results and Discussion

This chapter will give emphasis to the analysis and the interpretation of the data as well as the results obtained in the study. Discussions of the results are presented in the sequence of the research questions stated in chapter 1.

Table 1. *Level of Depression of the Respondents*

Item Number	Question	Mean	SD	Verbal Interpretation
3	I couldn't seem to experience any positive feeling at all	1.48	0.87	Normal
5	I found it difficult to work up the initiative to do things	2.26	0.92	Normal
10	I felt that I had nothing to look forward to	1.37	0.92	Normal
13	I felt down-hearted and blue	1.68	0.87	Normal
16	I was unable to become enthusiastic about anything	1.51	0.82	Normal
17	I felt I wasn't worth much as a person	1.21	0.87	Normal
21	I felt that life was meaningless	0.89	0.82	Normal
Overall Level of Depression		10.39	9.16	Mild

Table number 1 presents the level of depression of the respondents. The item which ranked the highest was question number 5 which states "I found it difficult to work up the initiative to do things" with a mean score of 2.26 ($SD = 0.92$). The item which ranked the second highest was question number 13 which states "I felt down-hearted and blue" with a mean score of 1.68 ($SD = 0.87$). The item which ranked the lowest was question number 21 which states "I felt that life was meaningless" with a mean score of 0.89 ($SD = 0.82$). The item which ranked the second lowest was question number 17 which states "I felt I wasn't worth much as a person" with a mean score of 1.21 ($SD = 0.87$). The total mean score of the overall level of depression was 10.39 ($SD = 9.17$). This score reflects as "Mild" on the verbal interpretation.

This indicates that the college students only experience mild level of depression during the pandemic period.

Similar to this findings, the study "Depression and Anxiety among University Students during the Covid-19 Pandemic in Bangladesh: a Web-based Cross-sectional Survey" by Akhtarul Islam et al states that, This unprecedented experience of 'home quarantine' under lockdown with the uncertainty of academic and professional career has multifaceted impacts on the mental health of students. The ongoing COVID-19 pandemic is creating a psycho-emotional chaotic situation as countries have been reporting a sharp rise of mental health problems, including anxiety, depression, stress, sleep disorder as well as fear, among its citizens, that eventually increased the substance use and sometimes suicidal behavior. Their results show that 392 (82.4%) students were found to have mild to severe depressive symptoms (Islam et al., 2020).

Table 2. Level of Anxiety of the Respondents

Item Number	Question	Mean	SD	Verbal Interpretation
2	I was aware of dryness of my mouth	2.09	1.06	Normal
4	I experienced breathing difficulty	0.73	0.72	Normal
7	I experienced trembling	0.82	0.67	Normal
9	I was worried about situation in which I might panic and make a fool of myself	1.70	0.93	Normal
15	I felt I was close to panic	1.15	0.83	Normal
19	I was aware of the action of my heart in the absence of physical exertion	1.51	0.90	Normal
20	I felt scared without any good reason	1.17	0.88	Normal
Overall Level of Anxiety		9.17	7.95	Mild

Table number 2 presents the level of anxiety of the respondents. The item which ranked the highest was question number 2 which states “I was aware of dryness of my mouth” with a mean score of 2.09 ($SD = 1.06$). The item which ranked the second highest was question number 9 which states “I was worried about situations in which I might panic and make a fool of myself” with a mean score of 1.70 ($SD = 0.93$). The item which ranked the lowest was question number 4 which states “I experienced breathing difficulty” with a mean score of 0.73 ($SD = 0.72$). The item which ranked the second lowest was question number 7 which states “I experienced trembling” with a mean score of 0.82 ($SD = 0.67$). The total mean score of the level of anxiety was 9.17 ($SD = 7.95$). This score reflects as “Mild” on the verbal interpretation.

This indicates that during the pandemic period, the college students only experience a mild level of anxiety.

Similar to this findings, the study “Depression and Anxiety among University Students during the Covid-19 Pandemic in Bangladesh: a Web-based Cross-sectional Survey” by Akhtarul Islam et al states that, results show that 389 (87.7%) students were found to have mild to severe anxiety symptoms (Islam et al., 2020).

Table 3. Level of Stress of the Respondents

Item Number	Question	Mean	SD	Verbal Interpretation
1	I found it hard to wind down	1.91	0.82	Normal
6	I tended to over-react to situations	1.88	0.81	Normal
8	I felt that I was using a lot of nervous energy	1.28	0.83	Normal
11	I found myself getting agitated	2.00	0.86	Normal
12	I found it difficult to relax	1.57	0.86	Normal
14	I was intolerant of anything that kept me from getting on with what I was doing	1.44	0.73	Normal
18	I felt that I was rather touchy	1.34	0.86	Normal
Overall Level of Stress		11.08	7.98	Normal

Table number 3 presents the level of stress of the respondents.

The total mean score of the level of stress was 11.08 ($SD = 7.98$). This score reflects as normal on the verbal interpretation. The item which ranked the highest was question number 11 which states “I found myself getting agitated” with a mean score of 2.00 ($SD = .86$).). The item

which ranked the lowest was question number 8 which states “I felt that I was using a lot of nervous energy” with a mean score of 1.28 ($SD = 0.83$).

The indication of the result means that the college students have a normal level of stress during the pandemic period.

Contrary to our findings, this article “More than Half of American say they’re More Stressed than they were Before the Covid-19 Pandemic” by Christina Farrar states that, a group of researchers from the University of North Carolina Chapel Hill and Harvard Medical School released results from a survey they conducted in the second half of May, and 55% of people said they were more stressed than in January, before the virus was perceived to be a widespread threat. “It can be stated with certainty based on these survey findings that at least a quarter of U.S. adults is presently in a condition of high emotional distress directly attributable to the pandemic,” the study reads (Farr, 2020).

Table 4. *Difference in the Level of Depression in Terms of Gender Category*

Gender	N	Mean Rank	Sum of Ranks	U	Z	p value	Verbal Interpretation
Male	88	70.11	6169.50	2234.500	-.042	0.484	Not Significant
Female	51	69.81	3560.50				

level of significance = 0.05

Table 4 shows the difference in the level of depression in terms of gender category. The mean rank value for the males is 70.11 while the mean rank value for the females is 69.81 The sum of ranks for the males is 6169.50 while the sum of ranks for females is 3560.50. Mann-Whitney U test, result is 2234.500. Z score is -.042 A negative z-score reveals the raw score is below the mean average. For there to be a significant relationship, the p-value must not be greater than 0.05. The p-value of depression is .484.

Thus, there is no significant difference between the male and the female college students to the level of depression.

In contrast with this findings, a study by Kessler et al., 1994, 2005; Stoolmiller, Kim, & Capaldi, 2005 entitled “Childhood adversities and adult depression: Basic patterns of association in a US national survey” and Cochran & Rabinowitz et al, 2000; entitled Men and depression: Clinical and empirical perspectives mentioned that in particular, to depression the relative lack of research focusing on men’s experience raises a range of public health issues. It is well known that women are twice as likely to be diagnosed with major depression, population-based statistics suggest that there are still a large number of men suffering from the condition and there is evidence that the gender gap is narrowing. Moreover, researchers and practitioners working in the area of men’s mental health have increasingly suggested that major depression can be “masked” in men and that this may produce an underestimate of the true rates at which men suffer from the disorder. Although women are twice as likely to attempt suicide, men are four times more likely to die from suicide attempts.

Table 5. *Difference in the Level of Depression in Terms of Age Category*

Age Category	N	Mean Rank	Sum of Ranks	U	Z	p value	Verbal Interpretation
Below 18 y/o	6	76.83	461.00	358.000	-.0427	.335	Not Significant
18 y/o and above	133	69.69	9269.00				

level of significance = 0.05

Table 5 shows the difference in the level of depression in terms of age category. The mean rank value for the group below 18 years old is 76.83 while the mean rank value for the group 18 years old and above is 69.69. The sum of ranks for below 18 years old is 461.00 while the sum of ranks for 18 years old and above is 9269.00. Mann-Whitney U test, result is 358.00. Z score is -.0427. A negative z-score reveals the raw score is below the mean average. For there to be a significant difference, the p-value must not be greater than 0.05. The p-value of depression is .335.

Thus, there is no significant difference between the age category of below 18 years old and the age category of 18 years old and above of the college students to the level of depression.

In contrast with this finding, a study by Blazer et al, 2003 entitled “Social support and mortality in an elderly community population” mentioned that depression is less prevalent among older adults than among younger adults but can have serious consequences. Late life depression is an important public health problem. It is associated with increased risk of morbidity, increased risk of suicide, decreased physical, cognitive and social functioning, and greater self-neglect, all of which are in turn associated with increased mortality. At the same time, contrary to common perception, major depression appears to be less frequent among older adults than at earlier ages.

Table 6. *Difference in the Level of Anxiety in Terms of Gender Category*

Gender Category	N	Mean Rank	Sum of Ranks	U	Z	p value	Verbal Interpretation
Male	88	69.83	6145.00	2229.00	-.066	.474	Not Significant
Female	51	70.29	3585.00				

level of significance = 0.05

Table 5a shows the difference in the level of anxiety in terms of gender category. The mean rank value for the males is 69.83 while the mean rank value for the females is 70.29. The sum of ranks for the males is 6145.00 while the sum of ranks for females is 3585.00. Mann-Whitney U test, result is 2229.00. Z score is -.066. A negative z-score reveals the raw score is below the mean average. The p-value of depression is .474.

Thus, there is no significant difference between the male and the female college students to the level of anxiety.

In contrast with this finding, a study by Kessler et al., 2005 entitled “Lifetime prevalence and age-of-onset distributions of DSM-IV disorders in the National Comorbidity Survey Replication” mentioned that anxiety disorders are the most common class of mental disorders, affecting nearly 1 in 5 adults in the U.S. One of the most widely documented findings in psychiatric epidemiology is that women are significantly more likely than men to develop an anxiety disorder throughout the lifespan.

Table 7. *Difference in the Level of Anxiety in Terms of Age Category*

Age Category	N	Mean Rank	Sum of Ranks	U	Z	p value	Verbal Interpretation
Below 18 y/o	6	97.08	461.00	236.500	-.693	.05	Significant
18 y/o and above	133	68.78	9147.50				

level of significance = 0.05

Table 7 shows the difference in the level of anxiety in terms of age category. The mean rank value for the respondents below 18 years old is 97.08 while the mean rank value for the respondents 18 years old and above is 9147.50. The sum of ranks for below 18 years old is 461.00 while the

sum of ranks for 18 years old and above is 9147.50. Mann-Whitney U test, result is 236.500. Z score is -1.693, a negative z-score reveals the raw score is below the mean average. The p-value of anxiety is .05.

Thus, there is significant difference between the age category of below 18 years old and the age category of 18 years old and above of the college students to the level of anxiety.

Similar to this findings, a study by Huberty, T. J. et al 2012 entitled “Anxiety and depression in children and adolescents: Assessment, intervention, and prevention” mentioned that anxiety is a normal reaction to certain situations. A small level of anxiety is normal, but severe anxiety can be a serious problem. Academic anxiety can become more detrimental over time. As a student’s academic performance suffers, the anxiety level related to certain academic tasks increases. Anxiety becomes a serious concern when it is in excess and irrational, and the individual is so affected as to be unable to focus. It can also happen that anxiety in a teenager can become a barrier between him/her and friends and peers, and they begin to avoid them just because they are under stress or in a state of panic.

Table 8. *Difference in the Level of Stress in terms of Gender*

Gender	N	Mean Rank	Sum of Ranks	U	Z	p value	Verbal Interpretation
Male	88	70.74	6225.00	2179.00	-.285	0.39	Not Significant
Female	51	68.73	3505.00				

level of significance = 0.05

This table 8 would demonstrate the difference in the level of stress in terms of gender and is intended to answer the sixth research question.

There were 139 respondents comprised by the members of two genders, male and female. There were 88 male respondents and 51 female respondents. The mean rank value for the males is 70.74 while the mean rank value for the females is 68.73.

The sum of ranks for the males is 6225 while the sum of ranks for females is 3505.

Using the Mann-Whitney U test, the arrived value is 2179. A Z score of -.285 is obtained. Z score shows how far away a single data point is from the mean relatively. Lower z-score means closer to the mean and a negative value means lower or smaller than the mean. The p-value obtained is 0.39 which is greater than the level of significance of 0.05.

Thus, there is no significant difference between the male and the female college students to the level of stress.

In contrast with this finding, a study by Chaplin, T. et al entitled, “Gender Differences in Response to Emotional Stress: An Assessment Across Subjective, Behavioral, and Physiological Domains and Relations to Alcohol Craving”, have found that their research suggests that men and women have a different response to stress. It is shown that women tend to experience greater sadness and anxiety, while men tend to greater manifest reward motivation cravings and emotional stress systems. These findings imply that women are at a higher risk for anxiety and depression, while men are at a higher risk for alcohol-use disorders.

Table 9. *Difference in the Level of Stress in terms of Age*

Age Category	N	Mean Rank	Sum of Ranks	U	Z	p value	Verbal Interpretation
Below 18 y/o	6	83.33	500.00	319.00	-.833	0.20	Not Significant
18 y/o and above	133	69.40	9230.00				

level of significance = 0.05

This table 9 would demonstrate the difference in the level of stress in terms of age and is intended to answer the sixth research question.

The mean rank value for the group with respondents below 18 years old is 83.33; while the mean rank value for the group with respondents of 18 years old and above is 69.40. The sum of ranks for the group below 18 years old is 500 while the sum of ranks for the group 18 years old and above is 9230.

Using the Mann-Whitney U test, the arrived value is 319. A Z score of -.833 is obtained. Z score shows how far away a single data point is from the mean relatively. Lower z-score means closer to the mean and a negative value means lower or smaller than the mean. The p-value obtained is 0.20 which is greater than the level of significance of 0.05.

Thus, there is no significant difference between the age category of below 18 years old and the age category of 18 years old and above of the college students to the level of stress.

In contrast with this finding, a study by Chen, Y. et al, entitled “Age Differences in Stress and Coping: Problem-Focused Strategies Mediate the Relationship Between Age and Positive Affect”, found that age has a negative relationship or inversely proportionality to problem-focused coping and positive affect in the context of stress. It is implied that with increasing physiological susceptibilities, challenges and difficulty in the use of problem-focused coping strategies may arise in older adults than younger adults, thus resulting to experiencing lower levels of positive affect.

Mental Health Education

Description:

This is a three-day program designed to improve the knowledge of college students on mental health promotion and the prevention of the development of mental health problems. The program will address mental health concerns and bring awareness to the topic to inform college students on information and possible services that may be available to them.

General Objectives:

The program will be conducted through a three-day seminar at one of the audiovisual rooms at the College of Nursing of the university. The main objective is to spread knowledge on mental health, improving one's mental health, and preventing mental health problems from developing.

Specific Objectives:

1. To raise awareness on mental health.
2. To teach about the mental health problems that can affect college students.
3. To spread knowledge on mental health to other members of the community.
4. To raise awareness on the ways to prevent and cope with mental health problems.

Financial and Manpower Resources

1. Sponsorship from different organizations for food, certificates and tokens during the program.
2. Certificate, tokens/ giveaways and documentation by the coordinators.
3. Financial support for the venue of the program will be from the coordinators

Title: Maintaining Mental Health and Social Well-being during the Pandemic

Venue: College of Nursing – Audiovisual Room

Participants: Enrolled college students

Number of Participants: 40-50 students per session

Number of Hours: 6 hours or 2 hours per session

Table 10. *Mental Health Promotion Program*

Specific Objectives	Key areas	Activities and Strategies	Time allotment	Resource Persons	Outcome
Given the situation, the college students will be able to:	1. Depression: Most prevalent symptoms:	Seminar conducted by the Psychology department entitled: Maintaining Mental Health and Social Well-being.			
-Be oriented with the AUP program via FB web page.	a. Lack of motivation				
	b. Feeling of down-hearted and blue	Day 1 Introduction and Orientation to AUP Mental Health & Psychosocial Support	2hours	Guidance counselor	After the seminar, the students will be able to understand the concept of Mental Health and Social Well-being during the pandemic and be able to share their thoughts about the topic. They will be able to demonstrate learning by identifying the most prevalent symptoms of depression, and anxiety.
-Demonstrate awareness on mental health	2. Anxiety: Most prevalent symptoms	Session #1: Awareness of Mental Health Activity 1:			
-Discuss the measures on how to prevent mental health problem	a. Dry mouth	Session 2: Mental health of College students during pandemic			
	b. Excessive worrying	Activity 1: Small group mentorship with clinical instructors			
-Describe the interventions to cope with health problems	3. Teenagers' anxiety level	Activity 2: Small group sharing with clinical instructors			
		Day 2 Session 3: How to prevent mental health problem	2 hours	Guidance counselor	After the counseling, the students will be knowledgeable on how to prevent mental health problems and will demonstrate interventions of prevention.
		Activity 1: Separate in small group with counselors.			
		Day 3 Session 4: How to cope with mental health problems	2 hours	Guidance counselor & Clinical Instructor	After the counseling, the students will be able to understand & demonstrate interventions on how to cope with mental health problems.
		Activity 1: Separate in small groups with counselors			

Conclusion

The researchers aimed to gauge the extent of depression, anxiety, and stress of college students during the Covid-19 pandemic as well as the difference of depression, anxiety, and stress of college students during the Covid-19 pandemic considering the age and gender.

This research highlights that the 139 college student respondents during the Covid-19 pandemic have *mild depression, mild anxiety, and have a normal level of stress*. It also implies that there is no significant difference between the male gender and the female gender to the levels of depression, and there is no significant difference between the age category of below 18 years old and the age category of 18 years old and above to the level of depression; that there is no significant difference between the male gender and the female gender to the levels of anxiety, however, *there is a significant difference between the age category of below 18 years old and the age category of 18 years old and above to the level of anxiety*; that there is no significant difference between the male gender and the female gender to the levels of stress, and there is no significant difference between the age category of below 18 years old and the age category of 18 years old and above to the level of stress.

Recommendation

Based on the findings and conclusion, the following are the recommendations made:

Nursing Education. The researchers recommend incorporating periodical mental health assessments in every orientation and in every succeeding academic level to be done by the educators and counselors. The researchers also recommend having regular seminars and assessment of mental health every semester based on the need of the college students.

Nursing Research. It is recommended to conduct further study in which the Covid-19 pandemic is integrated in the assessment of depression, anxiety, and stress for an improved gauging of these factors. It is also advised to acquire a more diverse sample of population to be able to expand the assessment of additional moderating factors.

Nursing Community. The researchers recommend that the nursing community should have a centralized mental health program in which the guidelines, policies and services are uniform all throughout the country. It is advised to collaborate with the government health sector in the dissemination of information with regards to mental health concerns during the Covid-19 pandemic in the Philippines.

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Spiritual Health and Emotional Intelligence of Nursing Students

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Abstract

Spiritual health and emotional intelligence status of nurses are important in the delivery of quality nursing care. Descriptive research design were used to determine the level of spiritual health and emotional intelligence (Self-control, Well-being, Emotionality, Sociability) of nursing students, the relationship of the variables, and the difference in the emotional intelligence when age, gender, and nationality were considered. Nursing students ($N = 150$) in seven (7) different sectarian schools in the Philippines were surveyed through purposive sampling. Results showed that the spiritual health and emotional intelligence of the respondents were *high*. There was a *positive significant relationship* between spiritual health and emotional intelligence ($p .000$). The higher the level of spiritual health of the nursing students, the higher is the emotional intelligence. However, there was *no significant difference* in the emotional intelligence of the nursing students when gender, year level, and religion were considered. The results of the study supported the concepts in the Careful Nursing Values Model, that emotional intelligence is deeply rooted to the spiritual values and that spiritual values enforces emotional health. Based on the findings, it is important for nursing educators to create programs and activities that would enhance the spiritual health and emotional intelligence of the nursing students, and for nursing students to participate in those activities. Future research studies should consider including other variables, increase the sample size and do a qualitative study to gain a deeper understanding of the phenomenon.

Keywords: *spiritual health, emotional intelligence, self-control, emotionality, well-being, sociability*

Emotional Intelligence is essential to the individual's everyday life. It is defined as the individual's capability to control and manage his/her public or private emotions. The better an individual can control their emotions; they can be emotionally stable (Drigas & Papoutsis, 2018). Emotional intelligence can improve self-esteem and confidence and gives individuals' positive view of situations. Azarsa et al., (2015) stated the ability to constantly have control of one's emotions enhances one's spiritual health. And further argued that quality of care is affected by one's sense of spirituality. In a study reported by (Zimmer et al., 2016), in the overall population around the world, 60 years old and older is about 900 million representing about 12% of the global population. This age relates to having connection with a higher power and slowly using that benefit to enhance emotional intelligence. That there is still meaning in life, even when there is suffering that comes around the world. Many people have learned to cope and rely on their connection that makes their lives wholesome (Thomas, Liu, & Umberson, 2017).

Nursing is more than just a job, but an area of health that provides holistic care. Holistic health is caring and addressing the needs not only of the social, physical, spiritual or mental health, but it's about dealing and caring for the whole person. It is founded with the thought that when one aspect of the person is affected, the overall health is affected and involved (Holland, 2018).

The mind, body, and spirit are one just as the Creator has made living creation. Spiritual health can affect health providers and according to studies, spiritual health is determined by many factors such as age, gender, religion, education, socioeconomic status, sexual orientation, and occupation. Furthermore, due to these factors, the dependency of spiritual care from healthcare providers is important in providing revival to an individual's holistic health. Since spiritual health provides an equilibrium of health for every life form, it is important to include it into nursing care. Many studies have determined the factors that influence spiritual health and emotional intelligence, but this study determined whether spiritual health has an impact on the emotional intelligence, specifically on the nursing students. With that in mind, it is important to know the relation between spiritual health and emotional intelligence.

This study wants to find out the level of health, emotional intelligence of the nursing students as to their well-being, self-control, emotionality, sociability and overall emotional intelligence, and the relationship of their spiritual health to their emotional intelligence. Furthermore to find out if their being male or female, their religion and year level significantly differ their emotional intelligence.

Methodology

To guide the study, Careful Nursing Spiritual Values Model was used as a framework. The focus of which is spiritual value's approach to nursing practices chosen by nurses to be implemented in their nursing care. In which these values are deeply related to spirituality than others (Meehan, 2012). Values that are more related to spirituality than others are 'Caritas.' Caritas is a 1st Century term 'agape', meaning unconditional love. This value demonstrates a deeper connection because agape love is a love that can never be demonstrated if the individual does not have a connection with God. It is viewed to uniquely empower human helping and nursing care. Another value identified in the model is 'Contagious calmness.' It describes an important quality and ability to influence calmness in nurses in any stressful nursing care settings. If the value is demonstrated in a nursing setting, it can have a contagious effect to the environmental setting. This model can be used by nurses to implement their nursing care effectively. When implemented by involving each value it can effectively not only improve nursing care, but positively enforce health wellness through the implementation of spiritual and emotional intelligence (Meehan, 2012).

Descriptive non-experimental research design was used in the study to determine the relationship of spiritual health and emotional intelligence among 150 nursing students from first, second and third year level regardless of their gender and religious affiliation and who voluntarily participated. When informed consent was signed by the participants a full explanation about the study was sent to them prior to the distribution of survey link. Participants were informed that their anonymity and the confidentiality of their responses will be kept confidential by assigning codes to them.

Online survey through google forms was used to gather the data in which the link of the questionnaire were sent through email and messenger account of the qualified nursing students after they were referred by their classmates or batchmates. The challenge of finding the participants virtually was addressed through snowball sampling technique in which one participant sent or share the link of the survey questionnaire to a friend, a classmate, or batchmate that are eligible for the study. Then, the gathered data were carefully tallied and submitted for statistical treatment. After which, they were analyzed and interpreted.

Statistical Package for Social Sciences Version 23 was used to analyze the data wherein, percentage and frequency were used to analyze the demographic data. To know the extent of emotional intelligence and spiritual health among nursing students, mean and standard deviation were applied. To understand the relationship between the emotional intelligence and the spiritual health, Pearson Product Moment Correlation was used. Whereas, ANOVA and T-test were used to test if there is a difference in their emotional intelligence if to consider their religion, year level and gender.

Results and Discussions

The demographic data gathered revealed that out of the 150 respondents, the following are the percentage per school, 1 (0.7%) from school A, 123 (82.0%) school B, 3 (2.0%) school C, 4 (2.7%) from school D, 12 (8.0%) from school E, 1 (0.7%) from school F, 6 (4.0%) from school G. When it comes to their gender, majority of the respondents are females as there were 106 (70.7%) of them compared to 44 (29.3%) were males. In this 150 nursing students there were 123 (82%) Seventh-Day Adventist, 20 (13.3%) Roman Catholic, and 7 (4.7%) belonged to either Islam, Protestants and Jehovah's Witness. Majority of them were second year nursing students with their percentage of 32.7% (49), while, first years were only 41.3% (62), and 26% (39) for third year.

Tables 1 and 2, will show the descriptive results of the nursing students' level of spiritual health and emotional intelligence in terms of well-being, self-control, emotionality, sociability and overall emotional intelligence. Table 3 will reflect the statistical relationship of the nursing student's spiritual health and their emotional intelligence. While, Tables 4, 5 and 6 will reflect their the difference in their emotional intelligence considering their religion, gender and year level.

Table 1. *Level of Spiritual Health of the Nursing Students*

No.	Items	Mean	SD	Scaled Response	Qualitative Descriptor
17	Respect for others	4.29	.746	Strongly Agree	High
7	Awe at a breathtaking view	4.27	.848	Strongly Agree	High
19	Kindness towards other people	4.19	.689	Strongly Agree	High
1	A love for other people	4.11	.737	Strongly Agree	High
13	Peace with God	3.92	.893	Strongly Agree	High
18	Meaning in life	3.89	.952	Strongly Agree	High
9	Self-awareness	3.85	.808	Strongly Agree	High
3	Forgiveness towards others	3.81	.877	Strongly Agree	High
4	Connection with nature	3.77	.944	Strongly Agree	High
14	Joy in life	3.71	.930	Strongly Agree	High
6	Worship the Creator	3.67	1.00	Strongly Agree	High
11	Oneness with God	3.63	1.00	Strongly Agree	High
5	A sense of identity	3.62	.840	Strongly Agree	High
10	Oneness with nature	3.60	.859	Strongly Agree	High

{table continues on the next page}

12	Harmony with the environment	3.57	.797	Strongly Agree	High
15	Prayer in life	3.50	.953	Strongly Agree	High
2	Personal relationship with a Divine/God	3.42	.957	Agree	Moderate
8	Trust between individuals	3.31	1.00	Agree	Moderate
16	Inner peace	3.28	.970	Agree	Moderate
Over-all Spiritual Health		3.76	.552	Strongly Agree	High

In Table 1, it can be seen that the respondent's descriptive result for their level of spiritual health was *high* as they strongly agree with most of the test items for spiritual health yielding a mean of 3.76 and an SD of .552, which means that they have a strong spiritual health.

Spiritual health is a purposeful aspect that allows individuals to maintain holistic well-being through equilibrium. Ghaderi et al. (2018) argued that spiritual health will enhance mental health and physical health. The characteristics firmly impact the individual's spiritual health and enhances the intervals to maintain their physical, social, and mental facilities. Spiritual health when connected to a higher power, can improve the individuals personal and social behaviors. It may also improve responsibility for oneself, self-awareness, self-purpose, self-esteem, self-worth, calmness, reasoning, and thinking. Nita (2019) reported, individuals that have spirituality, positively contributes both to their mental and physical health.

Table 2. *Level of Emotional Intelligence of Nursing Students*

No.	Items	Mean	SD	Scaled Response	Qualitative Descriptor
Well-being					
2	I generally believe that things will work out	3.43	.58409	Agree	High
6	*I do not find life enjoyable	3.33	.69026	Disagree	High
3	I feel I have a number of good qualities	3.15	.59513	Agree	High
1	On the whole, I'm pleased with my life	3.07	.64607	Agree	High
4	I believe, I'm full of personal strengths	2.99	.69501	Agree	High
5	* I have a gloomy perspective on most things*	2.57	.70929	Disagree	High
Over-all Well-Being		3.09	.42203	Agree	High
Self-Control					
10	I find ways to control my emotions	3.13	.66853	Agree	High
11	On the whole, I'm able to deal with stress	3.00	.67556	Agree	High
12	Others admire me for being relaxed	2.81	.72071	Agree	High
8	*I get involved in things I can't get out of	2.77	.74561	Disagree	High
7	*I find it difficult to regulate my emotions	2.55	.78181	Disagree	High
9	*I tend to change my mind frequently	2.29	.77327	Agree	Low
Over-all Self-Control		2.76	.46527	Agree	High
Emotionality					
18	I often pause and think about my feelings	3.17	.62837	Agree	High
19	Others complain when they're treated wrong	3.07	.61411	Agree	High
14	I experience other's emotions in their shoes	3.04	.64381	Agree	High
16	*It's difficult to see other's viewpoints	2.98	.71859	Disagree	High
15	*It's difficult to show affection to others	2.67	.83944	Disagree	High

13	Expressing through words is no problem	2.65	.88338	Agree	High
17	*Many times, I can't figure out my emotions	2.53	.85685	Disagree	High
Over-all Emotionality		2.87	.35964	Agree	High
Sociability					
21	I would describe myself as a good neighbor	3.21	.53829	Agree	High
29	I'm able to adapt to new environments	3.08	.72294	Agree	High
28	*It's difficult to bond with others close to me	3.05	.73991	Disagree	High
20	I can deal with people effectively	3.01	.61847	Agree	High
30	I'm a highly motivated person	2.93	.76935	Agree	High
26	*It's difficult to adjust my life	2.81	.77457	Disagree	High
25	*I don't have power over others' feelings	2.70	.75925	Agree	High
23	*I "back down" when I'm right	2.62	.75688	Disagree	High
22	*It's difficult to stand for my rights	2.61	.78494	Disagree	High
27	*It's hard to be motivated	2.57	.87736	Disagree	High
24	I influence how others feel	2.24	.60954	Agree	Low
Over-all Sociability		2.80	.331135	Agree	High
Over-all Emotional Intelligence		2.88	.30888	Agree	High

Legend: *Negatively stated test items

In Table 2, it can be seen that the nursing students overall emotional intelligence is high as it yield a mean of 2.88 and a standard deviation of .30888. This results from their high well-being because of its mean of 3.09 and standard deviation of .42203; their high self-control with a mean of 2.76 (SD .46527), their high emotionality with a mean of 2.53 (SD .35964), and their high sociability with a mean of 2.88 and a standard deviation of .30888. In summary, it can be seen that generally the nursing students have a strong emotional intelligence.

Students who possess a high level of emotional intelligence reap the benefits of several effective skills not only for schooling but for life as well. It is very useful to identify, understand and manage emotions especially when working as nurses interacting with many different people and developing interpersonal relationships (Watanabe-Crockett, 2018). Whereas, Grade Power Learning (2017) stated that higher levels of emotional intelligence will allow better management of relatability with others and with themselves. Further, high emotional intelligence will help a person to communicate well, increase self-motivation, and increase confidence in learning.

According to O'Connor (2019), individuals with a high Emotional Intelligence have the capacity to perceive and regulate own emotions as well as with others and have a wide range of adaptability to any emotional conditions.

Emotional Intelligence betters' one's self-esteem and confidently gives individuals a positive view of situations. The ability to constantly have control of one's emotions enhances spiritual health and wellbeing. When spirituality and emotions obtain equilibrium, not only does the individual live, but obtains peace and prosperity. As health care professionals, these characteristics are needed to be therapeutically healing towards the sick individuals (American Society of Registered Nurses, 2017, November 1).

Table 3. *Relationship Between Spiritual Health and Emotional Intelligence of Nursing Students*

		Emotional Intelligence				
		Well-Being	Self-Control	Emotionality	Spirituality	EI
Spiritual Health	Pearson Correlation	.566	.426	.471	.510	.627
	Sig. (2-tailed)	.000	.000	.000	.000	.000
		Significant	Significant	Significant	Significant	Significant
<i>Significant at .05 level.</i>		EI = Emotional Intelligence				

The results show a positive significant relationship between Emotional Intelligence and Spiritual Health ($p .000$), specifically in Well-being ($p .000$), Self-control ($p .000$), Emotionality ($p .000$), and Spirituality ($p .000$). This implies that the higher the spiritual health of the nursing student, the higher is the level of emotional intelligence. This result rejected the null hypothesis.

Yadawa, Hooda, & Sharna (2011) in their study also found out that there was a statistically significant relationship between emotional intelligence and spiritual health among the 300 adult participants. Moreover, the study of Habib et al., (2012) mediated the relationship of the two variables. Rogers, et al., (2019, July 8) stated that when spirituality is included in one's life, social interactions empower the beginning of meaningful interpersonal and intrapersonal relationships therefore boosting one's emotional intelligence.

Table 4. *Difference in the Emotional Intelligence considering their Religion*

	Sum V Squares	Df	Mean Square	F	<i>p</i> value	Interpretation
Between Groups	.427	2	.214	2.278	.106	Not Significant
Within Groups	13.788	147	.094			
Total	14.216	149				

Table 5. *Difference in the Emotional Intelligence considering their Gender*

	Gender	N	Mean	Std. Dev.	<i>p</i> value	Interpretation
Emotional Intelligence	Male	44	2.890	.283	.786	Not Significant
	Female	106	2.875			

Table 6. *Difference in the Emotional Intelligence considering their Year Level*

	Sum V Squares	Df	Mean Square	F	<i>p</i> value	Interpretation
Between Groups	.000	2	.000	.001	.999	Not Significant
Within Groups	14.215	147	.097			
Total	14.216	149				

Tables 4, 5, and 6 the statistical differences of the respondents' emotional intelligence if to consider their religion, gender, and year level. It can be seen that all of the considerations have made *no significant difference* at all, because religion has a p -value of .106, gender has .786 and year level has .999 in which all these should be significant at .05 level. The result therefore gives us an idea that the nursing students' emotional intelligence in some ways is not affected by their religion, by their being male or female, and year level whether first, second, or third year.

In a study conducted in the University of Missouri, Wall (2012) found that regardless of differences in faith, rituals, beliefs, and religion; spirituality improves the health of the person. The programs to cater the patients' spiritual inclination was found to contribute to the improvement of

health of the person. If to consider different religions, it was found out that a better mental health and emotional intelligence was related to higher degree of spirituality.

In 2014, a study was done by Karimi, focusing on the relationship between religious beliefs and emotional intelligence in university students. The result of the study revealed that there was no statistical significant correlation observed in the mean of “religious beliefs growth” (88.41 ± 17.90) and “emotional intelligence” (52.39 ± 9.07) ($p = 0.139$; $r = 0.063$).

The study of Meshkat and Nejati have confirmed the result of this study. They conducted a study in 2017 to determine whether emotional intelligence is different between male and female. This was a study conducted among undergraduate English majors in three Iranian Universities. Results showed that statistically there was no significant difference in emotional intelligence of gender. In contrast, a study done by Karimi (2014) revealed that there was a statistically significant difference between the mean scores of female and male in their emotional intelligence and religious beliefs.

Conclusion and Recommendation

Based on the findings of the study, the nursing students have a high spiritual health resulting to a high level of emotional intelligence in terms of well-being, self-control, emotionality and sociability despite of their religion, gender and year level. As shown by the significant relationship of the variables, it was seen that once their spiritual health increases their emotional intelligence increases as well.

Based on the result of the study, it is recommended in the following:

Nursing education. The school/college of nursing/ university should maintain / strengthen spiritual health activities for nursing students. Encourage the nursing students to join a prayer group, religious group / retreats, community service, and Bible studies.

The nursing students should maintain / strengthen spiritual health activities like: spending time in nature, traveling, take time to meditate/ prayer, reading the Bible, appreciating music and arts, awareness through journaling, finding meaning & purpose in life, and think positively.

Nursing Practice. The nursing service should assess the spiritual health of nurses because based on the result of the study, as spiritual health increases emotional intelligence increases as well. And there are studies that shows that emotional intelligence skills can help improve nursing performance and the equality of services among patients.

Nursing Research. A similar study be done among registered nurses or staff nurses including other variables like personality type, educational attainment, and years of clinical experience and the like.

A study on spiritual health and other variables among frontliners using a qualitative and quantitative methodology in a larger sample size.

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