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EFFECT OF LIFESTYLE INTERVENTION PROGRAM ON THE HEALTH STATUS OF HYPERTENSIVE ADULTS IN KUALA LUMPUR

Mary Jane Botabara-Yap, Rosalinda Solano, Miriam Estrada

Abstract

This study aimed to determine the effect of a lifestyle intervention program on the health status of hypertensive adults in Kuala Lumpur. Of the 60 purposively selected participants, 30 were assigned to the experimental group, and 30 were assigned to the control group. The lifestyle promotion program was implemented for one month on the participants of the experimental group. The pre-test of the experimental group showed a *high* consumption of meat, dairy products, and canned or packet foods. Participants had *moderate* physical activity. Majority had Stage II hypertension, were overweight, and had body fat at 26-35%. After the intervention, there were significant improvements in dietary habits, physical activity, body mass index, blood pressure, and body fat of the participants. There was no significant difference in the gain score of dietary habits between the control and experimental groups. However, the gain score in physical activity and blood pressure between the control and experimental groups were significant, with p-values of 0.067 and 0.035, respectively.

Keywords: *hypertension, lifestyle intervention, dietary habits, BMI, body fat*

The American Heart Association (2017) defines high blood pressure or hypertension as a condition in which the blood vessels have persistently raised pressure as blood is carried from the heart to all parts of the body in the vessels (AHA, 2017). It is a condition that is estimated to cause 7.5 million deaths or about 12.8% of all total deaths per year and is a major risk factor for coronary heart disease, ischemic heart disease, and hemorrhagic stroke (WHO, 2013). It is considered a "silent killer" as one may have the condition without having to feel any physical symptoms; it may not cause any harm by itself but predisposes the individual to other diseases such as stroke, cardiovascular disease, and kidney disease (Seedat, 2014). The current medical standard suggests that normal blood pressure is less than 120/80 mmHg; however, a person with a blood pressure reading of 121-139/80-89 is considered as pre-hypertensive (AHA, 2017).

The World Health Organization (WHO) suggests that having high blood pressure is very dangerous as it increases a person's chance of getting heart disease, stroke or kidney disease and often it has no warning or signs and symptoms. The WHO suggests that controlling high blood pressure by taking preventive action is very important (WHO, 2013).

In Malaysia, being an industrialized country, the trend of hypertension is rising. Data from the National Health and Morbidity Surveys (NHMS) showed the following trend of hypertension prevalence: 32.9% (30%–35.8%) in 1996, 42.6% (37.5%–43.5%) in 2006, and 43.5% (40.4%–46.6%) in 2011 (MOH, 2011). This finding shows the magnanimity of the problem and the need to increase awareness about it, especially considering that levels of awareness among Malaysians are lacking and treatment and control are low (Rampal, Rampal, Azhar, & Rahman, 2008). Over the years, although there has been progress in increasing awareness, detection, treatment, and control of hypertension, studies indicate that about 50–75% of patients diagnosed with or being treated for hypertension do not have adequate control of their blood pressure (Oliveria, Chen, McCarthy, Davis, & Hill, 2005). Efforts are still needed in order to control this disease, which include increasing public knowledge and awareness, especially about the risks associated with uncontrolled blood pressure.

Hypertension is thought to be caused by the following factors: increasing age, family history, unhealthy diet, physical inactivity, and smoking. Although hypertension is controllable by taking pre-

scribed medications, it is a preventable disease that can also be controlled through lifestyle modifications (Bellows & Moore, 2011). Forman, Stampfer, & Curhan (2009) in a prospective cohort study of 83,882 adult women found that adherence to a low-risk diet and lifestyle was associated with a lower incidence of hypertension. In another study, it was revealed that even moderate physical activity can reduce high blood pressure (Frisoli, Schmieder, Grodzicki, & Messerli, 2011). A two-month intervention study that looked at the effects of lifestyle modification on blood pressure also showed that all 36 participants who adopted the healthy lifestyle program reported an improvement in their blood pressure reading (Rigsby, 2011).

With this, health promotion plays a very important role in the prevention of hypertension. For example, providing explanations on the relationship between obesity and the escalating incidence of hypertension and complications of heart disease can motivate participants to lose weight. Therefore, this study was conducted in order to strengthen the evidence base stating that lifestyle interventions can help address hypertension.

Objectives

The aim of this research was to study the effects of a lifestyle intervention program on the health status of hypertensive adults in Kuala Lumpur, Malaysia. It determined the pre- and post-intervention characteristics of the participants in both the control and experimental groups in terms of health practices (dietary practices, and physical activity), and health status (blood pressure, body mass index, and body fat). Moreover, it sought to identify any significant differences in the gain score in health practices and blood pressure between the intervention group and the control group.

METHODOLOGY

This research utilized a quasi-experimental, two-group pre-test and post-test design. The population was purposively chosen from a private institution located in Kuala Lumpur with the following criteria: a) 20-65 years old; b) with a hypertensive condition; c) living within the city of Kuala Lumpur; and d) willing to attend the four-week Lifestyle Promotion program. Thirty participants were selected for the experimental group and another 30 were recruited to compose the control group. Hence, 60 individuals were included in the study.

The population was composed of 17 (56.7%) females and 13 (43.3%) males. Four (13%) were within the age range of 20 to 30 years, 14 (46.7%) were 31 to 40 years old, 10 (33.3%) were 41 to 50 years old, and three (6.7%) were 51 years or older. Furthermore, it was observed that 14 (46.7%) were Muslims, nine (30%) were Christians, six (20%) were Buddhists, and one (3.3%) was a Hindu.

A self-constructed questionnaire based on the literature and the researcher's knowledge was designed using a quantitative approach. The questionnaire had four sections. The first section was on knowledge on the basic fundamentals of hypertension while the second section explored the health-related practices of the respondents. The third section measured the health status of the person, which included blood pressure taken with a digital sphygmomanometer, anthropometric measurements such as weight, height, and body mass index, and body fat taken with a hand held monitor analyzer (Karada, Omron). Finally, the fourth section collected information on the demographic data of the respondents.

The questionnaire underwent re-writes, corrections, and validation from a panel of experts which consisted of a statistician, the research adviser, and other professionals related to the field being studied. A pilot study was conducted on 30 conveniently selected respondents in Kuala Lumpur prior to the actual data gathering.

The title of the lifestyle promotion program implemented was "Take Control". The "Take Control" program was held three times a week (Saturday, Sunday, & Monday) for four weeks for one and half hours, from 7:30pm to 9:00pm, in a classroom. During each session, the participants were taught about necessary information to manage their hypertensive condition, prevent an increase in their blood pressure, and reduce their risk for heart disease complications. They participated in each activity as required, such as group discussions, cooking, and exercise demonstrations.

To analyze the data collected, this study utilized the Statistical Package for the Social Sciences (SPSS) software. In order to quantify the demographic data of the population, frequency table and percentage were used. Two-sample t-test was used to compare the differences in the change between the pre-test and post-test scores of the experimental and control group.

RESULTS AND DISCUSSION

Table 1 reflects the baseline characteristics of all the variables.

Table 1
Summary of Pre-Intervention Characteristics of the Control and Experimental Groups

	Control Group			Experimental Group		
	Mean	SD	VI	Mean	SD	VI
Dietary habits	3.75	0.20	High consumption	3.68	0.34	*High consumption*
Physical activity	3.06	0.48	Moderate	3.07	0.68	*Moderate*
Blood pressure	1.46	0.62	Hypertension I	1.50	0.86	*Hypertension I*
Body mass index	1.96	0.80	Overweight	2.30	0.74	*Overweight*
Body fat	3.46	1.30	Moderate	3.86	0.93	*High*

There was no difference in the baseline characteristics of the control and experimental groups. The respondents in both groups showed *high* consumption of unhealthy food, *moderate* physical activity, and first stage hypertension. Both groups were also overweight; *moderate* body fat was seen in the control group while *high* body fat was seen in the experimental group.

Table 2 reflects the post-intervention characteristics of the participants in terms of health practices and health status, comparing the control and experimental groups.

Table 2
Summary of Post-Intervention Characteristics of the Control and Experimental Groups

	Control Group			Experimental Group		
	Mean	SD	VI	Mean	SD	VI
Dietary habits	3.68	0.54	High consumption	3.48	0.56	*Average consumption*
Physical activity	3.06	0.71	Moderate	3.00	0.18	*Moderate*
Blood pressure	2.13	1.25	Hypertension I	3.06	1.28	*Pre-Hypertension*
Body mass index	1.90	0.80	Overweight	2.00	0.98	*Overweight*
Body fat	3.06	1.20	Moderate	3.23	0.85	*High*

There was a visible change in the dietary habits, blood pressure, and body fat between the control and experimental groups, yet there was no difference in physical activity and BMI between the control and experimental groups even after the intervention.

Table 3 compares the difference in the health practices of the experimental group before and after the intervention

Table 3
Comparison of the Difference in the Health Practices for the Experimental Group Before and After the Intervention

Health Practices	Pre	Post	Mean difference	SD of MD	t-value	p-value	VI
	Mean						
Dietary habits	3.68	3.48	0.20	0.63	1.71	0.045*	S
Physical Activity	3.07	3.00	0.71	0.18	2.15	0.04	S

**1-tailed*

There was a visible improvement in dietary habits (3.68-pre; 3.48-post) and physical activity (3.07-pre; 3.00-post) after the intervention; these values were both significant at 0.045 and 0.04 respectively.

Table 4 reveals the comparison of the difference in the health status of the experimental group before and after the intervention.

Table 4
Comparison of the Difference in the Health Status of the Experimental Group Before and After the Intervention

Health Practices	Pre Mean	Post	Mean difference	SD of MD	t-value	p-value	VI
BMI	2.30	2.00	0.30	0.91	1.79	0.041	S
Blood pressure	1.50	3.06	-1.56	1.75	-4.88	0.000	S
Body fat	3.86	3.23	0.63	1.09	3.15	0.004	S

**1-tailed*

The results showed differences in the health status of the participants pre- and post- lifestyle intervention for BMI, blood pressure, and body fat. The differences were all significant at p-value of 0.041, 0.000, and 0.04, respectively.

Table 5 reflects the gain score in dietary habits, health practices, and blood pressure between the control and experimental groups.

Table 5
Comparison of Gain Score in Dietary Habits, Health Practices, and Blood Pressure Between the Experimental and Control Group

Variable	CG	EP	MD	t-value	p-value	VI
Dietary habits gain	0.07	0.20	-0.13	-0.14	0.30	NS
Physical activity gain	0.007	0.071	-0.063	-1.86	0.067	S
Blood pressure gain	0.67	1.56	-0.90	-2.153	0.035	S

There was no significant difference in the gain score of the control and experimental groups when it came to dietary habits(*p*-value-0.30). However, the gain score in physical activity and blood pressure between the control and experimental groups were significant, with p-values of 0.067 and 0.035, respectively.

The participants in this research were found to have a high consumption of unhealthy food groups considered against the Dietary Approach to Stop Hypertension (DASH), which was adopted as a guideline for the dietary intervention of the program. The DASH diet is an approach which was designed to treat or control high blood pressure by reducing sodium intake and eating a variety of foods high in nutrients that help lower blood pressure (Heller, 2011). In a study on the effect of the DASH diet among Americans considering a diet rich in fruits, vegetables, and decreased fat content, results showed a significant decrease in blood pressure (Frisoli et al., 2011). In this study, the experimental group was given specific instructions on how to follow the guidelines according to the standards of the DASH diet such as eating vegetables, fruits, and whole grains, limiting foods high in saturated fats while using beans, legumes, fish, and low fat dairy products, and limiting sugary beverages (NIH, 2016). Results showed an improvement in the participants' food choices after the intervention.

In terms of physical activity, the result of the baseline data in the control and experimental groups was *moderate*. There was no change pre- and post-intervention in the experimental group. The Malaysian Dietary Guidelines (MOH, 2010) notes that the general level of physical activity in Malaysia has declined due to increasing urbanization and industrialization. Machines now do most of the work previously done by human hands, and only 15% of Malaysians are exercising correctly. As physical inactivity is an important risk factor for overweight, obesity, and high blood pressure (Guthold, Ono, Strong, Chatterji, & Morabia, 2008), this is something that health promoters should be alarmed by.

There is an overwhelming body of evidence (Bauman, 2004; Kruk, 2007; Guthold, et. al., 2008) that physical activity is an important factor in achieving good health. Even the WHO (2011b) notes that the risks posed by physical inactivity kills more than three million people annually and that physical inactivity is the fourth leading risk factor for global death after high blood pressure, smoking, and high blood glucose. This is a cause for concern, considering that the levels of physical inactivity are rising in many countries.

The participants from the two groups showed "Hypertension 1" or first stage hypertension. Stage 1 hypertension is a systolic pressure ranging from 140 to 159 mmHg or a diastolic pressure ranging from 90 to 99 mmHg. Post-intervention revealed a positive change in the experimental group from Stage 1 hypertension to pre-hypertension, which is defined as a person with a blood pressure reading of 121-139/80-89 mmHg (AHA, 2017). This result was confirmed by a study among 9,637 Finnish men and 11,430 women who were 25 to 74 years of age. The results of the study suggest that adherence to healthy lifestyle factors may have reduced the prevalence of hypertension by two-thirds (European Society of Cardiology, 2012).

BMI is a simple health index that is used to classify body weight among adults, independent of age and gender. The measurement of body fat is also an indicator of whether the person is overweight or obese. Poor lifestyle behaviors, especially lack of physical activity and unhealthy diet, are great predictors for increased BMI and body fat (Dallongeville et al., 2012). An update on the prevalence of overweight and obesity in Malaysia showed the rates of 33.6% (95% CI= 32.2, 35.0) and 19.5% (95% CI= 18.3, 20.7), respectively. The prevalence was highest among Indians, followed by Malaysians and Chinese (Mohamud et al., 2011). The report revealed that almost half of adult Malaysians are either overweight or obese (Ministry of Health, 2015). Reduction in weight is evident through the reduction of BMI and body fat. The results of this study showed that there was no difference between the control and post experimental group in terms of BMI. However, it showed positive changes in the experimental group post-intervention. In terms of body fat, there was a decrease in the experimental group post-intervention, from *high* body fat to *moderate* body fat.

CONCLUSION AND RECOMMENDATIONS

The results show that there was a significant difference in the physical activity and blood pressure between the control and experimental groups after the intervention. With these findings in mind, the lifestyle promotion program was found to be effective in improving physical activity and BP of the participants.

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DEVELOPMENT OF GRANOLA BARS WITH TARO *(COLOCASIA ESCULENTA)* ROOT, OKARA PULP FLOOR, AND *MORINGA OLEIFERA* LEAVES

Crisell Joy Dela Pena, Maybelle Fabito, Melarnie June Jacinto, Maribel Balagtas

Abstract

This study aimed to develop a granola bar product that incorporates *Colocasia esculenta* root, okara pulp flour, and *Moringa oleifera* leaves. The okara, taro, and moringa leaves were dehydrated using the Multi-Commodity Heat Pump Dryer and were later powderized. Dried ingredients were mixed together; afterwards it was mixed into the other liquid ingredients while being melted at low temperature. Sweeteners used were honey and muscovado sugar, vanilla for aroma, and moringa, peanuts, and pinipig for nutrient enrichment. The mixture was baked and cut into small squares. A serving of the product contains energy (802 kcal), protein (21.2g), carbohydrates (106.4g), fats (32.4g), phosphorus (359 mg), calcium (108 mg), iron (4.4 mg), niacin (13.1 mg), Vitamin A (2 mg), Vitamin C (2 mg), thiamin (0.14 mg), and riboflavin (0.2 mg). The acceptability of the product in terms of appearance, taste, texture, and aroma was determined by 34 grade four students, with an overall result of *like very much*. It has an estimated life span of 14 days at both room and refrigerator temperature. The selling price is PhP108.00 per pack of 12 pieces or PhP8.40 per serving.

Keywords: *okara, granola bars, taro, moringa leaves*

Children from Metro Manila eat less of their required consumption of healthy foods and tend to choose foods that are high in fat, calories, and monosodium glutamate (National Nutrition Council, 2007). In order to offset this unhealthy dietary habit in children, promoting snacks that are delicious yet nutritionally dense is an important responsibility of health professionals.

A granola bar is a cereal-based snack product consisting mainly of healthy whole grains such as oats, rice, and nuts. It is usually naturally sweetened with honey and fruits. It is stirred during baking to maintain a loose consistency. In a major production, the mixture is pressed into bars for easy packing and handling for sale. It is considered healthy because of its high fiber content and the nutritional goodness of its ingredients (Mohamad, Mohamad, Noh, & Saari, 2013).

Granola bars are simply prepared and can be conveniently added to a packed lunch or eaten as a snack (Lobato et al., 2012). It is considered as a convenient food as it is light and easy to store, thus it is suitable for those on the move or those who need immediate energy, dietary fiber, and reduced fat in a snack (Mohamad et al., 2013).

Taro *(Colocasia esculenta)* is a fruit mostly found in tropical countries (Nyabayo, Mwamburi, & Masai, 2016). It belongs to the *Araceae* family and is known as the *Amadumbe* in Southern Africa and *Taro*, *Dasheen* or *Cocoyam* in many other parts of the world. Like other root crops, the taro root is low in fat and protein but high in carbohydrates. It is a good source of nutrients, vitamins, and minerals as it is loaded with potassium, calcium, vitamin C, A and B, phosphorus, iron, and fiber. Because of its taste as well as its high nutritive value, it is cultivated and consumed throughout the world. In the Philippines, however, the production and the use of taro in family meal food preparations have not been fully explored.

Okara is a byproduct of soymilk and is rich in protein, lipids, and dietary fiber. It is also called soybean residue, bean curd residue/dreg, *douzha or tofuzha* (Chinese), *tofukasu* (Japanese), or *bejee* (Korean) (Li, Qiao, & Lu, 2012). It is the residue left from ground soybean after obtaining the water-extractable fraction used to produce bean curd (tofu) or soymilk. Most of the fiber in the grounded soybeans remains in this byproduct, along with significant amounts of protein and other nutrients. Properly processed okara adds fiber and nutritional value to baked goods and other foods.

The moringa *(Moringa oleifera)* plant, also known as "drumstick tree" and "horseradish tree," has been cultivated throughout tropical and subtropical countries. Other than the Philippines, countries like India, Pakistan, Hawaii, and other parts of Africa are

known to have imported moringa food supplements to treat and combat malnutrition (Valdez-Solana, 2015). *Moringa oleifera* leaves have an exceptionally high nutritional value: they are rich in starch, protein, vitamins A, B, and C and minerals including calcium and iron. They contain seven times more vitamin C than oranges, four times more calcium than milk, four times more vitamin A than carrots, three times more potassium than bananas and two times more protein than milk (Hsu, Midcap, Arbainsyah, & De Witte, 2006).

Granola bars are healthy alternatives to empty calorie snack foods, yet they are expensive in the Philippines because of their high-quality ingredients. The researchers want to utilize taro root, soy pulp flour, and moringa leaves as ingredients in making a healthy granola bar that is affordable and satisfying to elementary school children.

Objectives

The objective of this study was to develop a granola bar product that incorporates *Colocasia esculenta* root, okara pulp flour, and *Moringa oleifera* leaves. Moreover, it aimed to observe the product's shelf life and establish its selling price. Finally, it endeavored to determine the acceptability of the product in terms of appearance, texture, taste, and aroma.

METHODOLOGY

Figure 1 represents the process flow utilized in this study.

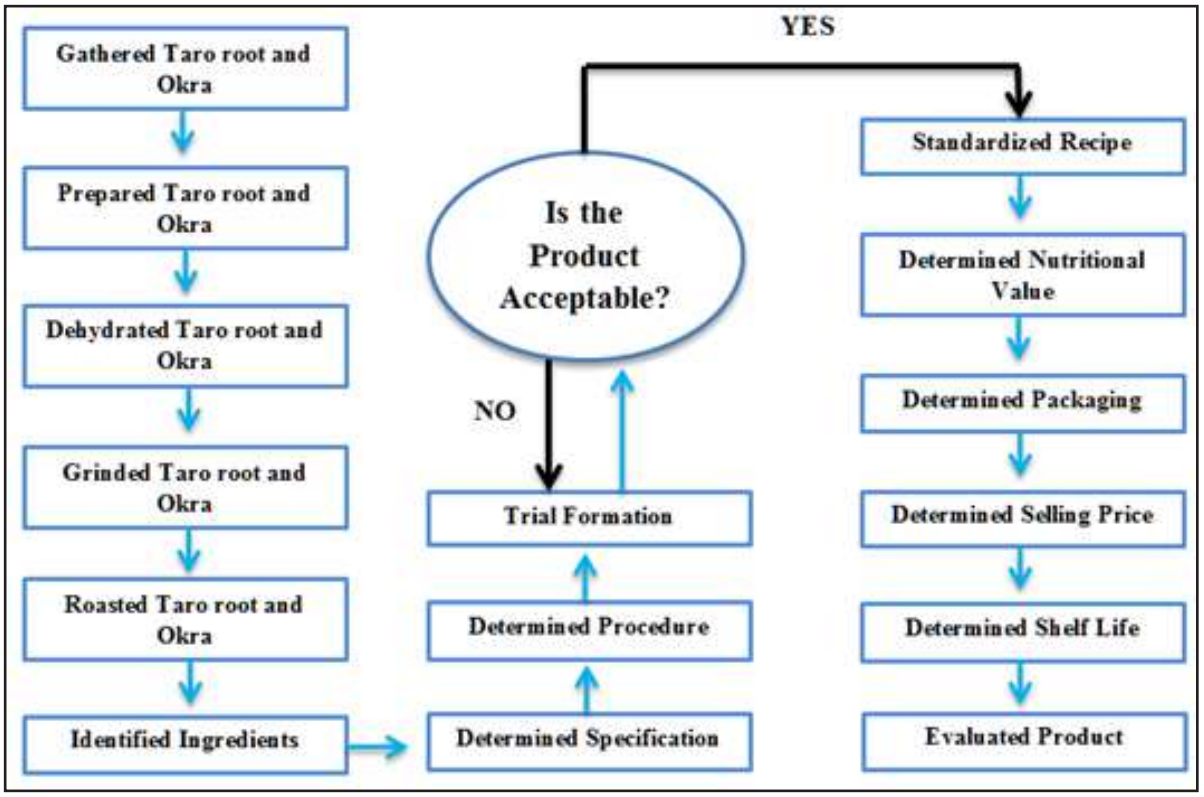

Figure 1. Process flow

Collection and Preparation of Ingredients

Taro roots were purchased from a farm. To ensure freshness, the taro was delivered the day after its harvest. Fresh okara was taken from a food factory that processes soybeans. The taro root was washed to make sure that it is free from soil and other contaminants. The skin was peeled and washed again before it was cut thinly into uniform thickness. The moisture content of the okara was reduced by squeezing the juice using a muslin cloth. This process is necessary to reduce the dehydration time.

The thinly sliced taro was dehydrated for six hours using the Multi-Commodity Heat Pump Dryer. The sample that was used to monitor the drying process showed that upon completion of the dehydration process, the 20-gram sample was reduced to 10 grams. For the okara, the 325-gram sample was reduced to 213 grams.

The dehydrated okara and taro root were then grounded using a food processor to ensure a fine, powdery texture. A sifter was used to remove granulated okara and taro. The big granules were further processed to obtain the powdered consistency. A small amount of the dehydrated taro root was roasted in a pan and was crushed using a mortar and pestle to gain a flaky texture similar to oats.

Identification of Ingredients

The recipe for granola bars was modified by adding ingredients such as taro, okara, and moringa to the recipe. Taro flour, muscovado sugar, honey, and peanut butter served as a binder for the granola. Vanilla was added to improve the aroma. Flaked taro root, moringa, okara, peanuts, and pinipig were added to make a nutritious granola bar.

Product Specification

The granola bars were golden brown in color, crunchy in texture with a vanilla, peanut, and honey aroma. Their appearance was rectangular in shape with a measurement of 1”x2”x3”.

Trial Formulation

Trial 1. The evaluation retrieved from teachers and classmates showed that the taste of the granola bars was not acceptable as the moringa taste was too strong and bitter. Its color was dark green, the texture was too soft, and the moringa aroma was too strong. Some of the suggestions were to lessen the amount of moringa and to make the consistency harder.

Trial 2. Honey was added while muscovado and soymilk were removed. The amount of moringa was also reduced. The evaluation showed that the product was still unacceptable. The taste was too sweet due to the honey, the color was too light, the texture was too hard, and the taste of honey was too overwhelming. It was suggested that the amount of honey be lessened and the texture be made crunchier.

Trial 3. Muscovado sugar was added to the recipe. The evaluators commended the taste and color of the product, but the hard texture and overwhelming taste of honey still made the product unacceptable. It was suggested that the texture be made softer and crunchier.

Trial 4. Okara flour was added to enhance the nutritional value. The taste, color, and texture were acceptable but the aroma needed more vanilla. Improvement of the shape and appearance of the granola by cutting it prior to baking was suggested.

Trial 5. More vanilla was added to the recipe and the product was cut evenly prior to baking. The product was deemed acceptable by evaluators. The aroma was good, the color was appealing, the texture was chewy, the taste was not too sweet nor bitter, and the shape was acceptable.

Table 1 shows the ingredients and their corresponding quantities throughout the five trials.

Table 1
List of Ingredients with Household Measurements Per Trial

Ingredients	Measurements				
	Trial 1	Trial 2	Trial 3	Trial 4	Trial 5
Taro flakes	1 cup	1 cup	1 cup	1 cup	1 cup
Taro flour	1 cup	1/2 cup	1/2 cup	1/8 cup	1/8 cup
Okara flour	-	-	-	1/8 cup	1/8 cup
Moringa	1/4 cup	1 tsp	1 tsp	1/2 tsp	1/2 tsp
Pinipig	1/4 cup	1/4 cup	1/4 cup	1/4 cup	1/4 cup
Peanuts	1/4 cup	1/4 cup	1/4 cup	1/4 cup	1/4 cup
Muscovado sugar	1/2 cup		1/4 cup	1/4 cup	1/4 cup
Unsweetened peanut butter	2 Tbsp	2 Tbsp	2 Tbsp	3 Tbsp	3 Tbsp
Honey	-	1/2 cup	1/4 cup	1/4 cup	1/4 cup
Vanilla	1 tsp	1 tsp	1 tsp	1 tsp	3 tsp
Salt	1/8 tsp	1/8 tsp	1 pinch	1 pinch	1 pinch
Soymilk	1 cup	-	-	-	-

Recipe Standardization

Table 2 shows the final standardized recipe.

Table 2
The Standardized Recipe for Granola Bars

Ingredients	Measurement	Quantity
Taro flakes	1 cup	18 g.
Muscovado sugar	¼ cup	37 g.
Pinipig	¼ cup	19 g.
Peanuts	¼ cup	25 g.
Honey	¼ cup	59.14 ml
Taro Flour	1/8 cup	18 g.
Okara Flour	1/8 cup	15 g.
Peanut Butter	3 tablespoons	25 g.
Moringa	1/2 teaspoon	9 g.
Vanilla	1 teaspoon	3 g.
Salt	1 pinch	0.001 g.
Temperature	127 C	
Cooking Time	10 mins	

Determination of Nutritional Value, Packaging Material, Shelf Life, and Selling Price

The nutritional value of the granola bars was computed using tools such as the FCT, iFNRI, and USDA as the guide in computing the approximate value of each nutrient. The following formula was utilized: (FCT value)/100 x EP weight (in grams).

Parchment paper was used as the primary packaging material. A pastry carton box was used for the secondary packaging to ensure the freshness of the product, ensure its safe consumption, and maintain its crunchiness and aroma. Selling price was determined by multiplying the raw price of the granola bar by a 1.5 markup.

To observe the duration of the product's quality and freshness, the samples were stored in a cabinet

(room temperature) and refrigerator (cold temperature). The granola bars were only observed for two weeks. The shelf life microbial growth was not determined due to financial and time constraints.

Product Evaluation

Thirty-four fourth-grade pupils were conveniently selected to evaluate the product. The participants were given free samples of the granola bars and an evaluation form with the hedonic test for texture, taste, aroma, and appearance. The data were analyzed using mean and standard deviation.

RESULTS AND DISCUSSION

Nutritional Value of Granola Bars

Based on the values obtained from iFNRI, the granola bar with taro root, okara, and moringa contains 72.58 kcal per ten-gram piece and 871 kcal per pack of 12 pieces. Table 3 shows the nutritional value of the granola bars per piece and per pack.

Table 3
Nutritional Value of Granola Bars Per Piece (10g) and Per Package.

Nutrients	**Per Piece**	**Per Package**
Energy (kcal)	72.58 kcal	871.0 kcal
Protein (g)	2.22 g	26.6 g
Fat (g)	2.95 g	35.4 g
Carbohydrate (g)	9.29 g	111.5 g
Calcium (mg)	11.92 mg	143.0 mg
Phosphorus (mg)	36.92 mg	443.0 mg
Iron (mg)	0.43 mg	5.1 mg
Vitamin A (mg)	0.17 mg	2.0 mg
Thiamin (mg)	0.02 mg	0.21 mg
Riboflavin (mg)	0.02 mg	0.24 mg
Niacin (mg)	1.2 mg	14.4 mg
Vitamin C (mg)	0.17 mg	2.0mg

Table 3 shows that carbohydrates are the major contributors of energy in the product. Based on the CODEX Alimentarius, the granola bar is high in energy and low in fat. It also contains Vitamins A and C, calcium, phosphorus, iron, and B vitamins such as thiamin, riboflavin, and niacin.

Acceptability of Granola Bars

The evaluation was held at an elementary school. The evaluators were 34 4th-grade pupils ages eight to 12 years old.

Table 4
Overall Acceptability of the Product

	Mean	SD	VI
Appearance	8.55	0.97	*Like extremely*
Aroma	8.42	1.15	*Like very much*
Texture	8.00	1.61	*Like very much*
Taste	8.63	0.94	*Like extremely*
Overall	8.40		*Like very much*

Legend: 1-1.49 Dislike extremely, 1.50-2.49 Dislike very much, 2.50-3.49 Dislike moderately, 3.50-4.49 Dislike slightly, 4.50 – 5.49 Neither like nor dislike, 5.50-6.49 Like slightly, 6.5-7.49 Like moderately, 7.5-8.49 Like very much, 8.50-9 Like extremely

The findings show that the product had an overall mean score of 8.40 which is interpreted as *like very much*. Of all the criteria, the product's taste and appearance were given the highest rating of *like extremely*, with a mean score of 8.63 and 8.55, respectively. Meanwhile, the product's texture had the lowest mean score at 8.00. However, the score for this criteria was still interpreted as *like very much.*

This result indicates that elementary school children had a positive reaction to the granola bar product.

Shelf Life of Granola Bars

The granola bar was kept in a cabinet at room temperature (27◦C) and in a refrigerator at cold temperature (4◦C). During the first week, the appearance of the granola bars was golden brown at both temperatures. However, the taste was less sweet, the aroma was fainter, and the texture was harder in the cold temperature. At room temperature, the taste of the granola bars was sweet, the aroma was distinct, and the texture was chewy.

On the second week, the granola bars were still edible but its texture was hard in the cold temperature and less chewy in the room temperature. Overall the granola bars were still good and safe for consumption after the second week.

Selling Price of Granola Bars

Table 5 shows the computation of the price of the granola bars per piece and per package. The raw cost of the product is PhP67.26 per package or PhP5.61 per serving. When the packaging price and 1.5 markup is taken into consideration, the selling price becomes PhP108.00 per package.

Table 5
Cost of the Granola Bars Per Piece and Per Pack

Ingredients	Quantity	Unit Price	Total Cost
Taro	47.0g	0.02/g	0.71
Peanuts	25.0g	0.12/g	2.9
Pinipig	19.0g	0.12/g	2.28
Muscovado Sugar	37.0g	0.2/g	7.4
Honey	59.14g	0.45/g	26.6
Okara flour	15.0g	0.0/g	0.01
Peanut butter	44.37g	0.6/g	26.62
Moringa	0.0g	0.0/g	0.05
Vanilla	5.0g	0.14/g	0.69
Salt	1.0 pinch	0.0/g	0.0
		Total Cost	67.26
		Yield	12
		Price	PhP5.61
		Price per serving	PhP8.42
		per package (12 pcs)	PhP101.00
		+ Packaging (0.38+7.5)	PhP108.00

As shown in Table 6, the granola bar with taro root, okara pulp flour, and moringa is more economical compared to other granola bar products that are sold in the market.

Table 6
Comparison of Prices Between Granola Bars

	Price per Package	Price per Piece
Granola bar A	220 Php (6 pcs)	40 Php
Granola bar B	160 Php (6 pcs)	30 Php
Granola bar C	300 Php (6 pcs)	50 Php
Granola bar with taro root, okara pulp flour and moringa	108 Php (12 pcs)	8.42 Php

CONCLUSION AND RECOMMENDATION

The study developed a nutritious and affordable granola bar as an alternative snack for elementary school children using locally available ingredients such as taro root, okara, and moringa. The end product was found to be an excellent source of energy while remaining low in fat. It contained protein, calcium iron, phosphorus, B vitamins, vitamin A, and Vitamin C. It was well accepted by school age children using the sensory attributes. The shelf life is shorter compared to commercial granola bars but the selling price is lower.

It is recommended that a testing of the nutritional value of the product through chemical analysis be done to obtain its exact amount of nutrients. Further studies on the acceptability of the granola bar to other age groups such as adolescents and adults are also recommended.

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DEVELOPMENT AND ACCEPTABILITY OF *CARICA PAPAYA* LEAVES AND *MENTHA SPICATA* ENHANCED ICE CREAM

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Abstract

Papaya leaf has a bitter taste but it is nutritious and has medicinal properties. This research study aimed to enhance ice cream through the addition of papaya leaves extract. To reduce bitterness and enhance flavor, spearmint leaves extract was added. The ingredients and procedures were determined after five experiments and a standardized recipe was established after performing six trials. Agar was dissolved in full cream milk and heated. All-purpose cream, *Carica papaya* leaves extract, *Mentha spicata* leaves extract, honey, and rock salt were mixed using an electric mixer and were chilled in the freezer for 20 minutes. The mixture was mixed every 20 minutes for a total of five times until it was thick and soft with no air bubbles. The mixture was poured into an airtight freezer container and hardened for 24 hours. *Carica papaya* leaves and *Mentha spicata*-enhanced ice cream contains 259 kcal per serving (125 ml). It is a high source of calcium, iron, and thiamin (26.7%, 23.0%, and 19.3% respectively) and source of vitamin C (7.3%).The ice cream was evaluated by 60 individuals from different age groups. The product was rated as *like very much* by the evaluators across age groups and gender. The raw cost of one serving (125 ml) is PhP28.00. Thus, through this study, the enhancement of ice cream using *Carica papaya* leaves and *Mentha spicata* leaves extracts was made possible. Further studies to test the potential of the product to increase the platelet count in dengue patients is recommended.

Keywords: *papaya leaves, spear mint leaves, ice cream, calcium, iron*

The papaya tree can be easily found in tropical countries. The leaves are not that popular, it is not known as an edible food, and it is not consumed in the Philippines and some other countries. In some parts of Asia, people steam or boil the young leaves (Sfetcu, 2014). Papaya leaf has a bitter taste which may deter some people from tasting it; however, it is nutritious (Aravind, Bhowmik, Duraivel, & Harish, 2013) and can help in the treatment of dengue fever (Nishant, Mohanty, & Luthra, 2014). It contains some minerals such as potassium, which in high amounts can reduce the risk of having high blood pressure, stroke, and heart disease (Maisarah, Asmah, & Fauziah, 2014).

Spearmint, on the other hand, has a strong smell and flavor. It is an herb that gives a cooling effect. It is used for tea; it may also be used as a flavor for chewing gum to enhance flavors and sweetness (O'Donnel & Kearsley, 2012).

Ice cream is a snack that is not easily spoiled as long as it is in the freezer. It is usually soft, which makes it easier to consume, especially by those who are on a soft diet. It has a smooth texture that calms the palate while its coldness makes it desirable in tropical countries. Ice cream is dairy-based and contains lactose, a milk sugar. The unique palatability of ice cream makes it a favorite dessert. It is universally liked and distributed as a refreshment snack or dessert (Goff & Hartel, 2013).

The development of this product was intended to make papaya more palatable for young people and people who have sicknesses that could be alleviated by papaya. This research enhanced ice cream through the incorporation of papaya leaves in order to take advantage of its health benefits, while using spearmint leaves as its flavoring agent. Therefore, this research aimed to make ice cream that is healthier, cheaper, and easier to prepare.

Objectives

The research study aimed to develop *Carica papaya* leaves and *Mentha spicata* leaves-enhanced ice cream. Specifically, the researchers sought to identify

the nutritional value of *Carica papaya* and *Mentha spicata*-enhanced ice cream and determine its acceptability among different age groups and genders. Further, it aimed to discuss methods to enhance the product's marketability through selection of appropriate packaging material and examination of its shelf life.

METHODOLOGY

Figure 1 shows the process flow of making the ice cream and the method to determine its acceptability, shelf life, nutritional value, selling price, and appropriate packaging.

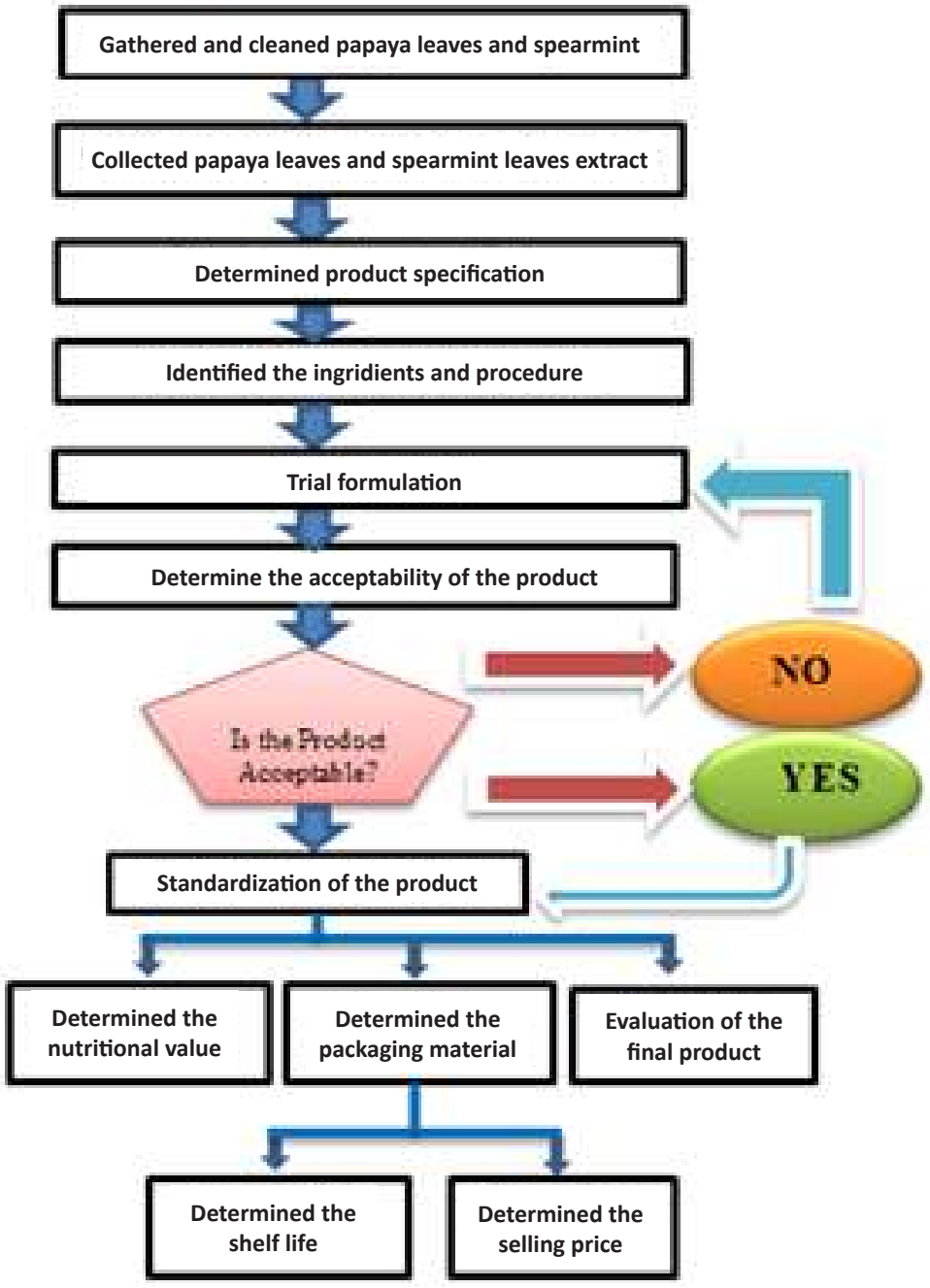

Figure 1. Process flow of making *Carica papaya* leaves and *Mentha spicata*-enhanced ice cream.

Collection of Ingredients

Young papaya leaves were gathered directly from trees. Young leaves are preferred over older ones as their taste is less bitter. Spearmints were bought from the market or gathered from a school herb garden. The leaves were washed thoroughly under running water to remove any pesticides or dirt. They were then crushed separately using a mortar and pestle to get the concentrated juice of the leaves. Distilled water was also added with the ratio of 1:1:1.

Product Specification

The following characteristics were determined for the product specification: the ice cream should have a greenish color, with slight bitter-sweet cool taste. It should have a smooth texture with no big ice crystals. Full cream milk, all-purpose cream, honey, agar-agar, rock salt, spearmint leaves, and papaya leaves were identified as the final ingredients.

Trial Formulation and Determination of Acceptability Factors

Six trials were done until the product became acceptable based on the determined product specification. The product was tested using sensory evaluation by five students and five faculty members to determine if the product was acceptable or not. Continuous trial formulation was done until the product was deemed acceptable.

Trial 1. A day after the production, the ice cream had a soft texture and a bitter, salty taste. It had a milky aroma and the color was greenish-white. The ice cream was tested using sensory evaluation form by five students and five faculty member a week after production.

Table 1
Ingredients for Trial 1

Ingredients	Measurement
Full cream milk	1/3 cup
All-purpose cream	3 T
Condensed milk	1 t
Papaya leaves	20 g
Rock salt	1 t
Vanilla extract	¼ t

Trial 2. The agar was dissolved in 45 ml of simmering water. Full cream milk was changed to soymilk because soymilk has a lower fat content. *Carica papaya* leaves were extracted to form a concentrate and mixed with distilled water with a ratio of 1:1.

Table 2
Ingredients for Trial 2

Ingredients	Measurement
Soy milk	¼ cup
All-purpose cream	¼ cup
Condensed milk	¼ cup
Papaya leaves concentrate	20 g
Rock salt	1/8 t
Agar-agar	1 t

The researchers also combined the *Carica papaya* leaves concentrate with the milk. The product formed two layers and the product was not creamy enough. The taste was very bitter as well. The researchers proceeded to Trial 3 to reduce the product's bitterness and improve its texture.

Trial 3. *Carica papaya* leaves concentrate was extracted using 50g of papaya leaves that yielded a 7.2 ml concentrate. The ratio used for the *Carica papaya* leaves concentrate, lemon balm concentrate, and distilled water was 1:1:1. Lemon balm mint was used to remove the bitterness.

Table 3
Ingredients for Trial 3

Ingredients	Measurement
All-purpose cream	½ cup
Soymilk	½ cup
Condensed milk	½ cup
Papaya leaves concentrate	50 g (7.2 ml)
Rock salt	1/8 t
Agar-agar	1 t
Lemon balm leaves concentrate	7.2 ml

The procedure was the same as the procedure discussed in Trial 1. However, the ice cream melted easily compared to the product in Trial 1. The color was white, bearing a close resemblance to vanilla ice cream. The texture was soft, with a slightly bitter taste.

Trial 4. Condensed milk was reduced and honey was added for this trial. The amount of agar-agar was also increased. The end product was too sweet and the color was not aesthetically pleasing.

Table 4
Ingredients for Trial 4

Ingredients	Measurement
All-purpose cream	½ cup
Soy milk	½ cup
Honey	½ cup
Condensed milk	1/8 cup
Papaya leaves concentrate	50 g (7.2 ml)
Rock salt	1/8 t
Agar-agar	2 t
Lemon balm leaves concentrate	15 pcs

Trial 5. The researchers modified the ice cream according to the suggestions and comments from 10 evaluators. Full cream milk was used instead of soy milk, and the amount of honey was reduced. The lemon balm was changed into spearmint. The result showed that the spearmint gave a stronger aroma and masked the bitterness better than the lemon balm. The product was smooth and creamy. The product was acceptable among the evaluators but the yield was very small.

Table 5
Ingredients for Trial 5

Ingredients	Measurement
Full cream milk	¼ cup
All-purpose cream	90 ml
Honey	45 ml
Papaya leaves concentrate	20 g (2.9 ml)
Rock salt	1/8 t
Spearmint leaves concentrate	60 pcs
Agar-agar	½ t

Trial 6. Trial 6 utilized the same ingredients in Trial 5, but with modifications in quantity to increase the yield of the recipe. The result of this trial was used for recipe standardization.

Table 6
Ingredients for Standardized Recipe

Ingredients	Measurement
Full cream milk	1 cup
All-purpose cream	1½ cup
Honey	½ cup
Papaya leaves concentrate	146g (19.2 ml)
Rock salt	½ t
Spearmint leaves concentrate	300pcs
Agar-agar	2 t

Recipe Standardization

The final product was standardized to measure the ingredients and finalize the procedure that produced the same quality and yield. Table 6 presents the standard recipes of *Carica papaya* leaves and *Mentha spicata* leaves-enhanced ice cream as based on the sixth trial. The standardized recipe yielded 750 ml (three cups) or six servings (150ml each).

It is to be noted that the product was processed manually using a hand electric mixer instead of an ice cream maker; therefore the texture could be different with an ice cream maker or for commercial production.

Determination of Nutritional Value, Packaging Material, Shelf Life, and Selling Price

The nutritional value of the product was determined using iFNRI, packaging of the raw ingredients, and literature, and not through chemical analysis. It was computed manually using the formula: *FCT Value/ 100 * weight of ingredients in grams.*

There were two considerations for the packaging of the product. The packaging should be favorable and will not change the palatability of the product. The packaging should be an airtight container to prevent ice crystals from forming. The two options were polypropylene and plastic from generic materials or resin number eight.

The shelf life was tested every two days under freezer temperature (-18°C) for two weeks until there were changes in sensory attributes. Changes in the product were recorded during the observation.

The cost per serving and the selling price were computed manually. The mark-up used was 1.50 which covered the other costs in the production.

Product Evaluation

Sixty individuals from different age groups and both genders evaluated the final product. The evaluators (15 elementary pupils, 15 high school students, 15 college students, and 15 workers of the university) evaluated the acceptability of the final product in terms of taste, appearance, texture, and aroma.

RESULTS AND DISCUSSION

Nutritional Value

Table 7 presents the estimated nutritional value of the product per serving. The ice cream contains 259.16 kcal per serving. According to Codex Alimentarius (2013), any amount that is 20% higher than the percentage daily value is considered high, thus the product is high in saturated fat and total fat. This is due to the full cream milk and all-purpose cream that were used. However, the product is high in calcium and iron which is good for children and adolescents.

Table 7
Nutritional Value of the Product

Nutrients	Per Yield (750 ml)	Per serving (125 ml)	%NRV	Indicator
Energy (kcal)	1554.97	259.16	12.96	
Protein (g)	18	3	6.00	
Carbohydrate (g)	119.265	19.87	6.60	
Fat (g)	110.4	18.4	28.30	*High*
Saturated Fat (g)	70.3	11.7	58.54	*High*
Sodium (mg)	582.45	97.075	4.00	*Low*
Sugar (g)	115.59	19.27		
Trans fat (g)	5.93	0.99		
Cholesterol (mg)	305.63	50.94	16.97	
Calcium (mg)	1604.5	267.4	26.74	*High*
Fiber (g)	1.51	0.25	1.00	*Low*
Iron (mg)	19.355	3.22	23.00	*High*
Phosphorus (mg)	18.3	3.05	0.30	*Low*
Magnesium (mg)	21.23	3.54	1.18	
Vitamin C (mg)	26.177	4.36	7.27	
Potassium (mg)	504.23	84.039	2.40	
Riboflavin (mg)	0.2258	0.037	3.10	
Thiamine (mg)	1.3904	0.23	19.30	

In the standardized recipe, 19.2 ml of papaya leaves extract were used per recipe, which translates to 3.2 ml of papaya leaves concentrate per serving. According to the pilot study of Hettige (2008), a 5ml dose for adults and 2.5 ml dose for children taken by dengue patients at an eight-hour interval results in elevated platelet and white blood cell counts. Thus, this final product could be considered in future researches for increasing the platelet count, especially in children.

Acceptability

The acceptability of the product was based on the evaluation of appearance, color, aroma, texture, and taste. The evaluation was conducted among 60 evaluators, comprising of 15 elementary students, 15 academy students, 15 college students and 15 workers using a sensory evaluation form with a nine-point hedonic scale. Table 8 presents the overall results.

Table 8
Overall Acceptability of the Product

	Mean	SD	VI
Appearance	8.25	0.86	*Like very much*
Color	8.37	0.92	*Like very much*
Aroma	7.82	1.17	*Like very much*
Texture	7.98	1.00	*Like very much*
Taste	8.03	1.15	*Like very much*

Legend: 1-1.49 Dislike extremely, 1.50-2.49 Dislike very much, 2.50-3.49 Dislike moderately, 3.50-4.49 Dislike slightly, 4.50 – 5.49 Neither like nor dislike, 5.50-6.49 Like slightly, 6.5-7.49 Like moderately, 7.5-8.49 Like very much, 8.50-9 Like extremely

The results show that appearance, color, aroma, texture, and taste were all rated as *like very much* by the evaluators. Of all the criteria, color was the most highly rated with a mean of 8.37. It is to be noted that the color of the product was minty green. The aroma, which is described as milky, got the lowest score with a mean of 7.82. However, it is still verbally interpreted as *like very much*.

For more specific results, the evaluation result was divided into two groups, according to age and according to gender. There were 27 males and 33 females in the group.

Table 9
Acceptability of the Product by Gender

	Males			Females		
	Mean	SD	VI	Mean	SD	VI
Appearance	8.30	0.95	*Like very much*	8.21	0.78	*Like very much*
Color	8.44	0.80	*Like very much*	8.30	1.02	*Like very much*
Aroma	7.89	1.31	*Like very much*	7.76	1.06	*Like very much*
Texture	8.04	0.98	*Like very much*	7.94	1.03	*Like very much*
Taste	8.52	0.94	*Like extremely*	7.64	1.17	*Like very much*
Overall	5.24		*Like very much*	4.97		*Like very much*

Legend: 1-1.49 Dislike extremely, 1.50-2.49 Dislike very much, 2.50-3.49 Dislike moderately, 3.50-4.49 Dislike slightly, 4.50 – 5.49 Neither like nor dislike, 5.50-6.49 Like slightly, 6.5-7.49 Like moderately, 7.5-8.49 Like very much, 8.50-9 Like extremely

Table 9 shows that males gave a higher score to the product than females, giving it a mean score of 5.24 as compared to 4.97 from the females. It is to be noted that both groups rated the product similarly for appearance, color, aroma, and texture, giving all four categories an overall rating of *like very much*. However, males seemed to show a higher preference for the taste of the product, giving it a mean score of 5.52, which is interpreted as *like extremely*. Females, on the other hand, gave the taste a slightly lower score of 4.64, which is interpreted as *like very much*.

Out of all the criteria, females seemed to prefer the color of the product the most, giving it their highest rating of 5.30. On the other hand, males gave their highest score to the taste of the product. Both groups gave aroma the lowest score.

Table 10
Acceptability of the Product by Age

	Children			Adolescents			Young Adults			Middle Adulthood		
	Mean	SD	VI	Mean	SD	VI	Mean	SD	VI	Mean	SD	V I
Appearance	8.29	0.83	*Like very much*	8.27	0.70	*Like very much*	8.07	0.96	*Like very much*	8.44	1.13	*Like very much*
Color	8.50	0.76	*Like extremely*	8.18	1.10	*Like very much*	8.33	0.90	*Like very much*	8.67	0.71	*Like extremely*
Aroma	7.79	1.19	*Like very much*	8.00	0.82	*Like very much*	7.40	1.50	*Like moderately*	8.11	1.27	*Like very much*
Texture	8.21	1.05	*Like very much*	7.86	0.94	*Like very much*	7.80	1.08	*Like very much*	8.22	0.97	*Like very much*
Taste	7.86	1.51	*Like very much*	8.23	0.97	*Like very much*	7.73	1.44	*Like very much*	7.78	1.20	*Like very much*
Overall	8.13		*Like very much*	8.11		*Like very much*	7.87		*Like very much*	8.24		*Like very much*

Legend: 1-1.49 Dislike extremely, 1.50-2.49 Dislike very much, 2.50-3.49 Dislike moderately, 3.50-4.49 Dislike slightly, 4.50 – 5.49 Neither like nor dislike, 5.50-6.49 Like slightly, 6.5-7.49 Like moderately, 7.5-8.49 Like very much, 8.50-9 Like extremely

Table 10 shows the results of the product's acceptability when divided by age group. Overall, all age groups rated the product as *like very much*. A closer look at the mean scores, however, shows that the middle adult group gave the highest rating to the product with a mean of 8.24, while the group that gave the product the lowest score was the young adult group with a mean of 7.87.

The findings also show that the highest scores for appearance, aroma, color, and texture were given by the middle adulthood group. The product's taste, however, was most preferred by the adolescents with a mean of 8.23. All the lowest scores for the criteria came from the young adult group except for color, which had the lowest rating among the adolescents with a mean of 8.18.

To further break down the findings by age group, it may be observed that out of all the criteria, the children and young adults preferred the product's color the most while ranking aroma as the least. Adolescents preferred the product's appearance the most, but ranked the texture the least (smooth and soft). On the other hand, middle adults ranked the product's color the highest but ranked the taste the least.

Selling Price

Table 10 shows the price of each ingredient per gram used in the standardized recipe. It also shows the quantity and cost of each ingredient per recipe. The computed price of the product is based on the mark-up of 1.5.

Table 11
Computation of the Selling Price

Ingredients	Price per unit (peso)	Quantity	Total Cost (peso)
Honey	0.192/ml	125 ml	24.00
All-purpose cream	0.18/ml	375 ml	67.50
Milk	0.082/ml	250 ml	20.50
Spearmint	25.00/plant	2(300leaves)	50.00
Papaya leaves	Free	2 Leaves	0.00
Salt	0.024/g	2.5 g	0.06
Agar-agar	0.54 /g	10 g	5.40
			Total Price: 168.00
	Yield: 6 servings		*Raw cost per serving: 168/6 = PhP28.00*
	Packaging: PhP6.00		*Mark-up: 28 x 1.5 = PhP42.00*
			Selling price: 42.00 + 6 = PhP48.00 per serving

The results show that one standardized recipe of the final product (750 ml) costs PhP168.00. One serving is 125 ml, thus one recipe yielded six servings with the raw cost of PhP28.00 per serving. The retail price was computed using the mark-up of 1.5 for other costs in the production with the addition of the packaging. Thus, the retail price of the final product is PhP48.00 per serving.

Packaging

The researchers used plastic-based materials for the packaging of the ice cream. There were two materials that were used: polypropylene and generic materials plastic. The packaging was used during the observation of the shelf life to determine which packaging is appropriate for the product.

Polypropylene. It is a plastic that is cheap and has a resin number five. It is recyclable and was designed for microwave use. It is good for long term use because it is rigid and stiff (Ebnesajjad, 2013).

Generic materials. It is a plastic made from polyethylene which has low density and is cheaper than polypropylene (Plastic Europe, 2008). It is a plastic with resin number 8 and still being debated according to the Minnesota Pollution Control Agency.

Based on observation of the findings, the generic plastic or the resin number eight was breakable, which is not ideal for long-term use. However, it can be an alternative for one-time consumption. On the other hand, polypropylene was found to be good for packaging as it is harder than the generic plastic. However, it is not the best material to use as packaging for ice cream because of its brittleness when subjected to temperatures below the freezing point.

Shelf Life

The shelf life was observed for two weeks and the product was tested every two days in a freezer temperature (below 0°C). The product was divided into two based on the two types of packaging described above. The results of the observations are listed in Tables 12 and 13.

Table 12
Observation Results for Product in Polypropylene

Day	Appearance	Texture	Aroma	Taste
1	Minty green	Very smooth	Milky	Slight bitter
2	Minty green, without ice crystal	Soft	NC	Sweet
4	NC	NC	NC	NC
6	Minty green, with medium ice crystals	Little bit hard	NC	NC
8	Slight ice crystals	Smoother	NC	Sweeter
10	Minty Green	Smooth and creamy	NC	NC
12	Greener than the other packaging	NC	NC	NC
14	Minty green with little ice crystal	NC	NC	NC

*NC = No Change

Table 13
Observation Results for Product in Generic Materials

Day	Appearance	Texture	Aroma	Taste
2	Mint green, without ice crystal	Soft	Milky	Sweet
4	Mint green, NC	NC	NC	NC
6	Mint green with small ice crystals	NC	NC	NC
8	Mint green, little air bubble	Smooth	NC	NC
10	Not so green with few air bubbles	NC	NC	NC
12	Not so green, more air bubbles	NC	NC	Slightly sour
14	Minty green with lots of air bubbles	NC	No smell	NC

*NC = No Change

The results show that the longer the ice cream stays in the freezer unopened, the smoother and less bitter it is, and the longer it takes to melt. The ice cream on polypropylene had some ice crystals but the taste and the aroma were not affected. However, the ice cream in the generic plastic cup had air bubbles and had a slightly sour taste. Therefore, the researchers concluded that the polypropylene is better compared to generic plastic, although further research is needed for more packaging tests.

CONCLUSION AND RECOMMENDATION

The *Carica papaya* leaves can be used as one of the ingredients in enhancing ice cream. The product has a smooth texture, minty green color, and milky flavor, with a slightly bitter taste or after taste. In addition, the *Mentha spicata* leaves were found to be effective in masking the bitter taste of the *Carica papaya* leaves. The researchers also concluded that the product could stay for more than two weeks and that polypropylene packaging is better for long-term use.

It is recommended that further development of the product be done to reduce the fat content and make all the ingredients plant-based. Chemical analysis of the *Carica papaya* leaves and *Mentha spicata* leaves enhanced ice cream is recommended to obtain the actual nutritional value. Furthermore, a longer period of time to determine the shelf life of the product to observe the changes in sensory attributes is needed. Microbial testing and objective shelf-life determination are also recommended. Finally, a study to prove the effectiveness of the product to increase the platelet count of patients with dengue and related conditions is encouraged.

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BUFFERED ZINC ACETATE PRE-TREATMENT OF HEMOLYZED SERUM SAMPLES FOR TOTAL BILIRUBIN ASSAY

Mizael David, Anna Liza Fofue, Michael Joshua Tiongson, Yanna Yvonne Macayan

Abstract

This research aimed to formulate a way to eliminate interference in total bilirubin assay due to free hemoglobin in hemolyzed serum samples. The amount of 120 uL of 0.12 M buffered zinc acetate was used to precipitate 0.9 g/dL hemoglobin in a 1000-uL hemolyzed serum sample. This normally precipitates hemoglobin but did not result in a clear serum. Nevertheless, the effects of this metal cation precipitation technique in the results of total bilirubin assay were compared to the results of hemolyzed and non-hemolyzed serum controls to test the hypothesis that hemoglobin can be efficiently precipitated by zinc to check for hemolysis without causing another interference. Three of 15 sets of samples were randomly considered for testing to determine possible changes before and after pre-treatment. It was proven that 0.12 M of zinc acetate can precipitate 0.90 g/dL of free hemoglobin. However, other suspected moieties of serum constituents or the excess zinc itself caused turbidity even after centrifugation, suggesting technique modification. Therefore, further trials must be reconsidered.

Keywords: *buffered zinc acetate, hemoglobin, hemolysis, serum, turbidity, interference*

For a laboratory, the best option for a hemolyzed sample, unless in vivo in nature, can be rejection and recollection (McPherson & Pincus, 2009). A report in Ontario, Canada stated that only 38% of laboratories use automated serum indices for assessing any possible interference (Dolci & Panteghini, 2014). More so, Contois and Nguyen (2012) presented that interference testing is not normally performed in a laboratory, which implies that the quality of patients' results is affected or the immediate diagnosis may be delayed. Pre-analytical factors mainly cause variations in clinical chemistry testing (McPherson & Pincus, 2009). It is reported that hemolysis has become the most common reason for sample rejection, and because of this, recollection creates an important problem in the laboratory (Koseoglu, Hur, Atay, & Cuhadar, 2011).

Free or excess hemoglobin from hemolyzed patient samples serves as interference for different biochemical assays especially in automation, or at least affect the amount of the analyte due to different chemical processes that occur pre-analytically (Lippi, Salvago, Montagnana, Brocco, & Guidi, 2006). The International Federation for Clinical Chemistry and Laboratory Medicine (IFCC) reported in a medical study that in vitro hemolysis accounts for majority of the hemolyzed samples sent to the laboratory; of which, technical errors and problems such as inappropriate blood collection, storage, or transport are the main causes (Thomas, 2015). In this study, we focused on finding a potentially useful method to eliminate or reduce the interference caused by free hemoglobin in the measurement of total bilirubin.

Hemolysis can be corrected or reduced by deproteinization (ultrafiltration or precipitation), sample blanking, and bichromatic measurement (Contois & Nguyen, 2012). Another corrective measure is the addition of potassium iodide, but this has not been recommended due to its variant impurities and wavelength interference due to I2-formation (van der Woerd-de Lange et al., 1983). With this respect, it may be enough to postulate that the use of deproteinization by precipitation may serve as a useful way to solve for hemolysis problems limited to the measurement of total bilirubin only. However, the fact that chemical interactions may occur pre-analytically during the serum pre-treatment phase has not been identified.

This research sought to provide a useful and cost-effective method of solving for hemolysis in the measurement of total bilirubin. It could be of help to the medical laboratory scientist, especially because some laboratory errors in the pre-analytical phase may be inevitable, or if a patient's diagnosis is urgently needed and recollection seems inconsiderable. The laboratory worker cannot compromise patient diagnosis and convenience because of the errors committed beyond customer errands.

Removal of free hemoglobin from hemolyzed serum samples for total bilirubin assay using zinc acetate as pre-treatment is targeted. Effects of these procedures, in pre-treated hemolyzed serum samples by Jendrassik-Grof method modification by *Biorex* compared to the untreated hemolyzed and non-hemolyzed serum sample controls by the analysis of levels of total bilirubin, were evaluated.

Objectives

The objective of the study was to formulate a way to eliminate interference in total bilirubin assay due to free hemoglobin in hemolyzed serum samples using buffered zinc acetate.

METHODOLOGY

The sampling method used was random sampling technique. Fifteen healthy students, ages 18 and above, were randomly chosen from a selected university. They were subjected to a few questions to limit the interferences that can be caused by their medical history. Informed consents were secured from all the participants.

Blood samples were collected using 10 cc syringes. For each patient, three serum samples were derived: one non-hemolyzed control, one hemolyzed control, and one hemolyzed serum pre-treated with buffered zinc acetate.

Preparation of Hemolysate.

Six mL of EDTA whole blood was collected from a subject whose blood type was "O" Rh-positive. This would be utilized for the whole experiment. The hematocrit level was determined manually. "O" Rh-positive blood is recommended to eliminate expected antibodies from forming agglutination which may cause false precipitates. Using a sonicator, two tubes of EDTA anticoagulated whole blood were agitated for 20 minutes to hemolyze the red blood cells and release the hemoglobin.

Preparation of Precipitating Reagent

An amount of 0.12 M buffered zinc acetate solution was prepared by pouring 25 mL of distilled water into a beaker and adding 0.55 g of zinc acetate and 2.0 g of Tromethamine (TRIS) buffer (TRIZMA@ Sigma Aldrich, Singapore). The solution was thoroughly mixed and covered with foil while not in use.

Sample Preparation

Whole blood (10-12 mL) was collected from the subjects. Each sample was allowed to coagulate for 10-15 minutes before being spun in a centrifuge for 10-15 minutes at 4000 rpm. The sera (approximately 4-6 mL respectively) were immediately transferred into clean separate tubes (Tube A) covered with aluminum foil. Test tubes were labelled as follows:

Tube A = Normal serum
Tube B = Hemolyzed serum
Tube C = Experimental serum
Tube D = Normal serum with 173.2 whole blood

The experiment was performed in a dimly lit room with a maintained temperature of 20-24°C. The amount of 2500 uL was transferred from Tube A into Tube B and was spiked with 173.2 uL of the hemolysate to make a standard of 0.9 g/dl of hemoglobin concentration. Before spinning Tube B, 1000 uL was transferred to Tube C. The volume of the supernatant needed was collected for the assay under hemolyzed control.

Serum Pre-treatment with Zinc Acetate

One hundred twenty (120) uL of 0.12 M buffered zinc acetate was added to precipitate the hemoglobin in Tube C. The samples were mixed, and then centrifuged for 10-15 minutes. The volume of the supernatant needed was collected for the assay under experimental serum.

One thousand milliliters of serum was transferred from Tube A to Tube D and 173.2 uL of whole blood (unhemolzyed) was added to eliminate further differences with that of the experimental sample because the plasma from the hemolysate also contains bilirubin. These were centrifuged for 2-5 minutes. The volume of the supernatant needed was collected for the assay under normal control.

Figure 1 shows the preparation of hemolyzed serum. A free hemoglobin concentration of 0.9 g/dL was uniformly used for all sera. Volumes are based on the given problem in Appendix B. Adjustments may be made using mathematical corrections depending on the amount of serum collected.

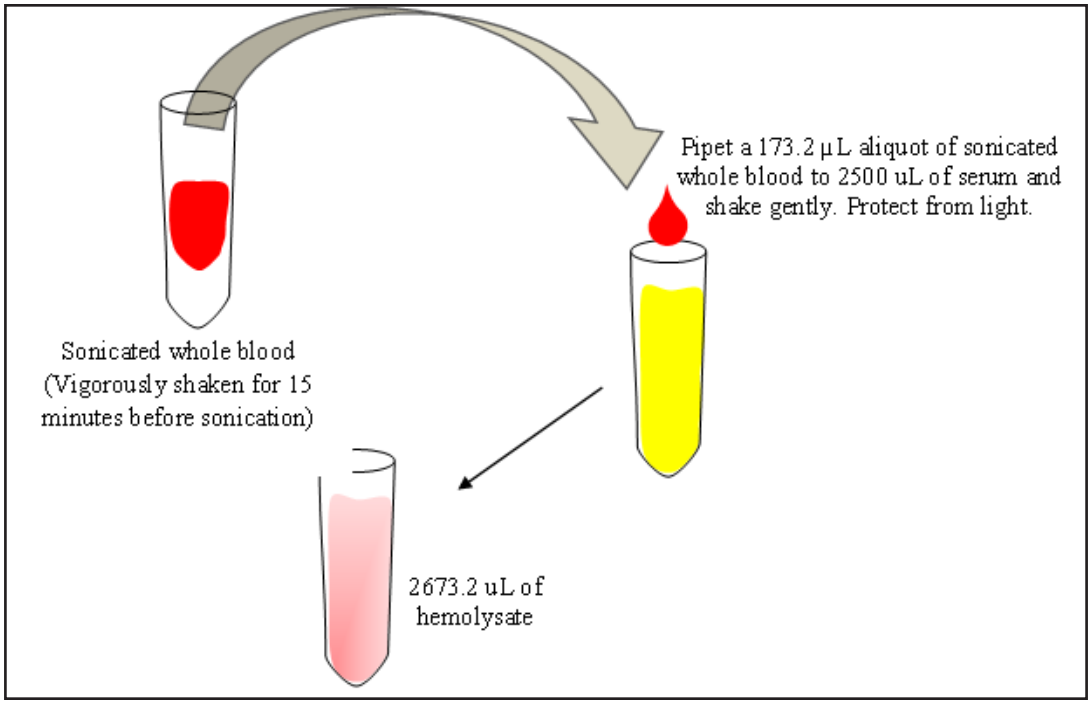

Figure 1. Preparation of hemolyzed serum

Figure 2 shows the flowchart of the sample preparation.

1. Collect 10-12 mL of whole blood
2. Clot then centrifuge for 15 minutes
3. Aliquot serum into two portions

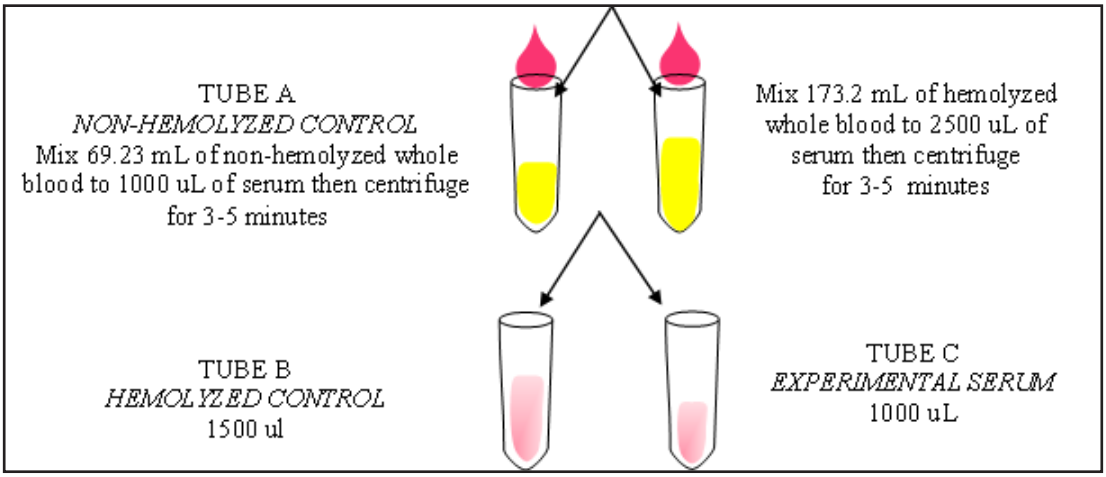

Figure 2. Preparation of sample preparation

Figure 3 shows the flowchart of the treatment of serum with zinc acetate.

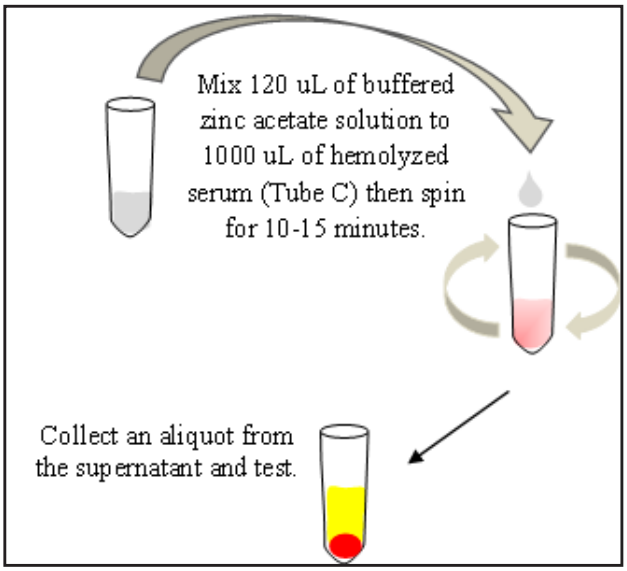

Figure 3. Treatment of serum with zinc acetate

Assessment of Precipitant Effects

To assess whether there are certain chemical interactions that affect the concentration of the analyte, 1000 uL of non-hemolyed control sera were added to 120 uL of 0.12 M buffered zinc acetate, and centrifuged for 10-15 minutes. Collected supernatant was analyzed under normal serum with buffered zinc acetate. Values were then mathematically corrected for dilution effects by multiplying the results by 1.12, the dilution factor. The summary of the dilution formula for free hemoglobin approximation is shown below.

Step 1: Rule of 3

Patient hematocrit / 3 = patient hemoglobin estimate value (g/dL)

Step 2: Dilution of Hemolysate

Needed concentration of free hemoglobin: 0.9 g/dL

Formula: $Conc_1\ Vol_1 = Conc_2\ Vol_2$

Sample given:

Patient hemoglobin estimate: 13.0 g/dL

Amount of serum: 2.5 mL

Question: Based on the above information, how much hemolysate should be added to 2.5 mL of serum to achieve a free Hb concentration of 0.9 g/dL?

Solution:

(13.0 g/dL) (V1) = (0.9 g/dL) (2.5 mL)

[(13.0 g/dL) (V1)] / 13.0 g/dL = [(0.9 g/dL) (2.5 mL)] / 13.0 g/dL

[(~~13.0 g/dL~~) (V1)] / ~~13.0 g/dL~~ = [(0.9 ~~g/dL~~) (2.5 mL)] / 13.0 ~~g/dL~~

V1 = [(0.9) (2.5 mL)] / 13.0

V1 = 0.17307692 mL ~ 0.17307 mL

V1 = **0.17307 mL**

How much is 0.17307 mL in microliters (μL) if 1 mL equals 1000 microliters?

Solution:

0.17307 mL * (1000 μL / 1 mL)

0.17307 ~~mL~~ * (1000 μL / 1 ~~mL~~) = **173.07 μL**

RESULTS AND DISCUSSION

Table 1 shows that after pre-treatment with zinc acetate (C), values are lower compared to the hemolyzed control (B); however, values of C vary when compared to values of A. Sample set 1 values of A and C appear to yield the least difference, with 5.4 umol/L and 5.1 umol/L, respectively.

Table 1

Comparison of Results (in umol/L) from Three Sets of Samples

Sample number	1	2	3
Normal (A)	5.4	7.7	5.2
Hemolyzed (B)	6.5	9.6	7.2
Experimental (C)	5.1	8.8	6.5
Nonhemolyzed serum with buffered acetate (D)	4.3	7.2	9.9

Table 2 displays the results of C and D corrected for dilution. Obtained C and D values on sample Sets 2 and 3 are now higher compared to values of A although Set 1 values remain close. A pattern cannot be demonstrated when C is compared to B.

Table 2

Values of Total Bilirubin (in umol/L) with Correction for C and D

Sample number	1	2	3
Normal (A)	5.4	7.7	5.2
Hemolyzed (B)	6.5	9.6	7.2
Experimental (C)	5.712	9.856	7.28
Nonhemolyzed serum with buffered acetate (D)	4.816	8.064	11.088

Analyzed data of total bilirubin values in Table 1 present a pattern when C is compared to B. This suggests that the elevated values obtained from the hemolyzed controls decrease when samples are pre-treated with zinc, thus supporting the proposition that zinc eliminates hemoglobin interference. Precipitation of free human hemoglobin by zinc (II) has been proven effective in the form of zinc chloride (Shull, Lees, & Li, 1980). This works by the interaction between zinc and hemoglobin to form a complex which in turn precipitates the hemoglobin because of its affinity to zinc (Frantzen, Grimsrud, Heggli, & Sundrehagen, 1997). As to the data, the use of zinc chloride proved useful but one research also demonstrates that other forms of zinc like zinc acetate can also prove useful (Ihara, Kakinoki, Morita, Matsumino, & Shino, 2010). This is because zinc is inorganic and is redox-inactive in physiological environments so the chances of affecting our analyte of interest is reduced in two ways: (1) less interactions with organic components in human serum; and (2) the redox process that can eventually form compounds, which interfere in the assay, is expected inhibited. However, given that albumin is the protein carrier of zinc in the human serum, the possibility that it may cross react with zinc in vitro is unknown (Ihara et al., 2010). That creates a challenge in formulating the concentration needed to precipitate hemoglobin by zinc (II).

On the other hand, while closer values are observed when C is compared to A, conflicting interpretation arose when A is compared to D. Decreased values of D may have been caused by the dilution effects brought about by 120 uL of buffered zinc acetate.

Values of C and D were corrected by multiplying them by a factor of 1.12 to eliminate the dilution effects. Table 2 shows that corrected values were higher than the normal values, suggesting that complete dilution had not taken place since precipitates were formed. Even so, limited data cannot be completely conclusive in this case although the concentration of zinc used is approximately the optimal molarity needed to solve for hemolysis without affecting the analyte of interest.

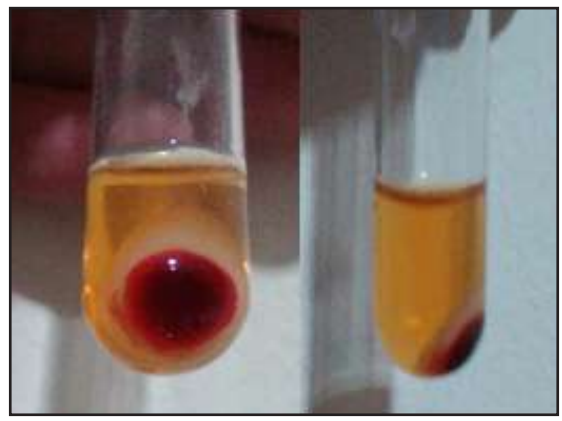

Figure 4. Experimental (Tube C).
(Left) Bottom view (Right) Side view

Figure 5. Comparison of normal and experimental serum Tube A and C).
(Left) Tube A (Right) Tube C

Figure 4 shows two noticeable layers of precipitates after addition of 120 uL of buffered zinc acetate, and centrifugation; white and red. Figure 5 shows the visible difference between the normal control and the experimental sera. Tube C appears to be hazy to slightly turbid.

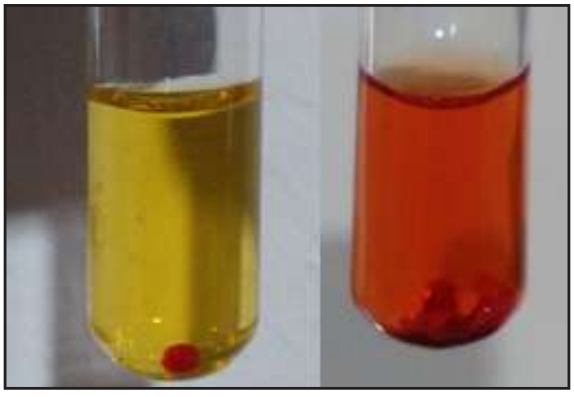

Figure 6. Tube D and Tube B, normal serum with zinc and hemolyzed control respectively

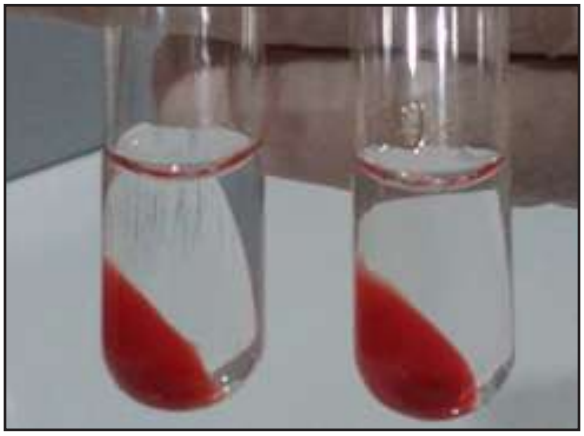

Figure 7. Precipitating reagent control. Hemolysate in distilled water after centrifugation shows effective precipitation by zinc.

Figure 5 shows differences in the color of the hemolyzed control from the normal control. Figure 6 displays precipitation of hemoglobin in distilled water showing the effectivity of zinc as a precipitant of hemoglobin.

Also, as shown in Figure 7, the precipitate settled with two noticeable layers: the bottom should be the precipitated hemoglobin due to its red color while the upper layer is unknown. This may have been due to possible competitive binding by other substances, most likely proteins, or the excess zinc itself. Because of this, testing yielded values that are not reliable due to possible increase in absorbance. Three sets of samples and portions of normal sera treated with a ratio of zinc were tested otherwise to at least assess for any effect of zinc on the value of total bilirubin.

CONCLUSION

It is proven that 0.12 M of zinc acetate can precipitate 0.90 g/dL free hemoglobin. However, the exact optimal concentration that cannot cause any possible interference was not determined because 0.12 M can induce slight turbidity of serum. The present data cannot be suggestive of the use of buffered zinc acetate as pre-treatment for hemolyzed serum ordered for total bilirubin measurement.

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AVERRHOA BILIMBI EXTRACT AS AN ALTERNATIVE ANTICOAGULANT FOR MANUAL COMPLETE BLOOD COUNT

Ma Estrella Sales, Arvyl Jan Andaya, Prince Duncan Maylas

Abstract

This study was designed to determine whether Averrhoa bilimbi (Averrhoa bilimbi) extract can be used as an alternative anticoagulant for manual complete blood count (CBC) in the hematology clinical laboratory instead of Ethylenediaminetetraacetic acid, the recommended anticoagulant for CBC. Blood from 15 volunteers were extracted and placed in EDTA-anticoagulated tubes and tubes with Averrhoa bilimbi extract. Samples from both tubes were tested for CBC. Statistical analysis using independent t-test showed no significant differences ($p< 0.05$) in the RBC count, WBC count, hemoglobin, hematocrit, and three-part differential of EDTA anticoagulated blood and blood with Averrhoa bilimbi extract as anticoagulant. The morphology of lymphocytes and monocytes were not affected; however, the granulocytes showed cytoplasmic distortion and vacuolation in the Averrhoa bilimbi extract.

Keywords: *Averrhoa bilimbi, anticoagulant, fruit extract, complete blood count*

Anticoagulants are added to blood to stop the coagulation process both in vitro and in vivo. In the specific field of in vitro diagnostics, anticoagulants in hematologic testing are commonly added to collection tubes to preserve blood samples in a state similar to their state inside the body (Banfi, Salvagno, & Lippi, 2007). Different types of anticoagulants are used depending on what test is being carried out. With the current trend of maximizing natural resources to minimize the waste products that could potentially harm the environment, studies are being done to determine natural sources of anticoagulants. One such possible source is *Averrhoa bilimbi*, locally known in the Philippines as kamias.

Averrhoa bilimbi, or its local name kamias, is found in the forests of Philippines and Southeast Asia. The fruit of the plant is commonly used as an ingredient for cooking but can also be used in treating wounds, rheumatism, venereal diseases, poisonous bites and beri-beri. The leaves can be used for cough and relief of rectal inflammation, while the flowers can be useful for coughs and thrush (Anitha, Geetha, & Lakshmi 2011). Kamias has a property to chelate metal cations. Based on a study by Daud, Hashim, and Samsulrizal (2013), the extract was effective in reducing the thrombophilic condition in rats. They extracted the fruit using ethanol and concentrated it using a rotary evaporator. The rats were treated with the fruit extract. A decrease in clot formation was observed.

Kamias' ability to chelate metal cations is due to the presence of oxalic acid. Oxalic acid is an odorless, colorless, and strong organic acid that is naturally present in plants and vegetables. It is relatively stable below 189.5°C but it is affected by excess heat and highly reactive to oxidizing agents, metals and alkalis, and forms as an oxalate when combined with soluble salts (Al-Wahsh, Wu, & Leibman, 2012). Oxalate, the conjugate base of oxalic acid, can chelate metal cations like Ca2+ and Mg2+ (McPherson & Pincus, 2017). Calcium is essential in the formation of a fibrin clot. Removing or inhibiting calcium would also inhibit fibrin clot formation (Turgeon, 2016)

There are currently multiple ways of extracting oxalate. Chromatography, rotary evaporation and manual extraction can be done to obtain oxalic acid. According to Al-Wahsh et al., (2012), extraction of oxalic acid can be done using hot or cold extraction using 2 N HCl and deionized water for both methods. In the material safety data sheet for oxalic acid found in the Science Lab website, it was mentioned that hot extraction from herbal plants yielded much more oxalate than cold extraction.

With these data in mind, kamias shows potential for serving as an anticoagulant for manual complete blood counts. Complete blood count or CBC is a routine laboratory test under the hematology division. A CBC includes red blood cell (RBC) and white blood cell (WBC) count, hematocrit, hemoglobin, WBC differential and RBC indices. RBC indices are calculated based on RBC count, hematocrit and hemoglobin. RBC indices include mean corpuscular volume (MCV),

mean corpuscular hemoglobin and mean corpuscular hemoglobin concentration (MCHC) (Rodak, Fristma, & Keohane, 2016).

CBC can be done manually or using automated machines. Manual counting of CBC requires the use of a hemocytometer, capillary tubes, microscope, dilution fluids, and pipette. According to Rodak et al. (2016), an automated method provides more accuracy and precision than manual methods and provides an early diagnosis and treatment of disease. However, the manual technique is more cost-effective and provides visualization of individual cell morphology.

EDTA (ethylenediaminetetraacetic acid) is the most commonly used anticoagulant in the hematology laboratory, and is the anticoagulant of choice for CBC because it preserves cell morphology and cell count (Eldin & Eldin, 2015). It chelates calcium and forms a complex that inhibits its action needed for coagulation (Kumar, Gousia, Anupama, & Latha, 2013).

Although EDTA can be used as the recommended anticoagulant for CBC, it can lead to erroneous results when blood is not immediately analyzed. This is based on studies done by Baffour, Quao, Kyeremeh, and Mahmood (2014) and Shrestha and Karki (2014). Artifactual changes in a blood smear like WBC vacuolation and platelet satellitism may occur if blood is stored in EDTA for more than two hours. Prolonged storage in EDTA for more than five hours can lead to changes in erythrocyte morphology. In addition, platelet clumping occurs when blood is stored in EDTA for four hours, giving a falsely low platelet count. Whenever these artifactual changes happen, it is necessary to recollect the sample and prepare the blood smear immediately.

Objectives

The objective of this study was to determine the use of *Averrhoa bilimbi* as an alternative anticoagulant for EDTA in manual complete blood counts.

METHODOLOGY

Extract preparation

Ripe fruits of *Averrhoa bilimbi* were harvested from a garden in Baranggay Malitlit, Santa Rosa, Laguna. Stalks and leaves were removed. The fresh fruits were washed with distilled water and dried; bruised or over ripe parts were removed. Juice collected after the fruits were processed in a blender and pressed was filtered using gauze to remove solid particles and was transferred into test tubes. The tubes with the extract were incubated in a water bath at 80°C for 30 minutes. The extract was then centrifuged at 4200 rpm for 10 minutes and the supernatant filtered using a Whatmann filter paper. The resulting extract was frozen until CBC could be performed.

Sampling

Six milliliters of whole blood were collected from 15 volunteers with no history of hematologic condition or current infection. The samples were divided into two aliquots with 3 mL whole blood per tube, where one tube contained a standard volume of EDTA as anticoagulant (lavender top) and the other 80 microliters of *A. bilimbi* extract as anticoagulant. The volume of extract added was based on a pilot test where different volumes of the extract were added to blood, and clotting time was determined. Tubes containing blood and extract that remained fluid were centrifuged to check for hemolysis. The lowest volume where no clotting occurred was chosen as the final volume used throughout the test. Manual CBC containing the following parameters was performed for both sets of tubes: RBC count, WBC count, hematocrit, hemoglobin level, neutrophil count, lymphocyte count, and mixed count.

Complete Blood Count

Red blood cell and white blood cell counts were obtained by diluting the blood using Thoma pipette and counting under the microscope using the Improved Neubauer hemocytometer. The Adam's microhematocrit method was used for hematocrit and the WBC differential was based on the prepared peripheral blood smears stained with Hema-Quick stain and read at 1000x.

RESULTS AND DISCUSSION

The study demonstrated that crude extract from ripe *Averrhoa bilimbi* fruit has anticoagulant properties. Manual complete blood count with peripheral blood smear or film preparation was performed on blood with *A. bilimbi* extract, with EDTA-anticoagulated blood serving as control. Results of the RBC count, WBC count, hematocrit, hemoglobin, and the three-part differential were compared using the independent t-test to determine whether there is significant difference between the parameters tested.

Effect of Averrhoa bilimbi Extract on Blood Cell Counts

Based on the p value of the compared parameters of the independent t-test shown in Table 1, there was no significant difference in the results of the EDTA-anticoagulated blood, considered as the recommended anticoagulant for CBC, and whole blood using

A. bilimbi extract as anticoagulant. The p values of RBC count, WBC count, hematocrit, hemoglobin, neutrophil count, lymphocyte count, and mixed count were all more than 0.05. This indicates that cell counts of blood with *A. bilimbi* extract is comparable to EDTA-anticoagulated blood.

Table 1
T-test Result for CBC Parameters Comparing EDTA-Anticoagulated Blood and Averrhoa bilimbi Extract-Anticoagulated Blood

CBC Parameter	t-Test for Equality of Means		
	t	df	Sig
RBC Count	0.196	28	0.846
WBC Count	1.461	28	0.155
Hematocrit	-1.426	28	0.165
Hemoglobin	-1.424	28	0.166
Neutrophil Count	0.579	28	0.604
Lymphocyte Count	0.979	28	0.869
Mixed Count	-0.749	28	0.631

p-value of <0.05 = significant

Effect of Averrhoa bilimbi Extract on Blood Cell Morphology

Blood smear evaluation was also performed to determine the effects of *A. bilimbi* extract on the morphology and distribution of red blood cells, white blood cells, and platelets right after the addition of the extract to the blood. In EDTA-anticoagulated blood, discernible changes in the blood cell morphology may be observed at approximately two hours from the time of collection. By 12 to 18 hours, the change in cell morphology becomes more apparent. Morphologic changes observed might include crenation or sphering in red blood cells; and vacuolation and nuclear budding in white blood cells. In a freshly prepared blood film from a patient with no underlying condition, all cells should be evenly distributed in the critical area, showing no clumps or aggregation. (Dacie & Lewis, 2015) In the current study, two slides were made and examined from all samples regardless of the additive used.

In evaluating the morphology of RBCs in blood with *A. bilimbi* extract, no rouleaux formation and agglutination was observed in the smear. However, two out of the 15 blood smears observed showed echinocytes (Figure 1) or crenation. Echinocytes, also known as burr cells, are red blood cells with spicules or small projections on the surface. Although it is a common artifact in peripheral blood films, echinocytes are frequently caused by use of hypertonic or alkaline solution and prolonged storage (Walker, Hall & Hurst, 1990). Comparison of the pictures of EDTA-anticoagulated blood film (Figure 2A) and *A. bilimbi* extract-anticoagulated blood film (Figure 2B) shows no echninocytes present in the blood film made from EDTA-anticoagulated blood. From the observations made, since only two out of the 15 samples exhibited echinocytes, this may be attributed to slight variations in the smearing or staining technique.

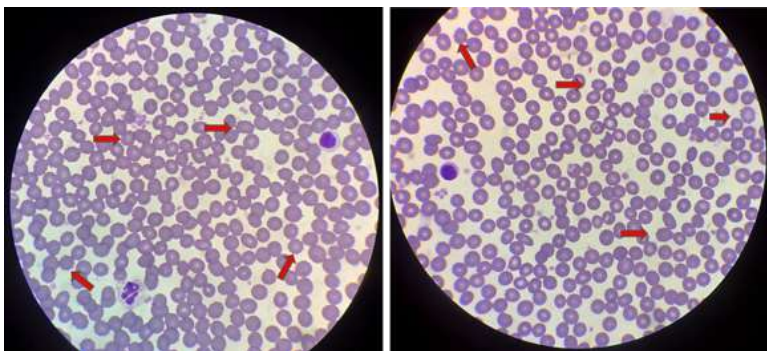

Figure 1. Photo showing echinocytes (arrow) present in peripheral blood smears of two samples with *A. bilimbi* extract.

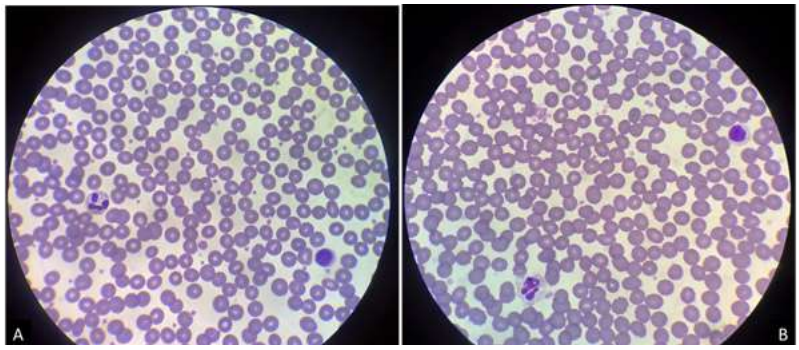

Figure 2. Comparison of pictures taken from peripheral blood films prepared from EDTA-anticoagulated blood (A) and blood with *Averrhoa bilimbi* extract (B).

Upon evaluation of the WBC morphology, 10 out of 15 blood smears in *A. bilimbi* extract were observed to show more distortion of the cytoplasm and the appearance of vacuoles. Granulocytes exhibited more morphologic distortion compared to monocytes and lymphocytes. Cytoplasmic vacuolation (arrow) are present in the granulocytes shown in Figure 3 but lymphocytes in the right field appear morphologically normal. When comparing the slides prepared from EDTA tube and *A. bilimbi* tube, granulocytes from the EDTA tube exhibited almost no change in morphology (Figure 4). Cytoplasmic vacuolation, although one morphologic change observed in slides of patients with infection, may also be artefactual. Storage of more than two hours in EDTA may lead to autophagocytosis and is evidenced by the presence of small, distributed vacuoles in the cytoplasm. The appearance of vacuoles in the nucleus and cytoplasm especially in monocytes and neutrophils may be associated with loss of granules and nuclear swelling. (Rodak et al., 2016; McPherson & Pincus, 2017).

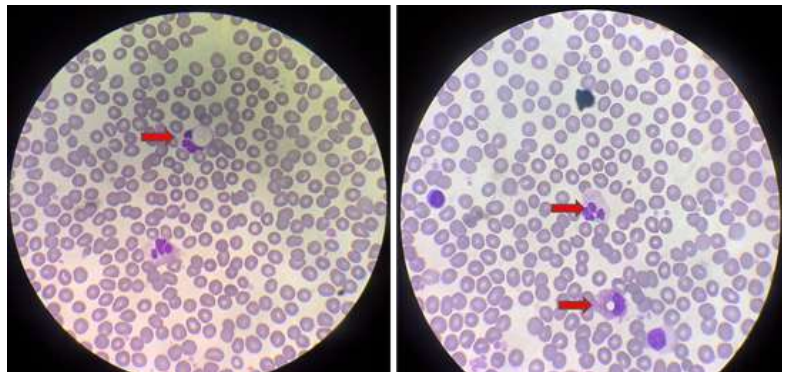

Figure 3. Pictures of peripheral blood smears showing morphologic changes in granulocytes of samples mixed with A. bilimbi extract.

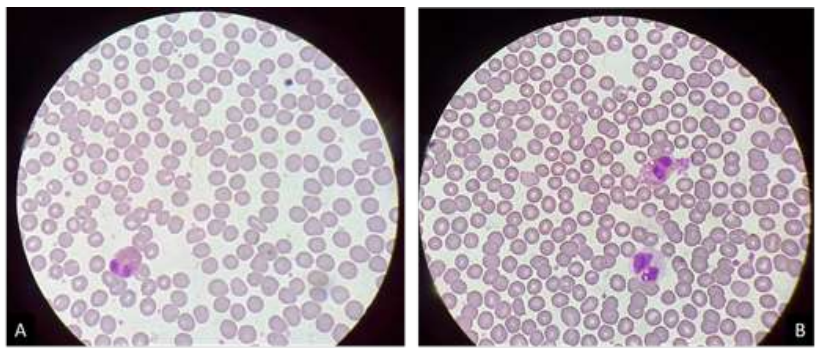

Figure 4. Comparison of pictures of granulocytes in blood with EDTA (A) and blood with *A. bilimbi* extract (B) where granulocytes in the latter show cytoplasmic and nuclear vacuolization.

Platelets in peripheral blood smears prepared from fresh, whole blood should be evenly distributed in the critical area. Platelet activation during specimen collection, preparation or testing results in the formation of platelet clumps. (Rodak et al., 2016) Out of the 15 blood films prepared from samples with *A. bilimbi* extract, 11 showed platelet clumping (Figure 5B) that was not found in the control slide (Figure 5A).

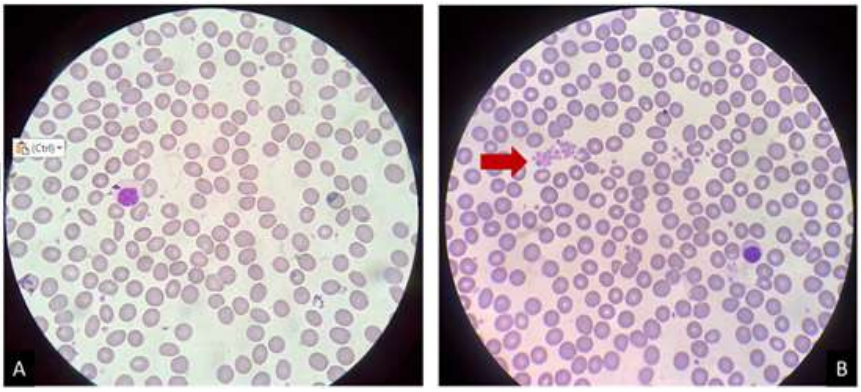

Figure 5. Comparison of the platelet distribution of blood with EDTA (A) and blood with *A. bilimbi* (B) where blood with A. bilimbi shows platelet clumping.

CONCLUSION AND RECOMMENDATION

Oxalate anticoagulant has been reported to distort blood cell morphology faster than EDTA during storage. Degenerative changes associated with the use of oxalate in CBC includes shrinkage of red blood cells leading to lower hematocrit, nuclear swelling in white blood cells, and more rapid appearance of cytoplasmic vacuoles, abnormal segmentation of granulocytes, and loss of cell cytoplasm (McPherson & Pincus, 2017). However, in the current study, cell counts of blood with *A. bilimbi* extract and EDTA showed no significant difference. Morphologic changes in cells observed in the peripheral blood films prepared from blood with the extract may limit the use of the extract in morphologic evaluation of blood cells. Further study on the effect of other bioactive compounds present in *A. bilimbi* extract on blood cells is recommended.

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PERSONAL DETERMINANTS AND THEIR RELATION TO HEALTH ASSETS AS MEDIATED BY ROLE TRANSITION RE-SPONSE

Angel Grace Bingcang

Abstract

This study sought to find the relationship between personal determinants and health assets as mediated by role transition among the retired population. Data were collected from randomly selected towns and cities nationwide. The study respondents were 268 retirees purposively chosen from Luzon,Visayas, and Mindanao. They were retired for at least one year and above, aged 57-99, in their proper frame of mind, and not currently diagnosed with Alzheimer's disease or experiencing any diseases of such kind. The findings showed that majority were female, 57-99 years old, a college graduate with a monthly income of 10,000 pesos and above, and enjoying hospitalization benefits. They perceived their physical environment and social support as *good*. The transition response regarding depression was *low*; attachment was *fair*, while empowerment and integrity were *high*. Health assets in terms of subjective health was *fair*, functional health was *good*, and a majority were pre-hypertensive and mildly undernourished in terms of biological health. There was a significant relationship between personal determinants and transition response. The role transition response was significantly related to health assets in terms of subjective health and functional health. Furthermore, personal determinants in terms of social support and physical environment were positively related to subjective health and body weight. The relationship between personal determinant in terms of social support and health assets in terms of subjective and functional health was fully mediated by the role transition response. A retirement preparation program was developed based on the results of the study.

Keywords: *personal determinants, health assets, role transition response, retirement preparation*

The achievement of excellent health among people of the third age is one of the greatest challenges for many health practitioners these days. As the so-called elderly progress further to retirement, they will have to face what lies ahead, making it an age imposed with emotional strain which could further lead to the failure to achieve excellent health (ODPHP, 2017).

There are so many factors which may influence individuals' health experience as they transcend into retirement age. Among the many integral constituents required to achieve excellence in health are the personal determinants that become more and more important as one progresses in age (ODPHP, 2017).

The United States Census (2014) envisions that the elderly population will double in the year 2050. Today, 8.5% of people worldwide are age 65 years and over. The United Nations Economic and Social Commissions for Asia and the Pacific (2017) mentioned that the Asia-Pacific region is currently home to about 60% of the world's so called "third-age." In the Philippines, approximately 4.38% of the 102,624,209-strong Philippine population are 65 years and over.

These statistics showing increasing population growth among those who belong to the third age poses a great challenge to health practitioners who are faced with the task of assisting retirees through a healthy transition experience. Jacobsen, Kent, and Marther (2016) mentioned that after the euphoria of "Yay, I don't have to work today," wears off, retirees often feel a sense of loss. This feeling is brought about by the lack of social interaction, lack of purpose, feelings of being no longer needed, and even feelings of being disconnected from society. This further highlights the importance of managing their retirement expectations through careful planning so that retirees can be ushered into the achievement of positive health outcomes.

According to the WHO (2017), personal factors have a large impact on the health of an individual. The community where one lives, the state of his/her environment, genetics, gender, income, educational level, and relationships with friends and family have considerable importance to health. Picker (2016) also mentioned that education and health are interlinked because they have a considerable impact on one's well-being.

This was supported by Natividad, as cited by Caagbay (2012), who stated that having a higher educational attainment is equated with being well as being well-educated is parallel to better job opportunities.

Similarly, social support has a significant impact on the health of the individual. Prince and Prince as cited in Mona (2011) expressed that high levels of social networks can help reduce the stress of an individual and have a positive influence on his or her ability to cope with and adapt to external stimuli like that of retiring from work. Tomey (2013) also believed that people who are supported by close relationships are less vulnerable to ill health.

However, growing old will eventually take its toll in one's life. There is no getting around it, because as one ages, the body and mind change and eventually enter the retirement phase of life. Nierenberg (2013) stated that retirement, which is marked by several major changes in one's life, can affect healthy lifestyles in either a favorable or unfavorable way. The switch from employment or a very active professional life to reaching the third age might cause varied symptoms. One of these symptoms is unhealthy coping to the life transition.

To those people belonging to the third age, this sudden shift of events also comes with the awareness of what life would be after retirement from work, the adjustments they have to make after they retire, and the challenges of coping with this transition. They may also find themselves in the situation of questioning what and who they would become after retirement.

The idea of achieving the best in life even in the third age is the goal of this study. However, the achievement of the best health is still highly individualized because of individual personal differences. Hence, an exploration of the personal and behavioral determinants including the influence of the transition response must be done. With enhanced knowledge on how the variables interact with each other to achieve a healthy life during the retirement transition, it is believed that the pursuance of this study will shed light on the mediation of the middle range transition theory on the health of retirees.

Objectives

This study aimed to find the relationship between personal determinants (physical environment and social support) and health assets (body weight and blood pressure) as mediated by role transition among the retired population.

METHODOLOGY

This study utilized 268 retirees age 57–99 years using a multi-level cluster sampling technique. Participants were asked to answer a self-constructed and adapted questionnaire. The questionnaire was composed of three parts. The first part of the questionnaire determined the respondents' personal factors such as demographic profile, physical environmental condition, and social support. The demographic profile included the respondents' age, gender, family income, medical benefits, and highest educational attainment. Table 1 shows this profile.

Table 1
Respondents' Profile

	Frequency	Percentage
Age		
66 and below	93	34.7
67-71 years old	83	31.0
72 and above	92	34.3
Gender		
Male	111	41.4
Female	155	57.8
Family Income		
10,000 and below	100	37.3
10,001-20,000	99	36.9
20,001 and above	66	24.6
Medical Benefits		
Medical Subsidy		
Yes	92	34.3
No	165	61.6
Missing	11	4.1
Hospitalization		
Yes	218	81.3
No	42	15.7
Missing	8	3.0
Highest Educational Attainment		
Elementary	10	3.7
High School	47	17.5
College	166	61.9
Masters Degree	30	11.2
Doctorate Degree	5	1.9
Others	1	0.4
Missing	9	3.4

The second part of the questionnaire evaluated the participants' health assets in terms of their subjective health, biological health, and functional health. Finally, the last part of the questionnaire covered the participants' role transition response. The assessment evaluated areas such as depression, attachment, empowerment, and integrity.

Data analysis included the use of the following: frequency distribution and percentage, mean and standard deviation, correlation coefficient test, and Structural Equation Modelling (SEM) using AMOS software.

RESULTS AND DISCUSSION

Respondent's Personal Determinants

Respondents' physical environment. The respondents perceived their physical environment as good as shown in Table 2. They have privacy and are living comfortably in their respective homes.

Table 2
Respondents' Physical Environment

	Mean	SD	Scaled Response	Verbal Interpretation
In my home, I have:	4.42	.66	Agree	*Good*
1. The privacy I need	4.32	.74	Agree	*Good*
2. Good room ventilation	4.39	.74	Agree	*Good*
3. Good water supply	4.09	.86	Agree	*Good*
4. Non-slip flooring	4.26	.75	Agree	*Good*
5. Bathroom designed for easier accessibility	4.02	1.02	Agree	*Good*
6. Telephone access that is readily available	3.74	1.15	Agree	*Good*
7. Handrails on the stairs	4.39	.73	Agree	*Good*
8. I am living comfortably in my own home.	4.20	.77	Agree	*Good*
9. I can easily access any food sources.	4.21	.78	Agree	*Good*
10. I can easily access local transportation	4.19	.60	Agree	*Good*
Physical Environment	4.19	.60	Agree	*Good*

Legend: 1.00-1.49 Very Poor, 1.50-2.49 Poor, 2.50-3.49 Fair, 3.50-4.49 Good, 4.50-5.00 Very Good

The results show that overall, the respondents have a good physical environment. They have privacy and are living comfortably in their respective homes. The findings also show that privacy (as one of the basic human rights) was indeed considered important by the retirees and their family. According to Yazdanparast, Davoudi, Ghorbani, and Abbaspoor (2016), the observance of personal privacy is an important variable in determining the individual's level of satisfaction and perception of service quality provided by care agencies.

Respondents' social support. The respondents' social support was rated as good since they have people they can turn to for tangible support as shown in Table 3.

Table 3
Respondents' Social Support

	Mean	SD	Scaled Response	Verbal Interpretation
1. My family is proud of my accomplishments.	4.44	.66	Agree	
2. I have my family who comforts me whenever I am lonely.	4.33	.73	Agree	
3. My family thinks that I'm not good at helping them with their problems.	3.54	1.31	Agree	
4. I have a hard time finding someone to take me anywhere I need to go.	3.51	1.17	Agree	
5. I have a circle of friends who meet regularly.	4.06	.78	Agree	
6. There is no one with whom I feel comfortable talking about my problems.	3.57	1.30	Agree	
7. I have people to take me to the doctor whenever I am sick.	4.28	.82	Agree	
8. I could easily find someone to help in case of an emergency.	4.23	.75	Agree	
9. There is no one with whom I can share my private worries.	3.75	1.18	Agree	
11. I have someone whom I can turn to when I need suggestions with my problems.	4.23	.72	Agree	
12. It is difficult to find someone who will take care of my house if I need to go somewhere.	3.22	1.22	Moderately Agree	
13. I have a hard time keeping pace with my friends.	3.57	1.05	Agree	
14. I don't get invited to do things with others.	3.70	1.06	Agree	
15. There is one person I know whose advice I can trust.	4.20	.92	Agree	
Social Support	3.91	.53		*Good*

Legend: 1.00-1.49 Very Poor, 1.50-2.49 Poor, 2.50-3.49 Fair, 3.50-4.49 Good, 4.50-5.00 Very Good

The findings show that the retirees have people such as family, relatives, friends, and significant others they can turn to for tangible support. The response showing the highest score given by the respondents indicate that the family is proud of whatever accomplishments were achieved by the retiree. While the respondents have people who encourage them and recognize their achievements, they still find it difficult to find someone who will take care of their house whenever they need to go somewhere as seen in the table above.

Respondents' Role Transition Response

The role transition response in terms of depression was low; attachment was moderate, while empowerment and integrity were high as shown in Table 4.

Table 4
Role Transition Responses

	Mean	SD	VI
Depression	2.16	.53	*Low*
Attachment	3.29	.42	*Fair*
Empowerment	4.20	.54	*High*
Integrity	4.34	.64	*High*

Legend: 1.00-1.49 Very Low, 1.50-2.49 Low, 2.50-3.49 Fair, 3.50-4.49 High, 4.50-5.00 Very High

The study implies that with the low depression result, the risk for suicide is not prominent among the respondents. As the suicide rate in people ages 80 to 84 is more than twice that of the general population, the findings of this study show that the suicide risk of the respondents is relatively low.

The findings also show that the respondents showed moderate attachment to family, relatives, friends, and significant others. It implies that the respondents experience moderate emotional and social loneliness. They have moderately positive emotional expressions, which were also observed in the study of Shunqin (2015) which said that the effects of elderly attachment on their physical and mental health are of important theoretical and practical significance. Having moderate attachment shows that retirees have people whom they trust and that they are confident that they can lean on them whenever they need help.

Further, the respondents' degree of empowerment was high. This is a good indicator that they have a positive self-perception of aging. Paswan as cited in Rabiei, Mostafavi, Masoudi, and Hassanzadeh (2013) mentioned that empowerment for the retirees is necessary as it improves their physical and mental capacities through talking about their needs. However, if individual statements will be observed, the retirees were still longing to become the boss of their life. It must be noted, however, that traditionally, Philippine culture dictates that part of the extended family role of Filipinos is to care for and support elders as a show of respect (Rabiei et al., 2013).

Webster (2014) defines integrity as the firm adherence to one's moral code or artistic values. Deciding whether or not to choose to speak the truth needs to come from one's honesty with oneself. The results reveal that the respondents have a high level of integrity. The findings indicate that the respondents observe honesty in their dealings with themselves and other people.

The result further shows that retired people who participated in the study have fewer tendencies to become depressed, paranoid, hypochondriacal, and develop patterns of senility. On a positive note, they can look back on their lives and feel comfortable with the course of events and the choices they have made along the way which is a good indicator of a positive transition to retirement life.

Respondents' Health Assets

Subjective and biological health. Health assets in terms of subjective health was fair, and a majority were pre-hypertensive as shown in Table 5.

Table 5
Respondents' Health Assets

	Mean	SD	Scaled Response	VI
Subjective health	3.41	.52	Moderately Agree	*Fair*
Biological health				
Blood pressure (BP)				
Systolic BP	129.99	13.42		Prehypertension
Diastolic BP	81.70	14.02		Prehypertension

The respondents were confident that their health would not get worse. They did not agree with the statement that they get sick more easily than other people. The overall evaluation of health was just fair, which means that they do not feel completely well about themselves. It was noted that there was some decline in their bodily functioning which may have hindered them from reaching their maximum potential and feeling good about themselves.

The findings showed that the respondents were generally pre-hypertensive. In normal physiology, the heart continues to pump enough blood to supply all parts of the body. However, as one ages, an older heart may not be able to pump blood when one makes it work harder which is why high blood pressure and orthostatic hypotension are more common with older age (Sheth & Jadav, 2016).

Body weight. In terms of actual weight, respondents were mildly undernourished as shown in Table 6.

Table 6
Respondents Actual Body Weight

Actual Body Weight	Frequency	Percentage
1. Mildly Undernourished	99	36.9
2. Normal	74	27.6
3. Moderate Undernourished	47	17.5
4. Overweight	15	5.6
5. Severely Undernourished	14	5.2
6. Obese	10	3.7
Missing	4	3.4

The result of the study shows that approximately 60% of the total population or two-thirds of the respondents were mildly to severely undernourished. There were only 27.6% who belonged to the normal body weight category. However, it must be noted that with old age, body composition changes so that fat mass and muscle tissue lessens, thereby affecting body weight. Retirees are at even greater risk for malnutrition because of changes in their metabolism as well as the inability to cook or even feed themselves (Ulger et al., 2010). However, there were 27.6% who still maintained normal body weight despite their greater tendencies to gain weight due to relatively sedentary lifestyles or be malnourished because of their inability to prepare healthy food due to mobility problems.

The findings reveal that the respondents have good functional health. The independent performance of activities such as common household activities among the retired population is an important indicator of functional health. Functional health refers to how the muscles, bones, joints, nerves, and everything else responsible for physical ability move (Serper et al., 2014). In terms of physical activity, the result shows that the retired population can perform activities of daily living independently and that functional decline was not prominently observed. Thereby, complications related to unhealthy aging process are less likely. The result may be associated with the idea that most of the respondents belong to the young-old age group, wherein functional capacity will be much better compared to the old-old age group. This means that they can perform physical activities independently or without help.

Respondents' Personal Determinants and Transition Response

Physical environment was found to be positively related to role transition response in terms of attachment and empowerment but negatively related to depression. Social support was positively related to role transition in terms of attachment, empowerment, and integrity, but negatively related to depression. These may be seen in Table 7.

Table 7
Personal Determinants and Transition Response

		Attachment	Empowerment	Depression	Integrity
Social Support	Pearson Correlation	.489**	.339**	-.645**	.428**
	Sig. (2-tailed)	.000	.000	.000	.000
	N	268	268	268	267
Physical Environment	Pearson Correlation	.163**	.314**	-.264**	.099
	Sig. (2-tailed)	.007	.000	.000	.105
	N	268	268	268	267

The results indicate that the better the physical environment and social support are, the higher the levels of attachment and empowerment, and the lower the incidence of depression. Further, higher levels of social support are also associated with higher levels of integrity.

The positive relationship between social support and role transition implies that having relatives, friends, and significant others including family which they can turn to in times of need or crisis gives an individual a broader focus and positive self-image that will act as buffer against adverse life events. Evidence showing how social support can bring about positive impacts on health can be observed in the study of the Public Health Agency of Canada (2013), WHO (2015), the works of Carlson (2011), and many others. These agencies and experts proved that support groups, either in person or online, could make a tremendous difference on how well one can cope with the harsh environment that surrounds them, thus making a positive impact on the health assets of the retirees.

It is important for people to understand that this is very significant for retirees. Burleson et al., Cohen et al., Shaw and Gant, Goldsmith, Goldsmith, and Albrecht (as cited in Wright, 2016) mentioned that there are decades of research studies that show how social networks and interpersonal relationships have a substantial impact on the physical health and psychological well-being of an individual. A study conducted by Wright (2016) showed that the negative aspects of social networks and relationships could lead to negative health outcomes.

Transition Response and Health Assets

Role transition response in terms of attachment, empowerment, depression, and integrity was found to be significantly related to subjective health as shown in Table 8. Empowerment was found to be significantly related to functional health. Systolic blood pressure, diastolic blood pressure, and ideal body weight do not show any significant relationship with the role transition response.

Table 8
Transition Response and Health Assets

		Subjective Health	Functional Health	ABW	sys	dias
Attachment	Pearson Correlation	.345**	.057	-.056	-.080	.009
	Sig. (2-tailed)	.000	.356	.370	.195	.890
	N	268	268	261	264	263
Empowerment	Pearson Correlation	.217**	.185**	.040	.021	.028
	Sig. (2-tailed)	.000	.002	.521	.738	.652
	N	268	268	261	264	263
Depression	Pearson Correlation	-.472**	.988	.009	.057	.019
	Sig. (2-tailed)	.000	.108	.885	.354	.759
	N	268	268	261	264	263
Integrity	Pearson Correlation	.165**	.111	.067	.053	-.012
	Sig. (2-tailed)	.007	.069	.281	.393	.841
	N	267	267	261	264	263

In the relationship between role transition response and health assets, only subjective health was found to be significantly related to all the role transition response indicators. Subjective health is defined by Seligman (2008) as the sense of physical well-being in which an individual enjoys a sense of energy, vigor, vitality, and health. This means that the better people feel about life, the better their health would become. It indicates good functional capacity and positive outlook of the individual as seen in the popular quote, "Feel good, look good, and do good." If individuals feel good about themselves, they would strive to look good and would eventually work hard to do good. If one has a healthy lifestyle, such as diet, nutrition, and exercise, one feels good.

It may be further observed that while attachment, empowerment, and integrity were positively related to subjective health, depression correlates negatively with subjective health. This means that when depression level is low, there would be good subjective health.

Only empowerment was found to be significantly related to functional health. This would shed light on the concept that once an individual is empowered, it brings a sense of fulfillment, enthusiasm, and personal accomplishment to the elderly. Thus, functional capacity is also enhanced.

Mediation of Role Transition Response Between Determinants and Health Assets

Figure 1 shows that the role transition response fully mediates the relationship between personal determinants in terms of social support and health assets and behavioral determinants in terms of physical health behavior and health assets.

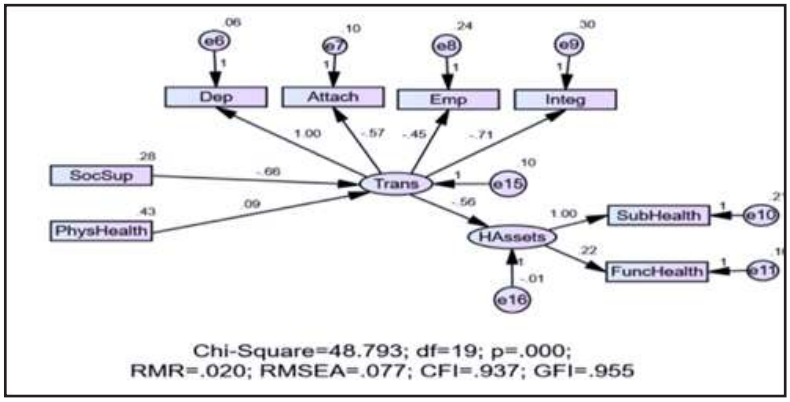

Figure 1. Modified model analysis result using AMOS.

The result indicates that the feel good experience or positive outlook of an individual is correlated with personal and behavioral determinants of health and that role transition response mediated the effect. Hence, empowerment, attachment, integrity, and coping against depression are necessary in order for the positive effects of social support and physical health behavior to be seen in health assets.

CONCLUSION AND RECOMMENDATION

The role transition response fully mediates the relationship between personal determinants in terms of social support and health assets and behavioral determinants in terms of physical health behavior and health assets. The results of the study confirm the Middle Range Transition Theory. It is recommended that another study using a larger and wider population range considering other variables such as marital status and length and kind of employment be done. Furthermore, another study may be conducted comparing the transition response and health assets of retiree couples.

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LIFESTYLE PRACTICES AND THE PREVALENCE OF OBESITY AMONG COLLEGE STUDENTS

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Abstract

Obesity is one of the most neglected and pervasive health problems worldwide, affecting all ages, genders, socioeconomic classes, and ethnicities. This descriptive-correlational study aimed to determine the relationship between lifestyle practices (physical activity and dietary intake) and the prevalence of obesity among 173 college students. The study found that majority of the participants (72.8%) were of *normal* weight; however, 24 (13.9%) were either *overweight* or *obese*. Their physical activity level was *average*. Meat intake was *low*, legume, dairy, and junk food intake were *average,* vegetable and fruit intake was *moderately high*, and grain intake was *high*. Higher legume intake was found to be significantly associated with higher BMIs (p=0.42). There were also significant differences in BMI when gender and monthly allowance were considered (*p-value-0.001*). Together, legume intake, gender, and monthly allowance account for 13.1% of the total variance in the BMI, with gender having the largest bearing at 8.1%.

Keywords: *Lifestyle practices, prevalence of obesity, dietary pattern*

Obesity is one of the most neglected and pervasive health problems worldwide, affecting all ages, genders, socioeconomic classes, and ethnicities. It is defined as a condition of abnormal or excessive fat accumulation in adipose tissue, to the extent that health may be impaired (WHO, 2011). It is rightly referred to as "globosity," as it has emerged as a global non-communicable epidemic.

Obesity is the fifth leading cause of death all over the world (Ko, 2007). Its prevalence is increasing worldwide at an alarming rate in both developed and developing countries. According to the WHO (2011), obesity has more than doubled since 1980, with more women afflicted than men. In 2008 alone, the WHO estimated that worldwide, around 200 million adult men and nearly 300 million adult women were obese.

Studies among university students in developing countries also show a high prevalence of overweight and obese individuals in this demographic. The prevalence is 10% in Nigeria (Nwachukwu et al., 2010) and 25.3-59.4% in Egypt (Abolfotouh, Bassiouni, Amounir, & Fayyad, 2007). The rates are especially high in Asia, with 31% in Thailand (Banwell et al., 2009), 20-30.1% in Malaysia (Gopalakrishnan, Ganeshkumar, Prakash, & Amalraj, 2012), and 34.1% in the Philippines (Florentino, 2011).

Studies on the risk behaviors and lifestyle circumstances that lead to being overweight have identified unhealthy dietary patterns, sedentary lifestyles, socio-economic factors, and perceptions and beliefs about overweight and obesity as key elements of concern for public health and well-being. Evidence of the varying interaction between obesity-promoting factors in our political, economic, physical, and social environments and the daily routine practices of diet and physical activity have been documented (Pearce & Witten, 2010).

The WHO recommends that individuals should perform at least 150 minutes of moderate intensity aerobic physical activity or at least 75 minutes of vigorous intensity aerobic physical activity throughout the week. When individuals engage in moderate to vigorous physical activity, they are likely to prevent weight gain and improve body composition. However, a study conducted in the US indicated that an estimated 55% of adolescents do not meet these physical activity guidelines (Sanchez et al., 2007). Conversely, 30% of those adolescents view television for more than two hours a day, hence further increasing their obesity risk as inactive lifestyle practices such as television-viewing, computer, and media use have been shown to have profound effects on body weight among Caucasian populations (Sugiyama, Healy, Dunstan, Salmon, & Owen, 2008).

On the other hand, obesity can also occur when energy intake from food and drink consumption,

including alcohol, is greater than the energy requirements of the body's metabolism over a prolonged period, resulting in the accumulation of excess body fat. Therefore, obesity may also be attributed to poor dietary patterns (Fung et al., 2001). In fact, the nutrition transition resulting from urbanization and affluence has been considered as the major cause for the obesity epidemic. This transition includes a higher energy density diet, greater saturated fat and sugar intake, marked increases in animal food consumption, reduced intake of complex carbohydrates and dietary fiber, and reduced fruit and vegetable intake. These dietary changes are compounded by lifestyle changes that reflect reduced physical activity at work and during leisure time (Chan & Woo, 2010).

Obesity is emerging as a serious problem throughout the world, not only among adults, but also among children, teenagers, and young adults. Early prevention of this condition is an important strategy for curbing the epidemic; hence it is important that risk factors that appear at an early age be identified as soon as possible. However, few studies have examined this health risk among adolescents and young adults in developing countries. Therefore, a body of evidence on the relationships between specific lifestyle practices and obesity must be built up in order to support and create policies that will allow targeting of these practices and this age group.

Objectives

The purpose of this study was to determine the relationship between lifestyle practices such as physical activity and dietary pattern and the prevalence of overweight/obesity among college students. It aimed to identify whether there will be a significant difference in the body mass index (BMI) of participants when gender and monthly allowance are considered. Finally, it analyzed which of the aforementioned variables (physical activity, dietary pattern, gender, monthly allowance) best predicts the BMI of the participants.

METHODOLOGY

This study utilized the descriptive-correlational research design in order to investigate and describe the relationships between lifestyle practices and the prevalence of overweight/obesity among college students in a selected university. A total of 173 undergraduate students between 16 to 24 years old were recruited from a selected university using convenience sampling.

The participants were asked to answer a three-part questionnaire. Part I of the questionnaire included questions on the participants' demographic profile (gender, monthly allowance, height and weight). Part II was composed of 20 items to measure the physical activity of the respondents. Physical activity was assessed in terms of intensity, frequency, and duration for each specific type of activity done by the respondents. The scores were computed by multiplying the frequency of days per week with the duration per session in minutes and the Metabolic Equivalents (MET) for each intensity level. Those scores were all added together to get the total physical activity score of the individual for the week. This computation was based on the International Physical Activity Questionnaire and is further outlined in Table 1.

Table 1
Formula for Computing Physical Activity

MET levels	MET-min/week for min episodes, days/week
Walking = 3.3 METs	3.3*min*days = …. MET-min/week
Moderate Intensity = 4.0 METs	4.0*min*days = …. MET-min/week
Vigorous Intensity = 8.0 METs	8.0*min*days = …. MET-min/week
	TOTAL = …… MET-min/week
Total MET-min/week = (Walk METs*min*days) + (Mod METs*min*days) + Vig METs*min*days)	

(By: Guidelines for Data Processing and Analysis of the International Physical Activity Questionnaire (IPAQ) - Short Form, Version 2.0, April 2004)

The Likert scale was then used to interpret the total physical activity score based on the recommendations of the Physical Activity Guidelines for Americans of the U.S. Department of Health and Human Services (2008). Table 2 outlines the interpretation of the scores.

Table 2
Interpretation of the Physical Activity Scores

Mean Interval	Verbal Interpretation
0 - 639.99	*Poor*
640 - 1240.99	*Average*
1241 and above	*Good*

Part III of the questionnaire was made up of 20 items derived from the Food Frequency Questionnaire. A seven-point Likert scale was employed to measure the dietary patterns of the respondents, where 7 was interpreted as extremely high and 1 was interpreted as poor.

Finally, the participants' BMI were derived from the height and weight information they provided in Part 1 of the questionnaire.

Table 3 presents the profile of the participants in terms of gender distribution, monthly income, and body mass index.

Table 3
Participants' Profile

Variable	Frequency	Percentage
Gender		
Male	68	39.31
Female	104	60.12
Third gender	1	0.58
Monthly allowance		
PhP 1,999 and below	55	31.8
PhP 2,000 - P 3,999	44	25.4
PhP 4,000 - P 5,999	32	18.5
PhP 6,000 and above	42	24.3
Body mass index		
Underweight (17.9 & below)	23	13.3
Normal (18-24.9)	126	72.8
Overweight (25-29.9)	19	11.0
Obese (30 & above)	5	2.9

The participants were predominantly female (60.12%). Their monthly allowance was near uniformly distributed across the board, with 31.8% of participants having a monthly allowance of PhP1,999 and below. Majority (72.8%) were of normal weight; however, 24 (13.9%) of them were either overweight or obese.

The gathered data were then analyzed using the Statistical Package of the Social Sciences (SPSS). Mean and standard deviation were used to determine the lifestyle practices of the students in terms of physical activity and dietary pattern. Pearson's Coefficient Correlation was utilized to determine the relationship between lifestyle practices and BMI. ANOVA was utilized to determine any significant differences in the students' BMI considering gender and monthly allowance, while linear regression was used to determine the independent variable that best predicted participants' BMI among the variables.

RESULTS AND DISCUSSION

Physical Activity

Table 4 outlines the physical activity level of the participants, showing that overall, they had an *average* amount of physical activity every week when the three intensity levels were combined together.

Table 4
Extent of Physical Activity of Respondents

Item	Mean	St.D	Median	V.I
Overall Score for Physical Activity	665.19	941.81	459.00	*Average*

The 2008 Physical Activity Guidelines for Americans (2008) recommend that adolescents should engage in at least 60 minutes of physical activities daily. Most of those 60 minutes should be either moderate or vigorous in intensity, and should be performed at least three days a week. As part of their 60 or more minutes of daily physical activity, children and adolescents should perform muscle-strengthening and bone-strengthening physical activity at least three days a week. The findings of this study therefore indicate that the compliance of the participants in reference to these physical activity guidelines is *average*.

Dietary Practices

Table 5 presents the overall dietary practices of the participants in reference to the six food groups.

Table 5
Participants' Dietary Pattern

Items	Mean	St.D	S.R	V.I
Meat	2.288	.77907	Less than 1 time per week	*Low*
Legumes, beans, nuts and seeds	3.26	1.11309	1-3 times per week	*Average*
Dairy (cheese, milk, yogurt, etc.)	3.36	1.3762	1-3 times per week	*Average*
Vegetables and fruits	4.37	1.3407	4-6 times per week	*Moderately high*
Grains (bread, pasta, rice, etc.)	4.57	1.698	1 time per day	*High*
Junk food	3.07	.861	1-3 times per week	*Average*

Legend: Extremely High= 6.50- 7.49, Very High= 5.50-6.49, High= 4.50-5.49, Moderately High= 3.50-4.49, Average= 2.50-3.49, Low= 1.50-2.49, Poor= 0.50-1.49

The American Institute for Cancer Research (2017) recommends that meat intake be limited to no more than 18 ounces weekly or three to six servings per week. It may be observed that in this study, meat intake had the lowest score at less than once per week. These findings differ from a study by Hosu, Arowolo and Fayemi (2015) which found that 80% of male students consumed above the recommended meat intake of 52g and 56g per day. The low intake of meat found in this study may be due to the fact that the university from which the participants were selected serves only vegetarian food in all of its food service establishments.

Furthermore, a closer examination of the meat data shows that of all the different types of meat, other meats such as duck, lamb, and venison were the most frequently eaten at four to six times per week. On the other hand, turkey was the least eaten at less than once per week. These findings may simply reflect the availability of meat in the region.

In contrast, grains such as bread, pasta, and rice were the most frequently consumed by the participants at the rate of once per day or seven times a week. Vegetables and fruits were consumed frequently as well, at four to six times per week.

The findings of low meat intake and high grain and vegetable intake in this population indicate a better diet than what is most commonly found in college students. The diet of most college students is typically lacking in fruits, vegetables, fiber, while also being high in dairy, fat, sodium, and sugar content. Their diet is also characterized by a limited variety of food, high frequency of snacking, high incidence of meal skipping for weight loss, and a high consumption of fast foods (Brunt & Yee, 2008). Poor consumption of fruits, vegetables, and dairy products, diets lacking in nutrient quality, and sporadic meal patterns increase nutritional risk and unwanted weight gain.

Relationship Between Lifestyle Practices and Body Mass Index

Table 6 presents the correlational results between lifestyle practice and BMI of college students in the selected university. The results indicate that of all the lifestyle practices, legume intake was found to be significantly correlated with BMI.

Table 6
Relationship Between Lifestyle Practices and Body Mass Index (BMI).

		Phy.	Meat.	Leg.	Dairy	Veg/Fru	Rice	Junk
BMI	Pearson r.	.149	.089	.155*	.106	.090	.106	.050
	Sig. (2-tailed)	.051	.243	.042	.167	.241	.167	.517

Further analysis of the data as will be seen in Table 9 shows that the higher the legume intake, the higher the BMI. This contradicts the current body of literature which shows declining BMIs with increasing legume intake. A study by Bailo, Jain, Keeler, and Smith (2017) showed that adults and children who consumed legumes were more likely to exhibit healthier eating patterns such as having a higher intake of nutrients such as fiber, folate, protein, calcium, and iron. They were more likely to consume their total energy from protein food instead of from sugar sources. Furthermore, adult legume consumers also ate more of the encouraged food groups such as whole grains, fruits, and vegetables. Consequently, it was seen that those who ate legumes had significantly lower BMIs than those who did not. Furthermore, children who ate legumes also had a lower prevalence of obesity.

A study by Williams, Grafenauer, and O'Shea (2008) further supports the benefits of legume intake. They found strong evidence linking a high-grain, high-legume diet with weight loss. This seems to support the conclusion that legume intake is associated with healthier diets and healthier body weights in both adults and children. Furthermore, it has been recommended that legumes be incorporated into meat products such as sausages and burgers to lower the energy density of these foods while providing important nutrients. This method could help reduce obesity and related disorders such as cardiovascular diseases and diabetes (Rebello, Greenway, & Finley, 2014).

The contrast between this study's findings and previous studies may serve as a point for further research in order to identify the reasoning behind why increased legume intake in this study was seen to be associated with increasing BMI.

Differences in BMI Considering Gender and Monthly Allowance

ANOVA was utilized to determine any significant differences in the BMI of college students considering monthly allowance, while t-test was utilized to determine any significant differences in the BMI of college students in terms of gender.

Table 7
Difference in the BMI of the Respondents when Gender is Considered

Gender	Mean	Std. Deviation	T	Sig. (2-tailed)	Interpretation
Male	22.6765	3.57412	3.420	.001	Significant
Female	20.9529	2.98732	3.295	.001	Significant

Table 7 shows that there was a significant difference in BMI when gender was considered, with males being significantly more likely to have a higher BMI than females. This finding echoes a study done among university students from 22 low and middle income and emerging economy countries which found that the male gender was associated with the prevalence of overweight/obesity in those populations (Boo et al., 2010). This may be attributed to differences in dietary patterns among the two genders, as a study based on the semi-quantitative food frequency questionnaire showed significant differences between male and female university students with respect to their regular consumption of individual food categories. Males consumed more fish, white bread, rice and pasta, carbonated beverages, fruit juice, fast food, and fried potatoes and chips than females, while females consumed more brown bread, meat, grains, olive oil, fruits, and raw and cooked vegetables. Only hot beverages and sweets were equally consumed by males and females (Salameh et al., 2014).

Table 8
Difference in the BMI of the Respondents when Monthly Allowance is Considered

Allowance	Mean	Std. Deviation	F	Sig.	Interpretation
P 1,999 and below	20.59	2.19367	2.943	.035	Significant
P 2,000 - P 3,999	21.52	3.96247			
P 4,000 - P 5,999	22.46	3.04076			
P 6,000 and above	22.26	3.99225			

Table 8 shows the differences in the BMI considering the monthly allowance of the students. It yields a p-value of .035 which indicates that there is a significant difference in BMI considering the monthly allowance of the students.

Students' monthly allowance may be considered as their income, as it functions as their source of purchasing power. Multiple studies have sought to evaluate the relationship between income and BMI, leading to various results. Globally, high-income countries have been seen to have greater rates of obesity than middle-and low-income countries. Countries that are currently seen to be developing wealth have also been experiencing increased obesity prevalence. A nationwide survey in Brazil covering a total of more than 69,000 households found that the prevalence of overweight and obesity was highest in the wealthier southern portion of the country, while the prevalence of underweight was highest in the poorer rural Northeast. Hence, it was found that obesity in Brazil was positively associated with income (Sichieri, Coitinho, Leao, Recine, & Everhart, 1994). Another study done in Brazil supported this finding, showing that the risk of obesity in men strongly increased with income. Income was also directly related with obesity in women living in less-developed regions (Monteiro, Moura, Conde, & Popkin, 2004). A similar study done in the United States on 417 children also showed that in African-American children, those with a higher socio-economic status were at increased risk for becoming overweight.

It seems that internationally, obesity coincides with greater wealth. However, a closer link at national trends specifically within America shows that those who live in the most poverty-dense counties are those most prone to obesity (Levine, 2011). Furthermore, as demographic, nutrition, and lifestyle transitions continue to occur throughout the world, the influence of income on overweight and obesity is weakening (Wang & Zhang, 2006). Over the past three decades, the prevalence of obesity has increased at all levels, regardless of income. It is also to be noted that relationships between obesity and income may occur only within certain racial groups. For example, there is a strong inverse gradient for income and obesity for white women, while a positive gradient emerges for black and Mexican-American men (Chang & Lauderdale, 2005).

With these varying findings, the links between income or allowance and increasing BMI must continue to be evaluated, as this study showed a significant relationship between the two variables.

Predictors of BMI

Linear regression was utilized in order to determine the independent variable that best predicts the participants' BMI. The following table shows that gender, monthly allowance, and intake of legumes, beans, nuts, and seeds were found to be significant predictors of BMI. Together, these variables account for 13.1% of the total variance in the BMI, with gender having the largest bearing at 8.1%.

Table 9
Predictors of Body Mass Index

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	R Square Change
	B	Std. Error	Beta			
(Constant)	21.346	1.365		15.633	.000	
Gender	-1.618	496	-.23	-3.262	.001	.081
Mo. Allowance	.538	214	.185	.514	.013	.025
Leg, Bean & Nut, Seed	.484	222	.159	2.185	.030	.025

R: .362a R2: .131 P: .000a F: 8.476
Significant if Sig ≤ .05

The findings imply that male college students are expected to have higher BMIs than female college students. More specifically, the BMIs of the female college students are expected to be lower than male college students by 1.618. Meanwhile, the B-coefficient of monthly allowance and intake of legumes, beans, nuts and seeds are positive, indicating that those college students who have high monthly allowances and high legume, bean, nut & seed diet intakes are expected to have higher BMIs. College students with high monthly allowance are expected to have high BMIs that differ by .538. Likewise, the college students with high legume, bean, nut, and seed intake are expected to have higher BMIs by .484. The equation to predict the BMI is:

College student's BMI = 21.34-1.618+.538 (monthly allowance) + .484 (legume,bean,nut & seed)

CONCLUSION AND RECOMMENDATION

The study showed that there is a significant relationship between the intake of legumes, beans, nuts, and seeds and BMI in college students. Moreover, there were significant differences in BMI when gender and monthly allowance were considered.

Based on the findings of the study, it is recommended that a follow-up study be conducted to further investigate the influence of legume intake on the BMI of students using a larger population. In addition, future programs aiming to prevent obesity must consider the influence of monthly allowance and gender on the weights of the participants and must tailor their interventions accordingly towards the more vulnerable groups identified.

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PREDICTORS OF CLINICAL PERFORMANCE OF STAFF NURSES AND STUDENT NURSES: A SYSTEMATIC REVIEW

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Abstract

The clinical performance of health personnel is one of the major considerations in achieving the millennium development goals of the WHO to reduce diseases and poverty. Hence, this study was conducted to determine the factors that hinder or advance the performance of nurses in the clinical setting. The purpose of this study was to identify the predictors of clinical performance of staff nurses and student nurses based on recent studies done in Southeast Asia. This study utilized the meta-analysis design using two databases, namely EBSCO and Google Scholar, to retrieve 16 relevant studies conducted from 2000-2016. Out of the 16 research papers, nine predictors of clinical performance were found, namely: emotional intelligence, self-efficacy, stress, social support, personal characteristics, academic performance, self-concept, work environment, and affective commitment. Stress was found to be the most studied predictor, while self-efficacy had the highest relationship ($r=0.73$) with clinical performance. The literature showed that emotional intelligence, social support, self-efficacy, self-concept, academic performance and personal characteristics have a significant positive relationship with clinical performance, while stress has a negative significant relationship. Identifying the predictors of clinical performance will help the field of nursing education give further attention to these areas in order to produce fit and capable nurses who will discharge their duties with excellence.

Keywords: *clinical performance, meta-analysis, staff nurses, student nurses*

The excellence of an institution has to start with the good performance of its people. It is a factor that determines whether the goals of an institution can be achieved. It is the performance of people that reflects the benchmark of the performance of an institution (Martires & Fule, 2000). Clinical performance is the practical application of theories, fundamentals, and concepts of the nursing process to the actual clinical environment with an actual patient. Working in the actual clinical setting dictates that nurses need to consider the life and feelings of the patient and not just merely perform actions for the sake of learning and performing the skill. As they go along their clinical duties, this body of knowledge becomes clinical skills, which in turn become their competencies in the performance of their roles and duties as professionals.

The clinical performance of health personnel is one of the major considerations in achieving the millennium development goals to reduce disease and poverty (Smith, Mossialos, & Papanicolas, 2008). The quality, efficiency, and equity of performance are all dependent on the availability of skilled and competent professional nurses when and where they are needed. One of the actions proposed by the WHO to address this is to improve the clinical performance of staff nurses. The American Association of Colleges of Nursing (2008) support this proposal, as they have stated that nursing has the potential to make the biggest impact on the transformation of healthcare delivery to a safer, better, and more cost-effective system.

Clinical performance is the ability to perform nursing tasks in a manner that yields desirable outcomes (Lane and Ross, 1998). It indicates success in applying knowledge, skills, and abilities in the right place, at the right time, with the right situation. Health workers acquire better performance in their work as time goes on. Although competence is considered to be a major milestone in professional development, it is not the final point that comes with proficiency. The ultimate status of expert comes after many years of experience and professional growth (Benner, 1984).

Currently, there is a major gap in the literature when it comes to the exploration of factors that impact students' clinical performance. This gap may be due to the difficulty in accurately evaluating and measuring clinical competence (Cowan, Norman, & Coopamah, 2005; Hunter, Levett-Jones, Piutt, & Powis, 2012). Hence there is a need to conduct a comprehensive review of the literature to lay out what has been studied and what specific areas still need further exploration when it comes to predictors of clinical performance.

Purpose of the Study

This study aimed to help bridge the gap in literature by examining the body of data through a meta-analysis of research on the predictors of clinical performance of nursing students and staff nurses from 2000-2016.

METHODOLOGY

This study utilized the meta- analysis design to conduct a complete coverage of relevant studies, examine them for heterogeneity, and explore common robust findings (Crombie, 2009). The researchers retrieved previous studies on the predictors of clinical performance of the staff nurses and student nurses from 2000-2016 using the electronic databases Google scholar and EBSCO. The following search terms were used: *predictors of clinical performance, predictors of clinical performance of student nurses, predictors of clinical performance of staff nurses,* and *influence on clinical performances.* The researchers then assessed the studies to validate whether they meet the criteria for samples. Qualified research papers were then summarized and systematically analyzed to determine common trends. They were also categorized according to scope, methodology, predictors, and significant relationships and tallied for common aspects and findings.

RESULTS AND DISCUSSION

Out of 16 research journals, the researchers extracted nine predictors of clinical performance of student and staff nurses: emotional intelligence, self-efficacy, stress, social support, personal characteristics, academic performance, self-concept, work environment, and affective commitment. Table 1 shows a summary of the research studies that were used and the corresponding predictors that the research study discussed.

Table 1
Predictors of Clinical Performance

Author	Title	Year	Country	r	r2	Predictor
N Soputri P Gaikwad	The importance of theoretical comprehension of nursing students' clinical competence	2009	Philippines	0.49 0.39	0.2401 0.1521	Theoretical Intelligence Social Support
K Bulmer-Smith J Profetto-McGrath G Cummings	Emotional intelligence and nursing: An integrative literature review	2009	Canada	None	None	Emotional intelligence
Z Zhang W Luk D Arthur T Wong	Nursing competencies: Personal characteristics contributing to effective nursing performance	2000	China	None	None	Personal characteristics
MM Bakr SM Safan	Emotional intelligence: A key for nurses' performance	2012	Egypt	0.59	0.3481	Emotional Intelligence
C Marvos F Hale	Emotional intelligence and clinical performance/ retention of nursing students	2015	USA	0.20	0.04	Emotional Intelligence
S Mohamadirizi S Kohan F Shafei S Mohamadirizi	The relationship between clinical competence and clinical self-efficacy among nursing and midwifery students	2015	Iran	0.73	0.5329	Self-efficacy
R AbuAlRub	Job stress, job performance, and social support among hospital nurses	2004	Jordan	.17 -.10	0.0289 0.01	Social Support Stress

L Akhu-Zaheya I Shaban W Khater	Nursing students' perceived stress and influences in clinical performance	2015	Jordan	-.09	0.0081	Stress
F Poorgholami S Ramezanli MK Jahromi ZB Jahhomi	Nursing students' clinical performance and professional self-concept	2016	Bangladesh	0.24	0.0576	Self-concept
AM. Beauvais N Brady R O'Shea MQ Griffin	Emotional intelligence and nursing performance among nursing students	2010	USA	.26	0.0676	Emotional intelligence
RC Nabirye KC Brown ER Pryor EH Maples	Occupational stress, job satisfaction, and job performance among hospital nurses in Kampala Uganda	2010	Uganda	-.131	0.017161	Stress
M Jehangir N Kareem A Khan MT Jan S Soherwardi	Effects of job stress on job performance & job satisfaction	2011	Pakistan	None	None	Stress
D Buhat-Mendoza JN Mendoza C Tianela E Fabella	Correlation of the academic and clinical performance of Libyan nursing students	2014	Libya	None	None	Academic Performance
Z Jahromi M Kargar S Ramezanli	Study of the relationship between nurse self-concept and clinical performance among nursing students	2015	Iran	0.24	0.0576	Self-concept
E Tantia	Stress response level and clinical performance of third year nursing students	2008	Philippines	0.151	0.0023	Stress response
BB Mergal	Personal and environmental factors as correlates of clinical performance of staff nurses	2013	Philippines	0.36 0.15	0.132 0.0023	Work environment Affective commitment

Table 2 presents the methods used by the 16 studies. Convenience sampling was the most frequently used sampling technique while random and computerized database were the least used. Furthermore, the descriptive correlational design was the most frequently used research design.

Table 2
Methodology Used by 16 Studies

Author	Title	N	Design	Sampling Procedure
N Soputri P Gaikwad	The importance of theoretical comprehension of nursing students' clinical competence	365 nursing students	Descriptive-correlational	Stratified random sampling
K Bulmer-Smith J Profetto-McGrath G Cummings	Emotional intelligence and nursing: An integrative literature review	39 articles	Integrative literature review	Computerized database
Z Zhang W Luk D Arthur ThoTmas Wong	Nursing competencies: Personal characteristics contributing to effective nursing performance	50 nurses	McBer method	
MM Bakr S Safan	Emotional intelligence: A key for nurses' performance	143 staff nurses	Descriptive cross-sectional	Convenience sample
C Marvos F Hale	Emotional intelligence and clinical performance/ retention of nursing students	104 student nurses	Exploratory, Quantitative, Descriptive	
S Mohamadirizi S Kohan F Shafei S Mohamadirizi	The relationship between clinical competence and clinical self-efficacy among nursing and midwifery students	100 nursing students 50 midwifery students	Cross-sectional	Stratified sampling
R AbuAlRub	Job stress, job performance, and social support among hospital nurses	303 nurses	Correlational descriptive	Convenience sampling
L Akhu-Zaheya I Shaban W Khater	Nursing students' perceived stress and influences in clinical performance	539 student nurses	Descriptive, correlational, cross-sectional	
F Poorgholami S Ramezanli MK Jahromi ZB Jahromi	Nursing students' clinical performance and professional self-concept	86 student nurses	cross- sectional -analytical	Census method
A Beauvais N Brady E O'Shea MQ Griffin	Emotional intelligence and nursing performance among nursing students	87 student nurses	Descriptive correlational	Convenience sample and non-probability sampling
RC Nabirye KC Brown ER Pryor EH Maples	Occupational stress, job satisfaction, and job performance among hospital nurses in Kampala Uganda	333 nurses	Non-experimental, correlational, cross-sectional	
M Jehangir N Kareem A Khan MT Jan SSoherwardi	Effects of job stress on job performance & job satisfaction	500 nurses	Correlation research design	Convenience sampling

D Buhat-Mendoza JN Mendoza C Tianela E Fabella	Correlation of the academic and clinical performance of Libyan nursing students		Descriptive, non-experimental	
Z Jahromi M Kargar S Ramezanli	Study of the relationship between nurse self-concept and clinical performance among nursing students	86 senior and junior nursing students	Cross-sectional analytical	Census method
E Tantia	Stress response level and clinical performance of third year nursing students	282 3rd year nursing students	Descriptive correlational	Pure random sampling
BB Mergal	Personal and environmental factors ass correlates of clinical performance of staff nurses	230 staff nurses	Descriptive correlational	Convenience sampling

Predictors of Clinical Performance

Stress. The predictor that was found to have been studied the most in literature is stress. There have been five studies on stress as a predictor of clinical performance. The study of AlRub (2004) in Jordan with 303 staff nurses revealed a significant relationship between stress and clinical performance (r=-.10). Another study from Nabirye, Brown, Pryo, and Maples (2010) utilized the correlational, cross-sectional design with 333 nurses and revealed a negative relationship (r=-.131) between the two. Furthermore, a study in Jordan conducted by Akhu-Zaheya, Shaban, and Khater (2015) using a descriptive-correlational, cross-sectional design with 539 student nurses also found a negative relationship between stress and clinical performance (r=-.09). In addition, a correlational study of Jehangir, Kareem, and Khan (2011) with 500 female nurses from various wards of public sector hospitals of Peshawar, Pakistan also revealed a negative correlation between job stress and clinical performance. Finally, the descriptive-correlational study of Tantia (2008) in the Philippines on 282 third year nursing students demonstrated a significant relationship between stress and clinical performance.

Stress is a normal part of life and is considered necessary to increase functional capacity. However, when stress occurs over a prolonged period of time or if it causes extreme distress, it can lead to debilitating effects that reduce work output, increase absenteeism, and reduce one's ability to cope with situations (Alzayyat & AlGamal, 2014). The studies have presented a negative correlation between stress and clinical performance; hence, determining ways to reduce stress in the environment must be done to improve the quality of nursing care given to the patient.

Emotional intelligence. Out of 16 research articles, four of them related emotional intelligence with clinical performance and found a positive correlation between the two, indicating that the higher the emotional intelligence, the better the clinical performance.

Bulmer-Smith, Profetto, and Cummings (2009) conducted an integrative literature review study on 39 articles as their sample and found several research papers that find significant relations between clinical performance and emotional intelligence. Moreover, Bakr and Safaan (2012) used a descriptive cross-sectional design to research on 143 staff nurses from Egypt and discovered a positive significant relationship between the two (r=0.59). In addition, Beauvais, Brady, O'Shea, and Griffin (2010) applied a descriptive correlational study to determine the relationship between emotional intelligence and clinical performance of 87 student nurses from the USA and found a significant correlation (r=.26). Lastly, Marvos and Hale (2015) utilized the exploratory, quantitative, descriptive design to determine the relationship between emotional intelligence and clinical performance in 104 nursing students from a large, ethnically diverse, public university located in the Pacific region of the United States. They discovered that the level of clinical performance covered five areas: noticing, interpreting, responding, reflecting, and professionalism. Their study showed that emotional intelligence sub-scores for "managing emotions" is positively correlated with the clinical performance task of "responding" (r=.20). Therefore, the nurse's ability to handle emotions is necessary to maintain a calm and confident demeanor during clinical duty.

Emotional intelligence, the ability to perceive and express emotions, is important in the workplace. This is because emotionally intelligent nursing staff deliver higher quality services and perform beyond the patients'

expectations, which in turn leads to patients' loyalty, guarantees their purchases, and affects consumer behavior positively. The research also found a positive correlation between emotional intelligence and job satisfaction. Being satisfied means being happy and content with the situation/job; hence job satisfaction leads to a better clinical performance (Ezzatabadi et al., 2012)

Self-efficacy. The predictor that was found to have the highest relationship with clinical performance is self-efficacy (r=0.73). This study was performed by Mohamadirizi, Kohan, Shafei, and Mohamadirizi (2015) in Iran among 150 students (100 nursing students and 50 midwifery students). Their cross-sectional study found a positive correlation between self-efficacy and clinical performance.

A person with a high-self efficacy is more likely to perform better in the clinical setting. They demonstrate confident behavior towards their capabilities and therefore perform better in the clinical area. Hence, interventions to evaluate and improve self-efficacy may be helpful to improve the quality of nursing performance of individual nurses.

Social support. Social support as a predictor of clinical performance was also discussed in two research papers. AlRub (2004), who researched on the social support of 303 nurses in Jordan, used the descriptive-correlational design and found a significant relationship between social support and clinical performance (r=.17). Social support was further studied by Soputri and Gaikwad (2009) in the Philippines; their study utilized the descriptive-correlational design and discovered a significant correlation between social support of the nursing students from staff nurses, clinical instructors, and their peers and the clinical performance (r=.10) of 365 nursing students. These findings indicate that stronger social support leads to better clinical performance.

Social support contributes a positive effect to the nursing practice. Family, friends, relatives, clinical instructors, and staff nurses are good sources of social support to assist in stressful situations and boost the confidence of student and staff nurses. A good relationship between the clinical instructors, the staff nurse, and the student nurse is necessary for the nursing student to have a good learning experience and absorb as much knowledge as possible.

Personal characteristics. A study by Zhang, Luk, Arthur, and Wong (2000) in China discovered 10 personal characteristics of 50 nurses that were frequently useful in clinical performance. These characteristics are the following, in descending order: interpersonal understanding, commitment, informational gathering, thoroughness, persuasiveness, compassion, comforting, critical thinking, self-control, and responsiveness.

Competency scored the highest among all characteristics. *Competency* is the combination of observable and measurable knowledge, skills, abilities and personal attributes that contribute to enhanced performance. Second among the top characteristics is *commitment*, which is the ability to engage and become dedicated to one's work. *Information gathering* is the willingness to know more about the patient's disease process and the ways to provide optimal care for him/her. *Thoroughness* is the ability of the nurse to provide critical care to the patient in an all-out manner. *Persuasiveness* is the ability of the nurse to convince the patient regarding treatment and/or medications. *Compassion* is the willingness to care for and help others; it is a manner of showing concern for the patient. *Comforting* is the ability of the nurse to provide information necessary for the patient in order to alleviate his/her worries, stress or anxieties. *Critical thinking* is the ability of the nurse to make judgments and perform the right thing based on the patient's situation. *Self-control* is the ability of a nurse to remain calm while providing patient care no matter how stressful the environment or situation may be. Finally, *responsiveness* is the ability of the nurse to respond or react to the patient's needs and concerns.

Personal characteristics are the qualities a person has within them. The specific personal characteristics mentioned above enable a nurse to perform better and more effectively in the clinical setting. These identified characteristics can help a nurse determine and improve the qualities they need to provide better and safer patient care.

Academic performance. Academic performance is the performance of the student without relation to practical or clinical performance. It may be evaluated through the final theoretical grades the students receive for the school year. In the descriptive-correlational study by Soputri and Gaikwad (2009), they looked at theoretical intelligence as a predictor of the clinical performance of 365 nursing students in the Philippines. They used the student's GPA to measure the theoretical intelligence of the students and found that theoretical intelligence does have a significant relationship with clinical performance (r=.49). Another study used the students' grades in nursing specializations to measure their academic performance and found a significant positive correlation between academic performance and clinical performance (Buhat-Mendoza, Mendoza, Tianela, & Fabella, 2014).

These studies show that a student with a high academic performance/grade demonstrates a better clinical performance compared to the others. This may be because the student's knowledge on concepts and fundamentals of nursing practice is more easily recalled and applied in specific situations. In addition, a high academic grade may increase the student's confidence to perform better in the clinical setting.

Self-concept. Another predictor of clinical performance is self-concept. Self-concept is the way an individual perceives his/herself. Achieving a positive self-concept can increase self-esteem so that they may confidently perform tasks in the clinical setting. Poorgholami, Ramezanli, Jahromi, and Jahromi (2016) conducted a cross-sectional-analytical study on 86 student nurses in Bangladesh and discovered that self-concept is significantly correlated with clinical performance (r=0.24). The same significant correlation (r=0.24) was found in the cross-sectional study of Jahromi, Kargar, and Ramezanli (2015). Their study was composed of 86 senior and junior nursing students from a university in Iran.

These two research papers support the idea that an individual with a high self-concept is more likely to perform better in the clinical setting.

Work environment. A study on 230 staff nurses from the Philippines utilized the descriptive correlational design and found that work environment is a significant predictor of clinical performance with r=0.36 (Mergal, 2013). This implies that more positive work environments lead to better clinical performance.

Affective commitment. Another predictor of clinical performance that Mergal (2013) discussed is affective commitment where r=0.15. Affective commitment demonstrates the dedication a nurse has towards work.

CONCLUSION AND RECOMMENDATION

Out of 16 journals evaluated, this study came up with nine predictors of clinical performance of student and staff nurses: emotional intelligence, self-efficacy, stress, social support, personal characteristics, academic performance, self-concept, work environment, and affective commitment. Identifying the predictors of clinical performance will help the field of nursing education give further attention to these areas in order to produce fit and capable nurses who will discharge their duties with excellence. Factors that contribute to an effective clinical performance must further be studied in order to improve the standard of health care and services provided for the patients.

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STUDENT NURSES' FIRST PATIENT DEATH EXPERIENCE IN THE CLINICAL DUTY: A PHENOMENOLOGICAL STUDY

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Abstract

This study explored the experience of student nurses regarding their first patient death during clinical duty. A qualitative research design using the phenomenological approach was employed. A semi-structured interview was conducted with 11 purposively selected nursing students. Colaizzi's method was used for analysis. Themes from the transcribed data were generated. The data was validated with the participants' clinical instructors and block mates. The three domains that emerged from this study are: personal experiences, coping mechanisms, and perception towards the nursing profession. *Personal experience* had three sub-themes: intrapersonal experience, interpersonal experience, and impact of death. *Coping mechanisms* introduced two sub-themes: emotion-focused and problem-focused coping mechanisms. Two emergent themes arose from *perception towards nursing profession:* positive and negative. This study underscores the importance of placements and programs in the clinical setting that support and strengthen the coping mechanisms of nursing students.

Keywords: *first patient death experience, clinical duty, Colaizzi's method*

Death is perhaps the greatest loss an individual can experience. It is an inevitable end to human life. Nurses play an important role in helping a dying patient end their life with dignity. It is the nurses' responsibility to establish meaningful relations with patients at the end of life (Browall, Melin-Johansoson, Strang, Danielson, & Henoch, 2010).

Nurses who are already working may have already developed coping mechanisms and ways that help them deal with death cases. As for the nursing students who monitor and provide care to the dying patient, the phenomena can be emotionally demanding and can have an impact on their practice. Studies have demonstrated that nursing students have difficulties in dealing with death (Parry, 2011; Edo-Gual, Tomas-sabado, Bardallo-Porras, & Monforte-Royo, 2014; Strang, Bergh, & EK, 2014) and feel emotionally unprepared to care for dying patients (White, Coyne, & Pattel, 2011).

Parry (2011) as cited in Heise and Gilpin (2016) confirmed that nursing students experience considerable anxiety, including feelings of being unprepared for the death of a patient. Students described not knowing how to reconcile their feelings with how they believed they were expected to react (Gerow et al., 2010), and they reported feeling inadequately unprepared for the situation (Parry, 2011). Ek et al. (2014) cited studies from Deffner and Bell (2005) and Cooper and Barnett (2005) stating that nursing students can feel helpless, guilty, and distressed while caring for dying patients. Such emotional reactions limit the professional ability of nursing students to care for dying patients and make it difficult for the students to comprehend the emotional responses of the patients and their families. In addition, previous research indicates that nursing students have little support from clinical instructors at the time of a patient's death and later (Huang, Chang, Sun, & Ma, 2010).

Assisting student nurses to develop coping skills with regard to the death of patients is important, as student nurses may not be able to distance themselves from getting attached to the patient within the short period of care. While nursing students assist families in the grieving process, they seldom learn how to deal with their own feelings of sadness or loss. However, current researches that talk about how student nurses cope with a patient's death are scarce and mostly anecdotal.

This study was conducted to address the scarcity of the literature on the topic of coping amongst nursing students. Most current studies focus on staff nurses; however, student nurses who are likely to ex-

perience patient death also need guidance to cope with the phenomena. This study seeks to address that dearth by examining the structure of coping from the nursing students' point of view regarding their first experience of patient's death during the clinical duty.

Objectives

The objectives of the study were to explore the different experiences of nursing students regarding their patients' death, identify their coping strategies, and evaluate the impact of the experience on their views of the nursing profession.

METHODOLOGY

A qualitative phenomenological approach was adapted in this study. The researchers used a purposive sampling method to recruit 11 participants using the following criteria: (1) have experienced the death of a patient first-hand, (2) are currently second to fourth year nursing students, (3) are 18 years old and above, and (4) can properly understand what is being asked of them and can articulate themselves in a way that can be clearly understood.

A semi-structured questionnaire composed of open-ended questions was used as a guide during the interview. A voice recorder was used to record statements from the participants, and the data gathered were transcribed and analyzed. Observations from participants' facial expressions and non-verbal gestures were noted by the researchers.

Triangulation was accomplished through participants, fellow students, and clinical instructors who also witnessed the death of the patient to identify any discrepancies and validate the results. The researchers utilized a checklist for the students and clinical instructors to describe the participant's reaction, emotions, and behavior during the scenario to verify the statement. For transcriptions, the researchers conducted follow-up interviews with the participants to validate the data gathered.

Colaizzi's Method was used to analyze the data. This method consists of seven steps. First, the participants' descriptions of their experiences were read in order to acquire a sense of the whole situation. Second, significant statements that were related to the study were highlighted. Third, those highlighted statements were sorted into groups to formulate meanings and reduce overlapping expressions of the participants. Fourth, meanings were clustered into themes. Fifth, themes were categorized into divisions and subcategories. Sixth, the themes were integrated into a comprehensive description. The researchers formulated and exhausted the description of the phenomenon under the study in as unequivocal a statement of identification as possible. The researchers placed all existing assumptions and biases in abeyance, so as not to influence the data. Finally, the results of the research study were presented to the participants to verify the statements and to validate if there were other aspects of their experience that were omitted or overlooked by the researchers.

RESULT AND DISCUSSION

Personal Experiences Regarding the First Patient Death

The encounter with death constitutes one of the most stressful experiences reported by nursing students during their clinical training (Edo-Gual et al., 2014). The first experience with patient death may pose considerable cognitive, emotional, and clinical challenges because they expect patients in the hospital to recover. Hence, nursing students may experience despair when faced with the unexpected death of patients (Anderson, Kent, & Glynn, 2015; Park, Jee, Kim, & Kim, 2014).

The analysis led to the identification of 10 theme clusters. These clusters transpired through finding common attributes from 56 meaningful statements that led to the saturation of significant statements. Through a process of abstraction and interpretation, the 10 theme clusters were grouped according to relevance, which consequently yielded three emergent themes. Table 1 presents the themes and theme clusters that emerged from the study regarding the personal experiences of the student nurses with regards to death.

Table 1
Personal Experiences of Student Nurses Regarding Their First Patient Death During Clinical Duty

Theme No.	Emergent Theme	Theme Clusters
1	Intrapersonal Experiences	Shock Sense of foreboding Powerlessness Distress Guilt and Regret Empathy
2	Interpersonal Experiences	Benevolence Compassion
3	Impact of Death	Enriching Experience Intrusive Thoughts

Theme 1: Intrapersonal experience. The participants reported that the experience of patient death invoked overwhelming feelings and emotions of *shock, sense of foreboding, powerlessness, distress*, *guilt*, and *regret*.

Shock. The student nurses' initial reaction of shock was due to the unexpected event that occurred during their clinical duty and their relative unpreparedness. It may also be due to inadequate orientation to the new environment. The impact of this is their realization that practice in the clinical setting is quite different from what they had expected or even imagined (Park et al., 2014).

> *"I was shocked, knowing that his case, based on what we have read, is manageable"* - Participant #6

Participants also talked about their experiences in emergency situations when the patient is on the verge of dying. Emergency nursing is, by nature, sporadic and unpredictable. Licensed nurses are already equipped in emergency situations, but for novice student nurses, this dimension of clinical practice is new. They stated:

> *"It was shocking; we only did an interview at that time. Then I went back to the student nurses' area. After 30 minutes, the nurses suddenly rushed to my patient."* - Participant #7
>
> *"I was surprised because nothing bad didn't seem to be actually happening. It's like, I was just absent for a few seconds or minutes, then the patient was already dead."* – Participant #6

There were also participants who further expressed their shock because they were able to experience actual death in front of them for the first time.

> *"I was very shocked because I've never seen a dead patient before."* - Participant #11

Sense of foreboding. The participants expressed a fear of encountering dying or recently deceased patients.

> *"Do you know the feeling when you see that your patient can hardly breathe, and you're the one who is pumping the Ambu bag? Scary. My actions were just like a robot - I'm just doing it, but deep inside I don't want to."* – Participant #7
>
> *"It was very scary because one second, they were just walking with me (nurses) to the room and everything was sort of okay. And then before I knew it, they were telling me he's having a heart attack."* - Participant #11

The participants expressed a fear of dealing with dead and dying patients as they viewed this as an encounter with the unknown.

> *"I feel nervous because I didn't know what will happen."* - Participant #8
>
> *"During the encounter, I felt obviously nervous when they were asking me to help insert the tubes."* - Participant #11

Some participants expressed that they lost the ability to remain calm.

> *"I panicked because the patient needed CPR."* - Participant #2
>
> *"The nurses suddenly rushed to my patient calling for epinephrine and Code Blue, and so I panicked."* - Participant #7

The statements regarding foreboding echo the theme that "The thought of death is more frightening than the actual experience" which emerged from the study of Ek et al. (2014). He stated that the first encounter with death appears to fill student nurses with different emotions of fear or nervousness. Fear is defined as an unpleasant, short-term emotional state that one may experience throughout his or her course of study. The demands of such an experience are compounded by the emotional fear and the trepidation of the unknown (Mumbre, 2010).

Powerlessness. The situation of desperately wanting to help someone who is dying, but knowing that there is nothing more that can be done, or not knowing what more one can do, invokes feelings of absolute helplessness in student nurses (Rooyen, Laing, & Kotze, 2005). This was seen in the following statements:

> *"It seems like my efforts were useless. He was not revived."* - Participant #2
>
> *"I didn't know what to do."* - Participant #3 and Participant #5
>
> *"We couldn't do anything much. We stood and observed."* - Participant #4
>
> *"I'm sad because I wasn't able to do anything."* - Participant #8
>
> *"I had no idea what I was supposed to do."*- Participant #11

Huang et al. (2014) conducted a similar study and observed that when seeing doctors and nurses dealing with an emergency situation where a patient is on

the verge of losing his or her life, student nurses tend to feel that they are not helpful at all, and consequently do not have a sense of presence. Worse, they consider themselves as a burden that should be moved away from an urgent and fearful space, which tends to decrease their self-esteem.

Distress. The death of a patient is a difficult time for everyone involved, including the health care team. Nursing students can feel helpless, guilty, and dis¬tressed while caring for dying patients. Such emotional reactions limit their professional ability to care for dying patients and make it difficult for them to comprehend the emotional responses of the patients and their families (Cooper & Barnett, 2005). The following statements describe this experience:

> "*I cried because it was so depressing, especially after I've done my best...*" - Participant #6
> *"I was sad because I took care of the patient for days."* - Participant #9
> *"I was sad. It was a heavy feeling because that was the first time I saw someone die."* - Participant #10

Two participants also reported getting emotional in the aftermath of the event. They expressed that they experienced heavy feelings and felt like they were physically and emotionally drained. They stated:

> *"Everything stopped, I cried. Everything really stopped."* - Participant #9
> *"After that, like after all the adrenaline left. I was so tired and sad, like I kind of wanted to cry because I had never been that close to death."*- Participant #11

A similar study by Heise and Gilpin (2016) found that the majority of students described emotional distress such as feeling upset, sad, uncomfortable, bad, helpless, or guilty. However, Muir (2002) says that sadness relating to the death of the patient is entirely normal and that a nurse should not feel that she is being unprofessional, nor feel ashamed about crying with family members (Rooyen et al., 2005).

Guilt and regret. The participants expressed guilt and regret as a result of not being able to intervene to prevent the death of their patients. They felt that there were things that they should have done or should not have done to stop or to interrupt the event.

> *"I felt guilty, and started to ask myself, 'Was that my fault?' I felt hurt inside.* - Participant #3
> *"It was a distressing feeling because I felt I wasn't able to do anything because I'm still on training."* -Participant #8

In the Asian context, Huang et al. (2010) stated that students who are new to nursing become concerned that due to their lack of knowledge, they may not have seen something that was important. Nursing students are worried about missing a clue that might have alerted someone to a potential problem (Niederriter, 2009).

Furthermore, nurses who have a strong desire for optimal outcomes may look for clarification and absolution when the outcomes are not achieved. While most nurses in Anderson et al.'s (2015) study viewed this positively, a few nurses found themselves burdened with ongoing guilt and regrets about their experiences. A metasynthesis study of Zheng et al. (2016) revealed that nurses and student nurses feel guilty for failing to provide more support and that they were left on their own to deal with their emotions toward patient death.

Theme 2: Interpersonal experiences. Students who are responsible for basic nursing care can spend a great deal of time with patients during their clinical placements. When death inevitably happens, nursing students try to soothe the demands of the patient and the remaining family members by offering oneself.

Empathy. Yu and Kirk (2009), as cited in Ouzoni and Nakaki (2012), stated that empathy is the capacity to participate vicariously and understand the experience and emotions of others. It can be described as the nurse's desire to understand what a patient is experiencing from the patient's perspective. This intellectual understanding allows the nurse to identify the patient's concerns more clearly. When the unanticipated occurrence of death transpired, participants of this study expressed having an understanding of the feelings brought about the situation. They disclosed:

> *"I felt sad for them; I empathized with them because I know the feeling of losing someone."* - Participant #1
> *"It was so sad because the family was expecting the baby and I was sad for the mother."* - Participant #5

Researchers agree on the positive role empathy plays in interpersonal relationships when providing health care. A study states that to prevent feelings of hopelessness, participants use empathy to build a rapport with patients and their relatives, so they feel able to discuss priorities for care (Bradshaw, 2011). Personal encounters with patient death enrich the individual's view of holistic nursing and empathy towards patients and families (Dorney, 2014).

Benevolence. Benevolence refers to the disposition to do good (Merriam-Webster, 2018). Participants of the study asserted that during and after the occurrence of the death of their patient, they had the desire to help the grieving family members. They felt a sense of responsibility to assist the family members. They expressed:

> *"I'm willing to help as much as I can."* - Participant #1

Butts (2015) stated that throughout nursing history, nurses have placed a high importance on benevolence, or kindness. The foundational concepts of nursing include doing good, promoting acts to benefit others, preventing harm, or doing no harm. Nurses who use benevolence as a central motivating factor do not just perform acts of kindness in a haphazard fashion when the opportunity arises; they seek out ways to perform acts of kindness rather than only recognizing ways to do good.

Compassion. The personal encounter with patient death enriched the participants' view of holistic nursing and compassion towards patients and families. Participants felt a connection with some patients and their families. Two participants stated:

> *"That patient is special for me."*- Participant #2
>
> *"I was the one who took care of the patient, that's why I felt an attachment to the patient for some reason."* - Participant #9

Participants also expressed performing simple gestures of compassion during and after the event and doing their best to make themselves available to the family members. They stated:

> "*I needed to be strong for the family because it was very distressing. The family was crying, and you too would cry."* -Participant #2
>
> *"We comforted the watcher because she was alone."* -Participant #7
>
> *"I tried to be strong for the patient in front of the family."* - Participant #10

As these participants reported, it is essential to provide a caring and compassionate environment with prompt and clear directions regarding accommodations for the patients and their bereaved families. Compassion for others is one of the main motivating factors for most individuals who join the nursing profession. Indeed it could be argued that nursing care is synonymous with compassion (Mills, Wand, & Fraser, 2014).

As participants sought to make sense out of this experience, they discovered that this experience fostered their compassionate care for the dying and for the family. Historically, developing "compassionate character" was the impetus for care, and gave the nursing profession its ethos. In Florence Nightingale's view, good nurses are good people who cultivate certain virtues or qualities in their character – one of which is compassion (Middleton, 2011).

Theme 3: Impact of death. This emergent theme describes the concomitant influence of the patient death on the participants after the death had occurred.

Enriching experience. Participants voiced that they felt privileged upon encountering patient death. It was a learning experience that made them conscious of their strengths and vulnerabilities as novices in the clinical practice. Participants voiced enthusiasm regarding the encounter, as they dealt with an experience that was previously unknown to them and therefore made an impact on their clinical duty experience. They said:

> *"There's a part that feels exciting because I see an actual patient dying."-Participant#7*
>
> *"It was exciting because I've never done it before."*- Participant #11
>
> *"I became more cautious because sometimes I'm taking for granted the things that I do, but after that, it's like in everything you do, you have to ask'what if.' What if your one mistake can cause the death of the other people?"* – Participant #8

The participants' responses echo the study of Edo-Gual et al. (2014) wherein the students also said that they learned things from a professional point of view, in that they had acquired greater knowledge about the process of dying and the needs of patients and families. This kind of learning was highly valued by the students, as they recognized that the experience not only increased their competences in this area, but also helped them to modulate their own response to death. Despite the impact that the first experience of death can have, all the students also spoke about the process of learning and growth. Edo-Gual etal. (2014) also cited studies (Huang et al., 2005) which suggested that having to face the reality of death can act as a stimulus to personal growth, as it enables the person to take on board difficult experiences, giving them meaning and incorporating them into a system of values.

Intrusive thoughts. An intrusive thought is an unwelcome involuntary thought, image, or unpleasant idea that may become an obsession, is upsetting or distressing, and can be difficult to manage or eliminate (OCD Action, n.d.) Examples of intrusion are flashbacks and nightmares where the event is re-experienced. Participants described these symptoms to the researchers. Participants in the study also stated that they had dreams and trances after their encounter with a patient's death and that this lasted days to weeks. They stated:

> *"When I woke up, I remembered her again because she was my first patient who died. I experienced it for two weeks."* - Participant #2
> *"There's one time that I dreamed of him."* - Participant #6
> *"Weeks after the death of the patient, I still dream about it."* - Participant #9
> *"It's like one week or two weeks that I'm seeing his face. It was because I was looking at him when his eyes were still open and I was the one who closed his eyes."* - Participant #10
> *"Sometimes when I'm not thinking of anything, his actual face suddenly flashes in my memory."* - Participant #10

A study by Anderson et al. (2015) similarly reported that participants who are experiencing intrusive thoughts after the occurrence of their patient's death are those that have been greatly affected by the event and experience on-going distress. One of the most striking features of these accounts is the vivid recall of details provided by participants. In addition to readily providing details of their own thoughts, actions, and feelings at the time, most participants spontaneously recalled the name and age of the patient who had died, pertinent information about family members, and in some cases, highly specific clinical details. Many reported that they had thought about the experience numerous times since it had occurred.

Coping Strategies

Psychologists Richard Lazarus and Susan Folkman (1984) scientifically defined coping as constantly changing cognitive and behavioral efforts to manage specific external and or internal demands that are appraised as taxing or exceeding the resources of the person. The coping mechanism domain concerns the ways students cope with their thoughts, feelings, and experiences after the death of their patient. Table 2 outlines the coping strategies utilized by the student nurses involved in this study.

Table 2
Coping Strategies Used by Student Nurses in Dealing with Patients' Death

Theme No.	Emergent Theme	Theme Clusters
1	Emotion-Focused Coping Mechanism	Praying for Guidance and Strength Seeking Support Distraction Distancing
2	Problem-Focused Coping Mechanism	Acceptance

Theme 1: Emotion-focused coping mechanism. Emotion-focused coping mechanism refers to strategies aimed at reducing emotional distress and maintaining a satisfactory mental state, such as dealing with the problem and regulating emotion through palliation. Emotion-focused coping is used when a situation is appraised as unchangeable.

Praying for guidance and strength. The concepts of religion and spirituality comprise different dimensions (affective, cognitive, and behavioral), and prayer is considered an expression of the behavioral dimension. Adults who are dealing with negative life issues and stressful situations often use prayer.

Some of the participants in this study strongly emphasized the value of gaining strength from spiritual beliefs and from being able to pray for the patient's death and family.

> *"I prayed that my patient's family are okay."* - Participant #1
> *"I prayed at that moment."* -Participant #2

As spiritual beliefs increase, there is an increased belief in the ability to overcome barriers. This finding indicates that spirituality is an essential coping mechanism in a stressful or aversive situation.

Seeking support. Seeking support describes personal efforts in seeking informational and emotional support. This support lets the person know that they are loved, cared for, esteemed, valued and that they belong to a mutually obliging communication network. Most of the participants in this study spoke to either friends or clinical instructors about what happened and what they experienced, mainly because all of them have participated in the care of the patient at some point, thus creating a bond.

> *"I asked help from my CI; she comforted me. My fellow student nurses were also there."* - Participant #3

"I opened up to my friends because it's hard to keep it to yourself." - Participant #9

Distraction. Distraction has been considered a type of emotion-focused coping (Lazarus and Folkman, 1984) which involves minimizing the emotional distress related to a stressor by using behaviors such as watching television, exercising, reading, or engaging in other pleasurable activities to distract oneself from the stressful event.

"I went out with my friends to always have fun because if I'm alone, I remember him." - Participant #2

"I went out to entertain myself because I really had a hard time then." - Participant #9

.

With the exception of one study which found that people high in self-compassion were no more likely to try to do things to take their mind off of negative events, research has not provided insight into how self-compassion might be related to the use of distraction as a means of coping with difficult and distressing events. One question to be addressed is whether distraction is more adaptive in the face of unchangeable stressors.

Distancing. Another theme that cropped up among the comments was the feeling of being emotionally distant from the circumstances of the patient's death. The personalities of nurses may have had some influence on whether or not they reacted emotionally to a patient death. Some nurses perceived they were not affected by death and therefore would not find a debriefing session helpful.

"After that incident, we didn't talk about it. My duty partner and I decided not to talk about it because it reminds us of what happened. We tried to avoid the topic." - Participant #6

Distancing describes efforts to detach oneself from the situation and implies avoiding becoming involved with others on a psychosocial level. This coping strategy has been documented as being most evident in the nursing profession where constant exposure to illness and death renders nurses helpless in a stressful environment. By pulling back their conscious awareness of what is occurring within their patients and themselves, they unconsciously guard and defend their personal psychological integrity.

Theme 2: Problem-focused coping mechanism. Problem-focused coping mechanisms refer to individual efforts to deal with the sources of stress, by either changing their own behavior or the environmental conditions which precipitated the event (McLeod, 2015). Problem-focused coping includes aggressive interpersonal efforts to alter the situation, as well as cool, rational, deliberate efforts to problem solve.

Acceptance. This theme explains that an individual can recognize a situation's process in an uncomfortable condition and choose to confront their past experiences. More importantly, they accept that suffering is necessary for them to gain valuable knowledge and grow character.

"I had to accept it; we were content we tried our best. There was no regret." - Participant #4

"It didn't really traumatize me for anything that much. I realized that I was, like, you know this is part of life. I just kind of accepted it." - Participant #10

The feelings of acceptance are realized by those participants saying that the event helped them understand and accept the fact that as a future nurse, situations like this could always arise. Since this theme cluster is seen to alleviate the emotional response of the participant, this coping mechanism may help the individual go forward and learn from the experience.

Perception of Nursing Students Toward the Nursing Profession

This section describes how nursing students viewed the nursing profession after experiencing the death of a patient during clinical duty. It also describes how they looked at the experience as a whole and how it shaped their vision about nursing as a future career. Table 3 identifies the themes that emerged.

Table 3
Perception of Nursing Students Toward the Nursing Profession

Theme No.	Emergent Theme	Theme Clusters
1	Positive	Readiness Motivation Confidence
2	Negative	Uncertainty

The study found that the experience of patient death influenced the student nurses' perception of the nursing profession, mostly in a positive way.

Theme 1: Positive nursing perception. Nursing care of the dying is a particularly demanding role that requires nursing skill and also necessitates that nurses have insight into their personal beliefs about

death and dying. Nurses who have a more positive attitude towards death are more likely to have a positive attitude towards providing end of life care for patients.

Readiness. Readiness is an essential and primary element in the profession; therefore the nurse should be ready to work under challenging circumstances. The nurse's readiness prepares him or her to overcome stress, focus on helping the client, be ready to accept death if it occurs, and comfort the client's family.

The experience of patient death was not easy as mentioned by the participants; it became a reminder of the amount of readiness and alertness that is required for the job. The participants pointed out that nurses should be ready to provide care to patients and make sure all their needs are met. They were also reminded to be ready when death happens so that they handle things professionally and don't collapse due to stress.

> *"As a nurse, you really need to perform your role. Because if your patient is high-risk, you need to fully monitor him to be safe. You need to be serious in your duty."* - Participant #1
>
> *"Nursing is hard because you have to experience those things. As a nurse in the future, you will experience those things. That's why you should be ready for it."* - Participant #7

According to Anderson, Williams, Bost, and Barnard (2008), students look beyond death and see it as a preparation stage for dealing with such cases in the future. Students who reported personal or professional experience with death had more positive attitudes and higher knowledge. Charalambous and Kaite (2013) stated that the death experience becomes a stepping stone in students' careers and makes them ready to carry out their future responsibilities toward patients who are dying with integrity and professionalism.

Confidence. The experience reminded the nursing students to take control of themselves and think positively. It made them more confident in handling dying patients and made them realize how important their role in helping others is.

> *"I became strong…I want to experience doing something, to be of help."* - Participant #2
>
> *"From someone who didn't want to be a nurse before, I am pursuing it more now to become a nurse to be able to help other people. With this experience, I was pushed to be a better person and to be a better nurse."* - Participant #9

The effort to accept death peacefully and look back on their life proves that the nursing students' experience of the death of patients had a positive effect on them, encouraging them to lead their lives in a more desirable direction. A study by Park et al. (2014) stated that nursing students expressed that the experience gave them a chance to consider death, life, and the nursing job seriously.

Motivation. The patient death experience is a bitter one for nursing students, but it also can be the base from which motivation rises to develop self and make necessary changes to be better nurses. The following are some of the statements that the participants shared:

> *"I realized that I really like nursing because nurses have the chance to witness the stages of life from birth to death. And it was a privilege to handle the situation. It's a motivation."* - Participant #3
>
> *"It motivated me more to lessen the risk of patient death. It drives me to do a better job in taking care of my patient."* - Participant #4
>
> *"It pushed me to be better and save people. I was disappointed, but I also saw it as a stepping stone that I should learn from."* – Participant #5

Theme 2: Negative nursing perception. Witnessing the transition of caring for a living human being who then becomes a dead body may be emotionally arduous.

Uncertainty. Hesitation and doubt to pursue a nursing career can arise after a stressful event such as the death of a patient. The students felt the burden of responsibility, perceiving patient's death as a stressful and risky situation. One participant showed uncertainty through this statement:

> *"It's like half and a half for me now if I would still pursue nursing. It was sad for me because I see dying patients. But then there are these lives depending on me."* - Participant #6

CONCLUSION AND RECOMMENDATION

The results of this study provide an understanding of nursing students' patient death experience in the clinical duty. Participants recognized their feelings of sadness, anxiety, and fear. However, they also felt supported and further recognized the value of the learning experience for future practice. This study underscores the importance of placements and programs in the clinical setting that support and strengthen the coping mechanisms of nursing students.

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SEX EDUCATION FROM HOME AND SCHOOL: THEIR INFLUENCE ON ADOLESCENTS' KNOWLEDGE, ATTITUDE, AND BELIEFS TOWARD SEXUALITY

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Abstract

It is an undeniable reality that adolescents are taking on more initiative in trying new things and learning more about their bodies and environment in relation to their sexuality. The purpose of this descriptive-correlational study was to determine the influence of sex health education from home and school on adolescents' knowledge, attitudes, and beliefs towards sexuality. A total of 247 participants ages 12-18 years old were randomly selected to answer an adapted questionnaire. The results show that the level of sex education received at home and school is *fair*. Adolescents have *high* knowledge but *negative* attitudes and beliefs regarding sex. Sex education received at home and school had a significant influence on the adolescents' attitudes (*p-value-0.000*) and beliefs (*p-value-0.000*) regarding sex. There was no difference in sexual knowledge, attitudes, and beliefs when age, gender, religion, family structure, socioeconomic status, and ethnicity were considered. It is recommended that schools implement a well-constructed program that addresses sexuality-related concerns of adolescents. Furthermore, resources should be made available to parents who need support in educating their children on this topic.

Keywords: *sex health education, knowledge, attitudes, beliefs*

Sexual health, also known as reproductive health, is not merely the act of sex; rather, it is the physical, mental, and social effects of sexuality on one's entire well-being. It involves the freedom to reproduce and the formation of a self-satisfying family plan (Ross, 2013).

Sexual development occurs during adolescence, at which stage the adolescent experiences self-discovery along with cognitive and physical development. During this phase, the adolescent experiences puberty and learns how the reproduction system functions. Depending on the religious and cultural norms to which he/she belongs, the adolescent learns how to behave according to religious values regarding sex before marriage, how to resist pressure to have sexual intercourse, and many other related issues.

The education and awareness gained from schools, parents, and other sources of information are thought to be beneficial for the adolescent during their sexual developmental stage (Locke, Cohen, Walker, Johnson, & Olsho, 2009). However, problems arise when the sources of information about this important topic are peers, internet, and media. These might portray a distorted image of what healthy sexual behavior and practices are, causing the adolescent to have a misunderstanding of healthy relationships, consent, and boundaries, and thus affect how they develop and engage in healthy sexual behaviors (Bellavance, 2014). For this reason, Baber (2005) points out that many parents, policy makers, and professionals generally prefer that young people practice abstinence until they attain social, cognitive, and emotional maturity.

Using data from the United States consisting of 1,000 adolescents, a 2009 study conducted to assess the attitudes and opinions of adolescents and their parents about sex and abstinence showed that 62% of the adolescents strongly agreed that engaging in sexual activity is reserved only for married couples. However, some adolescents were more permissive when it came to particular situations such as having sex when they are planning to get married, using birth control, and being in a relationship for over a year and feeling good about it. Around 46% of the respondents agreed with the idea that there is little that parents could do to prevent them from engaging in sexual intercourse (Locke et al., 2009).

De Jose (2013) conducted a study on 1,412 undergraduate Filipino students Manila regarding their sexual attitudes and behaviors. Fifty-six percent of the respondents viewed sex as sacred and only reserved for married couples while 48% have had an intimate relationship with their partners. When compared with the 1995 study, it is evident that there has been a decline in

attitudes and beliefs in the past two decades. The results showed that in a population of 1,295 students in 1995, approximately 90% of the respondents had an unacceptable attitude toward pre-marital sex and recreational sex. In the same year, the Nationwide Young Adult Fertility survey reported that 82% of the young Filipinos have never had any type of sexual intercourse (Lacson et al., 1995).

With these changes in adolescents' sexual attitudes and behavior through the years, there is a need to identify effective and efficient channels to provide guidance and education to adolescents regarding their sexual health. As the topic is still culturally sensitive, few studies regarding the process by which adolescents acquire their beliefs and attitudes on sexuality have been conducted in the Philippines. Hence, the researchers intended to look into the role of home and school in shaping the mindset of adolescents concerning sexual health.

Objectives

This study aimed to evaluate the education adolescents receive regarding sexual health from both the home and the school. It also aimed to investigate any relationships between the sex education received by the participants and their knowledge, attitudes, and beliefs.

METHODOLOGY

This descriptive-correlational study was conducted on 247 students between the ages of 12 to18 years who were randomly selected from three secondary schools, with no restrictions placed based on gender, religion, or culture.

Participants were asked to answer an adapted questionnaire based on the assessment tool developed by Rodriguez (2013). The instrument had five parts. The first section focused on demographic information such as gender, age, and family structure. The second part of the questionnaire assessed the content of the education that the participants received from the home and the school. The last three parts of the questionnaire measured the knowledge, attitudes, and beliefs the participants had regarding sexuality.

The data were encoded into the Statistical Package for Social Sciences. Frequencies and percentages were used to describe the demographic profile of the participants, while mean and standard deviation were used to determine the level of sex education received by the participants. Pearson's Product-moment Correlational Coefficient was used to determine the relationship between the level of sex education and the adolescent's attitude and beliefs towards sexuality. T-Test and Mann-Whitney U Test were used to determine significant differences in the adolescent's attitude and beliefs towards sexuality when demographic variables such as gender, religion, family structure, socioeconomic status, and ethnicity were considered.

RESULTS AND DISCUSSION

Sexual Health Education Received from Home

Table 1 presents the findings regarding sexual health education received from the home. Overall, their mean score for sexual health education is interpreted as *fair*. The action most done at home was teaching about puberty and/or physiologic changes to expect when growing up ($\bar{x}$=2.5425). The actions that were least done at home were discussing parents' personal sexual experiences ($\bar{x}$=4.4939), and teaching about premarital sex ($\bar{x}$=4.4656) and safe sex practices ($\bar{x}$=4.1053).

Table 1
Sexual Health Education Received from Home

Items	Mean	Std. Deviation	Scaled Response	VI
1. Gives advice and guidance on:				
a. What to do in relation to courtship	2.8704	1.19595	Sometimes	*Fair*
b. How to deal with relationships	2.9433	1.2481	Sometimes	*Fair*
c. How to deal with intimacy	3.2591	1.24844	Sometimes	*Fair*
d. How to avoid consequences of sex	3.0931	1.47176	Sometimes	*Fair*
2. Openly communicates about beliefs and values relating to sexuality	3.1741	1.28707	Sometimes	*Fair*
3. Shares personal stories about:				
a. Dating	3.3644	1.36031	Sometimes	*Fair*
b. Sexual experience	4.4939	0.9954	Rarely	*Poor*
4. Open to discussions about child's own beliefs or experiences with them	3.413	1.20615	Sometimes	*Fair*
5. Doesn't want child to talk about sexual things	2.7206	1.35809	Sometimes	*Fair*
6. Teaches child about premarital sex	4.4656	0.98661	Rarely	*Poor*
7. Teaches child about being friends with members of the opposite sex	3.4818	1.349	Sometimes	*Fair*
8. Approves hanging out alone with members of the opposite sex	3.4737	1.27448	Sometimes	*Fair*
9. Has taught child about:				
a. Puberty or other physiologic changes to expect when growing up	2.5425	1.22856	Sometimes	*Fair*
b. Safe sex practice	4.1053	1.27078	Rarely	*Poor*
c. Contraceptives	3.9433	1.26428	Rarely	*Poor*
d. Sexually transmitted diseases	3.7328	1.38571	Rarely	*Poor*
e. Male and female genital anatomy	3.5506	1.36017	Rarely	*Poor*
d. The process of reproduction and pregnancy	3.3198	1.39647	Sometimes	*Fair*
Grand Mean	**3.4415**	**0.64009**	**Sometimes**	***Fair***

Legend: 1-1.49 = Always, very good education; 1.5-2.49 = Often, good education; 2.5-3.49 = Sometimes, fair education; 3.5-4.49 = Rarely, poor education; 4.5-5 = Never, very poor education

The study shows that the respondents sometimes receive sexual health education at home, and that most of the education the students receive from home is about courtship and the physiologic aspect of sexuality rather than the personalized sexual behavior experienced by parents or siblings. As pointed out in the grand mean, the education received from home is only *fair*; therefore, it is insufficient to help the adolescents have the right knowledge, attitudes, and beliefs toward sexuality. It may be implied that students are not properly taught regarding issues such as premarital sex and safe sex practices at home.

This finding echoes a study by Olubayo-Fatiregan (2012) which revealed that most parents do not teach their children about sexuality. Parents believed that sexuality, being reserved only for married couples, is not to be taught nor discussed because it will encourage adolescents to engage in sexual activities. Further, a study by Sathe and Sathe (2005) showed that while 64.2% of boys and 79.4% of girls discussed their friendships with people of the opposite sex with their parents, topics such as sexual intercourse were discussed by only 7.4% of boys and 19.8% of girls. Around 12% of boys reported that their parents discussed night emission with them, and only 10% were able to discuss masturbation.

However, it must be emphasized that is important for the adolescent to feel connected with their family in order for them to keep themselves away from activities associated with risky sexual behavior. When parents

affirm the value of their children, it is likely that they will develop a healthy attitude towards themselves which will enable them to have the right attitude towards sexuality and sexuality-related topics. For example, teens whose mothers discussed condom use before the teens initiated sexual intercourse were three times more likely to use condoms than teens whose mothers never discussed condoms or discussed condoms only after teens became sexually active. This underlines the importance of home education about sexuality (Lagina, 2010).

Good communication between parents and their children is the basis for the passage of correct information about sexuality in its entirety. Adolescents that have good communication with their parents have been found to be more loving, caring, free of emotional distress, and have acceptable sexual behavior (Lagina, 2010).

Sexual Health Education Received from School

Table 2 presents the sex education received from school, with the overall results being interpreted as *fair*. According to the results, the three actions most done in the school setting are: teaching about puberty and other physiologic changes to expect when growing up ($\bar{x}$=2.4534), discussing love openly ($\bar{x}$= 2.6275), and integrating topics about sexuality in the curriculum ($\bar{x}$=3.0729). The three actions least done by the school are: involving students in sex education programs ($\bar{x}$=3.7004), teaching about safe sex practices ($\bar{x}$=3.6842), and discussing sex openly ($\bar{x}$= 3.6316).

Table 2
Sexual Health Education Received from School

Items	Mean	Std. Deviation	Scale Response	VI
1. Integrates topics on sexuality in the curriculum	3.0729	1.26022	Sometimes	*Fair*
2. Actively involves students in sex education programs	3.7004	1.30326	Rarely	*Poor*
3. Discusses love openly	2.6275	1.21262	Sometimes	*Fair*
4. Discusses sex openly	3.6316	1.15729	Rarely	*Poor*
5. Promotes healthy dating	3.1336	1.3831	Sometimes	*Fair*
6. Creates a suitable environment for dating	3.5101	1.30622	Rarely	*Poor*
7. Has helpful policies/ guidelines on sexuality	3.1943	1.37438	Sometimes	*Fair*
8. Has resources like books or pamphlets for individual learning about sexuality	3.6073	1.30182	Rarely	*Poor*
9. Provides a counselor that students can talk to about personal or sensitive issues	3.1822	1.34164	Sometimes	*Fair*
10. Teaches students about:				
a. Puberty and other physiologic changes to expect when growing up	2.4534	1.28027	Often	*Good*
b. Safe sex practices	3.6842	1.39594	Rarely	*Poor*
c. Contraceptives	3.4939	1.3309	Sometimes	*Fair*
d. Sexually transmitted diseases	3.2996	1.48684	Sometimes	*Fair*
e. Male and female genital anatomy	3.0364	1.38616	Sometimes	*Fair*
f. The process of reproduction and pregnancy	2.7206	1.46743	Sometimes	*Fair*
g. Sexual identity and preference	3.2794	1.37297	Sometimes	*Fair*
Grand Mean	**3.2267**	**0.86334**	**Sometimes**	***Fair***

Research indicates that well-planned and implemented sexual health education programs are effective in helping youth reduce their risk of STI/HIV infection and unplanned pregnancies. Furthermore, the primary goal of sexuality education is to equip children and young people with the knowledge, skills, and values to have safe, fulfilling and enjoyable relationships and make responsible and safe choices that promote and protect their health, safety, and well-being (NSW Department of Education, 2015).

Sexual health education encompasses a range of topics that go beyond sexual relationships. Children get acquainted with these topics through various sources long before they are actually taught about them in schools. They act according to the knowledge they have received; hence, it is important to equip them with effective education at school so that they may understand their bodies and feelings at an early age. Effective sexual health education in schools is important as they remain the most trusted place to receive information about sexuality and related issues in the past decades (NSW Department of Education, 2015).

However, despite the importance placed on sex education in schools, the results of this study show that the education the students received from schools is only *fair.* Similar to the education received from home, one of the least discussed issues in schools is safe sex practice or even sex in general. These findings reflect a study conducted by Wong and Lam (2013) in China, which showed that even after Chinese students were taught about sexuality, their knowledge was only limited to growth (reproductive anatomy) and puberty. The participants stated that the topic they were most taught in school was about puberty and other physiologic changes to expect when growing up.

This paucity in sex education can be explained by a study by Garcia (2015), which pointed out that most teachers feel inadequately prepared to teach about sexuality because they themselves didn't receive any education about it during their professional training. Chandra-Mouli, Lane, and Wong (2015) go further, saying that even though schools integrate sexuality education into their curricula, they do not implement them in an effective way. They claim that most curricula did not contain enough basic information about male/female condoms and contraception; key concepts of sex and sexual health were lacking, including information about reproduction, sexually transmitted infections, abortion, and where to access condoms and sexual health services; and most curricula did not pay enough attention to empowering young people, building agency, or teaching advocacy skills.

Knowledge, Attitudes, and Beliefs Regarding Sexual Health

Table 3 shows that the participants' knowledge regarding sexual health is *high*; however, their attitudes and beliefs are rated as *negative*. Regarding attitudes, the respondents showed generally positive attitudes towards women keeping their virginity until marriage ($\bar{x}$=1.8462) and hugging as an acceptable means of expressing affection ($\bar{x}$=2.3401). On the other hand, the most negative attitudes manifested by the respondents were seen in the following statements: *people who contract STDs are not promiscuous or sleep around a lot* ($\bar{x}$=3.6073); and *it is embarrassing to discuss sex with the parent of the opposite sex* ($\bar{x}$=3.0813).

The respondents showed positive beliefs when it came to perceiving virginity as purity ($\bar{x}$=1.8016) and perceiving sex as a gift from God ($\bar{x}$=2.2308). On the other hand, the most negative beliefs manifested by the respondents were seen in the following statements: *frequent masturbation can't cause dysfunction* ($\bar{x}$=3.5223) and *contraception is not acceptable to use* ($\bar{x}$=3.3239).

Table 3
Knowledge, Attitudes, and Beliefs of Participants Regarding Sexual Health

	Mean	Std. Deviation	Interpretation
Knowledge	11.5911	3.0348	High
Attitudes	2.6647	0.8359	Negative
Beliefs	2.8311	0.90577	Negative

The findings in Table 3 indicate that the level of knowledge of the students is *high*. In a study conducted in four Sub-Saharan African countries, it was noted that even though adolescents had the same level of knowledge about sexuality as adults, they still lacked in-depth knowledge (Bankole, Biddlecom, Guiella, Singh, & Zulu, 2008). The study revealed that even though three out of four adolescents had heard about HIV/AIDS, and two out of three had heard about contraceptives, only one out of four possessed deeper knowledge about HIV. Furthermore, only one out of five had detailed knowledge about pregnancy prevention.

In the same alignment of ideas, Rodriguez's (2013) study showed that there is a lack of deeper knowledge on sexuality among adolescents. Adolescents think they know more than what they actually do know. In the study, almost half of the respondents were not aware that women could become pregnant at the first intercourse; more than 20% didn't know that the reproductive function and menstrual cycle are related; and 2% could not

explain safe and unsafe periods in the women's cycle. Further statistics showed that according to 28% of the respondents, AIDS is curable. Another 73% thought they were immune to the disease.

This study's findings also show that the respondents have a *negative* attitude towards sexuality. A study conducted in Kenya found that most adolescents still had a conservative attitude towards premarital sex rooted in cultural and moral values, which was a hindrance to accessing sexual and reproductive health information and services (Adaji, Warenius, Ong'any, & Faxelid, 2010). In contrast, British respondents showed more tolerance to premarital sex, with only one out of 20 people agreeing that sex before marriage is wrong (Erens, McManus, Prescott, & Field, 2003).

Negative beliefs were also seen in this study. Similarly, a study in Papua New Guinea regarding beliefs on HIV/AIDS showed that almost half (48%) of the respondents believed that HIV/AIDS is a punishment from God (Jose et al., 2011). Another study conducted in three developing countries showed that only 13% of the respondents believed that the use of a condom is effective in preventing STIs (Osorio, Lopez-del Burgo, Ruiz-Canela, Carlos, & de Irala, 2015).

Relationship between Sexual Health Education and Participants' Sexual Knowledge, Attitudes, and Belief

Table 4 shows the relationship between sex education received from home and students' sexual knowledge, attitudes, and beliefs. The results show that there is a significant relationship between the sex education received from home and the participants' attitudes and beliefs toward sexuality.

Table 4

Relationship Between Sexual Health Education Received from Home and the Students' Sexual Knowledge, Attitudes, and Beliefs

Variables		Correlation R	p-value	VI
Knowledge	Pearson Correlation Sig. (2-tailed) N	-0.006	0.931	NS
Attitude	Pearson Correlation Sig. (2-tailed) N	0.223	0.000	S
Belief	Pearson Correlation Sig. (2-tailed) N	0.312	0.000	S

Note: VI-Verbal Interpretation, NS: Not Significant, S: Significant

The findings show that there is no significant relationship between sex education at home and adolescents' knowledge on sexuality. A study conducted in Egypt by Alseraty (2015) contradicts this finding. According to the study, parents who provide accurate knowledge on sexuality will result in better decision-making on the part of the children.

The findings also show a significant relationship between home sex education and the adolescents' attitudes. In a study conducted by Eze (2014), it was found that the general attitude of adolescents tends to be much more permissive (negative) than previous years. The researcher found that such attitudes are the adolescents' way to challenge their parents. Therefore, the failure to enforce moral codes towards their children is evidenced by much more permissive attitudes and a higher incidence of premarital sexual activity.

A significant relationship between home sex education and the adolescents' beliefs were also found in this study. According to Bersamin et al. (2010), our beliefs are expressed through our behaviors. A belief that an action will lead to a positive outcome is what makes a person act in a certain way. Therefore, it is important that parents influence their children to have healthy beliefs, especially through communicating about social consequences than through programs that focus more on negative health consequences.

Table 5
Relationship Between Sexual Health Education Received from School and the Students' Sexual Knowledge, Attitudes, and Beliefs

Variables		Correlation R	p-value	VI
Knowledge	Pearson Correlation Sig. (2-tailed) N	-0.006	0.920	NS
Attitude	Pearson Correlation Sig. (2-tailed) N	0.283(**)	0.000	S
Belief	Pearson Correlation Sig. (2-tailed) N	0.413(**)	0.000	S

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

Note: VI-Verbal Interpretation, NS- Not Significant, S-Significant

Table 5 shows that there is a significant relationship between sexual health education received from the school and the attitudes and beliefs of the participants. This implies that the attitudes and beliefs of the students about sexuality are positively correlated with the quality of sexual health education provided in school. Knowledge was not influenced by school sex education to a significant extent.

According to Ophea (2013), the community, including educators and policy makers, has a role to play in the knowledge and skills of students regarding sexual health education. The study postulated that not only is the school system the most logical place for sexual health education to begin, it is also a critical environment for meaningful health promotion. The study further indicated that 45% of students did not feel that the education they received from school was adequate to address their concerns about the challenges they face as adolescents.

Research has shown that well planned and implemented sexual health education programs are effective in helping youth reduce the risk of STI/HIV infection and unplanned pregnancy. It is important, therefore, for education in schools and communities, either through school-based curricula, mass media campaigns, or interventions, to partake in responsibly informing and educating youth about sex (Bleakley, Hennessy, Fishbein, & Jordan, 2009).

CONCLUSION AND RECOMMENDATION

There was a significant relationship between the sex education received in both the home and school and the sexual attitudes and beliefs of the adolescent participants. There were no significant differences found in the participants' knowledge, attitudes, and beliefs regarding sexual health when moderating factors such as gender, religion, family structure, socioeconomic status, and ethnicity.

The findings of this study unequivocally point towards the importance of the sex education adolescents receive from home and school. Given that schools are not just a logical place for sexual health education but a critical environment for meaningful health promotion, educators should be able to implement a well-constructed program that is effective in addressing issues that adolescents face in connection to sexuality and risk-free sexual practices. Furthermore, resources should be made available to parents who need support in educating their children on this topic.

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ANTIBACTERIAL EFFICIENCY OF POMELO PEEL EXTRACT ON VARIOUS CONCENTRATIONS AGAINST SELECTED MICROORGANISMS

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Abstract

This study determined the phytochemical components and antibacterial efficiency of *Citrus maxima* (pomelo) peel extract on two concentrations, 75% and 95%, against selected microorganisms. The phytochemical analysis revealed the presence of alkaloids, flavonoid, glycosides, saponins, sterols, tannins, and triterpines. Alkaloids were abundantly found while only traces of the other constituents were found. *E. coli* and *P. aeruginosa* both produced 10mm complete inhibition in 75% and 95% extract concentrations. On the other hand, *S. aureus* produced slight inhibitory activity with a mean zone of inhibition of 10mm against the 75% extract concentration. It also produced partial inhibitory activity with a mean zone of inhibition of 10mm against 95% concentration. In comparison, the antibiotic Levofloxacin which served as appositive control for *E. coli* and *P.aeruginosa* produced 17.92mm and 16.85mm complete inhibition for the 75% extract concentration. On the 95% extract concentration, Levofloxacin produced 18.73mm and 18.70mm complete inhibition. For the positive control of *S. aureus*, Clindamycin was utilized, which produced 16.30mm complete inhibition in the 75% concentration and 15.02mm complete inhibition in the 95% extract concentration. The results showed that pomelo peel extract is effective in inhibiting the growth of bacteria, and the difference in concentrations was significant for *S. aureus.*

Keywords: *phytochemical, antibacterial efficiency, Citrus maxima (pomelo) peel extract*

Ever since the birth of mankind, there has been a relationship between life, disease, and plants. *Citrus maxima* (pomelo), also known as Chinese grapefruit, belongs to the rue family (*Rutaceae*) and is the largest citrus fruit. It is native to the Southeast Asia and Indo-China regions (Cheong, Shao, Zhou, & Yu, 2012) and is one of the most important horticultural crops growing extensively in tropical and subtropical southern regions of Asia (Lan-Phi & Vy, 2015).

The pomelo tree is a perennial shrub that grows 16-50 feet (5-15 meters) tall. Its peel may be greenish-yellow or pale-yellow while the pulp varies from greenish-yellow or pale-yellow to pink or red. The fruit's taste varies from mildly sweet and bland or rather acidic, with a faint touch of bitterness (Cheong, Shao, Zhou, & Yu, 2012). Guo and Abeysinghe as cited in Toh, Khoo, and Azrina, (2013) state that the peel of the citrus fruit contains a higher amount of antioxidants as compared to its pulp, as the purpose of the peel is to protect the antioxidants in the fruit from oxidation. Therefore, it is recommended to consume the fruit together with its peel.

The pomelo fruit has been linked to several purposes. It is rich in vitamin C and has been used in indigenous medicine as a sedative for nervous affections and convulsive cough, and as a treatment for hemorrhagic disease and epilepsy (Vijaylakshmi & Radha, 2015). According to Arias and Ramon-Laca as cited in Caengprasath, Sathaporn, Kittana, and Siricahi (2012), the pulp of the pomelo was used as an appetizer, antitoxic, cardiac stimulant, and stomach tonic. Furthermore, Mokbel and Suganuma as cited in Naradisorn and Ruenkum (2009) state that pomelo extracts have been revealed to have an antimicrobial activity against several bacteria such as *Staphylococcus aureus, Bacillus subtilis, Bacillus cereus, Salmonella enteritidis,* and *Escherichia coli.*

The human skin normally serves as a primary line of defense against infections caused by the aforementioned microorganisms. However, some bacteria are found in normal flora which can turn opportunistic once there is breakage on the skin. Normal flora found

in the skin includes *Staphylococcus aureus*, which is mostly localized in the nose and other orofacial areas (Tognetti, Martinelli, Berti, Hercogova, Lotti, Leoncini, & Moretti, 2012). *Pseudomonas aeruginosa* could cause life-threatening infections in people who have compromised immune systems in different areas of the body such as the skin (Koehnke & Friedrich 2015). *Escherichia coli* strains are frequently isolated from skin and soft tissue infections (Petkovsek, 2009). It is a major cause of diarrheal diseases, peritonitis, colitis, bacteremia, infant mortality, and urinary tract infections (Blount, 2015).

Commonly used as a sweet delicacy, pomelo is overlooked as a source of prevention in microorganism proliferation. A study by Muhammad (2015) showed that citrus fruits exhibited antibacterial activity against *Escherichia coli, Pseudomonas aeruginosa* and *Staphylococcus aureus*. Further, the effect of crude extract from pomelo peel can be used to inhibit *Staphylococcus aureus* (Aichayawanich, 2012).

In view of previous findings regarding the high antimicrobial and anti-oxidant activities of a number of phytochemicals inherent in citrus fruits, the pomelo fruit can therefore be a potential replacement for synthetic preservatives as all citrus fruits have similar complex structures regardless of cultivars. Therefore, the pomelo holds potential for providing multiple benefits to consumers by way of its possible usage in the fields of medicine, therapeutics, and food technology (Barrion, Hurtada, Papa, Zulayvar, & Yee, 2014). Due to the components found in the pomelo peel, the antibacterial properties may aid in eliminating the bacteria found in a person's skin. This study was conceptualized to explore this potential and provide evidence of the fruit's antibacterial efficiency.

Purpose of the Study

This study determined the phytochemical components and antibacterial efficiency of *Citrus maxima* (pomelo) peel extract on two concentrations, 75% and 95%, against *Escherichia coli, Pseudomonas aeruginosa,* and *Staphylococcus aureus.*

METHODOLOGY

This study utilized an experimental research design. All the microorganisms were preserved and obtained from the Department of Science and Technology. The extract underwent phytochemical analysis and antimicrobial activity test using the disc agar diffusion method or Kirby-Bauer Test on the three selected bacteria.

Collection and Preparation of Pomelo Peels

Pomelo fruit peels were collected and placed in a clean air-tight container. The peels were thinly sliced for increased drying of moisture content. After slicing, the peels were placed in a container for weighing. Around 500 grams of pomelo peel were weighed. For drying, the peels were placed inside the Multi Commodity Heat Pump Dryer overnight. The peels were weighed again after an hour of drying to ensure the decrease in moisture content. The peels were placed in a blender and grounded until it turned into powder. They were afterwards placed in a clean plastic container.

Preparation of Pomelo Peel Extract

One hundred grams of the ground plant material were weighed in an Erlenmeyer flask. Three hundred milliliters of 80% ethyl alcohol were then added to completely submerge the materials. The solution was stoppered and soaked for 24 hours. It was filtered through a Buchner funnel using gentle suction. The flask and the plant material with fresh portions of alcohol were rinsed. The washings with the first filtrate were combined and the plant residue was discarded.

The filtrate under vacuum was concentrated to a syrupy consistency or about 20 milliliters. The exact volume of the concentrated extract was measured. This is the strength of the extract expressed in grams of plant material per milliliter of the extract. The extract was stored in a tightly stoppered container in a cold environment (0-5°C). The extract was then considered ready for phytochemical and microbiological screening. The extract was weighed for quantitative determinations in biological tests.

For fresh plant material, 200 grams of the finely cut fresh material were used and soaked in 300 milliliters of 95% ethyl alcohol to completely submerge the material.

Phytochemical Analysis of the Pomelo Peel Extract

Following the extraction, the pomelo peels underwent phytochemical analysis to test its chemical constituents. All the chemicals used for testing were purchased from the Department of Science and Technology and the process of analysis was based on the procedures of the Standards of Testing Division where the test was conducted.

Disc Agar Diffusion Method or Kirby–Bauer Test

Kirby-Bauer test was performed under the

standard conditions of the facility. The main purpose of this test was to calculate the inhibitory concentration for a given antibiotic by comparing the observed zone of inhibition's size to known values.

RESULTS AND DISCUSSION

Antimicrobial Activity Test Result

Table 1 presents the antimicrobial activity test results of the pomelo (Citrus maxima) peel extract of 75% concentration against three microorganisms.

Table 1
Antimicrobial ActivityTest: 75% Concentration of Ethanol Extract

	Escherichia coli			**Pseudomonas aeruginosa**			**Staphylococcus aureus**		
Sample/ Control	Total Mean Zone of Inhibition	Reactivity	Inhibitory Activity	Total Mean Zone of Inhibition	Reactivity	Inhibitory Activity	Total Mean Zone of Inhibition	Reactivity	Inhibitory Activity
Pomelo Peel Ethanolic Extract 75% (10mm)	10	2	+++	10	2	+++	10	2	+
Levofloxacin 5 ug (6-mm positive control)	17.92	4	+++	16.85	4	+++	N/A	N/A	N/A
Clindamycin 2 ug (6-mm positive control)	N/A	N/A	N/A	N/A	N/A	N/A	16.3	4	+++

The 75% ethanol extract showed that *Escherichia coli, Pseudomonas aeruginosa,* and *Staphylococcus aureus* are reactive organisms to the pomelo peel extract. The bacteria *Escherichia coli* produced complete inhibitory activity (+++) with a total mean zone of inhibition of 10 millimeters and had a mild reactivity rating (2) from the extract. This is in contrast with one study by Barrion, Hurtada, Papa, Zulayvar, and Yee (2014) where *E. coli* was observed to be resistant to all the sample extracts at all concentrations. The findings also show that *Pseudomonas aeruginosa* produced complete inhibitory activity (+++) with a total mean zone of inhibition of 10 millimeters and had mild reactivity (2) against the pomelo peel.

In comparison, the antibiotic Levofloxacin (5 ug) which served as a positive control for *Escherichia coli* and *Pseudomonas aeruginosa* produced complete inhibitory activity (+++) with a total mean zone of inhibition of 17.92 and 16.85 for for *Escherichia coli* and *Pseudomonas aeruginosa*, respectively. Both resulted to a severe reactivity rating (4).

On the other hand, *Staphylococcus aureus* produced slight inhibitory activity (+) with a mean zone of inhibition of 10 millimeters and had mild reactivity (2) against the extract concentration. For the positive control of the *Staphylococcus aureus*, a different antibiotic, Clindamycin (2 ug), was utilized. It produced complete inhibitory activity (+++) with a total mean zone of inhibition of 16.30 and a severe reactivity rating (4) for *Staphylococcus aureus*.

Table 2
Antimicrobial Activity Test: 95% Concentration of Ethanol Extract

	Escherichia coli			**Pseudomonas aeruginosa**			**Staphylococcus aureus**		
Sample/ Control	Total Mean Zone of Inhibition	Reactivity	Inhibitory Activity	Total Mean Zone of Inhibition	Reactivity	Inhibitory Activity	Total Mean Zone of Inhibition	Reactivity	Inhibitory Activity
Pomelo Peel Ethanolic Extract 95% (10mm)	10	2	+++	10	2	+++	10	2	++
Levofloxacin 5 ug (6-mm positive control)	18.73	4	+++	18.7	4	+++	N/A	N/A	N/A
Clindamycin 2 ug (6-mm positive control)	N/A	N/A	N/A	N/A	N/A	N/A	15.02	3	+++

Table 2 shows the antimicrobial activity test results of the pomelo *(Citrus maxima)* peel extract of 95% concentration against three microorganisms. The 95% ethanol extract showed that *Escherichia coli, Pseudomonas aeruginosa, Staphylococcus aureus* are reactive organisms to the pomelo peel.

Escherichia coli produced complete inhibitory activity (+++) with a total mean zone of inhibition of 10 millimeters and had a mild reactivity rating (2) from the extract. *Pseudomonas aeruginosa* produced complete inhibitory activity (+++) with a total mean zone of inhibition of 10 millimeters and had mild reactivity (2) against the pomelo peel. On the other hand, *Staphylococcus aureus* produced partial inhibitory activity (++) with mean zone of inhibition of 10 millimeters and had a mild reactivity (2) against the extract concentration.

In comparison, the antibiotic, Levofloxacin (5 ug), which served as a positive control for *Escherichia coli* and *Pseudomonas aeruginosa*, produced complete inhibitory activity (+++) with a total mean zone of inhibition of 18.73 and 18.70 for *Escherichia coli* and *Pseudomonas aeruginosa*, respectively. Both resulted to a severe reactivity rating (4).

For the positive control of the *Staphylococcus aureus*, a different antibiotic, Clindamycin (2 ug) was utilized. It produced complete inhibitory activity (+++) with a total mean zone of inhibition of 15.02 and a *moderate reactivity* rating (3) for *Staphylococcus aureus*.

The results of the antimicrobial activity test mean that the 75% and 95% concentration of the pomelo peel extract have the capacity to completely inhibit the proliferation of the bacteria *Escherichia coli* and *Pseudomonas aeruginosa*. This shows that the pomelo peel has positive antibacterial properties. These findings coincide with the study of Borah (2013) which determined that the plant extract of *Citrus maxima* showed significant antibacterial activity against *Escherichia coli* and *Pseudomonas aeruginosa*. Both bacteria displayed *mild reactivity* to the extract.

It is to be noted, however, that the 75% concentration of the pomelo peel extract did not completely inhibit the proliferation of the *Staphylococcus aureus*. Hence, it may be concluded that the extract is not as effective when exposed to this microorganism which showed mild reactivity to the pomelo peel extract.

The antibiotics Levofloxacin and Clindamycin completely inhibited the growth of bacteria and all microorganisms tested either reacted *moderately* or *severely* to the aforementioned antibiotics. Comparing the extract with the positive control or antibiotics, it showed that the antibiotics were still more effective in killing and inhibiting the growth of bacteria. Upon seeing the results of the antimicrobial test, the higher concentration of the extract displayed a more effective inhibition of bacteria.

CONCLUSION AND RECOMMENDATION

Based on the findings of the study, it was concluded that the pomelo peel extract showed positive results in inhibiting the growth of bacteria from the three selected microorganisms. The two different concentrations of pomelo peel extract showcased its capability to completely inhibit the proliferation or spread of *Escherichia coli* and *Pseudomonas aeruginosa*. The extract exhibited a partial or slight inhibitory activity against *Staphylococcus aureus*. The higher concentration showed a better antibacterial effect on *S. aureus* which implies more components of the pomelo peel are essential in order to increase the effectiveness of the antibacterial properties from the pomelo peel extract.

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DURATION AND FREQUENCY OF PHYSICAL ACTIVITY AS CORRELATES OF SELF-ESTEEM OF NURSING STUDENTS

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Abstract

The aim of this descriptive-correlational study was to determine the relationship between duration and frequency of physical activity and self-esteem among nursing students of a selected university. An adapted questionnaire was distributed to 104 conveniently selected nursing students from levels I-III of a selected college of nursing. Data was analyzed using descriptive and inferential statistics. The findings revealed that the average frequency of the participants' physical activity was three times a week, while the average duration was 30 minutes per day. Participants' self-esteem was assessed to be *high*. The study found that higher frequencies of stretching, weight-lifting, circuit training, sit-ups, and push-ups were associated with higher levels of self-esteem. Participants ages 20-30 years old had a significantly higher self-esteem level than participants less than 20 years old, while male participants had a significantly higher self-esteem level than females. There was no significant difference in participants' self-esteem when parents' monthly income and participants' place of residence were considered.

Keywords: *physical activity, self-esteem, nursing students*

Self-esteem is described as how people value themselves; it is how a person perceives their value to the world and how valuable they think they are to others. It affects trust in others, relationships, work, and nearly every other part of a person's life (Merriam-Webster, 2013). Positive self-esteem gives a person strength and willingness to take charge of their life and to grow from mistakes without rejection or fear.

Self-esteem is an important aspect of a college student's life. Self-esteem levels in this population have been seen to drop substantially during the first semester of college, recover by the end of the first year, and then gradually increase again over the next three years (Chung et al., 2014). Grades were seen to influence these variations in self-esteem, with those receiving good grades tending to show larger increases. On the other hand, students who entered college with unrealistically high academic expectations were associated with smaller increases in self-esteem. These findings seem to indicate that self-esteem among college students can continuously fluctuate over time.

Among the factors that can influence self-esteem is physical health. Physical health can cause a significant effect on the character, beliefs, and the overall well-being of a person. In particular, physical activity can affect interactions with others, health conditions, or the academic performance of a student. It has also been shown to improve self-esteem, self-acceptance, self-concept, and self-efficacy, and decrease negative emotions such as depression, anxiety, stress, and tension. As with anything, if a person enjoys the physical activity he is engaged in, he is more likely to continue the activity and inculcate its positive psychological effects (Cagas, Torre, & Manalastas, 2010).

Ekeland, Heian, and Hagen (2017), in their randomized controlled trial, sought to determine the capacity of exercise in enhancing self-esteem among mentally healthy subjects ages three to twenty years. Findings of the study revealed a positive short-term effect of exercise on esteem among children and young adults. A study published by Schwarz and Kindermann (1992) determined that the mood-elevating results of physical activity is based on the release of beta-endorphins, which create the "feel-good" effect. In addition to the endorphin related effects of physical activity, cortisol levels have been found to be altered by exercise. Cortisol is a stress hormone and has been found to be moderated and reduced by as little as 30 minutes of moderate aerobic exercise. Higher levels of cortisol are commonly associated with more negative affective states, while reduced cortisol levels have been related to more positive emotional mental status.

Lee, Dickson, Conley, and Holmbeck (2014) further studied 1,118 first-year college students and found that self-esteem predicted depressive symptomatology via perceived social support and disengagement coping. A separate study also found that a significant positive relation exists between levels of self-esteem and student nurses' professional nursing values (Iacobucci, Daly, Lindell, & Griffin, 2012). Self-esteem was also found to be significantly associated with attrition rates among nursing students in the United States (Peterson-Graziose, Bryer, & Nikolaidou, 2013).

When it comes to college students of the Philippines, the motivation to participate in physical activity may be in the form of several reasons. According to Cagas, Torre, and Manalastas (2010), the top five reasons college students participate in physical activity were: to lose weight, to increase strength, to become healthy, because it is fun, and because of a doctor's advice. In the university where this study was conducted, college students participate in physical activity in the form of walking to class, biking, participating in Physical Education classes, playing sports such as basketball, tennis, swimming, or rugby, and jogging in the early morning or night around the campus.

Considering the important role of self-esteem in the well-being of college students, it is important, especially among educational institutions, to study factors that could either promote or hinder self-esteem in this population. This study will add to that body of knowledge by evaluating the relationship between physical activity and self-esteem.

Purpose of the Study

This study aimed to determine the relationship between physical activity and level of self-esteem. It aimed to describe the level of physical activity of the nursing students in the selected university in terms of duration and frequency and to describe students' level of self-esteem in terms of self-worth, belonging, competence, and control. Furthermore, it sought to determine differences in self-esteem when variables such as age, gender, socioeconomic status, and residence are considered.

METHODOLOGY

The descriptive-correlational design was used to describe the relationship between physical activity and level of self-esteem. Convenient sampling was used to select a total of 104 nursing students from Levels 1 to 3 of a selected university's college of nursing. Thirty-five students were selected from each level, regardless of age, gender, socioeconomic status, and residence. Table 1 shows the demographic profile of the respondents.

Table 1
Participants' Profile

Variable	Frequency	Percentage
Gender		
Male	28	26.9
Female	76	73.1
Age		
Below 20 years old	59	56.7
20-30 years old	45	43.3
Monthly allowance		
PhP 5,000-20,000	11	10.6
PhP 20,001-40,000	32	30.8
PhP 40,001-60,000	21	20.2
PhP 60,001 and above	40	38.4
Residence		
Dormitorians	44	42.3
Faculty housing	26	25.0
Off-campus	34	32.7

The researchers utilized the questionnaire developed by Jump, Mauricio, Rizalino, Palma, and Ragira (2014) to determine the extent of the college students' physical activity. The questionnaire on self-esteem was adapted from Azucena, Lagarile, Palacol, and Yoo's (2012) assessment form.

The questionnaire consisted of three parts. The first part assessed the participants' demographic profile such as age, gender, ethnic origin, residence, and combined monthly income of parents. The second part contained questions that evaluated the respondents' level of self-esteem using a 5-point Likert scale. Finally, the third part contained questions pertaining to the duration and frequency of physical activity of the respondents. Frequency and duration were measured using a seven- and six-point Likert scale, respectively.

Descriptive and inferential statistics were used to analyze the data. Frequency and relative frequency distribution were used to quantify the demographic profile while mean and standard deviation were used to measure the level of self-esteem. Pearson product moment correlation coefficient was used to identify any relationships between physical activity and self-esteem. T-test, Mann-Whitney test, and ANOVA were used to identify significant differences in self-esteem in relation to gender, age, and residence. Finally, Kruskal-Wallis one-way analysis of variance was used to determine any significant differences in self-esteem in relation to income.

RESULTS AND DISCUSSION

Physical Activity of the Participants

Table 1 projects the duration of the physical activities the students are engaged in, with a total mean of 2.27 which equates to 30 minutes of physical activity every day. The physical activity which was done the longest was household chores, with a time frame of two to three hours per day.

Table 2
Duration of Physical Activity

Item	Mean	Std. Deviation	Interpretation
Watching TV	1.20	1.75	Less than 30 minutes
Playing musical instruments	1.20	1.75	
Doing household chores	4.74	0.89	2hrs-3hrs
Stretching	1.28	0.89	None
Weight lifting, circuit training, and sit-ups/push ups	1.38	1.79	None
Walking, brisk walking, jogging, swimming and stationary cycling	3.46	1.66	30min-1hr
Jumping rope, running, hiking, cycling, and swimming laps	1.40	1.89	None
Playing ball games, table tennis and badminton	1.25	1.94	None
Total	2.27		30 minutes

Legend: 1-1.49 = None, 1.5-2.49 = 30 minutes, 2.5-3.49 = 30 minutes to 1 hour, 3.5-4.49 = 1-2 hours, 4.5-5.49 = 2-3 hours, 5.5-6.45 = 3 hours or more

Table 3 shows the frequency of the participants' physical activity. It shows an overall mean of 3.87 which is equivalent to three times per week. It reflects the findings in Table 1, as household chores were also the activities done the most frequently at six times per week. Walking, brisk walking, jogging, swimming, and stationary cycling were also done frequently at five times per week.

Table 3
Frequency of Physical Activity

Item	Mean	Std. Deviation	Interpretation
Watching TV and playing musical instruments	3.77	2.26	3x a week
Doing household chores	6.55	1.22	6x a week
Stretching	2.95	1.68	Twice a week
Weight lifting, circuit training, and sit-ups/push-ups	2.75	2.14	Twice a week
Walking, brisk walking, jogging, swimming and stationary cycling	6.02	1.83	5x a week
Jumping rope, running, hiking, cycling, and swimming laps	2.59	2.13	Twice a week
Playing ball games, table tennis and badminton	2.47	2.21	Once a week
Total	3.87		3x a week

Legend: 1-1.49 = None, 1.5-2.49 = Once, 2.5-3.49 = Twice, 3.5-4.49 = 3 times, 4.5-5.49 = 4 times, 5.5-6.49 = 5 times, 4.5-7 = 6 times

According to the World Health Organization (2017), adults age 18-64 years old must engage in at least 150 minutes of moderate to intense physical activity per week, or 75 minutes of vigorous to intense aerobic physical activity per week. The aerobic activity must be performed for at least 10 minutes, with a minimum frequency of twice per week. This is to strengthen musculoskeletal and cardiorespiratory health, and decrease the risk of non-communicable diseases and depression.

Based on the results, the respondents met the minimum frequency of physical activity encouraged by the World Health Organization (2017); however, they fell short of the minimum duration requirement by around 30 minutes.

Interestingly, this study was conducted in a boarding school where students are expected to reside inside the campus, unless otherwise approved by the Student Affairs' Office. Majority of the participants (69.3%) live inside the university. A study by Hahn, Yoon, Kim, and Lee (2008) stated that students who live inside school campuses tend to have a higher level of physical activity than those who don't.

Level of Self-Esteem

Table 4 shows the participants' self-esteem considering their senses of worth, belonging, competence, and control.

Table 4
Level of Self Esteem

	Minimum	Maximum	Mean	Standard Deviation	Interpretation
Sense of worth	2.47	4.93	3.79	0.47	*High*
Sense of belonging	2.53	5.00	3.98	0.45	*High*
Sense of competence	2.47	4.67	3.4	0.42	*Average*
Sense of control	3.00	4.80	3.85	0.39	*High*
Self-esteem	3.00	4.77	3.76	0.33	*High*

Legend: 1-1.49 = Never, 1.5-2.49 = Rarely, 2.5-3.49 = Sometimes, 3.5-4.49 = Often, 4.5-5.49 = Always

The results show that the participants' level of self-esteem in terms of sense of worth, sense of belonging, and sense of control are high, while their sense of competence is average. However, when all are combined and evaluated as self-esteem, the overall mean is 3.76, which indicates a high sense of self-esteem.

The findings indicate a level of self-esteem that is relatively higher when compared to the self-esteem of nursing students in other studies. To compare, Papazisis, Nicolaou, Tsiga, Christoforou, and Sapountzi-Krepia (2013) evaluated 123 nursing students in Cyprus and found that majority of the students (71.3%) only had average self-esteem levels.

Relationship Between Frequency of Physical Activity and Self-Esteem

Table 5 shows that overall, the frequency of performing stretching, weight lifting, circuit training, sit-ups, and pushups were significantly related to overall self-esteem levels.

Table 5
Relationship Between Frequency of Physical Activity and Self-Esteem

Physical Activity	Sense of Worth		Sense of Belonging		Sense of Competence		Sense of Control		Self-Esteem	
	r	*p*	*r*	*p*	*r*	*p*	*r*	*p*	*r*	*p*
Doing household chores	.02	.81	.05	.65	-.02	.85	.06	.54	.04	.71
Stretching	.30	.002*	.21	.04*	.244	.013*	.14	.145	.30	.002*
Weight lifting, circuit training, sit-ups/push-ups	.20	.043*	.085	.392	.28	.004*	.014	.888	.19	.049*
Walking, brisk walking, jogging, swimming, stationary cycling	-.06	.533	.004	.97	-.043	.665	.152	.124	.010	.918
Jumping rope, running, hiking, cycling, and swimming laps	.14	.169	.10	.30	.23	.022*	-.07	.493	.14	.171
Playing ball games, table tennis, and badminton	.14	.147	-.04	.661	.11	.286	-.30	.002*	-.02	.849

**Correlation is significant at the 0.05 level (2-tailed)*

These findings are supported by Gothe et al. (2010), who mentioned that adults' self-esteem may benefit more from physical activities which involve flexing, toning, and balance as compared to walking. Lauer (2011) also stated that being physically active adds many benefits to health, such as maintenance of ideal weight, easier performance of activities of daily living, reduced risks of depression, and increased cognitive function.

These effects may be explained through various mechanisms. Traditionally, exercises such as stretching, weight lifting, and circuit training tend to improve overall physical appearance and fitness, which could then lead to a more positive view of self (Schwarz & Kinderman, 1992). Future research which investigates the unique effects of various frequencies of exercise on self-esteem domains in older adults as well as other populations is warranted.

Relationship Between Duration of Physical Activity and Self-Esteem

Table 6 shows that there is no significant relationship between duration of physical activity and overall self-esteem. However, the frequency of performing activities such as playing basketball, table tennis, and badminton were seen to be significantly associated with a sense of competence.

Table 6
Relationship of Duration of Physical Activity and Self-Esteem

Physical Activity	Sense of Worth		Sense of Belonging		Sense of Competence		Sense of Control		Self-Esteem	
	r	*p*	*r*	*p*	*r*	*p*	*r*	*p*	*r*	*p*
Doing household works	-.001	.994	.056	.575	.017	.868	.113	.253	.057	.565
Stretching	-.032	.746	-.172	.080	-.036	.719	-.106	.284	-.113	.254
Weight lifting, circuit training, sit-ups/push-ups	.153	.121	.057	.565	.177	.073	.015	.877	.135	.172
Walking, brisk walking, jogging, swimming, stationary cycling	.047	.636	.108	.276	.151	.127	.150	.129	.145	.141
Jumping rope, running, hiking, cycling, and swimming laps	.077	.435	.068	.495	.180	.068	-.042	.672	.095	.335
Playing ball games, table tennis, and badminton	.144	.143	-.007	.946	.199	.043*	-.183	.063	.059	.552

**Correlation is significant at the 0.05 level (2-tailed)*

Activities such as ball games, table tennis, and badminton are competitive sports where a player may gain a sense of satisfaction and achievement after playing, hence the relationship with a sense of competence. Schwarz and Kindermann (1992) further explained that the mood elevating results of physical activity are based on the release of beta-endorphins, which create the "feel-good" effect.

Differences in Self-Esteem Considering Moderator Variables

Table 7 indicates that there is a significant difference in self- esteem when age is considered. Respondents in the age group of 20-30 years had significantly higher levels of overall self-esteem when compared to respondents less than 20 years old. They also had a greater sense of worth and competence.

Table 7
Difference in Self-Esteem by Age

Self-Esteem	Age	M	SD	t	p	Interpretation
Sense of worth	Less than 20	3.71	0.40	-2.06	.042	Significant
	20 to 30	3.91	0.55			
Sense of belonging	Less than 20	3.93	0.42	-1.37	.174	Not Significant
	20 to 30	4.06	0.50			
Sense of competence	Less than 20	3.31	0.35	-2.629	.010	Significant
	20 to 30	3.53	0.47			
Sense of control	Less than 20	3.80	0.37	-1.816	.072	Not Significant
	20 to 30	3.94	0.41			
Self-esteem	Less than 20	3.69	0.29	-2.634	.010	Significant
	20 to 30	3.86	0.37			

**Correlation is significant at the 0.05 level (2-tailed)*

Manning (2007) discussed that the stage of life ranging from 18 to 30 years old is one of the most crucial points in the rise and decline of level of self-esteem. The competencies model mentioned by Twenge and Campbell (2001) predicts self-esteem to be at the lowest during adolescence, especially when competencies are challenged at the start of junior high school. However, self-esteem is expected to rise soon after. The model expects a moderate, straight increase in self-esteem as the student increases in age. This idea is also supported by Hamilton (2010), when he cited that self-esteem increases steadily as people age, and begin to decline at retirement.

Table 8
Difference in Self-Esteem Considering Gender

Self-Esteem	Gender	Mean Rank	U	Asymp syg	Interpretation
Sense of worth	Female	48.29	744.000	.019	Significant
	Male	63.93			
Sense of belonging	Female	50.65	923.500	.302	Not Significant
	Male	57.52			
Sense of competence	Female	47.56	688.500	.006	Significant
	Male	65.91			
Sense of control	Female	51.23	967.500	.479	Not Significant
	Male	55.95			
Self-esteem	Female	48.16	734.500	.016	Significant
	Male	64.27			

**Correlation is significant at the 0.05 level (2-tailed)*

Table 8 shows that males have significantly higher self-esteem than females. Further, they also had significantly higher senses of worth and competence.

A study conducted by Veselska (2009) revealed that gender has an influence on developing self-esteem. Boys are more likely to have higher self-esteem levels than girls. Gender differences have also been sighted in age-related changes. Self-concept among boys tends to increase, while self-esteem among girls tends to decrease as the years of adolescence go by. Women tend to have lower self-esteem than men because they often have a lower self-image and are more likely to dislike their bodies. While this may be true on some level, overall self-esteem is not dictated by gender.

CONCLUSION

The study found that higher frequencies of stretching, weight-lifting, circuit training, sit-ups, and push-ups were associated with higher levels of self-esteem. Participants ages 20-30 years old had a significantly higher self-esteem level than participants less than 20 years old, while male participants had a significantly higher self-esteem level than females. There was no significant difference in participants' self-esteem when parents' monthly income and participants' place of residence were considered. It is recommended that based on the findings, physical activity programs such as weight lifting, stretching, and circuit training be conducted among nursing students, especially among females and those less than 20 years old.

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PREVALENCE OF DENTAL CARIES ON PERMANENT FIRST MOLARS OF 7- YEAR OLD SCHOOL-AGED CHILDREN: BASIS FOR THE USE OF PIT AND FISSURE SEALANTS

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Nathalya Bmay Subido, Kevin Brendt Imperio, Lorcelie Taclan

Abstract

This descriptive-correlational study determined the prevalence of dental caries on the first molars of seven-year-old school-aged children as basis for the use of pit and fissure sealants. A total of 36 respondents underwent oral diagnosis. Data were analyzed using frequency distribution and Chi-square test. Results showed that out of 144 teeth of the respondents, there were 121 sealable non-carious, 14 sealable carious, and nine non-sealable carious teeth. There was no gender predilection for caries development. Therefore, the use of pit and fissure sealants should be strongly implemented in this age group, wherein the teeth are still sealable, to prevent and/or inhibit the occurrence of caries.

Keywords: *dental caries, permanent first molars, sealable carious*

Dental caries is the leading cause of oral diseases in young children all throughout the world. It occurs because of the dissolution and destruction of the enamel surface by the microorganisms *Mutans streptococci* and *Lactobacillus* (Dinesh, Uma, Meenatchisundaram, & Carmel, 2016). Once the tooth has been infected and the enamel demineralized, treatment would need to be rendered to inhibit the caries progression. If left untreated, the disease will progress, leading to severe pain, chronic infection, and eventually tooth loss. Although there are numerous factors contributing to the occurrence of dental caries, various studies have indicated that one of the most prominent reasons is the lack of prophylactic dental care.

The 2006 National Oral Health Survey (Monse et al., 2012) investigated the oral health status of Philippine public elementary school students and revealed that 97.1% of six-year-old children suffer from tooth decay. Furthermore, more than four out of every five children in this subgroup manifested symptoms of dentinogenic infection. The study found that many young children do not know how to take care of their teeth, are not concerned about caring for their teeth, or have not formed the habit of routine dental care. In accordance, their parents may not be educated on proper oral health maintenance and failed to emphasize the importance of prophylactic dental care and treatment, thus contributing to the prevalence of dental caries in the permanent molars of young children.

Studies have determined that among school-aged children, the majority of dental caries has been detected on pit and fissure surfaces of the first and second molars (Ahovuo-Saloranta et al., 2013). There are several prevention methods that can help reduce the effects of caries occurrence in the first permanent molars, especially in young children with mixed dentition. One of the leading preventive methods in dentistry is the application of pit and fissure sealants on newly erupted permanent molars (Herndon et al., 2015). Pit and fissure sealants are dental materials that are applied to the pit and fissure surfaces of teeth to create a barrier which protects the sealed tooth surface from decay (Irish Oral Health Services Guideline Initiative, 2010). This prophylactic measure is an inexpensive and non-invasive procedure. Sealants benefit children across a wide age range; however, to achieve greater effectiveness in caries prevention, it is recommended that sealants be placed on teeth soon after eruption (Herndon et al., 2015).

Objectives

The objective of the study was to determine the prevalence of first permanent molar caries among seven-year-old children as a basis for the use of pit and fissure sealants.

Moreover, the study aimed to identify the number of seven-year-old children with fully erupted first permanent molars through oral diagnosis. It also

aimed to classify the prevalence and degree of existing caries on all the first permanent molars using ICDAS II method of caries assessment, in terms of: (a) Sealable non-carious/ ICDAS II code 0; (b) Sealable carious/ ICDAS II code 1 & 2; and (c) Non-sealable carious/ ICDAS II code 3-6. Lastly, it also endeavored to determine if there is a gender predilection in the development of dental caries with the use of statistical analysis.

METHODOLOGY

Research Design

A descriptive research design was used to conduct the study. In accordance, this approach describes variables rather than testing a predicted relationship between variables. While examining the respondent's mouths, no manipulation or intervention was done. Observation was conducted via the use of mouth mirror only. Only cotton pliers and cotton rolls were used to remove the saliva for better visualization and assessment of caries on the first permanent molars.

Research Instrument

The researchers prepared parental consent forms for the parents of selected seven-year-old pupils. The tools used were a mouth mirror for caries detection, cotton pliers and cotton rolls to dry the tooth under investigation, adequate light for visibility inside the oral cavity, and proper seating.

The International Caries Detection and Assessment System (ICDAS II) was used to evaluate the status of permanent first molars as:

0 = No evidence of caries
1 = First visual change in enamel
2 = Distinct change in enamel
3 = Localized enamel breakdown due to caries with no visible dentin or underlying shadow
4 = Underlying dark shadow from dentin with or without localized enamel breakdown
5 = Distinct cavity with visible dentin
6 = Extensive distinct cavity with visible dentin

Population and Sampling Technique

Purposive sampling was utilized to select 47 seven-year-old school-aged children around the local area of Silang, Cavite and Santo Domingo, Santa Rosa, Laguna. The inclusion criteria were seven year old pupils with all four first permanent molars fully erupted.

Ethical Considerations

While in search of respondents for the sample population, nearby schools were the most appropriate place to find the participants. Therefore, permission letters were distributed to two local school principals for their approval to conduct the study on seven-year old Grade 1 pupils as the sample population.

Before proceeding to clinical examination, consent forms were distributed to the parents of the respondents. Upon parental agreement, clinical examinations were performed on the selected 7-year old children using the ICDAS II method for determining prevalence of decay on the first permanent molars.

Statistical Treatment

Frequency distribution and percentage were used to determine the status of the first permanent molar teeth of the participants based on the ICDAS II method. Chi-square test was performed to analyze gender predilection to caries development.

RESULTS AND DISCUSSIONS

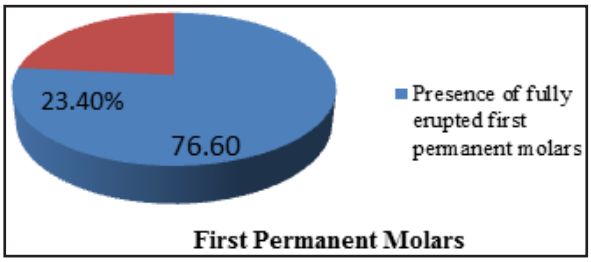

Figure 1. Fully erupted first permanent molars distribution of respondents

Figure 1 shows that there were initially 47 seven-year-old willing participants for the proposed study, but upon screening, only 36 (76.60%) of them met the criteria of having fully erupted permanent first molars. According to Nelson and Ash (2010), the age eruptions for permanent first molars are at six to seven years of age. However, not all children follow the set age criteria or pattern in the eruption of their permanent dentition. Some children undergo early eruption of secondary teeth and some have delayed emergence of permanent dentition. Furthermore, the textbook indicates that only about 50% of all children have their permanent first molars within the specified age range. Based on literature review, the placement of pit and fissure sealants is indicated for non-carious and/or non-cavitated fully erupted permanent molars. Sealants should not be placed on partially erupted teeth, teeth with cavitation, or caries of the dentin due to poor isolation of teeth and insufficient accessibility of surface area for sealant placement.

The prevalence and degree of existing caries on all the first permanent molars are assessed using ICDAS II method of caries assessment:

a. Sealable non-carious/ICDAS II code 0
b. Sealable carious/ICDAS II code 1 & 2
c. Non-sealable carious/ICDAS II code 3-6

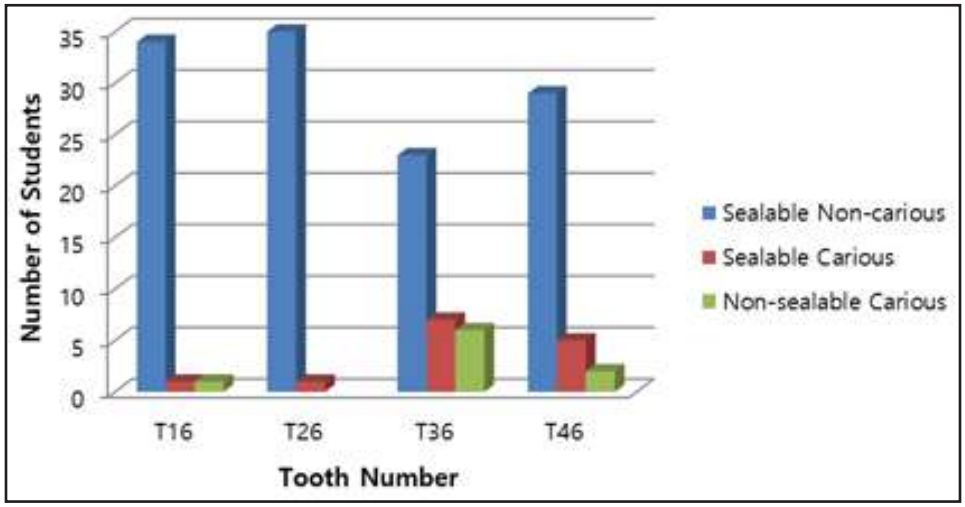

Figure 2. Status of first permanent molars based on the possible application of pit and fissure sealants

Figure 2 shows the status of first permanent molars of 7-year-old respondents according to the FDI tooth numbering system. The findings show that for tooth #16, the upper right first molar, there were 34 sealable non-carious teeth, one sealable carious tooth, and one non-sealable carious tooth. For tooth #26 which corresponds to the upper left first molar, there were 35 sealable non-carious teeth and one sealable carious tooth. For tooth #36, the lower left first molar, there were 23 sealable non-carious teeth, seven sealable carious teeth, and six non-sealable carious teeth. Lastly, for tooth #46 or the lower right first molar, there were 29 sealable non-carious teeth, five sealable carious teeth, and two non-sealable carious teeth.

Teeth 16 and 26 had a higher incidence of being non-carious and carious sealable, meaning they should be considered for immediate pit and fissure sealant procedures for prevention and inhibition of caries progression as indicated under the ADA guidelines. Teeth 36 and 46 showed a greater disparity between non-carious and sealable, showing active caries progression which needs to be restored rather than implementing preventive methods. Even though the above teeth had greater caries progression, the results for teeth 16 and 26, which are sealable, is still significantly high. Results showed that 121 teeth out of 144 were still considered sealable. The high number of sealable first permanent molars suggests that this is the proper time to seal the first permanent molars with pit and fissure sealants. The use of pit and fissure sealants should be practiced in dental clinics, dental schools, and in community dentistry programs to promote good oral hygiene and preserve first permanent molars, which are to last a lifetime, in young children.

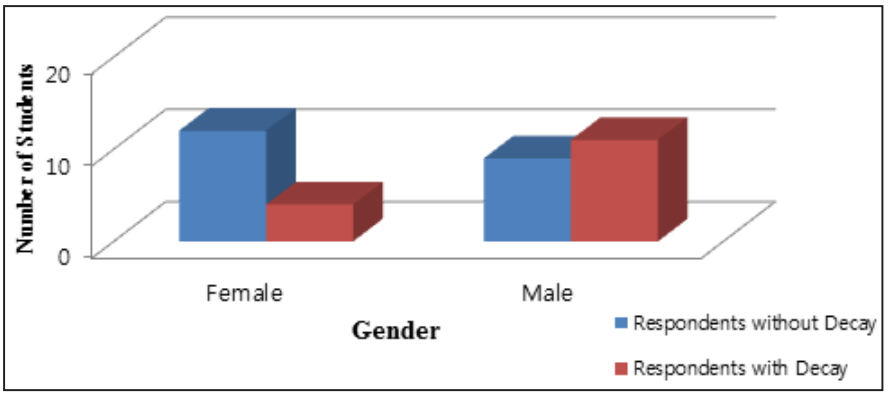

Figure 3. Comparison of the prevalence of dental caries in males and females

Figure 3 shows the prevalence of tooth decay in females and males. With the female respondents, there were four out of 16 that had dental caries on their first permanent molars. For the males, there were 11 out of 20 who exhibited permanent first molar dental caries. Research results showed that males had higher caries prevalence than the females at 30.6% and 11.1%, respectively. However, the Chi-square test gave a p-value of <0.07, which indicates statistical insignificance for gender correlation to caries occurrence. This indicates that there is no gender predilection in dental caries. Therefore, when a child reaches age seven or has fully erupted permanent first molars, pit and fissure sealants should be applied as the child has the right to protect his/her teeth from caries occurrence.

CONCLUSION AND RECOMMENDATIONS

The study found that out of 144 teeth of the respondents, there were 121 sealable non-carious, 14 sealable carious, and nine non-sealable carious teeth. Males had a higher caries prevalence compared to females; however, statistically there is no significant difference in prevalence between the two genders. The high number of sealable first permanent molars suggests that this is the proper time to seal the first permanent molars with pit and fissure sealants.

It is recommended that further studies be conducted on the early and delayed eruption of first permanent molars and their correlation to the development of dental caries. Local studies on the actual application of pit and fissure sealants to pediatric patients should also be undertaken specifically in the Philippines.

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EFFECTIVENESS OF STORY TELLING ON CHILDREN'S DENTAL ANXIETY

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Abstract

This study determined if storytelling is an effective method in reducing children's dental anxiety prior to dental treatment procedures. A one-group pretest-posttest quasi-experimental design study was conducted on eight (8) children aged between 5–8 years with high dental anxiety. A single pre-test observation was taken on the group of participants; storytelling intervention was conducted on a single post-test observation on the same measure. Pre-test and post-test level of dental anxiety was assessed by using the Faces version of the Modified Child Dental Anxiety Scale (MCDASf). The pre-test mean score of the participants was 3.91 which suggest a high level of dental anxiety. The post-test mean score was 2.98 which suggest a moderate dental anxiety level. The results showed that story telling has a significant effect towards the dental anxiety of the children (t = -10.003; p = 0.000). Age (H = 2.500; p = 0.475), gender (U = 5.00; p = 0.456) and frequency of dental visit (H = 0.717; p = 0.699) elicited no significant difference on the children's dental anxiety level. This study highlighted that storytelling can reduce the dental anxiety level of children prior to their dental treatment procedures. This study concluded that storytelling can be a pre-behavior management method to prepare children with dental anxiety before their dental visit.

Keywords: *dental anxiety, storytelling, behavioral management*

As early as the first tooth eruption, one should pay a visit to the dental clinic. Many children are reluctant to visit the dentist due to several reasons. One common problem is dental anxiety. Dental anxiety is defined as "an abnormal fear or dread of visiting the dentist for preventive care or therapy and unwarranted anxiety over dental procedures" (Andreatini & Assumption, 2013). Dental anxiety is considered as a significant problem in managing patients. It may cause the patient to avoid dental visits or to not cooperate fully during dental treatment procedures which may result to negative consequences on their oral health (Armfield, 2010) and often having the need to undergo more difficult treatment interventions, thereby entering a vicious cycle that tends to worsen the anxiety (Armfield, Stewart, & Spencer, 2007).

Dental anxiety is prevalent among children. The prevalence of dental anxiety among children can be expected since a dental visit includes several components that may stress the child, such as meeting unfamiliar adults, strange sounds and tastes, having to lie down, feeling uncomfortable, and pain (Koch & Poulsen, 2009). In fact, among the most problematic type of patients considered by dentists are children who are very anxious (Efron & Sherman, 2005). Based from the studies conducted in different countries around the world, which includes Canada, Denmark, Jordan, Netherlands, New Zealand, Norway, Russia, Scotland, Singapore and USA, the reported prevalence of dental fear and anxiety varies from 5% to nearly 20%, with USA having the greatest percentage (19.5% of children ages 5-11 years old) (Koch & Poulsen, 2009).

Storytelling is one of the oldest forms of education. It allows information to be imparted to its listeners (Hamilton & Weiss, 2005). Storytelling can establish trust and comfort for both the storyteller and his audience. Care is enhanced by the art of storytelling (Restrepo Davis, 2003). Many children love to hear stories; it is basically a part of being a child.

Storytelling has been found to be useful since the beginning of time, as evidenced through cave drawing and the continued use of books such as the Bible, Torah, Koran, etc. The power of a story is its ability to allow fantasy, creativity, feelings, thought, and change to continue as a focal medium in a child's development. Imagination can be a powerful tool in the mind of the child and can act as an instrument in allowing growth and acceptance without opposition (Hacker, 2009).

In another study by Restrepo and Davis (2003), it was mentioned that storytelling can lead to establishing a sense of trust and comfort, in other words a bond, between the storyteller and the audience. Storytelling is an important method of conveying what the dentists want to tell the children in ways they can understand. Imparting the knowledge is an important factor that will make the children less anxious when visiting the dentist. Storytelling has been used in changing the emotions. In the study of Parker and Wampler (2006), 42 female participants were randomly assigned to receive either a story or psychoeducational information. It was found out that both interventions are successful in reducing negative feelings of the participants. Tunney & Boore (2013) tested the effectiveness of a storybook on reducing the level of anxiety of children ages five to eleven-year-old who are undergoing tonsillectomy and adenoidectomy in Northern Ireland. Results of the study showed that a storybook is found to be effective in reducing pre-operative anxiety and was found to be particularly effective for females age seven years old.

In the study of Fazli, Kavandi, and Malekafzali (2014), storytelling was used as a distraction method in managing anxious pediatric patients during the dental procedures. Results of the study showed that storytelling was an effective method in increasing children's cooperation and familiarity on the treatment procedure, in making the child more comfortable and confident, in decreasing stress and fear of dental visits, and in maintaining their psychological health. Storytelling to children during dental visits distracts children's attention away from the painful stimuli, fear, and anxiety. The use of children's books with positive representations of a dental experience is also suggested as a pre-behavior management of children before a dental visit (Law, 2003). Positive words and pictures, and story characters that can help show children what they can expect to see, hear, and do at the dental clinic that is shown in story books is a great way to prepare children for their first dental visit (Friesen, 2016).

Presently, there are a lot of pharmacologic and non-pharmacologic behavior management techniques used in anxious pediatric patients. Some of these techniques may include the use of the following: Tell-Show-Do (TSD), voice control methods, Hand-over-mouth-exercise (HOME), nitrous oxide-oxygen analgesia, conscious sedation, use of restraints, combination of nitrous-oxide oxygen analgesia and conscious sedation with or without restraints, general anesthesia (Mathewson & Primosch, 1995), and use of music intervention (Osorio, 2014). These behavior management techniques are done during the dental procedure itself. Majority of these techniques are invasive and a lot of parents do not accept it (Fazli, Kavandi, & Malekafzali, 2014). There are no significant studies conducted using storytelling to reduce anxiety before a dental visit. Therefore, this study aims to know the effectiveness of storytelling as a method of reducing children's dental anxiety prior to dental treatment procedures.

Purpose of the study

This study determined the effectiveness of storytelling on the anxiety of children before a dental visit. Specifically, this study addresses the following: (1) to determine pre-test and post-test level of dental anxiety among the participants; (2) to determine if the effect of storytelling differ considering age, gender, and frequency of dental visits.

METHODOLOGY

This study used the one-group pretest-posttest quasi-experimental design or non-true experimental design which tried to investigate the causal effect of the dependent and independent variable with just one intervention given to the participants. A single pre-test observation is taken on the group of participants (O1), treatment (X) then occurs as a single post-test observation on the same measure (O2) that follows:

O1 X O2

Pre-test and post-test levels of dental anxiety of the participants were then compared after the treatment. This study determined how effective storytelling is to children with high dental anxiety before dental visitation. The independent variable is storytelling. The dependent variable is dental anxiety. Age, gender, and frequency of visits are the moderating variables.

Population & Sampling Technique

This study was conducted among the pre-schoolers and grade school students aged five to eight years old of Hilltop Adventist Elementary School, Tartaria Elementary School, and Puting Kahoy Elementary School in the school year 2016-2017 which incorporated the use of purposive sampling technique. Purposive sampling was selected based on the purpose of the study. There were 359 students who underwent the pre-test assessment of dental anxiety. Among those students, only 16 children were presented with high dental anxiety level due to uncontrolled circumstances, only eight (8) were able to undergo the storytelling intervention and took the post-test assessment of dental anxiety.

Figure 1 shows the participants' profile in terms of age. There are 8 participants of which 2 (25%) are 5-year-old, 1 (12.50%) is 6 year old, 2 (25%) are 7 year old, and 3 (37.50%) are 8 year old. Figure 2 shows the participants' profile in terms of gender. Among the eight participants, 3 (37.50%) are males and 5 (62.50%) are females. Figure 3 shows the participants' profile in terms of frequency of dental visit in which 5 (62.50%) have no experience, 2 (25%) have experienced visiting the dentist once or twice, 1 (12.50%) have experienced visiting the dentist three or more times.

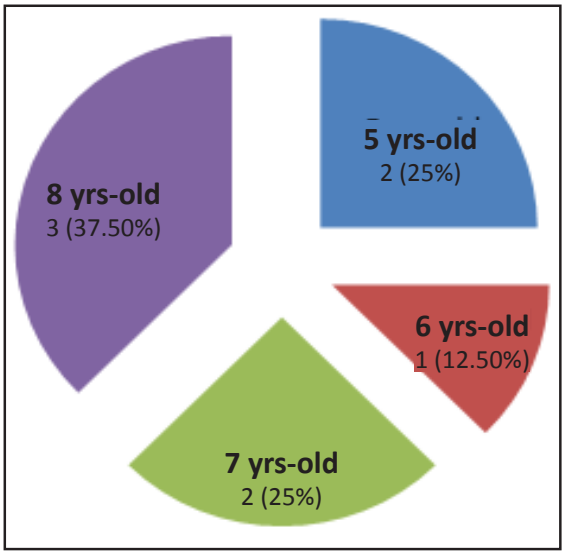

Figure 1. *Participants profile in terms of age*

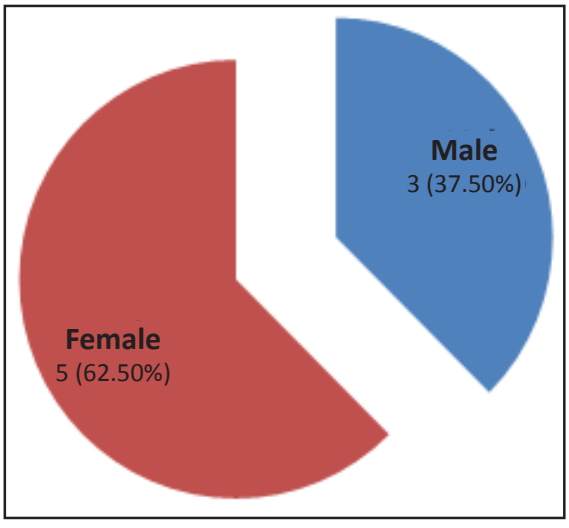

Figure 2. *Participants profile in terms of gender*

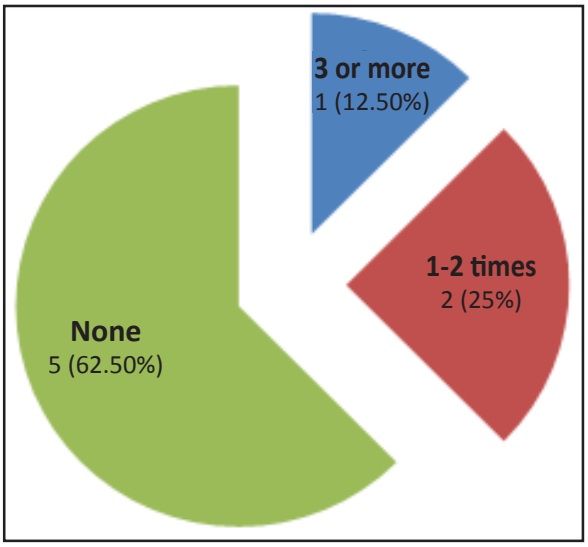

Figure 3. *Participants profile in terms of frequency of dental visit*

Instrumentation

This research incorporated the use of faces version of the Modified Child Dental Anxiety Scale (MCDASf) by Howard and Freeman (2007). It was translated to Tagalog by the researchers, which was comprised by seven questions. Each question asking how worried or relaxed the child is about different dental items. Upon the suggestion of the panel members due to difficulty in explaining the question items, the researchers opted not to include Q8 (…… having a mixture of 'gas and air' which will help you feel comfortable for treatment but cannot put you to sleep?) from the original MCDASf questionnaire. The MCDASf includes questions that distress children about dental procedures such as extraction, tooth filling, etc. To assess dental anxiety, a five-point Likert scale is used with scores ranging from one to five: (1) 'relaxed or not worried'; (2) 'very slightly worried; (3) 'fairly worried; (4) 'worried a lot'; and (5) 'very worried'. MCDASf has been shown to be a reasonable measure of dental anxiety of children exhibiting validity and good internal consistency. It is a simple but reliable and valid means of measuring dental anxiety in children. Inclusion of Smiley Faces Program (SFP), expressive faces or facial images to correspond to the Likert scale, is useful in emmediate assessment on the dental anxiety of the young as well as the anxious older children prior to undergoing dental surgery. This scale is proven reliable and valid (Howard & Freeman, 2007). The mean score is obtained per person by adding up the scores and dividing it into seven which corresponds to the number of items in the questionnaire. Mean scores

are rounded up to the nearest whole number. Scores are interpreted as anxiety ranging from one to five: (1) no anxiety, (2) mild, (3) moderate, (4) high, and (5) very high.

The researchers used a self-written story entitled "*Ang Pagbisita ni Buboy sa Dentista*". The story content is about a little boy named Buboy who will visit the dentist for mouth examination and scaling and polishing. Different parts of the dental clinic, the dentist, the different instruments and procedures, and feelings and emotions of the child during the visit were described in the story. The story informed the listeners about what they can expect to see, hear, and do at the dental clinic.

Data Gathering Procedures

The MCDASf questionnaires were prepared by the researchers. The consent letters were distributed to the principals of the corresponding schools together with the letters for the parents.

The survey was given to the preschool and grade school students' ages 4-8 years old last February 1-2, 2017. The children were informed that the survey will measure how they feel about going to the dentist. Researchers distributed the crayons and printed materials to each participant. The instructions and items on the materials were read out to the children and were completed in a class or group. This was done by the researchers in the following schools: Hilltop Adventist Elementary School, Tartaria Elementary School, and Puting Kahoy Elementary School

Researchers categorized the data gathered from the survey. Among the participants who underwent the pre-test survey, only the ones with high dental anxiety level underwent the remaining procedures of the research study.

The researchers distributed the consent letters to the parents of the screened participants last February 9, 2017 and collected it before the intervention. The storytelling intervention was conducted to the participants. The researchers brought the participants to AUP College of Dentistry. Then storytelling was conducted in a classroom set-up. The storytelling intervention lasted for about 15 minutes. Parents were allowed to accompany their children, provided that they were not inside the classroom during the intervention and post-test survey.

The post-test survey was given to the participant's right after the intervention. It used the same instrument (MCDASf questionnaire) in assessing the children's dental anxiety. Mouth examination and a two-minute scaling and polishing were done to the participants in the dental clinic. Data gathered were analyzed.

Statistical Treatment

The study used frequency and percentage to determine the profile of the participants. Mean and Standard Deviation were used to determine the level of dental anxiety for Pre-test and Post-test. T-test was used to determine the difference on dental anxiety before and after the storytelling. Kruskal-Wallis test was used to determine the difference of the pre-test and post-test results considering age and frequency of dental visit. Mann-Whitney U test was used to determine the difference of the pre-test and post-test results considering gender.

Ethical Considerations

The parents of the participants were given an informed consent that explained the nature of the research. The informed consent includes the information such as: (a) the purpose of the research; (b) expected duration and procedures; and (c) whom to contact for questions about the research.

RESULTS AND DISCUSSION

Pre-Test and Post-Test Level of Dental Anxiety among the Participants.

Table 1 presents the result of the pre-test of the eight participants (MCDAS Questionnaire served as their pre-test). The researchers computed the raw scores of the eight (8) participants and have the mean score of 3.91 which suggests a high level of dental anxiety. A high score in MCDAS Questionnaire indicates that the test taker have a high dental anxiety level

Table 1
Pre-Test Mean and Standard Deviation of the Participants

Pre-test	Mean	Standard Deviation	Interpretation
MCDASf	3.91	0.50	*High*

Table 2 presents the result of the post-test of the eight respondents (MCDAS Questionnaire served as their post-test). In administering MCDAS Questionnaire as post-test, the researchers exposed the participants to the storytelling intervention. After the respondents underwent the storytelling intervention, the researchers administered the MCDAS Questionnaire as post-test. The researchers computed the post-test raw scores of the eight respondents and got the mean score of 2.98 which suggests a moderate dental anxiety level.

Table 2
Post-test Mean and Standard Deviation of the Participants

Post-test	Mean	Standard Deviation	Interpretation
MCDASf	2.98	0.99	*Moderate*

Table 3 presents the MCDASf questionnaire items being scored and interpreted. This also differentiates each item question in the two tests: Pre-test and Post-test. Based on the pre-test mean of the eight participants also shown in Table 4, results show that: they have *moderate anxiety* (fairly worried) on Q2, Q3 and Q7; *high anxiety* (worried a lot) on Q1 and Q5; and *very high anxiety* (very worried) on Q4 and Q6.

Table 3
Pre-test and Post-test of the MCDASf Item

MCDASf Questionnaire	Pre-test			Post-test		
	Mean	SD	Interpretation	Mean	SD	Interpretation
How do you feel about…						
Q1 …going to the dentist generally?	4.13	1.37	*High*	1.88	1.36	*Mild*
Q2 …having your teeth looked at?	3.25	1.28	*Moderate*	2.63	1.30	*Moderate*
Q3 …having your teeth scraped and polished?	3.00	1.51	*Moderate*	2.75	1.49	*Moderate*
Q4 …having an injection in the gum?	4.75	0.46	*Very High*	3.63	1.06	*High*
Q5 …having a filling?	4.38	0.92	*High*	3.38	1.41	*Moderate*
Q6 …having a tooth taken out?	4.63	0.52	*Very High*	3.63	1.19	*High*
Q7 …being put to sleep to have treatment?	3.25	1.98	*Moderate*	3.00	1.60	*Moderate*

Table 4
Pretest Mean, Standard Deviation and Interpretation Ranked from Highest to Lowest

MCDASf Questionnaire	Pre-test		
	Mean	SD	Interpretation
How do you feel about…			
Q4 …having an injection in the gum?	4.75	0.46	*Very High*
Q6 …having a tooth taken out?	4.63	0.52	*Very High*
Q5 …having a filling?	4.38	0.92	*High*
Q1 …going to the dentist generally?	4.13	1.37	*High*
Q7 …being put to sleep to have treatement	3.25	1.98	*Moderate*
Q2 …having your teeth looked at?	3.25	1.28	*Moderate*
Q3 …having your teeth scraped and plished?	3.00	1.51	*Moderate*

Table 5 shows the post-test mean and standard deviation which presents that the participants have *mild anxiety* (very slightly worried) on Q1, *moderate anxiety* (fairly worried) on Q2, Q3, Q5 and Q7, and *high anxiety* (very worried) on Q4 and Q6. Although Q2, Q3 and Q7 presented the same interpretation for both pre-test and post-test, results show that there is a decrease in their mean score. Question 4 and Q6 got the highest mean score for both pre-test and post-test (from very high to high). Q4 and Q6 are related to getting an injection and having a tooth extracted. According to the study of AlSarheed (2011), the fear of local anesthesia and tooth extraction were the most common reasons why children dislike dental treatment. Q1 mean results went from *high* (worried a lot) to *mild* (very slightly worried) which describes the feeling of children towards visiting the dentist generally.

Table 5
Post-test Mean, Standard Deviation and Interpretation Ranked from Highest to Lowest

MCDASf Questionnaire	Pre-test		
	Mean	SD	Interpretation
How do you feel about…			
Q4 …having an injection in the gum?	3.63	1.06	*High*
Q6 …having a tooth taken out?	3.63	1.19	*High*
Q5 …having a filling?	3.38	1.41	*Moderate*
Q7 …being put to sleep to have treatement	3.00	1.60	*Moderate*
Q3 …having your teeth scraped and plished?	2.75	1.49	*Moderate*
Q2 …having your teeth looked at?	2.63	1.30	*Moderate*
Q1 …going to the dentist generally?	1.88	1.36	*Mild*

The difference between the pre-test and the post-test shown in Table 3 indicates that the storytelling intervention has lowered the anxiety level of the participants towards dental visit. The results agree with the study of Restrepo and Davis (2003), which they mentioned that storytelling can lead to establishing a sense of trust and comfort to the audience, thus lessening their anxiety.

Effect of Storytelling On The Level Of Dental Anxiety Of The Participants

Table 6
Effect of Storytelling on the Level of Dental Anxiety

Mean Difference (post-pre)	t	P
-1.93	-10.003	.000

The result showed that storytelling has a significant effect on the level of dental anxiety of the participants (t = -10.003; p = .000) as presented in Table 6. The result implied that storytelling lowered the anxiety level of the participants and that it can be a pre-behavior management method to prepare children before their dental visit.

Storytelling can be used in changing emotions as presented in the study of Parker and Wampler (2006) which supports CBT's basic premise and that is to target the emotion and thoughts to change one's attitude and behaviour. Dental anxiety is the feeling of uneasiness, apprehension, and worry to specific future uncertainties with regards to dental procedures. Information is the key to address those uncertainties. Storytelling is said to be the oldest form of education in which it allows information to be imparted to its listeners (Hamilton & Weiss, 2005). Storytelling can inform the children about what can they expect to see, hear, and do at a dental visit (Friesen, 2016).

Supporting studies regarding the positive impact of storytelling to anxiety can also be found. One example is the study conducted by Tunney and Boore (2013) which proves that the use of a storybook in children who are undergoing tonsillectomy and adenoidectomy in Northern Ireland is effective in reducing their anxiety. It is also suggested by Law (2003) that the use of children's books with positive representations of a dental experience can serve as a pre-behaviour management of children before a dental visit.

Difference Between the Participants' Pre-Test and Post-Test Results Considering: Age, Gender and Frequency of Dental Visit

Table 7 shows that there is no significant difference in the anxiety level considering the age of the participants (H = 2.500; p = 0.475). The results imply that the anxiety level of the respondents is the same regardless of their age. The researchers assumed that because of the close interval between the ages of the participants, and their limited number, the results are not significant. Although Rãducanu, Feraru, Herteliu, and Anghelescu (2009) mentioned that a child's perception of anxiety/fear tends to decrease as children age.

Table 7
Difference of Pre-test and Post-test Results Considering Age

Age	Mean Rank	N	Kruskal-Wallis test	H- p value	Interpretation
5	2.50	2	2.500	0.475	Not significant
6	4.00	1			
7	4.50	2			
8	6.00	3			

Table 8
Difference of Pre-test and Post-test Results Considering Gender

Gender	Mean Rank	N	Mann-Whitney U test	p value	Interpretation
Male	3.67	3	5.00	0.456	Not significant
Female	5.00	5			

Table 8 shows that there is no significant difference between the pre-test and post-test results of the participants considering gender ($U = 5.00$; $p = 0.456$). It shows that the level of dental anxiety does not differ regardless of gender. Male and female have the same level of dental anxiety. On the contrary, on other studies done, such as in Taani, El-Qaderi, and Abu Alhaija (2005), Rãducanu, Feraru, Herteliu, and Anghelescu (2009), and Settineri (2005) as cited by Osorio (2014), it was recorded that females are more prone to anxiety and disorders related to it. However, only less is known on how gender affects basic parameters like age of onset (McLean, Asnaani, Litz, & Hofmann, 2011).

Table 9
Difference of Pre-test and Post-test Results considering Frequency of Dental Visit

Dental Visit Frequency	Mean Rank	N	Kruskal-Wallis H-	p value	Interpretation
None	4.40	5	0.717	0.699	Not significant
1-2 times	5.50	2			
3 or more	3.00	1			

Table 9 shows that there is no significant difference between the pre-test and post-test results of the participants considering frequency of dental visit ($H = 0.717$; $p = 0.699$). The results imply that the anxiety level of the respondents is the same regardless of their frequency of dental visit. This result, however, differs with other studies conducted previously, such as Saatchi, Abtahi, Mohammadi, Mirdamadi, and Binandeh (2015) which concluded that patients who visit the dentist regularly were found to be less nervous and anxious when visiting the dentist. The difference in results of this study with others can be due to the limitations of the study.

CONCLUSION AND RECOMMENDATIONS

The participants manifested high anxiety over the idea of going to the dentist or having a dental treatment. The result of the study showed that children experienced anxiety upon their dental experience and idea of dental visit; however, children manifested reduced anxiety level after the storytelling intervention which was done before the dental procedure. The result suggested that storytelling can help in reducing the level of anxiety experienced by the children towards dental visits. The findings showed that there is no significant difference between the ages of the participants. The findings also denote that there is no significant difference between the pre-test and post-test results of the participants considering gender. It shows that gender does not play any significant role in affecting a person's level of dental anxiety even after the storytelling intervention. Moreover, frequency of dental visits does not influence the level of dental anxiety of a person.

The researchers recommend using developed Pediatric Dentistry Material in the storytelling activity. Storytelling may be done at home prior to visiting the dentist. An informed child can be more mentally and emotionally prepared for the upcoming dental procedures.

A larger number of participants and more in-depth study are recommended for a more accurate outcome of the result; like use of a more complicated procedure, such as extraction, in testing the reliability of the study in reducing the dental anxiety level of the children. The researchers recommend the consideration of the use of digital storytelling since people are now living in a modern age where technology is advancing and children nowadays are more tech-literate. The researchers also recommend to have a separate room for the storytelling activity in every dental office especially with those specializing in the field of pediatric dentistry.

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