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### Assessment of Oral Health Status of the Senior Citizens: Basis for Oral Health Program

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#### Abstract

linically, a lot of elderly suffer from an oral mucosa condition and most lose their teeth from a young age due to unawareness of the importance of oral health. That is an indication that they lack oral health education. This descriptive study was conducted to assess the oral health status of citizens who are 60 - 87 years old through random sampling in six barangays in Silang, Cavite. It may serve also as a basis for an oral health program for the elderly in relation to the World Health Organization campaign. Written questionnaires were accomplished by the 158 participants while mouth examinations were conducted on 120 randomly selected respondents in the underserved barangays. The chi-square was utilized to cross-tabulate the respondents' demographic profile such as age, gender, occupation and oral health status in terms of oral mucosa condition, dentition and prosthetic status including prosthetic needs. Almost 27% of the respondents who are 60 -79 years old clinically showed oral pathologic conditions and they were not being treated by any dentist. Edentulism became a common oral health problem of 72% of the elderly and only 50% of them have existing complete dentures. Further studies are recommended to gauge the feasibility of dental missions and local government assistance to implement an oral health education and services program for the underserved elderly citizens.

#### Keywords: senior citizens, oral health status, oral health program

Oral health is a determining factor for quality of life. Oral health means more than a set of good natural teeth. It allows us to speak, smile, chew, taste, swallow, and thus helps us to highly appreciate life. Problems of edentulism, complications like periodontitis and symptoms like dry mouth are commonly seen in the elderly population. Low awareness, lack of access to oral health services and the misconception that older people will not benefit from health education and preventive measures such as fluoridation, conspire to deprive the elderly across the globe of crucial care (Bulletin of the WHO, 2005). According to the World Oral Health report (2003), dental caries and periodontal diseases have historically been considered as one the most prevalent global oral health burdens. Ageing of the population is one of the most important demographic facts that came to the foreground in the 21st century. There are also associations between oral health, general health and wellbeing of older people. (Tirth, Kumar, & Tandon, 2012).

Torresyap,V. Hoover, Torresyap,M. and Kurananayake (2013) stated that the prevalence of oral diseases continues to be a public health issue in the Philippines. According to the Department of Health, more than 75% of the adult population have some form of periodontal disease. Edentulism (lack of teeth) is still considered to be moderate to high in many parts of the developing world and is more pronounced in underprivileged population groups in these nations. Shekar (2010) added that the attitude and awareness towards dental care and the cost of dental treatment might also be the significant factors that determine the prosthetic status (the need for a denture) of a person.

According to Nursing Standard (2011), with increasing age, teeth may become brittle and darker in color, may undergo abrasion (due to excessive tooth brushing forces), erosion of its surfaces, and attrition which may result from natural chewing activities. Penner (2004) mentioned that when sex is considered, it is a known fact that men and women have differences in genetic make- up and they respond differently to oral systemic diseases. Dental practitioners should be aware of sex-based disease/ health issues in order to provide optimum care for their patients.

Taking into consideration the socioeconomic status of the elderly people, the prevalence rates of tooth loss and experience of oral problems vary substantially. Experience of oral problems among older people is high in low income countries; meanwhile, access to health care is poor, especially in rural areas. Lack of financial support from the government and/or lack of third party payment systems render oral health services unaffordable to them (Petersen, Kandelman, Arpin, & Ogawa, 2010).

#### **Research Objectives**

This study was conducted to look into the oral health status of the elderly aged 60 years old and above in the six barangays of Silang, Cavite specifically in, (a) Cabangaan (PulongTalahiban), (b) Munting Ilog, (c) Hukay, (d) Carmen, (e) Balite II and (f) Tibig. The number of respondents were limited to a minimum of 20 respondents per barangay. These barangays were chosen according to the most underprivileged in terms of medical and dental missions in the whole municipality of Silang. The researchers aimed to develop an oral health program which will suit the oral health needs of the elderly. Specifically, this study answered the following problems: (a) What is the profile of the elders in Silang, Cavite in terms of age, gender and social economic status?; (b)What are the characteristics of the elders in Silang, Cavite in terms of: Oral Mucosa, DMFT Index, CIPTN, Prosthetic needs and Prosthetic Status?; (c) Is there a significant association between the respondents' demographic profile (age, sex, and occupation) and oral health status among the elderly in terms of oral mucosa, dentition status and treatment needs, prosthetic status and prosthetic needs?

#### Methodology

#### **Research Design and Instrument**

This quantitative study used descriptive research design in determining the most common oral health conditions of the elderly in the six barangays of Silang, Cavite. An original 1997 WHO oral health form modified by the researchers was used as the principal source of data in this study that was a pertinent aid in determining the common oral health status of the respondents.

#### **Population Sampling and Data Gathering**

The six barangays chosen to be part of this study were selected based on the first six in the list of the most underprivileged barangays in the whole municipality of Silang. Since the goal of this study was to be able to contribute to the dental health sector of the municipality of Silang in determining and creating a dental health program best suitable for their elderly citizens, the respondents per barangay were chosen according to their sex, age ranging from 60 years old and above, and were randomly chosen in terms of their occupation or socio-economic status. The researchers received the list of the names from the National Statistics Office of the Municipality of Silang, Cavite. Since there was an overall of 158 respondents for this study, the researchers divided them to the 6 barangays and derived a minimum of 20 respondents per barangay whose mouths would be examined. The 1997 modified WHO forms were distributed to the 158 respondents for them to fill out the personal information section and were given back to the researchers to be used in recording the data for the oral health examinations of the 120 randomly selected participants.

#### **Statistical Treatment**

Frequency and percentage were used to know the profile on the subjects in terms of age, sex, and social economic status. Moreover, mean and standard deviation were used to determine the characteristics of the subjects in terms of DMFT (decayed, missing, filled teeth) Index, CPITN (community periodontal index and treatment needs), prosthetic status and prosthetic needs. Finally, Chisquare was used to know the significant association between the respondents' demographic profile (age, sex, and occupation) and oral health status among the elderly in terms of:

- a. Oral Mucosa
- b. Dentition status and Treatment Needs

DMFT – (decayed, missing, filled teeth) CPITN – (Community Periodontal Index

six and Treatment needs)

- c. Prosthetic status, and
- d. Prosthetic needs

The Chi-square test for independency was used to determine whether or not a relationship exists between two categorical variables. Categorical data is a collection of observations measured using the nominal or the ordinal level of measurement. They are called categorical variables. The values these variables take on can usually be listed down into a few categories (Almeda, Capistrano & Sarte, 2010).

#### **Results and Discussion**

Based on the analysis and interpretation of data the following results were gathered:

Table 1.

Age Groups of the Elderly Respondents					
Age Group Percentage of					
	Respondents				
60-64 years old	27.20 %				
65-69 years old	36.10 %				
70-74 years old	16.60 %				
75-79 years old	10.10 %				
80-87 years old	6.90 %				

The age of the elderly respondents included in the study ranged from 60 to 87 years old. Overall, the highest number of respondents came from the age group 65 to 69 (36.1%), followed closely by the respondents from the age 60 to 64 (27.2%) while the age group with the lowest number of dental respondents was the 80 to 87 (6.9%) age group. The mean age is 68.67 (SD = 6.23).

Table 2.

Sex of the Elderly Respondents				
Sex	Percentage			
Male	29.7 %			
Female	70.3 %			
Total	100 %			

The table above shows that there were more female (70.3%), than male respondents (29.7%) who participated in the survey. Doyal and Naidoo (2010) stated that there is an extensive literature on sex and medical services in general with women apparently using services more than men.

## Table 3.Occupation of the Elderly Respondents

Occupation	Frequency	Percentage of Respondents
Professional	6	3.8 %
Laborer	100	63.3 %
Non-worker	50	31.6 %

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Others	2	1.3 %	
Total	158	100 %	—

Table 3 shows that most of the elderly respondents in their young age worked and 63% are stil working as laborers and that includes farming as pineapple harvesters and transporters. There are 31.6% who are not working and 3.8% are professionals such as retired teachers and government employees while 1.3% who are sari-sari store owners.

#### Table 4.

Age Group	With Abnormal Condition	With Oral Pathologic Condition	Ν	Chi- square	df	Sig. ( <i>p</i> -value)`	VI
60 -64	32	11	43	11.732	4	0.019	Significant
65 -69	44	13	57				
70-74	22	9	31				
75 - 79	7	9	16				
80 yrs & above	11	0	11				
Total	116	42	158				

The Association of Age and the Oral Health Status among Elderly in Terms of Oral Mucosa Condition

Table 4 shows that in the association of age and oral mucosa condition, in most of the elderly who have undergone oral examination for this study, most of those who are at the age of 75-79 were completely edentulous and they used their gums to chew food which developed sores and the elderly at this age were not aware that they have to continually clean their mouth even if they are already edentulous. The incidence of having the presence of oral pathologic condition decreases when the elderly reaches the age of 80 and above due to the change of their diet into a completely soft diet.

Out of 43 respondents aged 60-64 years old, 32 have normal oral mucosa condition while 11 have the presence of oral pathologic conditions; 44 out of 57 respondents aged 65-69 years old have normal oral mucosa condition while 13 have the presence of oral pathologic conditions; Among the 31 respondents aged 70-74 years old, 22 have normal oral mucosa condition while 9 have the presence of oral pathologic conditions; among the 16 respondents aged 75-79, 7 have normal oral mucosa conditions while 9 have oral pathologic conditions; Finally, all the 11 respondents aged 80 years and above have normal oral mucosa conditions.

Table 5.

The Association of Occupation and the Oral Health Statu	us Among Elderly in Terms of Treatment Needs
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		Occupation				
		Laborer	Non Worker	Total	Sig. (p-value)	VI
Treatment Needs	No Need Treatment	66	42	108	0.022	S
	Needs Treatment	34	8	42		
Total		100	50	150		

Table 5 shows that there is a significant association between occupation and the oral health status among elderly in terms of their treatment needs. This shows that the laborer who earns compared to the nonworker has a higher percentage of needing treatment like restoration, root canal, and periodontal treatment which signifies that these elderly are still not completely edentulous, as compared to non-workers who have a higher percentage of not needing treatments because of being completely edentulous. This also tells us that laborers at a young age, were able to somehow take care of their teeth and having the financial capability to visit the dentist which was a big factor to preserve their teeth.

#### **Conclusions and Recommendations**

Based on the findings, it was found that majority of the respondents have a monthly income of 5,000 pesos and below thus as a result most of them are incapable of going to a dental clinic. Majority of them are females and labor workers who have their farms in secluded areas of Silang, Cavite.

Most of the elderly respondents' oral health status were not recorded because the teeth needed for the oral health examination were extracted. Some have teeth but they are fractured, decayed or even have pocket depths of 4 mm and above. Others need extraction but due to medical conditions it is prohibited and the rest needs scaling and polishing. Most of them also need a prosthesis either complete or partial.

In this study, it can be concluded that the elderly are suffering from neglected oral health conditions. Oral hygiene and oral health issues are disregarded in areas or communities that are far to reach by the dental practitioners or other dental organizations conducting dental missions. This case affects the perception of the younger generation for what they have learned from the current old generation. As a result, the young people today will have the same problems like disregarding their oral health conditions in the future.

There is a great need in catering to the oral health needs of the elderly in those barangays. Since most of them are financially incapable to pay for their dental treatment and for some other reasons and concerns, the following recommendations are suggested:

Government. The local government of Cavite should give more priority to the medical and dental health concerns of every individual residing in the barangays especially those far from the town proper or far from medical and dental facilities. Government health agencies specifically the dental health department should conduct dental health check-ups at least bi-annually to check the oral health status of the individuals in those areas particularly the adults who are soon to become elderly while their teeth can still be saved or preserved.

A free dental mission should be done annually in less visited areas like the far-flung barangays for the benefit of adults who cannot afford to seek dental treatment. Basic dental procedures like scaling and polishing and restoration and extraction of decayed teeth should be done for the damaged or restorable teeth that are still remaining in the mouth of the patient. Health education or informative discussions and oral health awareness campaigns can be done by students preparing to be dental practitioners in cooperation with the local health officials to educate the residents of the barangays at least once or twice a year in specific localities. Low price or free prosthesis should be given to the elderly individuals who cannot afford to have a prosthesis which can be funded by the government or sponsored by NGOs (Non- Governmental Organizations) or through an extended community service by an institution like AUP.

#### Adventist University of the Philippines (AUP)

The AUP-COD (College of Dentistry) should enlarge its scope of community extension in the other barangays of Silang . By conducting a round of dental missions in the barangays of Silang especially the far and least served communities, AUP-COD will not only make Puting Kahoy smile but the municipality of Silang as a whole.

As the students of COD need complete denture patients, adequate coordination with the barangay captains should be done in order to help the elderly citizens of the barangays to restore their smiles and also to help the students with their dental school requirements. The AUP-COD Community Dentistry class should also conduct oral health lectures in the barangays of Silang, Cavite to educate the people on how to

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take better care of their oral health.

Here is the suggested program for the elderly feasible to be done in a span of three monthsMechanics of the Oral Health Program for the Elderly (3 months)

- a. Communicate with the Municipality and the Barangay officials (1st week)
- b. Conduct a dental mission and build a rapport with the community (2nd week)
- c. Give a series of Oral Health Education lectures (one topic per meeting, once a week)
- i. Orientation regarding Oral Health and its importance (3rd week)
- ii. Proper tooth brushing (giving of free tooth brushes and actual demonstration of tooth brushing) (4th week)
- iii. Oral diseases lecture (how these are acquired, how to avoid those diseases and how those can be treated) (5th week)
- iv. Lecture on their treatment needs and maintenance (6th week)
  - Restorative treatment
  - Periodontal treatment
  - Prosthetic needs and Maintenance
- v. Importance of visiting a dentist (7th week)
- vi. Lecture on Proper diet (8th week)
- d. Follow-up visitations (12th week)

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Assessment of Oral Health Status of the Senior Citizens: Basis for Oral Health Program

Torresyap, V., Hoover, J., Torresyap, M. & Karunanayake, C. (2013). Prosthodontic and periodontal status and needs in a selected population of urban poor in the Philippines: A pilot study. International Journal of Prosthodontics and Restorative Dentistry, 3(4), 136-142.

## Marginal Microleakage Evaluation of Four Temporary Restorative Materials Used as Double Seal in Endodontics: An In Vitro Study

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#### Abstract

utting a double-seal using temporary restorative cements is practiced but the sealing capabilities against marginal leakage of these materials have not been revealed. The study was conducted to know which combination of cements is more effective in providing provisional barrier in between endodontic appointments. A quantitative comparative research design was employed in this study. Four cements were selected to be used as double seal in 60 endodontically prepared teeth. The 60 specimens were grouped into five: Group A (Caviton and IRM<sup>©</sup>); Group B, (Cavit and IRM<sup>©</sup>); Group C (Caviton and Hy-bond Zinc Phosphate Cement); Group D (Cavit and Hy-Bond Zinc Phosphate Cement); and Group E, (combination of groups A, B, C, and D). All specimens were mounted in Portland cement up to their cervical lines, exposing their crowns. Moreover, all specimens underwent thermocycling and were immersed in methylene blue dye solution for leakage assessment for a certain period and were rinsed under tap water, dried, and sectioned mesiodistally. The greatest depth of dye penetration was measured using a periodontal probe and was recorded. Statistical significant differences were established using one-way ANOVA and Post Hoc Tukey tests (p < 0.05). Group C showed the least amount of dye penetration after 30 minutes. All the groups showed marginal micro leakage after immersion in methylene blue for 1 hour. Caviton and Hy-Bond Zinc Phosphate cements provide the most effective sealing ability against marginal leakage. None of the other groups of cements were able to prevent leakage consistently. These cements can be recommended to be used as double seal in between appointments following root canal treatment to prevent reinfection of the canal system.

#### **Keywords:** double-seal, marginal leakage, temporary restorative cements, dye penetration

Micro leakage can significantly affect the prognosis of endodontic treatment. Microbial infection is one of the foremost factors related with endodontic failure (Ricucci, Grondahl, & Bergenholtz, 2000). According to Jensen, Abbott, and Salgado (2007), "the microbial flora within a tooth and its root canal system can be eliminated through a combination of the following eight steps that form part of the typical endodontic treatment regime adopted by most dentists: (1) diagnose and remove the cause of the disease; (2) use an aseptic technique; (3) mechanically instrument the root canal to enlarge them; (4) irrigate the canals with one or more antibacterial solutions; (5) medicate the canals with one or more antibacterial agents; (6) temporarily restore the tooth to avoid bacterial ingress during and after treatment; (7) fill the root canal system once disinfected; and (8) restore the tooth to normal function."

An appropriate temporary filling material can be an important factor to determine the success or failure of root canal treatment. Filling materials seal the tooth temporarily, preventing the entry of fluids, microorganisms, and other debris into the root canal space. In addition, they prevent the escape of medicaments which were placed in the pulp chamber and root canal system.

Researches carried out abroad show comparisons among different types of temporary filling materials. Different authors have reported conflicting results. Many concluded that Cavit and IRM have withstood the strictness of testing and evaluation (Balto, Al-Nazhan, Al-Mansour, Al-Otaibi, & Siddiqu, 2005; Barkhordar & Stark, 2005; Hagemeier, Cooley, & Hicks, 1990; Kazemi, Safavi, and SpTngberg, 1994; Kenee, McClanahan, & Johnson, 2000; Lee, Yang, Huang, Chueh, & Chung, 1993; Mayer & Eickholz, 1997; Parris, Kapsimalis, Cobe, & Evans, 1964; Suaia et al., 2006; Zaia et al., 2002; Zmener, Banegas, & Pameijer, 2004). Other case reports claimed that Cavit and IRM showed greater leakage than other temporary restorative cements (Alpuerto & Santos, 2002; Urunga, Blum, Parahy, & Prado, 1999).

Comparison between ZOE-based cement and Zinc phosphate cement was done by Silvey and Myers (1976). They concluded that there is no significant difference in the clinical success between the two materials.

Controversial results were shown concerning the sealing ability of zinc phosphate cement. Access cavities with this material showed no leakage in more than two-thirds of cases in an in vivo study (Krakow, Destoppelaar, & GrUn, 1977). In another study using fluid filtration method to test micro leakage, zinc phosphate cement did not show significant micro leakage when compared to the intact crown, but visible leakage was observed in some of the samples temporized with this material (Bobotis, Anderson, Pashley, & Pantera, 1989).

#### **Statement of the Problem**

This experimental research compared the sealing abilities of the commonly used intermediate restorative materials to double seal the prepared endodontic accesses.

Specifically, the study aimed to answer the following questions: (1) What is the extent/amount of dye penetration among the groups of temporary cements: a. after 30 minutes of immersion in methylene blue and b. after 1 hour of immersion in methylene blue?; and (2) Is there a significant difference in the penetration among the groups of temporary cements: a. after 30 minutes of immersion in methylene blue and b. after 1 hour of immersion in methylene blue?

#### Methodology

Randomly selected 60 extracted teeth were were used in the experimental investigation of the study. Each specimen had the following qualifications: (a) specimen must be without restorations; (b) specimen must have undamaged marginal ridges; (b) specimen must have no carious lesions at the proximal, buccal and lingual surfaces; and (c) specimen must not have visible fracture lines.

A quantitative comparative research design was employed in this study. The values obtained were statistically analyzed using the Analysis of Variance (ANOVA) method and Post Hoc Tukey Test.

The results were also categorized into nine groups based on their dye penetration in millimeters:

No Penetration	= 0;
Very Low	= 0.1  mm to  0.9  mm;
Low	= 1 mm;
Slightly Moderate	= 1.1  mm to  1.9  mm;  Moderate = 2  mm;
Considerably Moderate	= 2.1  mm to 2.9 mm; Slightly High $= 3  mm$ ;
High	= 3.1  mm to  3.9  mm; and
Very High	=4 mm.

#### **Procedures in Data Gathering**

Sixty extracted teeth which passed the criteria were collected. The teeth were immersed in 5.25% NaOCl solution for five minutes to disinfect and clean the root surfaces. After cleaning, the teeth were rinsed and stored in a normal saline solution for 1 hour. All 60 teeth were endodontically prepared with a high-speed hand piece using a carbide bur.

The following were the criteria for good access preparation:

- 1. Pulp chambers must be totally debrided.
- 2. All walls must diverge occlusally.

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#### 3. Enamel walls must be smoothened at the access outline.

After the cavity preparation, all teeth were rinsed with 5.25% NaOCl solution for one minute. The chambers were air-dried upon access completion. Gutta percha was placed in the chambers and was compressed down to obtain a flat access floor. It permitted a 4-millimeter space (which was exacted by a periodontal probe) for the intermediate restorative material. All specimens were then mounted in Portland cement until their cervical lines. The Portland cement was allowed to set before the placement of the temporary cements.

The access openings were all sealed with a double seal using a plastic filling instrument. The first inner layer of cement was compacted and flattened using a plastic filling instrument. A damp cotton pellet was also used to moisten the cement and was allowed to set for 30 minutes. After 30 minutes, the cavities were filled with a top layer of more rigid cement.

The specimens were divided into five groups. The first four groups had ten selected teeth composed of: two central incisors, five premolars, and three molars (per group). The fifth group had twenty selected teeth. These twenty teeth were divided into four subgroups which consisted of: two anterior teeth, one premolar, and two molars (per subgroup).

Double seal were categorized as:

- Group A: Packed with a two-millimeter inner layer of Caviton followed on top by a twomillemeter IRM.
- Group B: Packed with a two-millimeter inner layer of Cavit followed on top by a two-millemeter IRM.
- Group C: Packed with a two-millimeter inner layer of Caviton followed on top by a twomillemeter Hy-Bond Zinc Phosphate Cement.
- Group D: Packed with a two-millimeter inner layer of Cavit followed on top by a two-millemeter Hy-Bond Zinc Phosphate Cement.
- Group E: Control group. This group will be a combination of the aforementioned groups (A, B, C, and D).

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Excess temporary cements were removed using cotton pellets. The temporary cements were allowed to dry up for 10 minutes.

The specimens were thermocycled for 100 cycles by placing them alternately in distilled water baths at a temperature range of 5oC and 55oC, 30 seconds in each bath. A thermometer was used to check the temperature of the water baths every cycle. The warm water bath was consistently reheated with the use of heater to maintain the indicated temperature and the cooler water bath was changed coherently to have a consistent temperature.

The extracted teeth were immersed in plastic containers filled with Methylene blue. Groups A, B, C, and D were contained at room temperature for thirty minutes, while Group E was contained at room temperature for one hour. All extracted teeth were removed from the Methylene blue after the allotted time and were rinsed under tap water and dried.

Subsequently, the teeth were sectioned mesiodistally by a diamond disc. The cements were reevaluated for evidence of dye dissemination on the margins using a magnifying glass and a periodontal probe.

Marginal micro leakage was graded using a periodontal probe in as follows:

0 = if no dye penetrated any cement

1 = if the dye penetrated less than 1 mm of cement from the most coronal part of the filling material

- 2 = if the dye penetrated up to 1 mm of cement from the most coronal part of the filling material
- 3 = if the dye penetrated more than 1 mm but less than 2 mm of cement from the most coronal part of the filling material

4 = if the dye penetrated up to 2 mm of cement from the most coronal part of the filling material

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- 5 = if the dye penetrated more than 2 mm but less than 3 mm of cement from the most coronal part of the filling material
- 6 = if the dye penetrated up to 3 mm of cement from the most coronal part of the filling material
- 7 = if the dye penetrated more than 3 mm but less than 4 mm of cement from the most coronal part of the filling material

8 = if the dye penetrated up to 4 mm of cement from the most coronal part of the filling material

#### **Results and Discussion**

Group C (Caviton and Hy-bond Zinc Phosphate Cement) showed the least amount of methylene blue dye penetration after 30 minutes of immersion compared to the other groups of cements (Table 1).

Dye Penetrati	on (in mm)				
	Average	Ν	Mean	Std. Deviation	Interpretation
GroupA	3.5	10	1.7500	.63465	Slightly Moderate
Group B	4.4	10	2.2200	.50067	Considerably Moderate
Group C	0.6	10	.3000	.48305	Low
Group D	2.5	10	1.2500	.82496	Slightly Moderate
Total		40	1.38	.82175	

All of the groups of temporary cements showed marginal micro leakage after immersion in methylene blue for 1 hour. Group E3 (Caviton and Hy-Bond Zinc Phosphate) displayed a very low penetration grade compared to the other groups (Table 2).

Table 2.	
Dye Penetration (in	mm)

Table 1.

	Average	N	Mean	Std. Deviation	Interpretation
Group E1	3.2	5	1.6000	.65192	Slightly Moderate
Group E2	3.6	5	1.8000	.83666	Slightly Moderate
Group E3	0.6	5	.3000	.27386	Very Low
Group E4	4	5	2.0000	1.41421	Moderate
Total		20	1.4250	1.06715	

There were significant statistical differences between the groups of temporary cements after 30 minutes of immersion in methylene blue. Group C demonstrated a low dye penetration and greater sealing capability than the other groups of cements. A significant difference between Groups B and D was also brought out. But then, statistically significant differences were not presented between Groups A and B; and Groups A and D (Table 3).

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#### Table 3. Differences in Dve Penetration (in mm)

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	20.285	4	5.071	7.803	.000
Within Groups	35.744	55	.650		
Total	56.028	59			

Table 4.

Post-hoc Test of the Dye Penetration (in mm) after 30 minutes

(I) Group	(J) Group	Mean Difference (I-J)	Std. Error	Sig.
Group A	Group B	4700	.36052	.198
	Group C	1.4500*	.36052	.000
	Group D	.5000	.36052	.171
Group B	Group A	.4700	.36052	.198
	Group C	1.9200*	.36052	.000
	Group D	.9700*	.36052	.009
Group C	Group A	-1.4500*	.36052	.000
	Group B	-1.9200*	.36052	.000
	Group D	9500*	.36052	.011
Group D	Group A	5000	.36052	.171
	Group B	9700*	.36052	.009
	Group C	.9500*	.36052	.011
* The mean difference is	significant at the .05 level.			

Group E showed statistically significant differences between its subgroups after immersion in methylene blue dye for 1 hour. Group E3 exposed a significance level of less than 0.05 when compared to the other groups of temporary cements. The differences in marginal leakage between Groups E1 and E2, Groups E1 and E4, and Groups E2 and E4 were statistically insignificant (Table 4).

Differences in Dye Penetration (in mm)									
	Sum of Squares	df	Mean Square	F	Sig.				
Between Groups	8.838	3	2.946	3.682	.034				
Within Groups	12.800	16	.800						
Total	21.638	19							

# Table 5.

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(I) Group	(J) Group	Mean Group Difference (I-J)		Sig.
Group E1	Group E2	2000	.56569	.728
	Group E3	1.3000*	.56569	.035
	Group E4	4000	.56569	.490
Group E2	Group E1	.2000	.56569	.728
	Group E3	1.5000*	.56569	.017
	Group E4	2000	.56569	.728
Group E3	Group E1	-1.3000*	.56569	.035
	Group E2	-1.5000*	.56569	.017
	Group E4	-1.7000*	.56569	.008
Group E4	Group E1	.4000	.56569	.490
	Group E2	.2000	.56569	.728
	Group E3	1.7000*	.56569	.008

Table 6.

Post-hoc Test of the Dye Penetration (in mm) after 30 minutes

In the present study, 60 intact extracted human teeth (anterior and posterior) without any caries and fractures were endodontically prepared and gutta-percha was placed and flattened to allow a 4 mm space for the temporary cements. This procedure was done to follow the recommendations of Webber, del Rio, Brady, and Segall (1978), who determined that the least depth of 3.5 mm of the temporary material was necessitated to keep micro leakage of the dye.

After the preparation of the specimens and after they were filled with 2 mm layer of IRM or Hy-Bond Zinc Phosphate and with 2 mm inner layer of Cavit or Caviton, these specimens were subjected to thermocycling procedure to stimulate temperature changes that take place in the oral cavity. Micro leakage assessment was performed after the thermocycling procedure by using dye penetration test. Dye penetration was measured visually by using periodontal probe and magnifying glass.

The results of the present study showed that all test materials, even when used as double seal, may display potential marginal micro leakage. This is in accordance to the studies conducted by Sauai et al. (2006), Tanomaru-Filho, da Silva, Duarte, Goncalves, and Tanomaru (2006), and Zaia et al. (2002) where all temporary cements may reveal some degree of marginal leakage.

IRM is the most widely used temporary cement. It is polymer modified Zinc Oxide Eugenol cement, which is purposely used as temporary filling and for thermal insulation. This cement is the least irritating of all dental cements and is known to have a sedative effect on exposed dentin (Anderson, Powell, and Pashley, 1988). In this study, IRM showed an inferior marginal sealing capability when compared to Hy-Bond Zinc Phosphate Cement. The result of this investigation, however, was somehow not in conformity with the study conducted by Silvey and Myers (1976) wherein there was no significant difference found in clinical success between zinc oxide-eugenol cement and the zinc phosphate cement.

Cavit is a widely used inter-appointment temporary restorative material in endodontics. This cement is non-eugenol-based material, easier to manipulate because it is already premixed and ready to be used by the operator. Cavit is well known for its superior marginal sealing ability when compared to other temporary cements. Studies by Anderson et al. (1988), Balto (2002), and Kazemi et al. (1994) support this issue. In this study, nevertheless, Cavit demonstrated significant amount of leakage compared to Caviton. Caviton is also supplied as single component putty like paste with the same composition with University Research Office JHS Vol. 2 No. 1 | July 2019

Cavit (which has zinc oxide, zinc sulphate-1-hydrate, and calcium sulphate-hemihydrate), and also sets by chemical reaction with water (Manappallil, 2003).

#### **Conclusions and Recommendations**

Caviton and Hy-Bond Zinc Phosphate cements provide the most effective sealing ability against marginal leakage.

Cavit can be more penetrated by micro leakage than Caviton. Comparing the sealing ability of the outermost cements of the double seal used in the experiment, IRM was found to have a considerably moderate penetration or has a poorer marginal sealing ability than that of Hy-Bond Zinc Phosphate cement.

All of the materials investigated in this study showed micro leakage; furthermore, significant statistical differences were detected for the groups of temporary cements used after 30 minutes and after 1 hour of immersion in methylene blue. Based on the mean scores, Caviton and Hy-Bond Zinc Phosphate cements exemplified a very low marginal micro leakage. None of the other groups of cements were able to prevent leakage consistently.

Caviton and Hy-Bond Zinc Phosphate cements can be recommended to be used as double seal in between appointments following root canal treatment to prevent reinfection of the canal system.

Other researchers may conduct further studies concerning the effects of food and beverages on the cement materials used in double sealing.

Further research may be conducted to compare cements regarding double seal with a layer of soft cement on top and an inner layer of hard cement.

Similar studies can be made but should have more number of specimens used, with masticatory loading, and a buccolingual sectioning of the specimen for evaluation of dye penetration.

Other researchers may conduct more researches regarding the double marginal sealing abilities of other temporary restorative cements that may be used in endodontics.

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## **Comparison of the Glycemic Response of White Sugar and Monk Fruit** Sweetener among Normoglycemic Subjects

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#### Abstract

eing overweight and a diet involving high calories that adds to the gaining of weight are some of the factors of diabetes mellitus type 2. There is a particular correlation on the glycemic index to some chronic diseases related to central obesity and insulin resistance. Diabetics are often advised to lessen sugar intake thus there is a growing number of artificial sweeteners that have come up to the market. The purpose of this research was to compare the blood glucose response of the participants after the consumption of similar concentrations of white sugar and monk fruit sweetener. The glucose loads were prepared by dissolving 50 grams of the sweetener to 250 mL of water. The blood of twelve non-diabetic participants ages 18 to 25 were obtained using capillary punctures and the glucose levels for fasting and at 15, 30, 45, 60, 90 and 120 minutes after the consumption of the glucose load were determined. The data were treated with Paired T-test to know if there is a significant difference between the fasting blood sugar and the blood sugar from the different time interval, and it showed that white sugar has significant increase from the baseline, while monk fruit has no significant difference. This result proved monk fruit will not affect blood glucose significantly and is safe for consumption by those who want to maintain a normal blood sugar. Comparing the monk fruit to other sweeteners used by diabetic patients is an area needed to be explored.

#### Keywords: DM Type 2, Monk fruit, White sugar, Blood glucose

The American Diabetes Association recommends that people should limit their intake of sugar-sweetened beverages for the human body is not made to consume excessive amounts of sugar and to help in the prevention of life style diseases. In the past, people with diabetes were told to completely avoid sugar. Now, experts are introducing sugar substitutes which offer sweetness while controlling the carbohydrate intake and blood glucose. Monk fruit, also known as Luo Han Guo is a native fruit mainly grown in the southern part of China. The scientific name of monk fruit is Siraitia grosvenorii formerly called as Momordica grosvenorii. Monk fruit, a perennial vine that is a member of the Curcubitaceae or the gourd family, is estimated to be 200-300 times sweeter than sugar. Mogrosides, the main bioactive component found in monk fruit is responsible for the sweetness of the fruit. The fruit claims to have many benefits to an individual's health. These health promoting properties include immune enhancement, anti-oxidant, anti-diabetes, anti-tumor, and anti-inflammation. Some studies University Research Office

have shown that mogrosides seem to increase insulin secretion and that it directly acts on the  $\beta$  cells of the pancreas owing to its antidiabetic function but this area remains to be unclear and further studies must be done. The aim of this study was to determine and compare the effects of the two sweeteners: monk fruit sweetener and white sugar. The fasting blood sugar of each participant was measured after an 8 to 10 hour fasting before the administration of the sugar load. The blood glucose of the participants were measured at time intervals of 15 minutes, 30 minutes, 45 minutes, 60 minutes, 90 minutes, and 120 minutes.

#### Methodology

#### **Material Preparation**

The monk fruit was procured from an online store while the white sugar was procured from a local store. The glucose loads were prepared by dissolving 50 gr of white sugar and monk in 250 mL of distilled water, respectively.

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The materials used in the collection of blood were 70% alcohol, cotton, gloves, microlancets, glucometer strips, and glucometer.

#### **Subject Preparation**

The 12 individuals who participated in the research were relatively healthy and non-diabetic. Their ages ranged from 18 to 25 years old and both males and females. The participants fasted for 8-10 hours before the testing was done. They were also asked to refrain from consuming alcohol on the previous evening and avoid vigorous exercise during the fasting period.

#### **Data Collection**

Blood extractions through capillary puncture for the fasting blood sugar (FBS) were performed. The participants were then instructed to consume the prepared sweetener load within 5-10 minutes. The capillary blood samples were collected to measure the blood glucose levels using a Glucosure glucometer at regular intervals of 15, 30, 45, 60, 90, and 120 minutes after the sugar load intake. The participants were asked to wait by sitting during the testing period. The participants underwent the same preparation and procedure for the two sweeteners. The collected data were recorded and treated statistically with paired T-test to know whether there is significant difference between the rise of the blood sugar from fasting blood sugar to different time interval.

#### **Results and Discussion**

After testing the blood for the glucose response at different time intervals, data from two sweeteners showed different results. The following graph and tables present the result of the comparison of the two sugars.



Figure 1. Mean blood glucose of white sugar and monk fruit.

Based on the line graph, the mean blood glucose levels of the participants for the monk fruit remained close to the fasting blood sugar (x=85.92 mg/dL), with very minimal increase, giving a mean blood sugar of 86.50 mg/dL as the highest, while the increase of blood glucose in the white sugar is very apparent, reaching its peak level at 30 minutes with 143.33 mg/dL from 96. 25 mg/dL fasting level and only returned to the fasting level at 120 minutes (x=94.83 mg/dL). From the graph, it is evident that the glucose responses of the two sweeteners are very different from each other. The glucose values produced from monk fruit remained close to the fasting level because of its component—mogrosides which is responsible for the fruit's sweeteness and its antiglycemic activity. Because of the fruit's level of sweeteness, small amount of the sweetener is only needed to make a drink or food sweet.

Paired S	ample			Paired	Difference	t-t	test
		Mean	Std. Deviation	mean	std. deviation	t	sig
Pair 1	FBS	85.92	6.56	-0.58	5.52	-0.37	0.721
	after 15 min.	86.50	9.35				
Pair 2	FBS	85.92	6.56	1.33	4.58	1.01	0.335
	after 30 min.	84.58	7.23				
Pair 3	FBS	85.92	6.56	2.08	4.89	1.48	0.168
	after 45 min.	83.83	6.31				
Pair 4	FBS	85.92	6.56	0.00	4.57	0.00	1.000
	after 60 min.	85.92	5.70				
Pair 5	FBS	85.92	6.56	3.25	7.98	1.41	0.186
	after 90 min.	82.67	7.68				
Pair 6	FBS	85.92	6.56	2.08	6.17	1.17	0.267
	after 120 min.	83.83	8.39				

Table 1.				
Paired t-test of Blood	Glucose	Values	of Monk	Fruit

Table 1 shows the comparison of the mean blood glucose at different time interval with the mean fasting blood glucose, which serves as the baseline. Using t-test, it shows that the blood sugar of the participants, from 15 minutes to 120 minutes has no significant difference from the fasting blood glucose, meaning the increase of the blood sugar is only minimal. Normally, consumption of food with carbohydrates increases the blood glucose because the carbohydrates are broken down into small monosaccharide units which are easily absorbed by the intestines into the blood stream, causing an increase in the blood glucose level, and as a result insulin hormones are released allowing the uptake of the glucose by the cells to reducing the blood glucose level until it returns to the normal level. This result indicates that the monk fruit does not raise blood glucose significantly, of which the mechanism behind its antiglycemic function is still unclear. The result somehow supports other studies claiming that the fruit has antiglycemic activity.

#### Table 2.

Paired t-test of Blood Glucose V	Values o	f White	Sugar
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Paired San	nples				Paired difference		t-test
		Mean	Std. Deviation	mean	std. deviation	t	sig
Pair 1	FBS	96.25	5.79	-40.08	19.89	-6.98	0.000
	after 15 minutes	136.33	20.20				
Pair 2	FBS	96.25	5.79	-47.08	26.48	-6.16	0.000
	After 30 minutes	143.33	27.80				
Pair 3	FBS	96.25	5.79	-30.67	21.93	-4.85	0.001
	After 45 minutes	126.92	22.88				
Pair 4	FBS	96.25	5.79	-18.50	21.45	-2.99	0.012
	After 60 minutes	114.75	21.15				
Pair 5	FBS	96.25	5.79	-5.08	7.60	-2.32	0.041
	After 90 minutes	101.33	7.83				
Pair 6	FBS	96.25	5.79	1.42	8.08	0.61	0.556
	After 120 minutes	94.83	6.97				

The values obtained from white sugar at different time intervals as shown in table 2, is evidently significant from its baseline—the fasting blood sugar. Unlike the monk fruit, white sugar increases the blood sugar significantly which may also cause significant increase (beyond normal values) in the blood sugar of people with type 2 DM which is dangerous for them.

#### **Conclusions and Recommendations**

The findings of this study showed that the monk fruit causes minimal and insignificant increase of blood sugar level of normoglycemic participants, compared to white sugar which significantly increases blood sugar after its consumption.

Further studies are recommended to test the glucose response of the subjects when monk fruit is used as an ingredient in food such as cookies or cakes to check if similar response will be produced; and to compare the monk fruit with other sweetener aside from the white sugar.

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## Effect of the Complete Health Improvement Program on Neutrophil **Phagocytic Activity**

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#### Abstract

The increased incidence of lifestyle diseases has led to the development of health intervention programs. These lifestyle programs have the potential to greatly change one's overall health. One such program is the Complete Health Improvement Program (CHIP). Although offered in various locations worldwide, this study involved CHIP participants held at Adventist Medical Center-Manila, Pasay City, Manila (AMCM). The goal of this study was to determine the effect of participating in the CHIP on the innate immune system particularly the neutrophil phagocytic activity. Incidental quota sampling was used to conduct a pretest-post-test intervention study design involving all participants who completed the 30day program. The phagocytic activity of neutrophils was determined through microscopic examination of slides prepared from the participants' heparinized whole blood, inoculated with a bacterial suspension of Staphylococcus aureus and stained with Wright's stain. Statistical comparison using dependent t-test of the pre- and post-CHIP neutrophil phagocytic activity of the participants who joined the program showed significant changes. Phagocytic percent, phagocytic index and phagocytic activity are significantly higher after the completion of the program. Further study on whether these results would be consistent in participants who can maintain the lifestyle and the effect on the adaptive immune system may be explored.

#### **Keywords:** Complete Health Improvement Program (CHIP), neutrophil phagocytic activity, phagocytic index, phagocytic percentage

Diseases, especially lifestyle diseases, are becoming more common these days. As a result, today's generation is becoming more aware and mindful that their lifestyle; like diet and activities of daily living may play an important role in the condition of a person's overall health. New programs have been embarked on to aid the human body in preventing and coping up with such diseases.

Inspired to make better health accessible to the masses, Dr. Hans A. Diehl, an Adventist Doctor of Lifestyle Medicine in Loma Linda, California, developed affordable. an community-based program designed to arrest and reverse society's most common diseases; thus, Complete Health Improvement Program (CHIP) was born.

Complete Health "The Improvement Program - formerly Coronary Health Improvement Project - is an affordable, lifestyle enrichment program designed to reduce disease risk factors through the adoption of better health habits and appropriate lifestyle modifications." The program

intends to help the participant make better lifestyle choices with regards to diet, physical activity, stress management, and provide the social and emotional support that a participant requires to maintain or restore health. It has been proven that the CHIP intervention can reduce cardiovascular risks, can improve eating and sleeping practices, and can reduce stress and depression.

While studies on the lowering effect of CHIP on weight, cardiovascular risk and glucose and cholesterol levels have been conducted, the direct effect of CHIP intervention on the immune system has not been fully explored. The goal of the researchers was to give an overview about the changes that may result when a person participates in such program. The main element of the immune system that this study tackled is the phagocytic activity of neutrophils which help fight infection by ingesting and killing microorganisms through the help of a certain enzyme called myeloperoxidase (MPO) enzyme. Subjects of the study were chosen

through incidental quota sampling. Microscopic evaluation of Wright-stained peripheral blood smears prepared from a mixture of the participant's heparinized blood and standardized bacterial suspension provided information on the neutrophil phagocytic activity.

The immune system, divided into innate and adaptive, is the body's defense against infectious organisms. Innate immunity occurs immediately when circulating innate cells recognize a problem. There are numerous types of innate immune cells with specialized functions. They include neutrophils, eosinophils, basophils, mast cells, monocytes, dendritic cells, and macrophages. Their main feature is the ability to respond quickly and broadly when a problem arises, typically leading to inflammation. Innate immune cells are also important for activating adaptive immunity. Innate cells are critical for host defense and disorders in innate cell function may cause chronic susceptibility to infection (Stevens, 2010).

Phagocytosis, as a response to infections, is the main component of innate defense mechanisms. Phagocytic cells such as the neutrophil carry out their nonspecific defense through what is known as phagocytic process (Miller, 2015). Phagocytosis is defined as the ingestion of particles by cells, and this process involves the binding of opsonized particles to the surface of phagocytic cells, followed by the internalization and destruction of these particles (Segal, 2005).

Neutrophils and macrophages are active in phagocytosis; they can ingest bacteria and dispose dead matter. Among WBCs, neutrophils respond most quickly to tissue destruction by bacteria. After engulfing a pathogen during phagocytosis, a neutrophil unleashes several chemicals to destroy the pathogen. These chemicals include the enzyme lysozyme which has strong oxidants that can destroy certain bacteria. Neutrophils also contain defensins, proteins that exhibit a broad range of antibiotic activity against bacteria and fungi. Within a neutrophil, vesicles containing defensins merge with phagosomes containing microbes (Derrickson & Tortora, 2009).

The multi-step phagocytic process is activated in response to invasion of foreign microorganisms and includes the rolling and adherence of neutrophils to the blood vessel

endothelium, the diapedesis and chemotaxis towards the invading organism, the ingestion, degranulation and the oxidative burst, ending with killing of the pathogen (Derrickson & Tortora, 2009). Measurement of neutrophil parameters is an area of interest in immunology because neutrophils play a critical role in host defense. Neutrophils comprise the majority of circulating leukocytes and represent the early body's response in the battle against bacterial and fungal infections (Cohn & Morse, 1996).

A relationship between intense exercise, leukocytosis, and susceptibility to illness was already reported at the beginning of the past century in three separate studies by Larrabee (1902), Cowles (1918) and Baetjer (1932). Short duration exercise could promote beneficial and appropriate physiological response to the immune system, while heavy exertion could be detrimental to health. In recent years, the development of advanced laboratory techniques contributed to enrich the knowledge and deepened the understanding of the mechanisms underlying the immune system in sports medicine (Buettner, 2007; Petersen, 2005). The potential influence of exercise on the immune system could be beneficial, detrimental or neutral. The immune response depends on the type of the particular exercise, its intensity, volume and duration (Friman & Wesslen, 2000; Mackinnon, 2000; Peters & Bateman, 1983).

Multi-factorial elements could be involved in the neutrophil behavior and in the immune responses to exercise. Studies by Gabriel, Schwarz, Born and Kindermann (1992), Ortega (2003), and Soppi,Varjo, Eskola, and Laitinen (1982) showed that of all subsets of circulating leukocytes, mainly neutrophils and lymphocytes increase dramatically during exercise. Neutrophil count may exhibit a biphasic response, characterized by an initial small increase, followed by a decline to resting values 30-60 minutes after the cessation of exercise (Busse, Anderson, Hanson, & Folts, 1992).

Exercise increases neutrophil numbers as well as the phagocytic activity of neutrophils, which could affect the phagocytic index and phagocytic percentage. Phagocytic activity may be influenced by an appropriate response to exercise-induced stress rather than an impaired immunocompromised state.

Aside from exercise, nutrition also has an

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effect on the immune response. The immune system needs nutrients to do its work, and a regular diet should provide enough nutrients for the immune system to function normally (Miller, 2015). Although some researches have studied the effects of nutritional changes on immunity, few studies actually address how diseases develop as a result of altered immunity. In the study by Miller, mice with protein-deficient diet are more likely to have reduced numbers of macrophages, T cells and an antibody called immunoglobulin A, all of which help fight off disease.

According to Kazawa (2013), author of "The Autoimmune Epidemic," when immigrants from South Asian countries moved to Western countries and added processed food to their diets, they showed an increase in autoimmune diseases such as Crohn's and ulcerative colitis. Fuhrman (YEAR), author of "Eat to Live," said that dramatic dietary changes have the greatest positive effects when the illness is just beginning, rather than in later stages. It was pointed out that most patients who make the changes do experience at least some level of benefit when taking the nutritional approach to control autoimmune illness and suppress inflammation. Based on another study, anti-inflammatory diets reduce symptoms in autoimmune illnesses such as Crohn's and rheumatoid arthritis. The research showed that children eating a diet consisting of whole foods instead of processed foods have a reduced risk of Crohn's disease, while those on a highly processed diet have increased risk.

Aside from a reduction in the symptoms of autoimmune illness, there are additional health benefits to be reaped from eating whole-foods, plant-based diet. This type of diet is recommended by the medical community to help prevent the high cholesterol, which is a factor in heart disease and strokes. It is a more nutrient-rich diet, and fruits and vegetables contain antioxidants and phytochemicals that have been shown to have a host of health benefits, including cancer prevention (Todar, 1997).

#### **Research Objective**

This study was conducted to determine the effect of participating in the CHIP to the phagocytic index, phagocytic percent and phagocytic activity by comparing pre- and post-intervention results for these parameters.

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#### Methodology

#### Sampling

Twenty-two participants of the Adventist Medical Center-Manila - Complete Health Improvement Program (AMCM-CHIP), ranging from 17 - 65 years of age consented to be part of the study and have additional blood drawn for the blood work-up before the start of the program and after its completion. Of the 22 only 18, seven males and eleven females, were able to comply with the 30-day intervention. Fasting blood samples were collected from each of the participant, between 7:00 to 9:00 am and transferred to heparin tubes for determination of phagocytic activity and in EDTA tubes for white blood cell (WBC) and neutrophil count.

#### **Preparation of Bacterial Suspension:**

Pure culture of Staphylococcus aureus was provided by the Manila Adventist Medical Center, Manila, Philippines and the Adventist University of the Philippines Medical Technology Department, Ground Floor, Cavite, Philippines. Staphylococcus aureus was sub cultured in blood agar plates, incubated at 37°C. Colonies of Staphylococcus aureus was collected from the blood agar plates and resuspended in normal saline solution (NSS) until it was comparable to the turbidity of the MacFarland standard.25

#### **Determination of Neutrophil Phagocytic Activity**

For each of the 18 samples collected, three blood films were prepared. A blood film prepared from the heparinized tube before determination of phagocytic activity served as check slide. These check slides were viewed closely to check for the presence of toxic granulation. Toxic granulation or primary granules accumulate in the cytoplasm of neutrophils as a reaction to infection, usually of bacterial origin. The presence of toxic granulation would have excluded the participant from being part of the study as toxic granulation might be mistaken for the bacteria. None of the participants' slides showed toxic granulation.25

Two more blood films were prepared from a mixture of 0.9 mL of heparinized blood and 0.1 mL of standardized bacterial suspension of Staphylococcus

aureus prepared in siliconized tubes. Before blood film preparation, the mixture of heparinized blood and bacterial suspension was incubated for 30 minutes at 37°C with continuous agitation. Slides were stained using Wright stain, air-dried, and viewed under oil immersion objective (1000x). For each blood film, the number of bacteria phagocytosed by the first 40 consecutive neutrophils seen were counted and recorded. Phagocytic neutrophils, neutrophils that have ingested at least 3 bacteria, were also counted.

Phagocytic percent was computed by dividing the number of phagocytic neutrophils by the total number of neutrophils (phagocytic percent = no. of phagocytic neutrophils/ total number of neutrophils). Phagocytic index was computed by dividing the number of bacteria within the phagocytic neutrophils by the number of phagocytic neutrophils (phagocytic index = no. of bacteria in phagocytic neutrophils/ phagocytic neutrophils). The phagocytic activity was computed by multiplying the phagocytic percent with the phagocytic index (phagocytic activity = phagocytic percent x phagocytic index).

#### **Results and Discussion**

Phagocytosis is a process by which a cell is able to engulf and consume foreign microorganisms. The production of these phagocytic cells in many infectious diseases plays a key role in a person's immune response. Therefore, the said process represents a critical component of host defense against microbial infections. Neutrophil, the most abundant type of WBC in the peripheral blood, is an important phagocyte and is the fastest to respond among other phagocytic cells (Abbas, Lichtman, & Pillai, 2015).

In this study, the researchers identified and viewed 40 neutrophils in Wright-stained peripheral blood smears and counted the bacteria ingested per neutrophil and the number of phagocytic neutrophils to determine the phagocytic index, phagocytic percentage, and phagocytic activity. Peripheral blood smears were prepared from heparinized blood samples collected from participants of the AMCM-CHIP who consented; with standardized Staphylococcus aureus before and after the program mentioned.

The CHIP is based on the premise that improvement in dietary choices, enhancement of physical activity, increase in support systems, and reduction and management of stress help in preventing and reversing lifestyle-related diseases like diabetes, heart disease and stroke. Previous studies support these principles. Consumption of whole-foods, plant-based diet provides natural sources of protein, nutrients, antioxidants, and phytochemicals that reduce inflammation, help lower cholesterol levels and prevent cancer (Miller, 2015). The intake of a person provides necessary nutrients that help maintain a functional and efficient immune system as well as the amount of time used up for exercise; a person's stress level is also something instrumental to the health state of a person. Neutrophils' number and phagocytic activity are influenced by the type, intensity, volume and duration of exercise. Short duration exercise causes an increase in neutrophil number while long duration exercise lowers neutrophil count (Peters & Bateman, 1983). In the study conducted, a slight increase in neutrophil activity as reflected in the phagocytic activity was observed.

Using paired t-test, the difference in phagocytic percentage, phagocytic index and phagocytic activity between the pre-intervention and post-intervention results were compared. Table 1 shows that a there is a significant difference in the results before and after the patients underwent the program. Based on the mean values, there was an increase in all three measurements for phagocytic activity.

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	N	Mean	SD	Т	Df	Sig
Phagocytic Activity (Pre-intervention)	18	6.4936	1.68000	-6.321	17	.000
Phagocytic Activity (Post-intervention)	18	12.1617	3.81205			
Phagocytic Percent (Pre-intervention)	18	.9517	.04172	-4.610	17	.000
Phagocytic Percent (Post-intervention)	18	.9979	.00643			
Phagocytic Index (Pre-intervention)	18	6.7867	1.61537	-6.133	17	.000
Phagocytic Index (Post-intervention)	18	12.1833	3.79991			

Phagocytic Activity Pre-& Post- Intervention

Table 1.

Data showed that all the parameters in measuring the phagocytic activity has significantly increased after the participants engaged in the lifestyle intervention program. An increase in the phagocytic index and phagocytic percent yielded to an increase in the phagocytic activity. This indicates a boost in the innate immune mechanism among the participants. The results revealed that participation in AMCM-CHIP has a positive effect on the phagocytic activity of neutrophils due to a distinct increase in the number of bacteria engulfed by the neutrophils and the number of neutrophils that were able to engulf more than three cocci. This is also illustrated in the bar graph (Figure 1) and the pictures (Figure 2). A consistent increase in all of the parameters was observed after the taking part in the intervention.



Figure 1. Changes in the phagocytic parameters before and after participating in the AMCM-CHIP.

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Figure 2 displays the amount of bacteria ingested by the neutrophils before and after the CHIP intervention. The number of bacteria was noticeably higher during the post-experiment than the pre-experiment.



Figure 2. Sample pictures of phagocytic neutrophil before (left) and after (right) the CHIP intervention

Although a slight increase in the number of leukocytes was observed, there is statistical evidence that the phagocytic activity was not influenced by this change. Generally, an increase in neutrophil count would positively affect the phagocytic activity. Table 2, which shows the relationship between the change in WBC Count and the change in phagocytic activity using Pearson correlation, indicates that the change in WBC count is not related to the change in phagocytic activity.

Table 2.Correlation of Changes in WBC Count and Phagocytic Activity

Phagocytic Activity				
WBC Count	Pearson Correlation	0.046		
(Gain)	Sig. (2-tailed)	.856		

#### **Conclusions and Recommendations**

Participation in the CHIP intervention not only showed a significantly greater effect in the participants' physical health but also in their immune system. As a result, significant increase in the phagocytic activity of neutrophils was observed after the participants joined in the intervention.

Hence, lifestyle change programs such as CHIP which aimed to improve physical health behaviors can likewise have a profound influence on the immune system specifically in the neutrophils' phagocytic activity.

Health interventions like CHIP are not only something new for most citizens but are also an affordable means of preventing deleterious alterations in health and in maintaining the well-being of a person. The researchers therefore propose that more of these activities be introduced to the public, for through CHIP, the physical, mental, social, and emotional needs of a person are being addressed.

The researchers also propose that flow cytometric analysis of the products of phagocytosis be measured for in-depth analysis of the phagocytic analysis. Further studies on other branches of immunity should also be done in order to gain additional information on its effects in the entire immune system.

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## Comparison of the Anticoagulant Property of Freshly-Collected and Powderized Latex of the Unripe Fruit of Carica Papaya

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#### Abstract

tudies claim that Carica papaya latex (CPL) has anticoagulant and antiplatelet properties as opposed to it being known in natural medicine to promote wound healing. In this experimental, intervention study, the researchers intended to ascertain only the anticoagulant property of CPL. The researchers used incidental sampling in obtaining fruit latex from accessible Carica papaya trees; as well as in drawing blood from 30 random people around the campus, mostly students. Informed consent was distributed and signed by the participants and the study was approved by the university's research ethics committee. CPL was used in two different preparations; first, in a freshly-collected form, second in its powderized form. The samples were tested for the Prothrombin Time (PT) and for the Activated Partial Prothrombin Time (aPTT). The samples were run three times; first, to get the normal parameters and then each for both the preparations mentioned a forehand. The PT and aPTT were significantly prolonged (p = <0.05) in the powderized form of CPL, having values of 15.71 and 33.74 seconds, respectively, compared to the control results of 12.32 and 28.14 seconds, respectively. Whereas, the freshly-collected CPL significantly decreased (p = <0.05) the clotting time for both tests, having results of 1.96 and 9.01 seconds respectively. This study showed that only the powderized preparation of CPL has anticoagulant properties. Thus, the powderized form of CPL can be utilized through further studies as a potential principal component of drugs used to address coagulation disorders and/or those in under anticoagulant therapy.

# **Keywords:** *Carica papaya, latex, anticogualant, Prothrombin Time, Activated Partial Prothrombin Time*

Lifestyle-related non-communicable diseases (NCDs) cause more than half of the annual deaths in the Philippines, and about 70% around the globe. The primary kinds of NCDs are cardiovascular diseases, chronic respiratory diseases, and diabetes; conditions very familiar to people living in low- to middle-income countries where such fatalities are prevalent (Diaz, 2017).

According to the World Health Organization (2017), "investing in better management of NCDs is critical. Management of NCDs includes detecting, screening and treating these diseases, and providing access to palliative care for people in need". Anticoagulant therapy is used in addressing these conditions because thrombosis is the leading underlying cause of these deaths (WHO, 2017).

The latex of Carica papaya (Caricaceae) had been proposed to have anticoagulant properties.

This research intends to provide knowledge on anticoagulants, how it affects the body's coagulation pathways and how it works. Its main objective includes knowing where in the cascade Carica papaya latex (CPL) arrests coagulation to determine the conditions it can treat best. If the proposed anticoagulant property of CPL is true, it can potentially be used in managing NCDs in a more frugal way; best helping third-world countries. This study also compared how CPL can be utilized given the knowledge obtained by testing. This experimental, intervention study employed incidental sampling in drawing blood from people regarded without coagulation disorders for comparison of two preparations of CPL, classified as powderized and freshly-collected.

#### Methodology

#### Sampling

The method of sampling that was used is incidental. The samples were obtained from accessible Carica papaya trees around the campus. All latex samples were from unripe Carica papaya fruit and stalk.

#### Materials & Methods

The unripe fruit latex of Carica papaya was collected in the morning, 8-11 am, from trees located around the university premises. It was harvested by cutting 2-4 cm incisions on the surface of the fruit using a Dorco stainless platinum blade, and letting the latex drip down to a non-stick baking mold. The latex went through the small, steel strainer first before the mold to ensure that the liquid sample is purer and without impurities. Once the latex collected is enough to spread to the mold surface, collection is stopped.

The freshly-collected liquid preparation of the latex was the method mentioned aforehand. However, the powderized preparation requires the latex be oven-dried. The oven used was a commercial home oven, preheated at 170°C for 15 minutes. While preheating, the oven was tested for hot-spots; this method implies a flat tray laden with loaf bread and timed to see which bread burns faster than the rest. The area with equal heat was where the researchers placed the baking mold containing the latex. The CPL was dried at 170°-200°C for 20 minutes. After cooling the mold, the dried CPL was scraped and crushed into a powder form using a kitchen wedge knife. Then, it passed through a steel strainer to remove large particles of powder. The powder was stored at room temperature, in a container surrounded by dehumidifiers. The dehumidifiers can be bought at Daiso Japan or any Japan Home Center outlets.

Blood samples were drawn from 30 volunteers, mostly college students, regarded as without coagulation disorders. The samples were obtained using Terumo/Indoplas 3cc syringes or via Evacuated Tube Method. The blood was placed in buffered sodium citrate anticoagulated tubes.

Samples were centrifuged at 2500g for 15 minutes and plasma was separated immediately using automatic pipets with plastic tips. Citrated plasma samples would always be  $50\mu l$ , as instructed by the test kits.

Citrated plasma without addition of CPL was used as the normal control. Each sample was tested for PT and PTT; first run for the normal, second with the powderized latex, and third for the freshly collected latex. The samples were all incubated at 3 minutes as timed by the machine.

The Render machine uses a mechanical, magnetic monitoring system which employs a steel ball within the plasma. The stopping or slowing of the movement of the steel ball will indicate clot formation and is detected by the sensor. Time elapsed until clot formation occurs will be displayed by the machine.

#### **Results and Discussions**

Comparison of the Mean, Standard Deviation (SD), and P- value of the two preparations of CPL is shown in Tables 1 and 2. Statistically significant results were measured at 2SD or P-value ( $\leq 0.05$ ).

Test	Control	Powder			Reference Range (in seconds)
	MEAN $(s) \pm SD$	MEAN $(s) \pm SD$	<i>p</i> Value	Interpretation	
APTT	$28.14\pm2.52$	$33.74\pm5.13$	0.02	*Significant	26-35
PT	$12.32 \pm 1.86$	$15.71\pm3.84$	0.003	*Significant	9-13.5

Comparison of the Control & powdered form of CPL

*Legend:* \**Significant (p value:*  $p \le 0.05$ )

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Table 1.

Comparison of the Anticoagulant Property	of Freshlv-Collected and Powderized Late	ex of the Unripe Fruit of Carica Papava

Comparison of the Control & freshty-contected form of CFL					
Test	Control	Powder			Reference Range (in seconds)
	MEAN $(s) \pm SD$	MEAN $(s) \pm SD$	P Value	Interpretation	
APTT	$28.14\pm2.52$	$9.01 \pm 4.66$	< 0.00	* Significant	26-35
PT	$12.32\pm1.86$	$1.96\pm2.22$	< 0.00	* Significant	9-13.5

Table 2.

Comparison of the Control & freshly-collected form of CPL

*Legend:* \**Significant* (p value:  $p \le 0.05$ )

The powderized form of CPL prolonged the clotting time of citrated plasma significantly ( $p \le 0.05$ ) with a baseline of 33.74 sec  $\pm$  5.13 for aPTT and 15.71 sec  $\pm$  3.84 for PT. However, at a baseline of 9.01 sec  $\pm$  4.66 for aPTT and 1.96 sec  $\pm$  2.22 for PT, clotting time was shortened significantly ( $P \le 0.05$ ) by the freshly-collected form of CPL.



Figure 1. Activated Partial Thromboplastin Time Results.



Figure 2. Activated Partial Thromboplastin Time Results.

A study regarding the anticoagulant and antiplatelet activity of Carica papaya latex was conducted however, it was only tested on lab animals, particularly, white rabbits (Asare et al, 2015). The results obtained from this study were tested on actual human plasma and run as routine.

As to where in the coagulation pathway powderized C. papaya latex arrests coagulation, an analogous study was used as reference wherein the researchers compared CPL to commercially available oral anticoagulants. Powdered CPL has similar effects ( $p \le 0.01$ ) to the direct thrombin inhibitor drug, rivaroxaban, in the Prothrombin Time test. Furthermore, in testing for the Activated Partial Prothrombin

Time, powdered CPL had comparable results ( $p \le 0.01$ ) to heparin, an indirect thrombin inhibitor (Asare et al, 2015). Hence, it arrests coagulation in the intrinsic and common pathway and can therefore be utilized where the conditions can be applied.

On the other hand, the procoagulant effect caused by the freshly-collected preparation of CPL may be grounded to its viscosity which interfered with the mechanical method employed by the machine. Moreover, in a study done by SM Journal of Clinical Pathology, some plant latex proteases, like Ficin from the latex of Carica papaya, have an affinity for certain blood coagulation factors which triggers blood clot formation (Venkatesha et al, 2015). The thermal stability of C. papaya proteases is only at 20-95°C (Sunmer, 1993). Thus, it did not cause any interference on the assays of this research which prepared the powdered form of CPL at 170-200°C, as mentioned in the methodology section.

In corresponding studies, flavonoids have been found to have an inverse relationship with the risk of CVD when ingested. It also showed in vivo inhibition of platelet aggregation in platelet-rich plasma and PPP to up to 80-97% percent when used in high amounts (Janssen, 1998). In addition, an alkaloid (nicotine) altered clotting time by modification of thrombin, and affected thrombin's effect on fibrinogen (Singh, 1975). Another study found the effects of carotenoids (saffron) in inhibiting platelet aggregation, FXa, COX-1 using in vitro and in silico studies (Sinakosa and Geromichalosb, 2016). These are probable explanations of the effect of C. papaya's alkaloids and carotenoids on blood coagulation.

A privately-accessed research identifies the main component responsible for CPL's anticoagulant property independent of its proteolytic activity, as well as its isolation and purification, which was not discussed in this research (PIIIai et al, 1995). After establishing the anticoagulant property of the powdered form of unripe Carica papaya fruit latex, further research should be made regarding its specificity.

#### Conclusion

Although both preparations, fleshly-collected and powderized, latex yielded significant results, only the latter preparation was advantageous for this study. Thus, the researchers conclude that CPL indeed has anticoagulant properties but only in its powderized form. The PT and aPTT test results were significantly prolonged in normal individuals, regarded without coagulation disorders. Therefore, it can be further employed to address the management of thrombotic disorders, and help patients undergoing anticoagulant therapy.

#### Recommendations

To further improve this study, the researchers propose that specimen handling must be carefully observed by processing the blood within 1-hour through an immediate separation using centrifugation and prevent deterioration of plasma that may lead to erroneous test results by performing aPTT within 2 hours of collection and PT within 4 hours of collection. The researchers also suggest that mixing the liquid or the powdered latex with plasma must be done after the three-minute incubation time and before adding CaCl2 for aPTT, or before PT reagent. Lastly, the researchers recommend avoiding icteric, hemolyzed, or lipemic plasma that may cause falsely prolonged or shortened time.
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Comparison of the Anticoagulant Property of Freshly-Collected and Powderized Latex of the Unripe Fruit of Carica Papaya

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## Adjustment Level of First and Second Year Nursing Students in a Private University in Thailand

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## Abstract

ew students experience adjustments in their new environment, social status, management means, their culture, and updates in information technology. This research aimed to study the adjustment level of nursing students at the Asia-Pacific International University as in terms of age and CGPA. It was revealed in the study among nursing students that on the average, 6.9% of them drops from the course for the past five years. The Havighurst Theory which asserts that an individual's development is a continuous process occurring in stages from one stage to the next relates with this period of adjustment and was employed as the fundamental adjustment theory. A total of 161 respondents were selected. One sample t-test was performed and result showed mean total adjustment score  $(3.89 \pm 0.41)$  which was higher than set norm adjustment score, a statistically significant difference of 0.89 (95% CI, 0.83-0.96), t (160) = 27.74, p = .000. Independent t-test was done and result revealed no significant difference in the adjustment score for 18-20 years old (m = 3.89, SD = .42) and 21-23 years old (m = 3.93, SD = .40); t (151) = -.42, p = 0.68. Lastly, one-way ANOVA was executed and found no significant effect of CGPA on adjustment score at the p < .05 level [F (4, 148) = 1.34, p = 0.26]. Overall, students' adjustment was at high level and their age including CGPA had no effect on the adjustment. Other factors like income or passion in nursing could be explored in future studies.

#### Keywords: adjustment, nursing students

New students experience adjustments as they progress from one stage of their life to the next. This adjustment could be in their new environment, social status, management of means, their culture and the updates in information technology. Such adjustments are crucial for them to live harmoniously and at peace with themselves, with other people, and the changes themselves. If adjustments do not take place, their academic performance, social life, and spiritual well-being will be affected. The study of the record of nursing students from the Registrar's Office, Asia-Pacific International University (AIU) reveals that 8.9% of nursing students dropped from the course in 2013, 12.2% in 2014, 2.3% in 2015, 7.8% in 2016, and 3.3% in 2017. Various reasons were cited including financial difficulty, inability to adjust to dormitory life, entrance at a cheaper university, inability to meet academic standards,

and dislike of nursing (Registration Office, 2018). This result places a challenge for the Mission Faculty of Nursing (MFON). Furthermore, there are nursing students who encounter adjustment problems who are still studying in the program. The effects of difficulty in adjustment are low academic performance, inappropriate behavior, discouragement, and anxiety. The statement is supported by similar studies from students who could not adjust well because of depression, discouragement, hopelessness, boredom, anxiety, low self-esteem, somatic distress, failures in classes, drop outs, and suicides (Jain, 2017; Lharsuwong, 1981).

According to Havighurst Theory, an individual's development is continuous throughout the person's entire life span. Adjustments should therefore be made for the purpose of solving

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#### Adjustment Level of First and Second Year Nursing Students in a Private University in Thailand

problems and performing tasks efficiently during each stage of life (HQ, 2017). The respondents of the study include first and second year students, their age and behavior belonging to the adolescent and early adulthood stage. At these stages, they are establishing emotional independence from parents, equipping themselves with skills needed for a profession, achieving gender-based social role, establishing relationships with peers, and establishing a profession. They need to accomplish all these tasks despite the changes that are happening around them. Adjusting well during development is the key which will bring up their confidence and satisfaction as they move into the next stage of life. Conversely, if they fail to adjust, unhappiness and difficulty in many dimensions of life are the consequences. Suwannkhot (2010) in a study at Naresuan University revealed that first year students adjust not only to their environment, but also to their teachers, peers, and their school activities. Among all factors influencing adjustment such as age, gender, birthplace, emotional intelligence, and democratic child-rearing, only democratic child-rearing influenced adjustment of the students at significance level of .05 (Suwannkhot, 2010). Moreover, Bunleard (2011) in a similar study found academic life, personality, emotion, and activity as the main areas needing adjustment. Of all the other factors such as gender, birthplace, and emotion, only gender influenced some of these domains. Undoubtedly, students need to achieve their tasks during this stage of life by going through the domains of adjustment in study, their teachers, friends, the environment, and the activity domain. More importantly, the variables influencing the adjustment are age, gender, grade, birthplace, and income. Since there was no research conducted thus far in non-profit religious based institution, therefore this study. The aim of the study was to find out the following: (a) the adjustment level of nursing students; (a) their adjustment level as differentiated by age; and (a) their adjustment level as differentiated by CGPA. The hypotheses are: (a) the nursing students have high level of adjustment at significant level of .05; (b) age influences each domain of adjustment of the nursing students of MFON, AIU differently at a significant level of .05; and (c) CGPA influences each domain of adjustment of the nursing students of MFON, AIU differently at significant level of .05. This study hopes to assist students in their adjustment period even at an early stage of transition into university life.

#### Methods

This cross sectional survey research obtained an approval to conduct the study from the authors' University Research Committee and its Institutional Review Board Committee.

#### Sample and Setting

The population is 161 first and second year nursing students of the Mission Faculty of Nursing, Muak Lek Campus, Asia-Pacific International University, Thailand (Registration Office, 2018). One hundred percent purposive sampling technique was utilized; therefore, all 161 nursing students were the sample group.

#### Instrument

The questionnaire comprised two sections. The first section considered was personal data comprising of gender, age, birthplace, CGPA, and year of study. The second section, adopted from Suwannkhot (2010), was a multidimensional scale measuring students' adjustment to university. The scale is composed of 5 domains distributed in 52 questions. These domains are studying (12 questions), teacher (10 questions), friends (13 questions), environment (8 questions), and activity (9 questions) which are in Five-point Likert Scale format. Scores are ranging from 5 as the most practiced to 1 as the least practiced. An average score is interpreted as follows:

4.21-5.00 means students can adjust at the highest level

3.41-4.20 means students can adjust at high level

- 2.61-3.40 means students can adjust at moderate level
- 1.81-2.60 means students can adjust at low level

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## 1.00-1.80 means students can adjust at the lowest level

For psychometric properties, face validity was performed by three experts who reviewed this adjustment questionnaire for items relevancy to objectives and content measured. Items adjusted according to the experts' suggestions. The questionnaire then tried out with 30 first year students for internal consistency reliability examination. Cronbach's Alpha Coefficient from each domain of adjustment which are study, teacher, friends, environment, and activity, were .86, .85, .84, .87, and .84, respectively. The values above 0.80 are acceptable (Waltz, Strickland, & Lenz, 2005).

## **Data Analysis**

Demographic data was calculated by using descriptive data analysis such as percentage, mean, and frequency. The nursing students' adjustment level was examined by using a one-sample t-test. The effect of age and CGPA toward adjustment in all domains was adjustments in study, teacher, friends, environment, and activity and calculated by an independent t-test and one-way ANOVA, respectively.

#### **Results and Discussion**

Demographic data from the total of 161 nursing students revealed the following: 143 (88.8%) were female, 137 (85.1%) were 18-20 years old, 152 (94.4%) originated from outside Saraburi Province, 56 (34.85) had CGPA 3.01-3.50, and 94 (58.4%) are first year students at the time of this study.

## **Adjustment Level**

From Table 1, one-sample t-test was conducted to compare whether the five domains of adjustment level in nursing students were different from normal, defined as an adjustment score of 3. The mean adjustment score of all domains which are study  $(3.84 \pm 0.40)$ , teacher  $(3.94 \pm 0.42)$ , friend  $(4.13 \pm 0.46)$ , environment  $(3.69 \pm 0.74)$ , and activity  $(3.86 \pm 0.69)$  were higher than the population's 'normal' adjustment score of 3.0. The mean total adjustment score  $(3.89 \pm 0.41)$  was higher than the population's 'normal' adjustment score of 3.0, a statistically significant difference of 0.89 (95% CI, 0.83-0.96), t (160) = 27.74, p = .000. There was a statistically significant different between the means (p < .05) and therefore, the researcher rejects the null hypothesis and accept this study's first hypothesis that "Nursing students had high level of adjustment at significant level".

Table 1.

Domain of	Test V	alue of 3/5	5 (60%)	Sig.	Interpretation
Adjustment	x	SD	t-value	(2-tailed)	of Result
Study	3.84	0.40	26.59*	0.000	High
Teacher	3.94	0.42	28.51*	0.000	High
Friend	4.13	0.46	31.54*	0.000	High
Environment	3.69	0.74	11.97*	0.000	High
Activity	3.86	0.69	15.94*	0.000	High
Total	3.89	0.41	27.74*	0.000	High

Adjustment Level of Sample (N=161) Classified by Each Domain

\*p < .05

 $x \le 3.00$ , Low level of significance (Needs improvement)

Criteria x<sup>-></sup> 3.00, High level of significance

x = 3.00, Moderate level of significance

Even though the students adjusted well in all domains, the results demonstrated that the respondents could adjust best with their friends. The students had the highest level of adjustment in the item "I am willingly to cooperate with friends in completing assignments" (4.36  $\pm$  0.60). According to Havighurst Theory, college age students normally try to establish relationship with peers and pave their way for a profession (HQ, 2017). At this university setting, all nursing students live in dormitory; hence, they form closer relationship and help each other. A study done among college students at Phranakhon Rachabhat University revealed that the students adjusted well in "good relationship and when they can depend on others" (Ruanprot, Wongkhumsin, & Phewluang, 2010). Furthermore, nursing curriculum offers preparation courses such as English and skills in using library and Internet prior to the start of the first semester. These courses assist students to be prepared to adjust in studying. Another study found students do not adjust well in academic domain due to difficulty in their courses, buying books, using the library and the Internet, and having weak relationship with teachers (Al-khatib, Awamleh, & Samawi, 2012). The teacher is another domain that is important. From the questionnaire, the students adjusted at high level with teachers especially in items "I pay respect to teachers when passing by them" or "I am willing to improve myself according to my teacher's advice" or "I participate in activity and task that were assigned". These items reflect students' willingness to learn from teachers and have good relationship with them which enhance their overall performance.

Moreover, nursing students also adjusted well at high level in activity domain. Many items ranked high adjustment. Examples were "I participate in activity fully" and "I am interested in university's activities". These statements imply that university offers very interesting activities which pull students to participate. In turns, this group of student did not have hard time adjusting with activity at all; plus, this creates skills for them to achieve well academically. To support the statement, a study found students who do more physical activity, could increase in academic self-efficacy and improve academic performance (Gillinsky, 2011). Furthermore, students who had high level of adjustment, they tended to perceive their classroom environment as comfortable (Stoklosa, 2015). Fortunately, this research setting maintains classrooms and compound up to cleanliness and standard which promote positive studying environment. The statement is supported by some items in this environment domain such as "I am eager in studying because of nice studying atmosphere in classrooms" and "I arrive at classroom earlier before class begins". These results indicate that this university has done a good job and the upholding the good quality is important.

## Adjustment Differentiated by Age

From samples, there were two groups of age. They were 18-20 years old and 21-23 years old. An independent-samples t-test was performed to compare adjustment level in 18-20 year old and 21-23 year old students. The result revealed that there was not a significant difference in the scores of 18-20 years old (m = 3.89, SD = .42) and 21-23 years old students (m = 3.93, SD = .40); t (151) = -.42, p = 0.68. These results suggested that age groups do not have effect on total adjustment and any other domains of adjustment. Therefore, hypothesis 2 stating "Age influences each domain of adjustment of the nursing students of MFON, AIU differently at significance level of .05" is rejected and the null hypothesis is accepted.

Even though this study showed that nursing students were capable to adjust at high level, their age does not play any role in their adjustment. The findings were inconsistent with a study that was conducted among nursing students in India which found a significant association between personal variables such as age and gender and adjustment problems (Hiremath & Wale, 2017). The difference could have been from preparedness and support given to the students. Majority of subjects came to study right after graduation from high school located outside Saraburi Province and Bangkok. Hence, they all had to take university preparation courses such as study skills in library, computer lab, typing, and English. Moreover, since almost all of them left their

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Table 2.

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Domain of	18-20	18-20 years		21-23 years		Sig.
Adjustment	x	SD	x	SD	-	(2-tailed)
Study	3.83	.40	3.86	.41	29	.77
Teacher	3.92	.42	4.11	.39	-1.79	.09
Friend	4.14	.47	4.11	.47	.24	.81
Environment	3.68	.77	3.72	.54	25	.80
Activity	3.87	.70	3.86	.59	.04	.97
Total	3.89	.42	3.93	.40	42	.68

Independent Sample t-Test between 18-20 years old and 21-23 years old group (N=153)

\*p < .05

Criteria x > 3.00, High level of significance

 $\bar{x}$  = 3.00, Moderate level of significance

x < 3.00, Low level of significance (Needs improvement)

## Adjustment Differentiated by CGPA

A one-way ANOVA compared the adjustment of students as differentiated by students' CGPA (1.85-2.00, 2.01-2.50, 2.51-3.00, 3.01-3.50, and 3.50-4.00) (study, teacher, friends, environment, activity, and total adjustment domain). Table 3 reveals that there is no significant of CGPA on their adjustment level at the p < .05 level specifically for the study domain [F (4, 148) = .89, p = .473]; teacher domain [F (4, 148) = .67, p = .616]; friend domain [F (4, 148) = 1.39, p = .240]; environment domain [F (4, 148) = .49, p = .744]; activity domain [F (4, 148) = 1.54, p = .195]; and total adjustment [F (4, 148) = 1.54, p = .195]. Since the results showed no significance, Post Hoc test was not necessary. The hypothesis 3 stating "CGPA influences each domain of adjustment of the nursing students of MFON, AIU differently at significance level of .05" is rejected and the null hypothesis is accepted. Please see Table 3.

In this study, CGPA does not affect all domains of adjustment including total respective homes for the first time; many of them felt homesick in the beginning. AIU maintains quality dormitories and qualified dormitory deans to take care of the students as this is their second home. Furthermore, AIU maintains a close relationship between teachers and students by providing an advisor system at the ratio of 1:8. Family meeting at faculty homes are conducted every other Wednesday. These supports seem effective to nursing students who come from similar common backgrounds despite their age differences. adjustment of nursing students. Conversely, a study in adjustment of students was done in Suranaree University of Technology and found CGPA affected the students' adjustment at a statistically significant level (p < .01) (Chairuck, 2013). According to Havighurst Theory, development is an ongoing skill throughout life for solving problems and performing well in their tasks (HQ, 2017). With the implication of this study, the students were focused and wanted to achieve. Likewise, studies showed students are prepared to adjust and are committed to reaching their goal (Al-khatib et al., 2012; Jain, 2017). They were willing to do whatever would bring them success. Therefore, preparation in various aspects such as preparation courses, comfort with classroom and teachers, dormitory as home, interesting activities, and friendly environment, that university offers, unmistakably promotes their smooth transition . Furthermore, this faith based university emphasizes characterist building and sharpens the students' mind by providing this activity from Christian worldview every week. As a result, the students could stay focused and are likely to make right decision in carrying on their lives. Moreover, their advisors set up a student tutorial program to assist weak students. As tutor friends, their studying curve is likely to be high. Obviously, the weak or the strong academic background that students receive, the same preparation, support, and mentoring system enables them to adjust very well at this university.

#### Table 3

ANOVA							
		Sum of	df	Mean	F	Sig.	
		Squares		Square			
totalstudy1	Between Groups	.579	4	.145	.887	.473	
	Within Groups	24.142	148	.163			
	Total	24.721	152				
totalteacher2	Between Groups	.461	4	.115	.666	.616	
	Within Groups	25.575	148	.173			
	Total	26.035	152				
totalfriend3	Between Groups	1.150	4	.287	1.389	.240	
	Within Groups	30.624	148	.207			
	Total	31.774	152				
totalenv4	Between Groups	1.107	4	.277	.489	.744	
	Within Groups	83.860	148	.567			
	Total	84.967	152				
totalact5	Between Groups	2.904	4	.726	1.536	.195	
	Within Groups	69.923	148	.472			
	Total	72.827	152				
totalALL	Between Groups	.895	4	.224	1.339	.258	
	Within Groups	24.723	148	.167			
	Total	25.618	152				

One-way ANOVA demonstrating adjustment among students with CGPA1.85-2.00, CGPA 2.01-2.50, CGPA 2.51-3.00, CGPA 3.01-3.50, and CGPA 3.50-4.00 (N= 152)

The results revealed that this faith- based, Christian, university has set and equipped standard preparation and system in various ways to facilitate students in transition into university life. As the university humbly adopt Jesus's teaching into practice as mentioned in Luke 6:31 NIV "Do to others as you would have them do to you" and Mark 12:31 "Love your neighbor as yourself", everyone tries their best to take care of the needs of these students as their own child. Therefore, the continuation of these practices from all involved parties such as the administrators, teachers, and staff will go a long way in helping the students to adjust well. However, the limitation of this study is about generalizability. The results of this study could not be utilized with other types of university such as government and for- profit private universities.

## **Conclusion and Recommendations**

Adjustment level in all domains of first and second year nursing students at AIU was higher than the population's 'normal' adjustment score of 3.0, a statistically significant difference of 0.89 (95% CI, 0.83-0.96), t (160) = 27.74, p = .000. Nursing students adjusted themselves at high school level in all domains: study, teacher, friend, environment, activity, and total adjustment. Whether the factors such as age and CGPA would influence adjustment was also looked into. The age group of 18-20 years old and 21-23 years old were compared for adjustment level and there was not a significant difference in the scores for 18-20 years old (m = 3.89, SD = .42) and 21-23 years old (m = 3.93, SD = .40); t (151) = -.42, p = 0.68. Hence, age groups had no effect on their adjustment. Similarly, comparing the effect of students' CGPA (1.85-2.00,

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2.01-2.50, 2.51-3.00, 3.01-3.50, and 3.50-4.00) on their adjustment (study, teacher, friend, environment, activity, and total adjustment domain) were performed. There was no significant effect of students' CGPA on their adjustment level at the p <.05 level for all domains.

It is recommended therefore that nursing administration assess continuously the need for preparation courses because high school students nowadays are more competent in typing, using computer, and using English than years ago. However, if there is still a need, administrators must secure this program in the nursing curriculum. Moreover, student life plays crucial role in caring for the students which includes the kind of dormitories they board in, the safety measures that the university provides, the kind of activities the students engage in, and the kind of discipline they receive. Nursing administrators needs to monitor the outcome of such program closely and work hand in hand with their administrators. Nursing education should maintain a caring atmosphere, help the students maintain a warm and caring relationship with their peers and superiors, and establish a conducive classroom atmosphere. Asian students normally respect teachers; hence, they accept their teachings well. Nursing research could have more samples representing non-profit universities from all parts of Thailand. This move could yield more interesting results for the nursing profession. Since the results did not support the hypotheses, further study can be explored regarding factors influencing adjustment which made students. These factors can be passion in nursing and financial support. Authors hope this study will be useful to other universities in the future.

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## Smartphone Usage and Academic Performance of College Students Julie Joy R. Lacificar

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## Abstract

here are varied views about smartphones weighed benefits and deemed disadvantages to academic performance. The researcher would like to break in the barrier between this prevalent yet still perplexing matter. This study described the relationship of smartphone usage and academic performance of college students in a faith-based institution. A descriptive correlational design was used to purposively sampled 75 students. Of the 75, 51% have high grade point average and 47% were using smartphone for an average of 5-8 hours per day. Students claimed they need smartphones in classroom primarily to provide additional resources for research work. However, they only use smartphone moderately to support their classroom learning. This study ascertained that most of the teachers were distracted when students use smartphones in the classroom. Nevertheless, the use of smartphone in the classroom has neither negative nor positive impact to student's learning. The study revealed no significant relationship between extent of smartphone use to support classroom learning and academic performance, between classroom learning and academic performance and between impact of smartphone use in classroom to learning and academic performance. However, this study showed a moderate, negative, significant relationship between hours spent in using smartphone per day and academic performance. This implies that the more time is spent in using smartphone, the lower the academic performance. Therefore, there is a need to regulate if not totally prohibit the use of smartphone in the classroom. Nonetheless, students must be encouraged to minimize the total number of hours spent in smartphone use per day.

#### Keywords: smartphone usage, academic performance, college students

The predicament the teachers face in colleges and universities regarding the student's use of smartphones during class time is one common issue that puts an emphasis on learning against the communication, gathering information, seeking entertainment, and social networking culture and habits of students. Smartphones are nowadays student's new best friend. They stay connected from the moment they rise until they fall asleep. They are their constant companion and source of information. In fact, Womack & McNamara (2017) said, over 95% of undergraduate students own smartphones.

As observed, most students bring smartphones in the classroom and use them whenever there is opportunity. Despite its usefulness, since they have become a very important part of student's daily lives and are considered a basic necessity as it is a very vital medium of communication, for most teachers, they are almost always a distraction. In fact, banning or unbanning smartphone usage in classroom and related learning activities became an issue of concern to most students since they always vindicate they need smartphones for learning purposes and teachers would say it is always a distraction.

According to the article written by Schreiner (2018), along with their books and school supplies, most high school and college students - and many younger students make their daily trip to school with their trusty smartphone. Smartphones connect students to one another, to educational resources, and to a potential host of distractions. The presence of smartphones presents both opportunities and challenges for today's students. Smartphones can be a helpful academic tool, or a hurtful academic disruption depending upon the attitude and use

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pattern of the students and the policies of the schools they attend.

Smartphone has fundamentally affected everyone's accessibility, safety and security, coordination of social and business activities, and use of public places. It has become part of everyone's culture. However, the negative effects of smart phone usage in the classroom on academic performance have been demonstrated across several studies. Ng, Hassan, Mohammad Nor, & Andul Malek (2017) found out that the more students utilized their smartphones for university learning activities, the lower their cumulative grade point. Furthermore, Murai (2015) said that excessive use of mobile phones causes students to fare poorly in elementary, junior high and high school, not only because it makes them lose their concentration due to a lack of sleep, but also because it apparently compromises what they have studied. On the contrary, Johnson (2013) found out that smartphones in class have been more popular amongst teens as they provide assistance and improving academic performance.

While there is still ongoing contested discussion and/or debate if there is a need to prohibit the use of smartphones in the classroom or not, the researcher would like to break in a barrier between this prevalent yet still perplexing matter. There are varied views about smartphones weighed benefits and deemed disadvantages to academic performance. Thus, the researcher would like to discover relationship of smartphone usage to academic performance of undergraduate students.

This study aimed to identify relationship between smartphone usage and academic performance of undergraduate students in a selected faith-based institution. Specifically, it aims to answer the following questions:

- 1. What is the profile characteristics of the participants in terms of:
- a. Grade Point Average
- b. Hours spent in using smartphone per day
- 2. How is smartphone used in the classroom?
- 3. What are the reasons of students about allowing smartphone usage during class time?
- 4. What is the extent students' use their smartphones to support their classroom learning?
- 5. What is the impact of smartphone use in classroom to student's learning?
- 6. Is there a significant relationship between the extent of students' use of smartphone to support their classroom learning and academic performance of undergraduate students?
- 7. Is there a significant relationship between hours spent in using smartphone per day and academic performance of undergraduate students?
- 8. Is there a significant relationship between classroom learning in terms of interest and readiness and academic performance?
- 9. Is there a significant relationship between classroom learning in terms of attention and concentration and academic performance?
- 10. Is there a significant relationship between impact of smartphone use in classroom to learning and academic performance?

## Methodology

## **Research Design**

Being aware of the primary objective of this study, the descriptive correlational design was used. It sought to describe the selected demographic characteristics and discover relationships between smartphone use in the classroom among undergraduate students and their academic performance. According to (Polit & Beck, 2008), a correlation is an interaction or association between two variables, that is, a tendency for variation in one variable to be related to variation in another.

## Participants of the Study

The study consisted of seventy-five (75) students from freshmen to senior students from different courses enrolled at Central Philippine Adventist College, who owns smartphones. The participants were

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enrolled in the Summer of 2018 and whose grade point averages were taken last Second Semester of Academic Year 2017-2018.

## **Sampling Technique**

The researcher used purposive sampling. The researcher consciously selected subjects to include in the study. Those selected by the researcher are information rich cases or from which a lot can be learned.

#### Instrumentation

The researcher used a self-constructed questionnaire that underwent validity and reliability testing. In the design of the questionnaire, there were two parts: Part I to contain the participant's demographic profile such as name, age, sex, course and grade point average. Part II contained questions about general smartphone usage in the classroom, classroom learning, use of smartphone to support learning, and impact of smartphone use to classroom learning and academic performance. To ensure the validity of the questionnaire, Good and Scates validity test was used after presenting the questionnaire to identified experts. The validity test overall score was 5.00 which shows that the instrument is highly valid. To establish the reliability of the instrument, the researchers used the Internal Consistency Method specifically Cronbach's Alpha. After the face and content validity, pilot study was conducted to 38 nursing students. The value obtained for r was 0.87 which indicated high correlation. For the purposes of this study, the 0.70 limit was used to test the reliability coefficient (Fraenkel, 2003).

#### **Results and Discussion**

#### **Profile of the Participants**

The study participants had high GPA (3.01 and above) which accounts to 51% of the total number, 33% had middle GPA (2.51-3.00) and 16% had low GPA (2.50 and below). In terms of hours spent using smartphone per day, 33% were using smartphone for less than 5 hours, 47% were using smartphone for an average of 5-8 hours and 20% were using smartphone for more than 8 hours per day.

The findings below show that majority of the participants had high grade point average (GPA) which means that they perform well in their classes. In terms of the number of hours spent using smartphone per day, most of the participants were using their smartphone for the average of 5 to 8 hours and only 20% were using the device for more than 8 hours. This result is similar to the recent statistics reported by statista showing the amount of time spent on daily smartphone usage in 2017, that as of that time, almost half of the respondents spent five or more hours on their smartphones daily.

Profile of the Participants

Category/Variable	Frequency	Percentage
Grade Point		
Low GPA (2.50 and Below)	12	16.0%
Middle GPA (2.51-3.0)	25	33%
High GPA (3.01 and Above)	38	51.0%
Average Hours Spent Using Sma	artphone per d	ay
Below 5 hours	25	33%
5-8 hours	35	47%
More than 8 hours	15	20%
Total Participants	75	100%

Table 1.

## Use of Smartphone in the Classroom

The result in table 2 shows that 12% of the participants do not bring smartphone in class, 30% bring it sometimes and 48% said they always bring their smartphones. 37.3% of the participants said bringing smartphone is not prohibited in their class, 54.7% said it is sometimes prohibited in class and 8% said it is always prohibited in class. When asked if they use smartphone during class time, 29.3% said no, 61.3% used sometimes and 9.3% said they are always using their smartphone during class time. 30.7% of the participants said they were not allowed to use smartphones in class, 62.7% said they are sometimes allowed to use and only 6.7% said they are always allowed to use their smartphone in class. When asked about their opinion if students should be allowed to use smartphones during class time, 24% said no, 8% said students should be allowed always and majority or 68% said students should sometimes be allowed to use smartphone during class time but not all the time. Looking into the typical status of their smartphone during class time, 54.7% said it was turned on but put away, 17.3% said it was turned off, 12% turns their smartphone on and periodically check it, 9.3% turns their smartphone on and regularly check it and 6.7% said it was on and they regularly check it when they notice a notification. When asked what is their topmost routine activity when using smartphone inside the classroom, more than half or 56% said they research on things related to school, 20% engaged in social networking sites, 10.7% were using it for communication, 6.7% were researching on things not related to school, 5.3% were playing and 1.3% was surfing the internet. When asked if any of their teachers ever been distracted by a student using a smartphone while they were teaching, 62% said yes and 18% said no. Further, when distracted, 33.6% said teachers usually tell the student to put her or his phone away, 25.5% make a general comment about your cell phone policy to the entire class, 12.1% ignore the student and continue teaching, 10.3% only stares at the student, 7.5% ignore the student but discuss her/his phone use after class, 7.5% confiscates the students phone, 2.8% ask the students to leave the classroom and 0.9% dock the student's participation grades.

The findings show that most of the participants brought smartphone to class always since most of them said bringing smartphones to class is sometimes prohibited but not all the time. Most of the participants said they use smartphones during class time and claimed they are allowed to use smartphone sometimes during class time. This means that there is no hard rule in prohibiting the students to bring and use their smartphones during class time. The behavior of the participants regarding the use of smartphone during class time suggests that they are not giving much attention to their device when most of the participants said their smartphone are often turned on but put away or even turned off. In the event they use their smartphones in class, the great number of the participants said they were using the gadget for research related to school although engaging in social networking such as facebook, twitter, instagram comes next and communication such as texting, calling and emailing. This means that most of the participants are taking their class seriously and they are using their smartphones to support their learning. The above result also found out that most of the teachers were distracted when a student uses a smartphone while they were teaching. Teachers handled the situation by mostly asking the students to put their phone away, and make a general comment about your cell phone policy to the entire class. While others ignored the student and continue teaching and talks to students after class and some would tend to stare to students, some confiscated the smartphone and few sent the students out of the classroom, and would dock the participation grades of students. This means that mostly teachers handled the situation in a lenient manner and few made a more stringent manner of correction.

# **52** Table 2.

Use of Smartphone in the Classroom

Item	Frequency	Percentage
Do you bring smartphone to class?		
Yes, always	36	48
Yes, sometimes	30	30
No	9	12
Is bringing smartphone prohibited in you	ur class?	
Yes, sometimes	41	54.7
No	28	37.3
Yes, always	6	8
Do you use smartphone during class time	e?	
Yes, sometimes	41	61.3
No	22	29.3
Yes, always	7	9.3
Are you allowed to use smartphones in y	our class?	
Yes, sometimes	47	62.7
No	23	30.7
Yes, always	5	6.7
Do you think students should be allowed	to use smartp	hones during
class time?		
Yes, sometimes	51	68
No	18	24
Yes, always	6	8
When you are in class, what is the typica	l status of you	r phone?
Turned on but put away	41	54.7
Turned off	13	17.3
On and I periodically check it	9	12.0
On and I regularly check it	7	9.3
On and I regularly check it when I notice a	5	6.7
notification.		
What is your topmost routine activity wh	ien using a sm	artphone
Descerch things related to school	42	56.0
Research things related to school	42	30.0
Social networking (TIF)	13	20.0
Communication (lexting, calling, email)	8	10.7
Compared to school	3	6.7 5.2
Games	4	5.5
Suring the internet	1 ••••••••••••••••••••••••••••••••••••	1.3
mave any of your teachers ever been dist smartnhone while they were teaching?	racted by a st	udent using a
Ves	67	87 7
105	02	02.1

Smartphone Usage an	d Academic Perform	nance of College Students	53
No	13	17.3	
How did the teacher handle?			
Tell the student to put her or his phone away	36	33.6	
Make a general comment about your cell phone policy to the entire class	27	25.2	
Ignore the student and continue teaching	13	12.1	
Stare at student	11	10.3	
Ignore the student but discuss her/his phone use after class	8	7.5	
Confiscate the student's phone	8	7.5	
Ask the student to leave the classroom	3	2.8	
Dock the student's participation grades	1	0.9	

## **Reasons of Students about Allowing Smartphone Usage During Class Time**

Table 3 shows the reasons of students about allowing smartphone use during class time, 29.1% said it gives additional resources, 22.5% claimed it is helpful in their research work, 15.4% believed it provides supplemental teaching tool for them, 13.7% used smartphone to record their assignment and organize their schedule properly, 8.2% said it can provide interactive activities, and 5.5% said they can learn at their own pace and another 5.5% believed it motivates them to learn.

According to Ishtiaque (2017), there are some positive effects of technology in our educational system. It can be used as educational tool in the classroom such that it can provide supplemental teaching tools like interactive presentations, video clips and graphics and other audio visual elements. It can motivate students to learn because many are stimulated and are apt to learn when they can interact with hands-on learning tools. It can also help students learn at their own pace and prepare children for the future.

Moller (2012) said cell phones should be allowed in classrooms because they're a useful resource and tool for the on-the-go student. Many students use their cell phones to record assignments and organize their days or weekends; this is very helpful in an educational setting. The upside to having your planner on your phone is that you always have your phone, whereas we have all seen people forget their planners. A study by scientists in Georgia showed that the effect of using a cell phone as a resource in the classroom and comes out with a positive result. People who were allowed to use their phones as a planner were more likely to record it and complete it than someone who was not. Texting a question to a teacher because you're embarrassed to raise your hand and stop the flow of the class may soon to be the future in classrooms. In a trial in Europe at the University of Hertfordshire, London, UK, people were able to text in a question they had about the lecture onto the class computer, then it would flash on the screen. Completely anonymous, the student feels less "stupid" but still can have a question answered.

Finally, Moller (2012) said cell phones are a great resource in the classroom. There are many helpful research applications, such as the dictionaries and translators. Also, you can easily look up an uncertain fact by Googling it on a smartphone. With the dictionary application, a portable dictionary is available right at your fingertips and would improve the spelling on handwritten documents. The translator application makes it easy for students to look up words in different languages, and with some applications, hear the word aloud. If everyone with a smartphone had the dictionary or translator application there would be no need to purchase a class set of dictionaries.

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Table 3.

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Reasons of Students	about Allowing	Smartphone	Usage	during	Class	Time
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Reasons	Frequency	Percentage
I can learn at my own pace	10	5.5
It can provide interactive activities	15	8.2
It gives additional resources	53	29.1
It motivates me to learn	10	5.5
It provides supplemental teaching tool	28	15.4
I can record my assignment and organize my schedule properly	25	13.7
It is helpful in my research works	41	22.5

## Extent Students' Use Smartphones to Support Classroom Learning

The result in table 5displays that students used their smartphone greatly to access the internet for research and referencing, to access online dictionary and thesaurus, for educational applications, to take a picture of the day's assignment scribbled on a whiteboard, and to keep track of schedules and dates. They used their smartphones moderately to record lectures, to deliver materials, to create short videos, for online discussion forums, and use slightly to download ebooks to help them in their lessons. The participants had an overall mean of 3.15 which means the participants used their smartphones moderately to support their classroom learning.

It is also important to note that while much research has been focused on the negative effects of smartphone, positive effects have also been measured. According to a recent study conducted by Pearson Education, 82% of high school students use mobile devices regularly. While there is a valid case to be argued by parents and educators that cell phones are disruptive to the learning environment and can lead to negative behaviors such as cheating on exams, cell phones can certainly enrich and become a useful educational tool in supplementing teaching instruction (Poll, 2015). Tindell & Bohlander (2012) said that this technology when used for educational purposes has the potential to revitalize student learning as it offers a more engaging and interactive way of learning but may also cause students to perform worse academically. However, students tend to take for granted the opportunity to use their smartphones for learning purposes.

### Table 4.

	1 0	1	
Response	Description	Verbal Interpretation	Mean Interval
1	To a Very Slight Extent(VSLE)	Used Very Slightly	1.00-1.49
2	To a Slight Extent(SLE)	Used Slightly	1.50-2.49
3	To Some Extent(SE)	Used Moderately	2.50-3.49
4	To a Great Extent(GE)	Used Greatly	3.50-4.49
5	To a Very Great Extent(VGE)	Used Very Greatly	4.50-5.00

Criteria in Interpreting the Extent Students' Use their Smartphones to Support their Classroom Learning

Smartphone Usage and Academic Performance of College Students						55	
Item	1 VSE	2 SLE	3 SE	4 GE	5 GE	Mean	VI
I use my smartphone o access to the Internet for research and referencing	4	3	18	29	21	3.80	GE
I use my smartphone to record lectures	7	14	23	18	13	3.21	SE
I use my smartphone to deliver materials	8	10	24	20	13	3.27	SE
I use my smartphone to access online dictionary and thesaurus	7	5	11	29	23	3.75	GE
I use my smartphone to educational apps	5	4	18	24	24	3.77	GE
I use my smartphone to create short videos	17	16	23	11	8	2.69	SE
I use my smartphone for online discussion forums	16	18	22	12	7	2.49	SLE
I use my smartphone to download e books to help me in my lessons	25	14	17	12	7	3.83	GE
I use my smartphones to take a picture of the day's assignment to scribble on a whiteboard	4	4	19	22	26	3.43	SE
I use my smartphones to keep track of the schedules and dates	7	7	22	25	14	3.29	SE
Overall						3.15	SE

## Impact of smartphone use in classroom to student's learning

The findings in Table 7 shows the overall mean of 2.93 which means that the impact of smartphone use in classroom is neutral of neither agree nor disagree.

In the study by Shooraibi and Gilavand (2017) regarding the use of smartphones for learning purposes found out that there was a positive correlation between the use of smartphones for general purposes and the use of them for learning purposes. They concluded that the use of smartphones for learning purposes or combining traditional educational approaches and e-teaching methods, including smartphones, can provide students with more diverse learning opportunities.

On the contrary, Allen (2017) in her article said that in one study that followed the impact of schools banning mobile phones found that mobile phones can have a negative impact on learning through distraction and that their removal from the classroom can yield an improvement in student performance, especially for the most vulnerable. In a tertiary setting, Kuznekoff and Titsworth found that students who did not use smartphones while participating in a lecture wrote 62 per cent more information in their notes and were able to recall more information than their phone-using counterparts. Students who did not use their mobile phones, or used them for class-related content, earned higher grades and scored higher on information recall than students who used their phone for unrelated purposes. With two opposing views, the result of the study determined that smartphone use in classroom neither gave a positive or negative impact to student's learning.

	0		
Response	Description	Verbal	Mean
		Interpretation	Interval
1	Strongly Disagree (SD)	Negative Impact	1.00-2.32
2	Disagree (D)	Neutral	2.33-3.66
3	Neither Agree nor Disagree (NAD)	Positive Impact	3.67-5.00
4	Agree (A)		
5	Strongly Agree (A)		

Criteria in Interpreting Impact of Smartphone Use in Classroom to Student's Learning

## Table 7.

Impact of Smartphone Use in Classroom to Learning

Item	1 SD	2 D	3 NAD	4 A	5 SA	Mean	VI
Using smartphone by taking slide pictures rather than note taking negatively affects ability to comprehend the lesson	10	14	16	24	11	3.16	Neither Agree or Disagree
I have difficulty comprehending the lesson because I am focused on using my smart- phone	18	16	233	16	2	2.57	Disagree
I believe smartphone use has affected my academic performance negatively	15	16	23	20	1	2.68	Neither Agree or Disagree
I find my grades decreased when using smartphones especially during class time	15	20	19	20	1	2.63	Neither Agree or Disagree
Motivated me for class participation and discussion	11	18	25	19	2	2.77	Neither Agree or Disagree
I feel more interested and ready to learn when I am using my smartphone in class- room.	6	15	29	22	3	3.01	Neither Agree or Disagree
I feel that smartphone use is a distraction to my academic learning activities	9	18	29	17	2	2.80	Neither Agree or Disagree
I easily get distracted when I use smart- phone in classroom.	8	17	27	19	4	2.92	Neither Agree or Disagree
My learning skills improved with the use of smartphone.	2	5	40	19	9	3.37	Neither Agree or Disagree
I cultivated my innovative thinking when I used my smartphone.	2	9	30	26	8	3.39	Agree
							Neither
Overall						2.93	Agree or
							Disagree

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Table 6.

# Relationship Between Extent of Smartphone Use in the Classroom to Support Classroom Learning and Academic Performance of Undergraduate Students

Table 8 result reveals no significant relationship between smartphone use in the classroom and academic performance of undergraduate students because the result showed a p value greater than 0.05. This means that the use of smartphone in the classroom to support learning had no significant influence on the academic performance of undergraduate students as measured by the grade point average. Therefore, the null hypothesis is accepted.

Table 8.

Relationship between extent of smartphone use in the classroom to support classroom learning and academic performance of undergraduate students

Variables	p value	sig.
Extent of Smartphone Use in the Classroom to Support Learning	149	.203
and Academic Performance		

alpha = .05

# Relationship between Hours Spent in Using Smartphone per day and Academic Performance of Undergraduate Students

The findings in table 9 tells a moderate, negative, significant relationship between hours spent using smartphone per day and academic performance of undergraduate students because the p- value is less than 0.01 level of significance. The variation in the dependent variable (academic performance) can be explained by the independent variable (the hours spent in using smartphone) by 9.36% only. The strength of the relationship is quite moderate. This means that the hours spent using smartphone per day moderately affect the academic performance of undergraduate students in terms of grade point average. The participants who used their smartphone to an average of 5-8 hours or even less had high GPA while those who used their smartphone to more than 8 hours per day had low GPA. Thus, the more hours is spent by students using their smartphones per day the lower their grade point average and the lesser they use their smartphone per day the higher their grade point average.

The result is similar to the multiple studies widely conducted and investigated. Kibona & Mgaya (2015 concluded that the impact of smartphone on the academic performance of higher learning students has revealed a negative results or progression on student's performance academically. Similarly, Lepp, Barkley, & Karpinski (2015) concluded in their study that increase cell phone use was associated with decreased academic performance. In another study by Ng and colleagues (2017), they found out that the more students utilized their smartphone for university learning activities, the lower their cumulative grade point average. Further, in the most recent study conducted by Felisoni and Godoi (2018) about an experiment on cell phone usage and academic performance, evidence showed that excessive cellphone usage might be harming student's performance. Their analysis yielded a significant negative relationship between total time spent using smartphones and academic performance, after controlling for known predictors of performance such as self-efficacy and past academic results. Each 100 min spent using the device on average per day corresponded to a reduction in a student's position at the school's ranking of 6.3 points, in a range from 0 to nearly 100. Moreover, when they considered usage during class time only (as opposed to during free time and weekends), the effect was almost twice as

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high. The magnitude of the effect found is alarming. Thus, this study brings new evidence of the potential harm of excessive smartphone use and should be useful for educators and other academic stakeholders interested in the subject of the impact of technology on students' performance. Thus, the null hypothesis is rejected.

Table 9.

*Relationship between hours spent in using smartphone per day and grade point average of undergraduate students* 

Variables	p value	sig.	Coefficient of Determination (r <sup>2</sup> )
Extent of Smartphone Use in the	149	.203	9.36%
Classroom to Support Learning			
and Academic Performance			
*C::			

\*Significant at 0.01 L

## Relationship between Classroom Learning and Academic Performance of Undergraduate Students

Table 10 findings show that there is no significant relationship between classroom learning in terms of interest and readiness to learn and attention and concentration and academic performance of undergraduate students at p value of .224 and .548 respectively. This means that academic performance is not significantly dependent on student's classroom learning specifically on students' interest and readiness to learn and their attention and concentration.

The above result is consistent with the study findings done by Li and Yang (2016) about effects of learning styles and interest on concentration and achievement of student in mobile learning which concluded that learning styles, interest and concentration of students do not yield interaction effects on the academic achievement of students. In another study conducted by Adolfo, et.al. (2012), they found out that there is no significant correlation between the student's performance in the attention test and their GPA. Thus classroom learning is not a significant determiner of student's academic performance. Thus, the null hypothesis is accepted.

Table 10.

Relationship between classroom learning and academic performance of undergraduate students

	Variables	p value	sig.
Cla A.	Issroom Learning Interest and Readiness to Learn and Academic Performance	142	.224
В.	Attention and Concentration and Academic Performance	.132	.548

*alpha* = .05

## Relationship between Impact of Smartphone Use in the Classroom to Learning and Academic Performance of Undergraduate Students

Table 11 findings reveal that there is no significant relationship between impact of smartphone use in the classroom to learning and academic performance of undergraduate students with the p value of .746. This means that the impacts of smartphone use in the classroom to learning do not significantly

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Smartphone Usage and Academic Performance of College Students

affect academic performance of the students. Thus, the null hypothesis is accepted.

## Table 10.

Relationship between classroom learning and academic performance of undergraduate students

Variables	p value	sig.
Classroom Learning	038	.746
A. Interest and Readiness		
to Learn and Academic		
Performance		
alpha = 05		

## Conclusion

Based on the findings of the study, the following conclusions were drawn.

More than half or 51% of the participants had high GPA (3.01 and above) and 16% had low GPA (2.50 and below). 33% of the participants were using their smartphone for less than 5 hours, 47% were using their smartphone for an average of 5-8 hours and 20% were using smartphone for more than 8 hours per day.

In terms of how smartphone is used in the classroom, 30% of the participants brought smartphone to class always and 48% claimed they do not bring their smartphone all the time. This means that there is no hard rule in prohibiting the students to bring and use their smartphones during class time. The behavior of the participants regarding the use of smartphone during class time suggests that they are not giving much attention to their device when most of the participants said their smartphone are often turned on but put away or even turned off. In the event they use their smartphones in class, majority of the participants said their class seriously and they are using their smartphones to support their learning.

Most of the teachers were distracted when a student is using a smartphone while they were teaching. Teachers handled the situation by mostly asking the students to put their phone away, and make a general comment about your cell phone policy to the entire class. While others ignored the student and continue teaching and talks to students after class and would tend to stare to students, some confiscated the smartphone and some sent the students out of the classroom, and would dock the participation grades of students. This means that mostly teachers handled the situation in a lenient manner and few made a more stringent manner of correction.

The reasons of students about allowing smartphone usage during class time are primary to provide additional resources for their research work and as a supplemental teaching tool for them. It also helps record their assignment and organize their schedule properly, provide interactive activities, and it can motivate them to learn as they learn at their own pace. However, despite the above reasons, the study found out that the participants used their smartphones moderately to support their classroom learning.

This study showed no significant relationship between smartphone use in the classroom and academic performance of undergraduate students. There is also no significant relationship between the impact of smartphone use to classroom learning and academic performance. This means that the use of smartphone in the classroom do not significantly affect the academic performance of undergraduate students in terms of grade point average.

However, the result further showed a moderate, negative, significant relationship between hours spent using smartphone per day and academic performance of undergraduate students at p value of 0.01 level of significance. This means that the hours spent using smartphone per day moderately affect the academic performance of undergraduate students in terms of grade point average. The participants who used their smartphone to an average of 5-8 hours or even less thus,

they had high GPA while those who used their smartphone to more than 8 hours per day had low GPA. Thus, the more students use their smartphones per day the lower their grade point average and the lesser they use their smartphone per day the higher their grade point average.

This study concludes that while there is no significant relationship between use of smartphone in the classroom, proper regulation of smartphone use must be implemented such that students can still focus on lectures and discussions. Students may be allowed to bring their smartphones but they will use it as necessary and to be determined by the teacher, since most of teachers are distracted when students are using smartphones during lecture time. Also the hours spent by students using their smartphones must be greatly regulated because it significantly affects their academic performance.

#### Recommendations

With the above findings, the researcher recommends that the school Administrators must improve school policy regarding the use of smartphone in the classroom and faculty to be able to set consistent and proper guidelines for students to properly use their smartphones as a learning device and improve instructional lesson strategies.

Parents must be aware of their roles and responsibilities in providing and guiding the students to give their quality time and learn the values of self-realization and help their students regulate use of smartphone per day.

Students must learn to control their time in using their smartphone device, must be responsible to use smartphone and should use smartphones mostly to support learning.

For future researches, the researcher recommends to conduct further study on bigger group of students in other colleges or universities, further explore the effects of using smartphone to classroom learning and further study on the effects of smartphone use to teachers teaching performance.

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## Evaluation of Phytochemical Composition and Antifungal Efficacy of Phaleria macrocarpa (Mahkota Dewa) Fruit Extract Against Candida albicans

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## Abstract

The study aimed to determine the phytochemical composition and anti-fungal efficacy of Phaleria macrocarpa (Mahkota Dewa) fruit extract against Candida albicans. The results of the phytochemical analysis revealed that Flavonoids and Triterpenes are the abundant followed by Tannins with moderate content. Traces of sterols, glycosides, and alkaloids were found. However, tests for the presence of saponins revealed that there were no traces of saponins in the extract. The antifungal susceptibility test results also revealed that P. Macrocarpa fruit extract, had no inhibitory activity and no reactivity against the test organismCandida albicans. The study recommends that a high level of concentration of the P. Macrocarpa fruit extract must be used for the antifungal susceptibility tests. Furthermore, it recommends that future researchers must develop their own scientific methods in preparing the extract.

#### Keywords: smartphone usage, academic performance, college students

Candida albicans is one of the microorganisms that act as normal flora in the human body. Although Candida albicans is less potent, it may cause infections in human, mostly localized infections such as oral and vaginal. The incidence of fungal infection has increased significantly in the past 25 years. Its prevalence makes the Candida species the most threatening fungal pathogens today, and are responsible for the majority of invasive and non-invasive fungal infections Orhan, Ozcelik, Ozgen, and Ergun (2010).

Herbal medicine plays a critical role in the development of pharmaceuticals, and thus there is a high demand in natural medicine for the global market. Although there are thousands of species listed as medicinal plants, only a small number are being commercially used in traditional treatments. In this respect, there are very few in-depth scientific studies on the medicinal properties of plants. However, traditional herbal medicine is still prominent and is considered a valuable alternative to conventional medicine particularly in the developing countries (Lay, Kaisani, Basnisalam, Mohajer, & Malek, 2014).

Thus, the researchers studied the phytochemical composition and anti-fungal efficacy of Phaleria macrocarpa (Mahkota Dewa) fruit extract against Candida albicans. Despite its well-known benefits, Phaleria macrocarpa is still relatively unknown in terms of its biochemical constituents and biological activity. P. macrocarpa is being used as a remedy for a variety of ailments such as cancer, diabetes mellitus, allergies, liver and heart diseases, kidney failure, blood diseases, high blood pressure, and stroke. It is also used to treat various skin diseases including acne. This review is expected to be useful for researchers are working on the potential roles of Phaleria macrocarpa in the treatment of diseases or for product development.

Phaleria macrocarpa, commonly known as "God's crown", "Mahkota Dewa", or "Pau", is a herbal plant that originates from Papua, Indonesia which belongs to a family of Thymelaceae. The plant is relatively small with about 1.5 to 3 meters and can is grown throughout the year. Extracts of P. macrocarpa are reported for some pharmacological activities, including antitumor, anti-hyperglycemia, anti-inflammation, anti-diarrheal, vasodilator, antioxidant, antiviral, antibacterial, and antifungal effect

According to Elionora (2017), the active ingredient of Phaleria macrocarpa is tannins, flavonoids, saponins, and alkaloids. The prior literature has mentioned that Phaleria plantation has an antimicrobial activity due to compounds inside. Noorehan Rastaon (2016) states that P. macrocarpa plant is an excellent source of flavonoids. Also, flavonoids have shown potent antimicrobial and antifungal activities. Orham (2010).

## Methodology

## **Procedure and Instrumentation**

Methods and Preparation of Phaleria Macrocarpa fruit. The researchers collected the Phaleria macrocarpa fruit around the Adventist University of the Philippines campus. It was thoroughly washed in distilled water and sliced and placed on a clean plastic. Phaleria macrocarpa fruit was weighed, and two kilos of the fruit were collected. The fruit was dried using the Multi-commodity Heat Pump Dryer which was located at the Nutrition and Dietetics Department at Adventist University of the Philippines. After thoroughly drying the fruit, it was placed in a clean container and was brought to the Organic Chemistry Laboratory Standards and Division Testing of the Department of Science and Technology in Bicutan, Taguig for fruit extraction.

**Preparation of Phaleria macrocarpa Fruit Extraction.** The materials used were Phaleria macrocarpa fruit, Knife, clean plastic container, distilled water, tray and cloth, multi-commodity heat pump dryer (MCHD).

**Methods.** The following were the procedures that were conducted; weigh 100g of the ground plant material in an Erlenmeyer flask, add 300 mL or sufficient 80% ethyl alcohol to completely submerge the materials, stopper and soak for 24-hours. Filter through filter paper coarse, rinse the flask and the plant material with fresh portions of alcohol, combine the washings with the first filtrate, discard the plant residue, concentrate the filtrate over water-bath at 40 to 60°C to syrupy consistency or about 20 ml. concentrated extract,

store the extract in a desiccator, the extract is ready for phytochemical testing, of fresh plant material, use 200g of the finely cut fresh material and soak in 300 mL or sufficient 95% ethyl alcohol to completely submerge the material and then follow the same procedure.

## **Analysis of Data**

**Phytochemical Analysis of Phaleria macrocarpa Fruit Extraction**. The Phaleria macrocarpa fruit undergone phytochemical analysis for its chemical constituents. The following phytochemical screenings were performed for each extract to determine the presence of particular bioactive compounds.

- 1. Phytochemical Test for Saponin (Qualitatiest Froth Test) Dissolve the alcoholic extract in hot water, and then filter. The aqueous filtrate extract, when shaken vigorously, should become frothy; honeycomb in nature should persist for at least 30 minutes.
- 2. Phytochemical Test for Tannins (Ferric Chloride Test). Dissolve the dried extract in hot water, filter.Add 1-2 drops of Ferric Chloride T.S. Production of dark coloration that may either be black, dark blue, blueblack, indicate the presence of tannins.
- 3. Phytochemical Test for Glycosides (Fehling's Test). Dissolve the alcoholic extract in hot water, and then filter. The filtrate is used for the test. Get 2 test tubes. Place 2 mL of sample in each test tube. To the tube 1, add 1.0 ml dilute HCl; to the tube 2, add nothing (control tube). Place the two test tubes in a boiling water-bath for 5 minutes, then allow them to cool. The samples are neutralized with anhydrous sodium carbonate until no effervescence is produced. Then add 1.0 mL Fehling's solution (mix 3 mL each of Fehling's A & B). Heat the sample tubes in a water bath for 2 minutes. Observe the amount of brick red precipitate formed. An increase in the amount of brick red precipitate in the hydrolyzed sample (the sample to which dilute acid was added) as compared to the control tube indicates the presence of

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Evaluation of Phytochemical Composition and Antifungal Efficacy of *Phaleria macrocarpa* (Mahkota Dewa) Fruit Extract Against *Candida albicans* **65** glycosides. (prepared as per manufacturer's recommendations,

- 4. Phytochemical Test for Flavonoids (Mg+ Turning Test). One mL or a small amount of the dried alcoholic extract was treated with 1.0 mL 10% HCl and magnesium turnings. A red coloration is observed for a positive result.
- 5. Phytochemical Test for Alkaloid (Mayer's Test). The dried alcoholic extract is extracted with 1% HCl. Filter. To the filtrate add two drops of Mayer's reagent. A cream colored precipitate is observed. Wagner's Test. To the small amount of dried extract dissolve it with 1.0 mL of dilute acetic acid. A white of cream colored precipitate is formed. (Note: For false positive reactions: To remove impurities capable of giving false positive reactions (i.e. proteins) from an initial aqueous acidic extract- salt out these materials by adding powdered NaCl.)
- 6. Phytochemical Test for Sterols and Triterpenes (Liebermann-Burchard Test) Dissolve a small amount of dried extract in acetic anhydride. Decant the soluble portion. To this add 1-2 drops of concentrated sulfuric acid. A green color, either immediately or slowly going to red or blue tones, will form. A pink to red color is indicative of triterpenoids, while a blue color indicates the presence of steroids. (Salkowski's Test) Add concentrated sulfuric acid to several mg of the substance. and two drops of acetic anhydride to its solution in chloroform. Production of red color indicates of triterpenoids, blue for steroids.

## Antifungal Assays

**Preparation of Test Organism (Candida Albicans).** Inoculate C. Albicans to Tryptic Soy Broth (TSB) and incubate 24-72 hours (until sufficient growth is observed) at 25°C. Use culture as inoculum for step B.

**Preparation of Antimicrobial Assay Plates.** If needed, adjust the culture to a turbidity comparable to 0.5 McFarland Standard, add 200mL of the fungal suspension as prepared from Step A to a standard-size sterile petri dish/plate, then add approximately 15ml-20ml of Potato Dextrose Agar (prepared as per manufacturer's recommendations, pH 5,6 $\pm$ 0.2). Swirl, and allow plates to congeal and dry and incubate the plates at 25°C for an hour before adding the filter paper discs containing the samples for testing.

Adding samples to filter paper discs (10mm). For non-viscous and less viscous extracts/ liquids: Pipette 10µL of the sample into the 10-mm sterile filter paper discs, then add the discs to the assay plates as prepared from Step B. For viscous extracts/liquids, creams, or ointments: Dip filter paper discs in the viscous extract, and allow the extract to spread into the paper. Remove excess by tapping into the sides of the container, then add the discs into the assay plates prepared from Step B. For dry extracts and solid samples: Take a sufficient amount of the extract/sample and add 1mL of water (or depending on the agreed upon concentration, if any) to dissolve. Filter paper discs will then be dipped into the sample in the manner described in C2.

Use of positive controls. Commercially available antibiotic discs are used as positive controls. Should the costumer require to use another set of positive controls, the addition of positive control to the plate will be similar to the procedure on Step C (depending on the form of the positive control provided), unless the costumer has another procedure on the preparation of positive control. This is upon approval of the laboratory.

## **Incubation and Interpretation of Results**

- 1. Incubate the plates at 24-48 h for C. Albicans.
- 2. Observe for zones of inhibition after incubation. Measure the zones of inhibition using the caliper. If there are no zones surrounding the paper discs, aseptically lift the paper and observe the area under the sample. Report results as follows:

Reactivity Rating:

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

beyond specimen) Inhibitory Activity Rating: (+++) complete; (++) partial; (+) slight, and (-) negative

### **Results and Discussion**

#### **Phytochemical Test Result**

The Phaleria macrocarpa fruit underwent extraction and was subjected to phytochemical analysis to test for its plant constituents. The results are shown in the table 1.

#### Table 1.

Phytochemical test for plant constituents

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

Note: (+) Traces, (++) Moderate, (+++) Abundant, (-) Absence of constituents

Table1 presents the Phaleria macrocarpa fruit extract phytochemical analysis results. It shows the following plant constituents: Sterols, Triterpenes, Flavonoids, Alkaloids, Saponins, Glycosides, and Tannins. Flavonoids (+++), and Triterpenes (+++) are the most abundant followed by the Tannins (++) with the interpretation of moderate. Sterols (+), Glycosides (+) and Alkaloids (+), followed by an interpretation of traces and lastly the Saponins (-) which is the absence of constituents.

The results showed that the Phaleria Macrocarpa extracts have traces amount of Sterols a result (+). According to M. Vecka (2016), sterols are important members of the metabolic pathways and structural motifs of the eukaryotic cells, are mostly referred to in common sense as cholesterol, and its metabolites. Apart from cholesterol, several other sterols can be found in human plasma. Many of these sterols are derived either from endogenous biosynthesis of cholesterol or they come from dietary sources and are mainly of plant origin, called phytosterols. In animals, cholesterol is converted

to bile acids to serve as emulsifying agents of lipids in their digestion. Such a broad abundance of compounds and several modes of action further emphasizes the importance of sophisticated systems regulating cholesterol hemodynamics, i.e. the integration of the absorption, intracellular uptake and endogenous synthesis which take place in parallel in humans and non-animals.

The results showed that the Phaleria Macrocarpa extract has the abundant amount of Triterpenes. According to J. Nazaruk (2016), triterpenes are phytochemicals built with 6 isoprene units and usually have a 4 or 5 fused rings structure, biosynthetically issued from squalene: they may exist as free molecules or linked with a glycosidic part as saponins. They have many interesting biological activities: anti-inflammatory, hepato-protective, anti-Hyperlipidemic properties and anti-tumor promotion effect. Our triterpene reference materials are classified here according to their hydrocarbon blackbone: ursane, oleanane, lupane, lanostane, cucurbitane. Simple triterpenes are components of surface waxes and specialized membranes and may potentially act as signaling molecules, whereas complex glycosylated triterpenes (saponins) protect against pathogens and pest.

The result also showed that Phaleria macrocarpa extract has the abundant amount of Flavonoids. According to Chen (2014), flavonoids are naturally occurring polyphenols, which are widely taken in diets, supplements and herbals medicines. Epidemiological studies have shown a flavonoidrich diet is associated with the decrease in incidence of a range diseases. Pharmacological evidences also reveal flavonoids display anti-oxidant, anti-allergic, anti-cancer, anti-inflammatory, anti-microbial and anti-diarrheal activities. Therefore, it is critical to study the biotransformation and disposition of flavonoids in human. This review summarizes the major metabolism pathways of flavonoids in human. Flavonoids are ubiquitous. They are also in food, providing an essential link between diet and prevention of chronic diseases including cancer. Anticancer effects of these polyphenols depend on several factors: Their chemical structure and concentration, and also on the type of cancer. Malignant cells from different tissues reveal somewhat different sensitivity toward flavonoids.

According to the phytochemical analysis

result, it showed that there are traces of alkaloids in the fruit of Phaleria macrocarpa. Some alkaloids have been found to have anticancer and antiviral activity (Lay, Kaisani, Basnisalam, Mohajer, & Malek, 2014). The presence of alkaloids signifies quantities that were reported to be used as antimalarials, analgesics, and stimulants (Salih, Norfan, Roslan, & Hanan, 2016).

Phytochemical analysis result showed traces of glycosides. The presence of glycosides in the methanol extract may be responsible for the antidiabetogenic activities of the leaves extraction (Salih, Norfan, Roslan, & Hanan, 2016). Glycoside was found in the fruits extracts of P. macrocarpa. They have been shown to protect humans against cancer (Alara, Alara, & Olalere, 2016).

The results showed that there were the moderate amount of tannins in the extract of the fruit of P. macrocarpa. Tannins are known to be necessary for their antiviral, antibacterial, antiparasitic effects, anti-inflammatory, antiulcer, and antioxidant properties. The presence of tannins may be responsible for the ability of P. macrocarpa seeds to be used in the treatment of diseases such as diabetes, diarrhea, and dysentery. (Lay, Kaisani, Basnisalam, Mohajer, & Malek, 2014). The presence of tannins in the methanol extract may be responsible for the antidiabetogenic activities of the leaves extraction (Salih, Norfan, Roslan, & Hanan, 2016). Tannins are present in the fruits of Phaleria macrocarpa. It contains tannin which is closely correlated with the induction of apoptosis and inter-nucleosomal DNA fragmentation in leukemia cells (Alara, Alara, & Olalere, 2016).

The extract from the fruit of Phaleria macrocarpa is stated to be rich in phytochemicals, reported to abundant in the bioactive constituents namely Flavonoids and Triterpenes followed by the Tannins. Furthermore, a study was done in the year 2013 by Anntila, Anna K and her team regarding condensed conifer wherein it was found out that containing tannins which is known to be a potent antifungal agent. Therefore, Phaleria macrocarpa may have the same effects as the antifungal agent because it has bioactive constituent tannins.

Lastly, the chemical constituents found in the Phaleria macrocarpa is saponins with the result (-) interpreted as absence of constituents.

## **Antifungal Susceptibility Test Result**

The Phaleria macrocarpa fruit extract following the phytochemical analysis underwent Antifungal susceptibility test. The results are reflected below:

## Table 2.

Antifungal Activity Test

Candida Albicans					
Sample/Control	Total Mean Zone of Inhibition (mm)	Reactivity	Inhibitory Activity		
Phaleria macrocarpa Fruit Extract (10mm)	0.00	0	(-)		
Positive Control: Clotrimomazole (10mm)	17.22	3	+++		
Negative Control: Sample-Free Discs (10mm)	0	0	(-)		

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**Reactivity Rating:** 

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

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

Table 3 presents the antifungal susceptibility test results of the Phaleria macrocarpa fruit extract against test organism, Candida albicans. The sample, P. Macrocarpa fruit extract, had no inhibitory activity (+++) and no reactivity (0) against the test organism, Candida albicans. Clotrimazole, which served as positive control, produced complete inhibitory activity (+++) with a total mean zone oh inhibition of 17.22 mm, resulting in moderate reactivity (3) against the test organism. Lastly, the sample free disc, which served as negative control, had no inhibitory activity (-) and no reactivity (0) against the organism.



Figure 1. Petri Dish of C. Albicans

The result of the antifungal test showed that the fruit of Phaleria macrocarpa extracts when tested on the following test organism: Candida albicans. It revealed that the Phaleria macrocarpa fruit extract has no reaction and no capacity to kill and inhibit the fungi C. albicans. The sample free disc, which served as the negative control also had no inhibitory activity and no reactivity against the organism. However, the antifungal clotrimazole, which was able to completely inhibit the fungi Candida albicans greater than the discs of 10 mm.

## Conclusion

In conclusion, it can be stated that the Phaleria macrocarpa fruit extract is rich in phytochemical constituents. It was found out that Flavonoids and Triterpenes are the most abundant followed by the Tannins. Tannins which is known has a potent antifungal agent. The Phaleria macrocarpa fruit extract does not affect to inhibit the+ C. albicans. However, As compared to antifungal clotrimazole, which was able to completely inhibit the fungi Candida albicans. In other words, the Phaleria macrocarpa fruit extract at the present mixture may have potential capacity to have inhibitory effects against Candida albicans.

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## **Perceived Self-Efficacy, Outcome Expectations, and Self-Care Behavior** of Hypertensive Patients at Hinlub Subdistrict Health Promotion Hospital, Muak Lek District, Saraburi Province, Thailand

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## Abstract

This research examined and compared the levels of perceived self-efficacy, outcome expectations, and self-care behavior of hypertensive patients who received treatment at the studied area. Purposive sampling of 76 patients (21 males and 55 females) who had blood pressure under 160/100 mmHg., answered the questionnaires (Alphareliability Coefficient as 0.96) during August to November 2017. Data was analyzed by looking at frequency, percentage, mean, standard deviation, one sample t-test, one-way ANOVA with comparison test by Scheffe's method, and Stepwise-multiple regression. The results are as follows: (1) The respondents were at a high level in all of the three aspectswhen comparing with the established criteria (60%) at the .05 level of significance with an average mean of 3.56; (2) comparison between genders was not significant (3) only income made the three issues significantly different at the .05 level of significance. The best predictor of self-efficacy perception is appropriate time selection for exercises, which could predict self-care behavior at 48.70 percent and at the .05 level of significance.

Keywords: Perceived Self-efficacy, Outcome expectations, Self-care behavior, Hypertensive patients

## Introduction

High blood pressure (hypertension) is a major cause of premature deaths (Pangjunant & Panthuvet, 2013). The worldwide deaths of adults due to hypertension were estimated to be almost 8 million each year, with about 1.5 million in Southeast Asian populations (Pangjunant & Panthuvet, 2013).

Data from the 4th annual health survey of the Thai population via health check-ups (2008-2009) revealed that there were 11.5 million people over 15 years old with high blood pressure, 60% male and 40% female. Of the 11.5 million people, 8.9% had undiagnosed high blood pressure. The condition is increasingly worse for patients with a positive diagnosis but without appropriate treatment (Pangjunant & Panthuvet, 2013). Data from the Bureau of Policy and Strategy, Ministry of Health showed 3,664 hypertension deaths in 2001. However, an almost fivefold increase occurred between 2001 and 2011, when the rate soared from

287.5 to 1433.6 per 100,000 (Bureau of Policy and Strategy, Ministry of Health, 2011).

Hypertension is a chronic disease and has no cure (Pangjunant & Panthuvet, 2013). One of the most dangerous aspects of hypertension is that people do not know if they have it. The early stage of hypertension usually has no noticeable symptoms, the reason it is sometimes called the "silent killer". The pathology of the disease will spread slowly until the symptoms are more severe. It is usually identified through health screening. Treatment is only symptomatic to reduce severity of symptoms, which may make the disease more aggressive. Untreated high blood pressure leads to worsening and severe complications, which may require longer and more sophisticated treatments. Hypertensive patients who cannot care for themselves or do not get proper treatment, symptoms result to premature death (Pangjunant & Panthuvet, 2013). Hypertension patients, hence,

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should possess appropriate health promoting behavior with self-value and full awareness of potentially hazardous health environments. Such health promoting behavior modifications should be practiced consistently as an integral part of a healthy life style. This can eventually lower health issues and complications, which may lead to overall wellbeing (Pender, 1996).

To understand how hypertensive patients practice and maintain health promoting behavior, this study sought to investigate the level, perception, and factors of perceived self-efficacy, outcome expectations, and self-care behavior in 3 categories (nutrition, physical exercise, and stress management). This study also aimed to glean insights into public health issues in the communities where senior nursing university students were completing their nursing training. To achieve these aims, this study conducted a health community survey at Hinlub Subdistrict Health Promotion Hospital in Muak Lek District, Saraburi Province. This was carried out by the researchers with the help of nursing students. This hospital was selected because it has been observed that there is a continuously increasing number of hypertensive patients, who also suffered from other complications, including ischemic heart disease, myocardial infarction, paralysis and renal failure. These increasing rates of people with hypertension and associated conditions prompted the health care providers to act on it. The researchers hope the study will reveal strengths and weaknesses in caring for hypertensive patients to prevent further complications in the future.

#### **Objectives**

- 1. To examine the level of perceived self-efficacy, outcome expectations and self-care behavior of the hypertensive patients who participated in this study.
- To compare the level of perceived self-efficacy, outcome expectations and self-care behavior of the identified hypertensive patients in Muak Lek District, Saraburi Province taking into consideration their gender and income.
- 3. To analyze factors of perceived self-efficacy and outcome expectations that are influencing self-care behavior of these hypertensive patients

#### Hypothesis

- 1. The level of perceived self-efficacy, outcome expectations and self-care behavior of the respondent hypertensive patients is very high.
- 2. Gender and Income make no difference on perceived self-efficacy, outcome expectations and self-care behavior of these hypertensive patients.
- 3. Factors of perceived self-efficacy and outcome expectations influence self-care behavior of these hypertensive patients

### **Research Framework**

The authors adopted the Self-Efficacy Theory by Bandura (1997) as a framework for this study. Figure 1 answer objective 2 and figure 2 answers objective 3



Figure 1. Research Framework for objective number 2



*Figure 2*. Research Framework for objective number 3

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#### Methodology

#### **Population and Setting**

**Population Group.** The population of this study comprise 76 (21 males and 55 females) hypertensive patients with blood pressure <less than 160/100 mmHg between the months of August to December 2017.

**Sampling Group.** A hundred percent purposive sampling method was used for the selection of a total of 76 subjects.

#### Instrument

The researchers obtained permission to adopt the questionnaire utilized by Charernyuth (2009) entitled the "Effectiveness of Health Promoting Program for Hypertensive Patients" for this study. The data collection questionnaire consisted of 4 sections:

- Section 1) General information about the population group such as gender, age, marital status, education level, occupation, domicile, family status, income, medical history of hypertension in patient's family, treatment expense, health checkup, smoking status and alcohol consumption status.
- Section 2) Perceived self-efficacy, consisting of nutrition, physical exercise, and stress management on a five-point rating scale with a format of positive response questions (most, very, moderate, little, least).
- Section 3) Outcome expectations, consisting of nutrition, physical exercise and stress management on a five-point rating scale (strongly agree, agree, somewhat agree, disagree, strongly disagree).
- Section 4) Self-care behavior of nutrition, physical exercise and stress management of hypertensive patients consisting of frequency of self-care behavior on a five-point rating scale (routinely, very often, often, sometimes, rarely).

The criteria and interpretation of the perceived self-efficacy, outcome expectations and self-care behavior was divided into five levels: a) the highest level – average score = 4.51-5.00, b) high level – average score = 3.51-4.50, c) intermediate level – average score = 2.51-3.50, d) low level – average score = 1.51-2.50, and e) the lowest level - average score = 1.00-1.50. Reliability testing was tested on 30 hypertensive patients. Cronbach's Alpha Coefficient was performed. The reliability of each section, perceived self-efficacy, outcome expectations, and self-care behavior, was 0.92, 0.94, and 0.88, respectively. The total reliability of this questionnaire was 0.96.

#### Data analysis

- a. Statistical analysis of general information of the respondents using frequency and percentage
- b. Statistical analysis as indicated under Objective 1 in Mean ( $\bar{x}$ ) and Standard Deviation (S.D.). One sample t-test endeavored to find the significant difference (by comparing mean with 60% criteria or 3 out of 5 in five rating scales) and the interpretation are as follows:
  - 1) Mean is higher than 3 (in five rating scale) or 60% and p<.05 = High level
  - 2) Mean is close to 3 or 60% and p>.05= Moderate level
  - 3) Mean is lower than 3 or 60% and p < .05 = low level
- c. Statistical analysis as indicated under Objective 2 by Independent Samples t-test, One way ANOVA and with comparison test by Scheffe's method.
- d. Statistical analysis as indicated under Objective 3 by Stepwise-Multiple Regression as follows:

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### **Results and Discussion**

#### Demographic of questionnaire respondents

There were 76 questionnaire respondents from Hinlub Health Promoting Hospital. The majority were female 72.40%, 75% aged 60 years and above; 67% were married 44. 7% were unemployed 23.& were farmers, 72.40% had elementary school as their highest education level , and 57.9% and 32.90% perceived themselves as having an inadequate and adequate income respectively, as shown in Table1.

#### Table 1.

Demographic of questionnaire respondents (Sample $N=62$ )						
Subject	Quantity	Percentage				
1. Gender						
Male	21	27.60				
Female	55	72.40				
2. Age						
18-35 years old	-	-				
36-59 years old	19	25.00				
60 years and above	57	75.00				
3. Marital status						
Single	4	5.30				
Married	51	67.00				
Widowed	17	22.40				
Divorced	4	5.30				
4. Occupation						
Employee	16	21.10				
Agriculture	18	23.70				
Merchant	8	10.50				
Unemployed	34	44.70				
5. Education level						
No school	13	17.10				
Elementary	55	72.40				
High school	5	6.60				
Bachelor degree	1	1.30				
Higher than Bachelor degree	2	2.60				
6. Living income level						
Inadequate	44	57.90				
Adequate	25	32.90				
Adequate with savings	7	9.20				

# The levels of perceived self-efficacy, outcome expectations and self-care behavior of hypertensive patients.

Table 2 shows the data for perceived self-efficacy, outcome expectation and self-care behavior of the respondents. Perceived self-efficacy, outcome expectation, and self-care behavior of patients, was at a high level when compared with the established criteria (60%) at the .05 level of significance, University Research Office JHS Vol. 2 No. 1 July 2019

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average mean as 3.56. When identifying the average means of each aspect, it was found that patients had perceived self-efficacy, outcome expectations, and self-care behavior at the same high level, average means as 3.94, 3.36, and 3.40 respectively, as shown in Table.

Statistical data and category interpretation of hypertensive						
Category	Ν	Μ	SD	t-value		
Perceived self-efficacy	76	3.36	0.59	5.34*		
Outcome expectation	76	3.94	0.57	14.46*		
Self-care behavior	76	3.40	0.61	5.73*		
Total	76	3.56	0.49	10.01*		

Table 2.

\* p< 0.5

## Levels of perceived self-efficacy, outcome expectations and self-care behavior of hypertensive patients considering gender and income.

Table 3 showed that gender had no different effect on perceived self-efficacy, outcome expectations, and self-care behavior of hypertensive patients when considering gender and income.

Table 3.

Independent Sample t-test of hypertensive patients with gender classification

Category	Male	(n=25)	Female (n=55)		4	C:-
	<sup></sup> X	S.D.	-X	S.D.	- i	51g.
Perceived self-efficacy	3.33	0.14	3.37	0.57	-0.31	0.85
Outcome expectations	3.85	0.50	3.97	0.59	-0.83	0.46
Self-care behavior	3.38	0.66	3.40	0.59	-0.13	0.71

\*p<.05

Table 4.

One-way analysis of variance of perceived self-efficacy, outcome expectations and self-care behavior of hypertensive patients classifying with incomes.

Source	<b>S.S.</b>	df	M.S.	F	Р
Perceived self-efficacy					
Between group	2.72	4	1.36	4.32	0.01*
Within group	22.98	71	0.32		
Total	25.70	75			
<b>Outcome expectations</b>					
Between group	1.87	4	0.93	3.08	0.05*
Within group	22.09	71	0.30		
Total	23.95	75			
Self-care behavior					
Between group	2.72	4	1.36	3.98	0.02*
Within group	24.94	71	0.34		
Total	27.66	75			

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#### \*p<.05

# Analyzed factors of perceived self-efficacy and outcome expectations influencing self-care behavior of hypertensive patients using Stepwise-Multiple Regression.

Seven crucial aspects were found affecting the Self-care behavior, could explain the variance of dependent variables at the 77.50 percent at the .05 level of significance. Those variables were: 1) self-efficacy perception in terms of setting aside time for exercise; 2) outcome expectations in terms of eating vegetables and fruits for reducing high blood pressure; 3) self-efficacy perception in terms of meditation for reducing high blood pressure; 4) self-efficacy perception in terms of drinking 6-8 cups of clean water a day for a regular excretory system and control high blood pressure; 5) self-efficacy perception in terms of selecting the appropriate exercise methods for reducing high blood pressure; 6) outcome expectations in terms of taking sufficient nutrient to help control high blood pressure; and 7) self-efficacy perception in terms of positive mind to reduce stress and to help control high blood pressure. It was also found that the best predictor of all self-efficacy perception was setting aside time for exercise. Furthermore, only one aspect could predict the self-care behavior of high blood pressure patients at 48.70 percent and at the .05 level of significance, as shown in Table 5.

### Table 5.

Stepwise-Multiple Regression analysis of the effect of Perceived Self-Efficacy and Outcome expectations to Self-care behavior of hypertensive patients at Hinlub Sub-District Health Promotion Hospital in Muak Lek District, Saraburi Province

Madal	Faators	D٦	Б	Coefficient				
Model	ractors	K2	r	Constant	В	Beta	t-value	Sig.
1	• Perceived self-efficacy in terms of setting aside time for exercise (P2)	.487	70.15*	2.36	0.30	0.70	8.38*	.000
7	• Perceived self-efficacy in terms of setting aside time for exercise (P2)	.775	33.54*	.112	0.17	0.39	4.04*	.000
	• Outcome expecta- tions in term of eating vegetables and fruits for reducing high blood pressure (E1)				0.19	.291	4.82*	.000
	• Perceived self-efficacy in terms of meditation for reducing high blood pressure (P3)				0.10	0.24	3.99*	.000
	• Perceived self-efficacy in terms of drinking 6-8 cups of clean water to have a regular excretory system and control high blood pressure (P1)				0.11	0.19	3.05*	.003

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• Perceived self-efficacy in terms of selecting the appropriate exercise methods for reducing high blood pressure (P2)	0.13	0.30	3.12*	.003	
• Outcome expectations in terms of taking sufficient nutrient help control high blood pressure (E1)	0.13	0.18	2.87*	.005	
• Perceived self-efficacy in terms of positive mind to reduce stress (P3)	0.08	0.16	2.66*	.010	

## \* *P* < .05

Notation:

B: Regression Coefficients; Beta: Standardized coefficients F statistics or F ratio; R: Multiple correlation coefficients Sig. labels the two-sided P values or observed significance levels for the t statistics

#### Discussion

This is due to the past health care events held at Hinlub Subdistrict Health Promotion Hospital related to perceived self-efficacy, outcome expectations and self-care behavior. There were health care exhibits of hypertension highlighting facts, cause, symptoms/types, complications, diagnosis/test, treatment and self-care. The medical staff and nurses from Hinlub Subdistrict Health Promotion Hospital emphasize the importance and benefits of self-care, knowledge and skill in healthy nutrition, diet, weight control, video with demonstration of stretching & exercise and stress reduction techniques. The respondent patients participated in group discussions & questions and took materials home for review and practice. They also made house calls to follow-up on self-care behavior and did rotation visits on all the hypertensive patients at Hinlub Subdistrict Health Promotion for patient in self-care behavior at Lampoon Hospital and revealed comparable results with p<0.05. Saijai Chaisongkarm (2002) also reported that health promotion program for seniors at Muang District, Nonthaburi Province showed better results of perceived self-efficacy, outcome expectations and behavioral promotion in nutrition, physical exercise and stress management after experiment with p<0.05.

### **Conclusion and Recommendation**

There were 76 respondents from Hinlub Health Promoting Hospital. The majority comprised the female group at 72.40%, aged 60 years and above; 75.00%; married 67.00%, unemployed 44.70%, agriculture 23.70%, elementary school graduate 72.40%, inadequate and adequate income 57.90% and 32.90% respectively. The majority comprised the female group at 72.40%; whose ages ranged from 60 and above at 75%, the married ones comprise 67% of the total respondents; the unemployed at 44.7%; the agricultural workers at 23.7%, the respondents with adequate income at 32.9% and those with inadequate income at 57.9%.

From our study, Hinlub Subdistrict Health Promotion Hospital should routinely offer health related activities in 3 areas: nutritional intake, physical exercise and stress management. Information

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should be demonstrated with hands-on practice whenever possible to help enhance remembering. Physical exercise should not be vigorous to avoid injury since most hypertensive patients are elderly.

Future research, should adopt perceived self-efficacy theory with social/community support to promote health among hypertensive patients. Caretakers play an important role in assisting hypertensive patients and thus, this study suggests their participation in the on-going activities their transportation provided; and while at home, they help oversee and assist with nutrition, exercise, and stress management including utilization of health information of high blood pressure.

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# The Result of Stress Management Program in Freshman Nursing Students, Asia-Pacific International University

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# Abstract

This quasi-experimental research studied the stress level and the result of the stress management program of freshmen nursing students at the Asia-Pacific International University. Simple random sampling technique was used to select 60 freshmen nursing students divided equally into control group and intervention group. A stress management program was developed by investigators and implemented in the intervention group for 3 weeks. Stress level was assessed in both groups before and after the implementation in the intervention group by using Suanprung Stress Test-20, a standardized test with Cronbach's Alpha of .87. Descriptive and independent t-test were performed in statistical analysis. The results revealed the high level of stress in both groups (p < .05) before the intervention. However, the stress level of freshmen students who received stress management program in the intervention group decreased (t = 2.20, p < .05). These findings suggest that instructors and administrators should develop and promote mental health activities for nursing students.

Keywords: stress management program, stress, nursing students

#### Introduction

High bloStress is a condition of feeling pressured, uneasy, nervous, afraid, or anxious which is caused by a person's perception or evaluation of life experiences as a mental threat or a harmful condition that impairs function. This creates imbalances between the body and the mind causing many reactions such as the use of self-defense mechanisms, physiological changes, behavioral changes, ideological behavioral changes and emotional changes (Department of Mental Health, 1996). Stress affects physical health and mental health which leads to anxiety, depression, unreasonable fear, and unstable emotion. Moreover, it also affects a person's working efficiency, and relationship with family and close friends (Jitrakorn, 2004). If adjustments are made and satisfaction is acquired, then the individual is encouraged and strengthened to manage any stressful situation. However, if adjustments are not made and satisfaction is not achieved, then it will be stressful.

As a result, balanced living in the society is lost and there is a lack of efficiency in the workplace.

Though, stress occurs at any age, adolescence is the time when stress levels are high. Anderson, Levinson, Barker, and Kiewra (1999) mention that students aged 18-22 years need to adapt to the dramatic changes in life. Higher education is an area where students are required to use analytical thinking to be able to adapt to new academic environments. These kinds of adjustments in life --new student orientation, new teaching methods at the university, changes of places and friends-impact the stress level of students in the university.

The freshman nursing students at Asia-Pacific International University had to adjust to a new campus, environment, society and culture; make new friends, and activities and regulations of the university. All of these resulted in many kinds of stress. The research done by Boonpume (2010) regarding stress and stress management among Thai Traditional Medical College students found that the level of stress experienced by these university 80

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students can be improved by changing their lifestyles at the beginning of their university lives. From being high school students to adult, many adjustments must be made by students from orientation to new teaching methods. When they graduate, they must prepare to start a career and build a family. A self-assessment report of the Mission's Faculty of Nursing in curriculum discovered that of the 77 students, who were accepted in the first academic semester of 2016, only 70 students remained at the end of their freshman year. Factors affecting the change in number were students' resignation, leaving the faculty residences or absence due to financial issues. Other researchers found that students drop out because they were studying in fields that they did not like and had to pursue other careers, had problematic attitudes toward their field of studies, had problems with family status resulting to insufficient income to support their studies, students had uncaring parents who disturb their children's study by asking them to help in the family's businesses, and health concerns (Luesakul, 2010; Joseph, 1972; Phokeaw, 1996; Supyam, 2009).

In light of the findings above, stress among the freshman mission nursing students may be due to the effort of adaptation, participation in university activities, teaching and learning styles at the higher education level, personal factors and family status. The researchers recognized the impact of stress so they developed a stress management program that allowed the freshman nursing students to be able to measure and perceive their own stress level and learn techniques on how to manage their stress.

#### **Research Objectives**

- 1. To study the stress levels of the freshman nursing students at the Asia-Pacific International University
- 2. To study the effect of a stress management program on the freshman nursing students at the Asia-Pacific International University.

#### **Research Hypothesis**

- 1. The stress level of the freshman nursing students at Asia-Pacific International University is high significantly before the integration of the experiments when compared to the criteria of the Department of Mental Health which is statistically significant at the 0.05 level.
- 2 The freshman nursing students at the Asia-Pacific who received the integration of the stress management program have a lower level of stress level than the group that does not receive the integration of stress management program, with statistically significance level of 0.05.

#### **Research Framework**

The systematic theory of Lazarus (1996), the theory applied to this research, discusses the emotional response system as a result of an interpersonal relationship with the environment. The key components of the Lazarian concept of emotional response system are the stimuli, the evaluation of the person and the response of the person.



Figure 1. Research Framework

#### Methodology

This research is a quasi-experimental research with a 'Non-Randomized control Group Pretest-Posttest Design'. The independent variable is the stress management program and the dependent variable is the stress levels of the freshman nursing students of the Asia-Pacific International University.

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Population and the Sample

This study comprises 92 freshman nursing students of the Asia-Pacific International University. Being a quasi-experimental research, the sample size should not be less than 20-30 people (Polit & Beck, 2004). This study had 60 people for a sample size.

**Sampling method.** A simple random sampling technique was used to collect 60 students, 30 of which 30 were assigned to the experimental group and 30 to the control group.

### **Research Instrument**

The research instrument included the following:

- 1. Personal data questionnaire consisting of gender, age, family income, status of father or mother, number of siblings, physical activity and number of close friends.
- Suanprung Stress Test-20' developed by Mahatnirunkul, Phomphaisan, and Tapanya(1997) at the Suanprung Mental Health Hospital. It is based on a 6-point scale answer which is 0-5 points; no stress (0) to severe stress (5). But for the Suanprung Stress Test, the total score should be no more than 100 points which is divided into 4 levels.
  - Score 0-23, which means low level of stress
  - Score 24-41, which means moderate level of stress
  - Score 42-61, which means high level of stress
  - Score 62 and above, which means intense level of stress
- 3. A Stress Management Program which was created using the concept of Lazarus (1966), and the literature review and related research to investigate the effects of the stress management program on freshman nursing students at Asia-Pacific International University.
  - 3.1 Primary appraisal is the evaluation of a person's stress-inducing stimuli to eliminate the stress or to prevent the cause of the stress by finding a way to control the situation by having group activities, recording the problems and managing the stress.
  - 3.2 Secondary appraisal is the evaluation of a person's ability to manage a stressful event—a change that brings a solution to the problem, being able to respond to stress inducing stimuli by doing relaxation exercises in groups, relaxing the muscles and having a proper way of exercising.
  - 3.3 Reappraisal is the re-evaluation of the situation after the secondary appraisal to maintain the balance and to reduce the impact of stress by doing group activity in response to recorded problems.

### **Quality Control Inspection of Research Instruments**

**Content Validity.** Three experts examined the data questionnaire and the stress management program and assessed their content validity index (CVI) the criteria of which should be more than 0.8 (Burns and Grove, 2009).

**Reliability.** The researcher used the Suanprung Stress Test-20 to try out freshman nursing students at Asia-Pacific International University who have similar characteristics to, but were not part of the sample. The Cronbach's Alpha Coefficient's value was 0.87.

#### **Protocols for the Sample**

After being approved by the Ethics Research Board of the Asia-Pacific International University, the researchers called for the participants who met the criteria to explain to them the purpose of the research, the process of experimentation and the duration of the research emphasizing that they have the right to accept or refuse participation in the said research. Moreover, participants who were dissatisfied and wanted to cease from participating were free to withdraw anytime. All information provided by the participants were kept confidential. The data was presented as an overview without revealing any names. The researchers were contracted in case of questions or doubts.

#### Methods

- A letter for permission to conduct the research was delivered to the Deputy Dean of the Faculty of Nursing, Muak Lek after the review by the Research Ethics Committee of the Asia-Pacific International. The researchers clarified the objectives and the process of collecting data; requesting for permission to collect data, and data screen the participants.
- 2. After approval was received from the Deputy Dean of the Faculty of Nursing, Muak Lek campus, the researchers contacted and met the instructors of the sample group to explain and clarify the purpose of the research including the time of the data collection to secure the location and the cooperation of the participating group in the research.
- 3. Six research assistants with the following qualifications were prepared:
  - 3.1 The volunteering research assistants should have been junior nursing students with a course in introduction to nursing research and were able to travel to collect the data on Muak Lek campus on the days when they no class.
  - 3.2 The research assistants prepared the freshman nursing students of the Asia-Pacific International University for participation in the stress management programs which included three activities 1) recording problems and stress management, 2) stress management and 3) recording problems about stress issues.
  - 3.3 Training the research assistants included

3.3.1. Explaining to them the objectives of the research including the use of the instruments for collecting data; including the Suanprung Stress Test -20, 2) Preparing the freshman nursing students at Asia-Pacific International University, 3) Clarifying the stress management program and 4) Reviewing of the rights of the sample groups.

3.3.2 The researchers trained the research assistants for about 2-3 hours and gave them the opportunity to ask questions and to try out the data collection tools.

4. The researchers randomly selected 60 nursing students. These students completed the self-evaluation report on stress using the Suanprung Stress Test-20. Using the scores from this pre-test, the students were assigned into either the experimental or control groups by pair-matching similar scores and genders to keep similar the characteristics of both groups.

### **Data Collection**

- 1. After the experimental group was selected according to the criteria, the researchers established the relationship among all the participants; clarified the objectives and details of the research, the rights of protection and the requests for their cooperation in the research, and had them sign the consent form to participate in the research.
- 2. Participants completed the personal data questionnaire and the Suanprung Stress Test-20.
- 3. The process of conducting the experiment had three steps as follows:

#### Week One

- Activity one: Problem-recording and stress management. The participants were divided into groups of six to discuss for about 30 minutes their opinions about stress, their problems regarding stress, and the techniques they could use to manage stress. The problems discussed were recorded in a notebook.
- Activity two: Relaxation exercises to reduce stress. This was a whole group activity. The researchers demonstrated to the participants how to do relaxation exercises for reducing stress and for doing muscle relaxation training (about 15 minutes) and gave them the pamphlet "Exercise to Reduce Stress" which had the same content as the activity. They were taken home and reviewed.

#### Week Two

The experimental group recorded the problems of their stress and how they managed stress on their own,
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# in a notebook.

# Week Three

- Activity three: Problem-recording of stress issues. The participants were again divided into groups of six. Each group evaluated the problems of stress they had encountered and how they managed their stress. This was the summary from their recording. This they did for about 30 minutes.
- 4. After activity three was completed, the research assistants checked for about 5 minutes the stress level using the post-test survey.

#### **The Control Group**

**Week one.** 1. After the control group was identified according to the criteria, the researchers established relationship with the participants; clarified the objectives and details of the research, the rights of protection and the request for participation in the research and had the participants sign the consent form.

2. The participants completed the personal data questionnaire and the Suanprung Stress Test-20.

- Week two. The control group performed their normal daily activities.
- Week three. The research assistants evaluated for about 5 minutes the stress levels using the post-test survey.

#### **Data Analysis**

The data were analyzed using the statistical software and its statistical significance level at 0.05. The data from the questionnaire were analyzed using descriptive statistics. The average score of stress levels was analyzed by a one sample t-test. The comparison of stress levels between the intervention group and the control group employed an independent sample t-test.

#### **Results and Discussion**

Before the experiment, the average stress level of the participants was at 45.28, (Table 1) which was higher than the set criteria of 41 (according to the Suanprung Stress Test-20 of Department of Mental Health) with statistical significance of 0.05. This demonstrated that the freshman nursing students of the Asia-Pacific International University acquired a high level of stress due to their adjustment to the teaching in higher education and adapting to new friends and new activities. The methods of stress management could be divided into two types: managing stress either through solving the problem or managing stress by modifying the feelings or reactions to the problems.

After the intervention, the stress level of the experimental group was found to be lower than the control group with a statistically significant level of 0.05 (Table 2). From this result, it can be surmised that the integration of the stress management program, adapted from the theory of Lazarus (1966), helped the freshman nursing students to recognize the problems in their daily lives. These problems may have affected their stress levels. Group activities are a possible way to deal with these problems by asking the members of the group to find ways/techniques to manage stress to enable them to create a variety of ideas for stress management. Subsequently, in the face of stress, students can apply these stress management approaches correctly to reduce their stress levels. scores with a statistical significance of 0.05.

The control group had higher stress levels than those receiving the stress management program. The research done by In this research, 72% of those in the experimental group reduced their stress levels to a normal mental health level, 24% had a slight decrease, and 4% had a decrease in their stress level to a very good state of mental health. When comparing the differences in ratio on the level of stress between the experimental group and the control group, the results were different only with those who had stress.

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Table 1.

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Mean Score of Stress of Fi	reshman Nursing	g Students (E	Sefore Interve	$ention \ n = 60)$		
	Criteria for scoring 41/100 points (Suanprung Stress Test-20, Department of Mental Health)					
Stress Score						
		S.D.	t-value	Sig		
Pre-test	45.28	10.48	3.26*	0.002		

\**p* < 0.05

Table 2.

Comparison of the Mean Scores of Stress of Freshman Nursing Students at Asia-Pacific International University Between the Experimental Group and the Control Group

Stress Score	Experime (n =	ntal group : 30)	Control group (n = 30)		t-value	Sig
		S.D.		S.D.		
Post-test	39.90	10.00	46.57	12.46	-2.20*	0.032

\**p* < 0.05

#### **Conclusion and Recommendation**

Before the experiment most of the freshman nursing students at the Asia-Pacific International University had high levels of stress compared to the standard levels of Suanprung Stress Test-20, and the Department of Mental Health. After receiving the integration of stress management program that engages group activities to manage stress, stress relief exercises and reevaluation of group program management, the students that received the stress management program had reasonable levels of stress while those that did not high stress levels.

The duration of the research should be increased to have more time for the integration of the stress management program, to follow up on the continuum of the students' stress management and to make the stress management program more beneficial. This study should be done with the nursing students of other years to promote mental health so that the students will be able to manage their stress by themselves. Finally, the school administrators should use these results as a guide for mental health promotion and for the prevention of the problems that result from being stressed.

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