ASSESSMENT OF NUTRITIONAL STATUS ASSOCIATED WITH MACRONUTRIENT INTAKE OF ELDERS IN BRGY. 655, INTRAMUROS, MANILA

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ABSTRACT

According to World Health Organization (2015), malnutrition is a prevalent public health issue worldwide, predominantly among elders. With this, the study aims to assess the nutritional status of the elders residing in Barangay 655, Intramuros, Manila and their dietary pattern, to calculate and compare for the macronutrient component of their food intake with the recommended intake designed by the Food and Nutrition Research Institute, Philippines (FNRI) and the relationship between Mini Nutritional Assessment (MNA) score to the total consumption of each macronutrient component of the food. Lastly, to create food-based dietary guidelines for the elders. MNA was used to determine their nutritional status and estimated food record and FFQ was used to determine their food intake. The results showed that the elders residing in the barangay are mostly at risk of malnutrition and malnourished individuals. Food intakes are found to be inadequate. Nutritional status has a positive -moderate relationship to carbohydrates, positive but weak relationship to protein and negative and weak relationship to fats. Low carbohydrate intake is the main cause of malnutrition among the elders in the barangay. Based on the findings of the current study, the researchers produced dietary guidelines that will help improve their nutritional status.

Keywords: *Mini Nutritional Assessment, Nutritional status, macronutrients, elders and dietary pattern*

INTRODUCTION

Malnutrition is an important public health and clinical concern worldwide, predominantly among elderly (Virtuoso-Junior *et al.,* 2012) with the age of 60 and above (WHO, 2015) (FNRI, 2015). Malnutrition is defined as the condition that refers to the lack or excessive intake of nutrients in the body (Jamorabo-Ruiz & Serraon-Claudio 2010). In addition, it is a condition of an imbalance of energy, protein and other nutrients which may lead to the problems regarding the individual's body composition, physical capabilities and clinical results (Vandewoude, Alish, Sauer, & Hegazi, 2012). The World Health Organization (2015) expects that the problem of malnutrition is worsening due to an aging population. Over the pace of population, aging is faster than in the past year. In 2050, 80 % of older people will be settling in low- and middle-income countries that demand the increase of consideration of health professionals to this group (WHO, 2015). In Asia, the percentage of elderly is increasing fast, and malnutrition becomes common among the elderly (Agarwalla, Saikia, & Baruah, 2015). In Nepal, 24% were found as malnourished and 65% were found as at risk of malnutrition (Ghimire, Baral, &Callahan, 2017). In India, out of 360 elderlies, 15% were found to be malnourished and 55% were at risk of malnutrition (Agarwalla, Saikia, & Baruah, 2015). In Iran, out of 377 elderlies, 43% of the women and 25.7% of the men were found to be malnourished (Ahmadi *et al.,* 2013).

In the Philippines, according to the National Statistics Office (2016), the population aging 60 years and above has grown at a very fast rate, from 2.4 million in 1980 increasing to 5.4 million in 2007 and 6.3 million in 2010, and that as of July 2016, 4.38 % of the total population were senior citizens – 1,863,339 males and 2,628,315 females. By the year 2025, 10% of the population will be composed of senior citizens. In terms of the nutritional condition of elders, the 2013 National Nutrition Survey of the Food and Nutrition Research Institute reveals that 23.7% of the male elders and 23.4% female elders aged 70 and above are affected by Chronic Energy Deficiency (CED) or are undernutrition. Among the population, this age group has the highest percentage of CED while 33.5% of the male elders and 42.8% of female elders aged 40-49 have the highest percentage of being overweight. Undernutrition and over nutrition are the two types of malnutrition experienced by the older population in the Philippines. Undernutrition is a condition wherein the nutrient intake of an individual is inadequate to the recommended requirement while overnutrition is the condition that refers to excess consumption of the required nutrient intake of an individual (Noronha, Cunha, Araujo, Abrunhosa, Rocha & Amaral 2015). Due to growing population of the elderly, there is an urgent need to solve the negative aspects of aging specifically malnutrition. (Jaroch & Kedziora-Kornatowska, 2014). The negative changes are morphological, functional and biochemical changes due to malnutrition problems (Da Silva, Dallepiane, Kirsten,

& Kirchner, 2016). As a matter of fact, malnutrition has various effects on the organs and systems of the body. It lowers the immune response of an individual and may result in high infections. Also, it decreases the muscle mass and muscle strength that may lead to disability (Donini, Neri, De Chiara, Poggiogalle, & Muscaritolli, 2013).

As the population profile changes, people in an aging process will experience change with health and physical aspects. Those people may become ill due to natural physiological alterations that may cause chronic conditions (Floriano, Azevedo, Reiners, & Sudre, 2012). The elderly is considered a vulnerable group who are prone to nutritional deficiencies and suffer from malnutrition. The healthcare of the elderly is not given sufficient assistance by the policymakers due to other concerns like maternal and child health, malnutrition, and communicable diseases. Old age is said to be the stage of life that is not worth anticipating due to some older people with poor health, low wages, and no economic provision from their children and friends (Khamu & Langstieh, 2015).

In this life cycle, an attentive look to the application of principles of nutrition from the health professionals is required since this age group has an increased susceptibility to the development of various diseases (Da Silva, Dallepiane, Kirsten, & Kirchner, 2016). Aged persons become dependent for the reason that health alterations happen to them. Hence, there is a necessity to change on how and where proper care is given to them (Floriano *et al.,* 2012). The occurrence of malnutrition is the cause of the serious problem in an elder's personal health (Virtuoso-Junior *et al.,* 2012).

In the study of Rist *et al.* (2012) it was revealed that awareness about the prevalence of malnutrition in the community is essential due to health complications related to malnutrition. The aforementioned claim may be the reason for an increase in admissions to hospitals, long stays in hospitals or even an increase of mortality rate by 30% in one year. Most of malnourished elderly in the community are not recognized. Thus, nutrition must be the priority in care provision- for it deals with the condition of the people living in the community. Additionally, organizations in the community can provide care to the people by developing programs that will give significance to their nutritional needs. These government policy-based programs will address the problems of the community regarding the malnutrition and may enhance the health care system According to Noronha *et al.,* (2015), there is a prevalence of undernutrition of 32% in the community. Another study reported that 35% of elders who are living in the community shows a higher prevalence of malnutrition (Cuerda *et al.,* 2016). According to Rist, Miles & Karimi, (2012), there are 20-30% of malnourished elderly clients who live in the community. The reported cases of malnutrition among elders within the community is due to inadequate intake of food (Quann, Fulgoni, Auestad, 2015) which is related to dietary pattern (Granic *et al.,* 2016) food availability and food consumption (Milte and McNaughton, 2016) (Silva, Dallepiane, Kristen, and Kirchner, 2015) (Harland, Buttriss and Gibson, 2012).

The popularity of food consumption studies in elderly people have increased due to the aging of the population and to the relevance of nutrition to the issues of health and functional disability. Functional impairment in elderlies is related to malnutrition, which is also associated with the perception of quality of life (Chernof, 2016). As a person ages, insufficiency of food intake starts to emerge. Those related to some food groups containing macronutrients such as carbohydrates, protein, and fats are important at this life stage (Silva, Dallepiane, Kristen & Kirchner, 2015). Intake of carbohydrates like whole grains by elders can stimulate cognitive benefits (Wengreen *et al.,* 2013), lower the risk of cardiovascular disease, hypertension, and type 2 diabetes (Jonnalagada *et al.*, 2012). Elders who eat the correct amount of carbohydrates with normal glycemic load level can reduce their risk of developing dementia like Alzheimer's disease (Power & O`Connor, 2014).

Protein intake was noted to be highest among young adults and gradually drops as age advances. In the study of Rahi, Morais, Gaudreau, & Payette (2016), the intake of sufficient protein and energy intake was correlated with the prevention of weakening of functional capacity. This study further showed that protein intake of >1g/kg body weight has a significant effect on functional capacity via muscle strength maintenance. In the findings of Granic *et al.,* (2016), food selection and dietary patterns, especially in protein, was found to be important. It showed that a diet high in red meat, gravy and butter may have an effect on muscular strength and physical performance and aggravates age decline leading to malnutrition problems. In the study of Gopinath, Russell, Sue, and Flood (2015), the insufficient protein, folate and magnesium intake can impair olfactory functions.

Certain recommendations for variation of dietary fat must be made on an individual basis according to a complete profile of stroke and cardiovascular risk factors. A sufficient intake of fat, mainly unsaturated fatty acid, of elders was associated with a decrease in risk factors for cardiovascular disease, metabolic syndrome, and type 2 diabetes (Wengreen *et al.,* 2013). In the study of Gonzales, Lopez, Margolles, Suarez, Patterson (2013), the sufficient intake of fat, mainly polyunsaturated fatty acid, have an anti-inflammatory effect playing a significant role on the health of an individual. A healthy dietary pattern may have an enduring effect on physical function into late adulthood, regardless of cognitive status, physical activity, and disease burden (Granic *et al.,* 2016).

The assessment of the three macronutrients component of the food can be done with the use of dietary assessment. The purpose of dietary assessment is to measure the nutrients, foods or eating habits of the clients. There are various methods for assessing their dietary intake and one of them is ther estimated food records. (Coates, Colaiezzi, Fiedler, Wirth, Lividini, Rogers, 2012). Estimated food record is a self-reported account used to get the dietary intake of a client. This is an open-ended instrument because all food consumed by

the client must be recorded and the number of items is not limited (National Institute of Health, 2017). In this method, the client is provided with booklet. The clients were asked to record the food intakes using food models, photographs and measuring cups and spoons to increase the accuracy of the portion sizes. The trained individual will discuss how this method works to the clients in order to omit errors (Hernandez-Cordero, Lopez-Olmedo, Rodriguez-Ramirez, Barquera-Cervera, Rivera-Dommarco & Popkin, 2015) and also the trained interviewer will review the completed record in order for it to increase the quality of the record (National Institute of Health, 2017).

The study aims to assess the nutritional status of the target population, to calculate for the macronutrient component of the food intake of the elders and to determine their dietary pattern. Also, the current study aims to compare the macronutrient intake of the elders of Intramuros to the recommended intake designed by the FNRI and to get the relationship of the MNA score to the total consumption of each macronutrient component of the food, based on the result of the estimated food record. Finally, the study aimed to create food-based dietary guidelines that will be based on the findings of this study to help improve their dietary consumption.

The significance of the study is that the result can be the basis for food-based dietary guidelines given to health officers in the community. The findings of this study will greatly contribute to societal benefits considering the important role that nutrition plays. This justifies the need for nutritional assessment. Thus, communities that shall apply the recommended approached derived from the results of this research will be able to formulate reasonable nutrition programs specifically for the elderly. The elderly will be guided on what shall be emphasized to improve their nutritional status. For the researchers in the field of nutrition and dietetics, this study will help in uncovering critical areas in the nutritional behavior of the elderly and will open up opportunities for similar research for other age groups.

This study is bound on the elders residing in Barangay 655, Intramuros, Manila. It will only focus on the assessment of the nutritional status and its relationship with the computed macronutrient intake of the elders based on the estimated food record.

METHOD

Research Design

]The study was a cross-sectional design. It was conducted at Barangay 655, Intramuros, Manila, Philippines. The study was approved by the barangay office.

Research Sample

The study used purposive sampling. The population size of elders residing at Barangay 655 Intramuros, Manila Philippines has a total number of 80 individuals. The total sample size of 63 was derived using the qualifications set by the researchers. All elders were qualified from the criteria in subsequnce: individual with the age of 60 and above (WHO 2015 and FNRI 2015), permanent resident of research locale (Ghimire, Baral, and Callahan, 2017), capable of receiving food orally and no chronic and psychological disorder (Virtuoso, *et al.,* 2012). The respondents willingness to participated and were included in the study considering their ethical rights. Consent form was filled up before the study begins. More so, privacy and confidentiality of the information were maintained. The data about the name, address, and age of the qualified participants were verified by the barangay secretary and noted by the barangay captain.

Research Instrument

Mini-Nutritional Assessment (MNA) scale is a comprehensive tool that is specifically designed for elderly people for data collection (Khamu & Langstieh, 2015). It is devised by Nestle Nutrition Institute. MNA is composed of two parts: the screening and the assessment. It is an 18-item protocol that consists of: (a) dietary assessment; (b) anthropometric measurements (weight, height, mid-arm circumference, calf-circumference and weight loss); (c) general assessment (lifestyle, medication, mobility and psychological); and (d) subjective assessment (Self-perception about nutrition). The Mini Nutritional Assessment was being used by different researchers because of the high sensitivity of 84% and specificity of 94.4% (Virtuoso, *et al.,* 2012). Therefore, it is an effective and dependable tool in assessing elders. (Rist, Miles, & Karimi, 2012).

Food Frequency Questionnaire

Food frequency questionnaire (FFQ) is a questionnaire that determines how often or how much the respondents ate for a specific period of time. This kind of method is used for comprehensive assessment of long-term food consumption and is more accurate in gathering population-level dietary data. Moreover, FFQ is a widely used method for determining dietary patterns of large numbers of individuals (Shim, Oh, & Kim, 2014). Determining the amount of food consumption of individuals is one of the factors that have a substantial influence on the nutritional status. Furthermore, the dietary pattern of individuals is a vital determinant of manifestation of diseases (Shrivastava, Shrivastava, & Ramasamy, 2014).

The data from this instrument is a subjective report of food consumption routine. Several validation studies evaluating the use of standard FFQ in the elderly have demonstrated a satisfactory correlation between FFQ results and estimated food record method (Danit, Drora, Iris, & Hillel-Vardi, 2017).

Data Gathering Procedure

A. Nutritional Status

The researchers used a digital weighing scale (Miniso Electronic Lightweight Scale Led) with a calibration of "0" to get current weight and a portable stadiometer (seca213) to get the current height. Height and weight were measured without shoes and in light clothing. Shakir`s tape was used to get the mid-upper arm circumference and tape measure to get the calf circumference.

The Nutritional Status of the client was determined by the Mini Nutritional Assessment (MNA, 2015).

B. Mini Nutritional Assessment-Short Form (MNA-Full)

The Mini Nutritional Assessment one-on-one interview was conducted by the researchers. Each question has a corresponding score. The malnutrition indicator score is 24 to 30 points for normal nutritional status, 17 to 23.5 points for at risk of malnutrition and less than 17 points for malnourished. Several studies used MNA as a questionnaire for elders such as Buckinx *et al.,* 2016, Jimenez-Redodo *et al.,* 2016, Jaroch & Kedziora-Kornatowska, 2014, Kaur & Mal, 2017, and Virtuoso *et al.,* 2012. In administering the MNA, the current study used the manual entitled "Nutrition Screening as easy as MNA" A guide to completing the Mini Nutritional Assessment (MNA) set by the Nestle Nutrition Institute.

C. Food Frequency Questionnaire

Habitual food intake for the past 12 months was assessed using a food frequency questionnaire. The food frequency questionnaire (FFQ) was conducted by the researchers in the form of a face-to-face interview with the respondent and one immediate family member. The questionnaire was divided into beverage, dairy products, mixed dishes, meat and fish, vegetable, cereals, and grains, fruits, desserts and sweet and miscellaneous. In answering the food frequency questionnaire, the respondents chose one column (per day, per week, per month, per year or Never/Rarely) that best described how often the food item was being consumed for the past 12 months and the indicated number of servings. In determining the portion size, the researchers asked the respondent if she/he takes the food item in an average portion size. The average portion size of the food item was indicated in the questionnaire. If the respondents take the food item greater than the average portion size, it means that the consumption of the food item was in a larger portion size. But if the respondents consumed the food item lower than the average size, it means that the food item was consumed in smaller portion size. In cases that the respondents were not familiar with the specific food, the researchers used photographs (Hernandez-Cordero, Lopez-Olmedo, Rodriguez-Ramirez, Barquera-Cervera, Rivera-Dommarco & Popkin, 2015).

The food frequency questionnaire was adopted from the study of Liu *et al.,* (2012). It was based on his study entitled "Dietary intake and eating patterns of elderly people in Newfoundland and Labrador" that was supported by a research grant from Newfoundland and Labrador Centre for Applied Health Research (NLCAHR). The food frequency questionnaire by Liu *et al.,* (2012) was intended for elders residing in a small community.

D. Food Consumption

The current study used estimated food record to get the food consumption of the respondents. Estimated food record was conducted with the use of a booklet given to the respondents. If the respondents cannot read and write, the booklet was given to the respondent`s immediate family members. The recording was done within one week, it contains two weekdays and one weekend with a total of three days (Wong, Parnell, Howe, Black & Skidmore, 2013). The food record was divided into two columns, the food item with brand name / cooking method and estimated food amount. The researchers informed the respondents and immediate family members about the estimation of food items the process included the used of kitchen utensils such as cups (240 g for solid and 250 for liquid), teaspoon (5g), tablespoon (15 g) and a ruler (12 inches) (Liu et al, 2012). After the three days, estimated amount or measurement of each food item was converted into grams and liters for the computation of macronutrient composition including carbohydrates, protein, and fat.

After determining the food consumed by the residents, the nutrient content of food eaten was calculated by the researchers by means of Food Exchange List (FEL) by the Food and Nutrition Research Institute (2008). The method used was adapted and modified from Buckinx *et al.,* 2016 and Villaroel *et al.,* 2012.

Food Intake Computation

The estimated food consumption of the respondents indicated in the estimated food record was converted into metric measurements such as grams and liters. Each food item was classified according to the Food Exchange List classification.

Standard Value vs. Food Intake

In comparing the standard value and the computed value of each macronutrient, the Philippine Dietary References Intake 2015 was used as the standard basis for creating the standard value for carbohydrates, protein, and fats. For aged 60-69 years old, the total energy (kcal) requirement for male was 2140 kcal and 1610 kcal for female. For aged 70 years old and above the total energy (kcal) requirement for male was 1960 kcal and for female was 1540 kcal.

The distribution of total energy into three macronutrients was based on the Nutritional Guidelines for Filipinos (2012). For aged 60-69 years old, carbohydrates 60%, protein 15% and fats 25%. For aged 70 years old and above, carbohydrates 55%, protein 15% and fats 20%. A decrease of 10% each decade to the total energy requirement for aged 70 years old and above is required (Jamorabo-Ruiz & Claudio, 2010). In getting the Percentage Deficit and Adequacy of Intake, the following equations were being used:

$$D = RI\,(g) - CV(g) \qquad \textbf{Eqn. 1}$$

Where: D = Difference
RI = Recommended Intake
CV = Computed value from the estimated food record

$$PD = \frac{D\,(g)}{RI\,(g)}\ X\ 100 \qquad \textbf{Eqn. 2}$$

Where: PD = Percentage Deficit
D = Difference
RI = Recommended Intake

$$AI = \frac{CV\,(g)}{RI\,(g)}\ X\ 100 \qquad \textbf{Eqn. 3}$$

Where: AI = Adequacy of Intake
CV = Computed value from the estimated food record
RI = Recommended Intake

Statistical Analysis

Pearson R was used as the statistical tool for determining the significant between the relationship of nutritional status and macronutrient intake of elders. In determining the significant relationship between nutritional status and macronutrient intake of elders, the level of significance of $p< 0.05$ was considered. (Csontos *et al.*, 2016)

In using the r values the correlation was determined. Furthermore, Positive values denote positive linear correlation; Negative values denote negative linear correlation; the value of 0 denotes no linear correlation; the closer the value is to 1 or –1, the stronger the linear correlation.

RESULTS AND DISCUSSION

The two areas of nutritional assessment such as anthropometry and dietary assessment were used. Anthropometric measurement includes the weight, height, BMI, mid-upper arm circumference and calf circumference included in Mini Nutritional Assessment used in assessing nutritional status. Dietary assessment such as the food frequency questionnaire and estimated food record were used in getting food intake among the elders in Barangay 655 Intramuros, Manila.

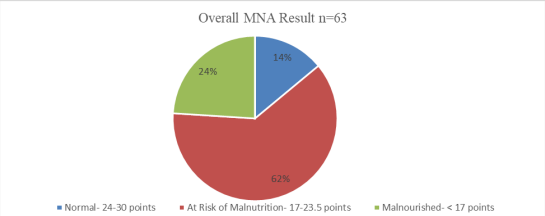

Figure 1. MNA result for both male and female elders. The MNA result was based on scores of every individual. It reveals that 62% of th total elders residing in Barangay 655, Intramuros, Manila are at risk of malnutrition.

Table 1.The MNA results for male and female ages 60-69 years old

MNA Classification			
60 years old and above	**Normal**	**At risk of Malnutrition**	**Malnourished**
Male (n= 12)	42%	58%	0%
Female (n= 26)	8%	92%	0%
70 years old and above	**Normal**	**At risk of Malnutrition**	**Malnourished**
Male (n= 7)	14%	14%	72%
Female (n= 28)	6%	38%	56%

Most of the At-risk individuals come from female with age group 60-69 years old. The results are the same in the study of Boulos, Salameh &Barberger and Gateau, 2013 that the at-risk malnutrition ias significantly more frequent in females due to low education attainment that results in low socioeconomic status.

Ages 60-69, both male and female, were reported of having an inadequate intake of carbohydrates, protein, and fat in which the age group with a higher percentage of at risk in malnutrition based on the MNA results. On the other hand, on ages 70 and above, both male and female, also resulted to an inadequate intake of carbohydrates, protein, and fat. The mean intake of the respondents did not meet the required amount of macronutrient based on their age group.

Table 2. Comparison of computed value and required amount of three macronutrients among male and female ages 60-69 and 70 years old and above.

Carbohydrates					
Male Age Group	**Requirement (g)**	**Computed value from Estimated Food Record (g)**	**Difference (g)**	**Percentage Deficit**	**Adequacy of Intake**
60-69	320	170.03	149.97	47%	53.13% (Inadequate)
70 and above	295	144.79	150.21	51%	49.08% (Inadequate)
Female Age Group	**Requirement (g)**	**Computed value from Estimated Food Record (g)**	**Difference (g)**	**Percentage Deficit**	**Adequacy of Intake**
60-69	240	156.46	83.54	35%	65.19% (Inadequate)
70 and above	220	131.13	88.87	40%	59.6% (Inadequate)
Protein					
Male Age Group	**Requirement (g)**	**Computed value from Estimated Food Record (g)**	**Difference (g)**	**Percentage Deficit**	**Adequacy of Intake**
60-69	71	26.94	44.06	62%	37.94% (Inadequate)
70 and above	62	41.27	20.73	33%	66.56% (Inadequate)
Female Age Group	**Requirement (g)**	**Computed value from Estimated Food Record (g)**	**Difference (g)**	**Percentage Deficit**	**Adequacy of Intake**
60-69	71	29.84	41.16	58%	42.03% (Inadequate)
70 and above	62	24.73	37.27	60%	39.89% (Inadequate)
Fats					
Male Age Group	**Requirement (g)**	**Computed value from Estimated Food Record (g)**	**Difference (g)**	**Percentage Deficit**	**Adequacy of Intake**
60-69	60	23.28	36.72	61%	38.8% (Inadequate)
70 and above	**45**	22.1	22.9	51%	49.11% (Inadequate)
Female Age Group	**Requirement (g)**	**Computed value from Estimated Food Record (g)**	**Difference (g)**	**Percentage Deficit**	**Adequacy of Intake**
60-69	45	24.98	20.11	45%	55% (Inadequate)
70 and above	35	25.07	9.93	28%	71.62% (Inadequate)

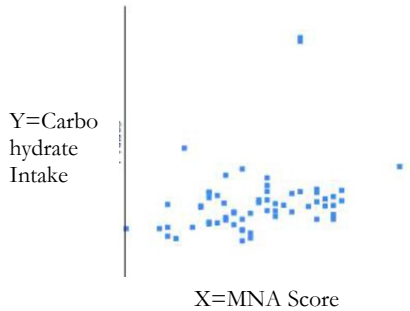

Figure 2. The value of R= 0.8727 with 0.00001 p-value. It means that the Nutritional status and carbohydrate intake of the respondents based on the Estimated Food record has a significant relationship with positive moderate correlation.

After the MNA and each macronutrient were computed, the relationship was performed using Pearson R as a statistical tool. The current study reveals that carbohydrates are the only macronutrient that has a significant relationship with a positive and moderate correlation to nutritional status. It means that low MNA score determines a low consumption of carbohydrates among elders. Most of the elders that are at-risk of malnutrition have a low carbohydrate intake. Low carbohydrate intake directly affects the nutritional status. The findings of the current study are in line with the study of Zazpe, Tainta, Santiago, & Arrillaga (2014) stated that an adequate amount of carbohydrate intake was found to be strongly associated with lower risk of malnutrition. Also, the study of Noto, Goto, Tsujimoto

& Noda (2012) supports the result of the current study that low carbohydrate intake is associated withhigh risk of malnutrition and death. Moreover, Hu *et al.,* (2012) reported that low carbohydrate diet is one of the reasons for having malnutrition and weight loss. Similarly, Makris *et al.,* (2013) also discussed that low carbohydrate diet results to malnutrition and weight loss that leads to an impairment of their cognitive processes.

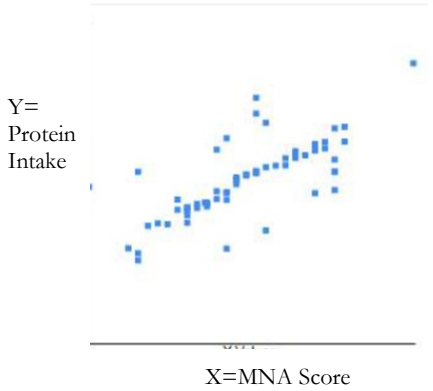

Figure 3. The value of R=0.28 with 0.026243 p-value. It means that nutritional status and protein intake of the respondents based on the Estimated Food record has a significant relationship with positive -weak correlation.

The current study reveals that nutritional status has a significant relationship with positive-weak correlation with protein intake, this result is in line with the study of Stomberg, Rodriguez, & Kerstter (2011), Isanejad, Mursu, Sirola,& Kroger, (2016) reported that protein intake has a positive relationship with the nutritional status which means that protein intake can contribute to the improvement of nutritional status if it was given at a right amount. It was supported in the study by Levine *et al.,* (2014) that low protein diet may bring risky effect the elders. Having inadequate protein intake may increase the number of malnourished and frail individuals and may be the risk of the development of diseases.

The positive but weak correlation of protein and nutritional status suggests a continuous study to strengthen the relationship because there are studies which state protein intake cannot directly affect nutritional status among elders since protein intake is strongly associated with sarcopenia or reduction in muscle mass that causes undernutrition among elders based on the study of Pederson & Cederholm (2014) and agreed in the study of Nowson, & O' Connell (2015.)

The significant relationship of the protein and nutritional status indicates the importance of the adequate amount of protein in the diet. It should be in medium portion (Jones, & Rasmussen, 2010) or 1.12 grams per kilogram body weight (NDAP, 2010) (Jamorabo-Ruiz, & Serraon-Claudio, 2010), so that it can prevent the advanced muscle deterioration and at risk of malnutrition. The amount below the required intake of protein can lead to Protein Energy Malnutrition (PEM) that leads to fatigue, weakness, and confusion. According to Wellman & Kamp (2012), the relationship of increase calorie, protein intake, and nutritional status among elders is one of the strategies in combating malnutrition in a community setting.

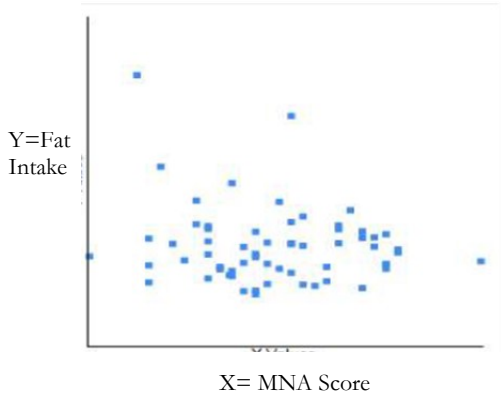

Figure 4. The value of R= -0.1571. It means that nutritional Status and fat intake of the respondents based on the Estimated Food record has a negative correlation and weak.

Average fat intake of the elders in Barangay 655 Intramuros, Manila was below the required amount. Furthermore, the result of the current study shows that the nutritional status and fat intake has a negative and weak relationship. It means that fat intake is not directly contributing to the cause of malnutrition because the fat intake is strongly associated with developing the related disease in older adults or chronic diseases. Therefore, the development of diseases due to fat intake is the cause of malnutrition (Power *et al.,* 2014; de Carvalho, Cesar, Fisberg & Marchioni, 2014; Previdelli, Goulart, & de Aquino, 2017). It is supported by Foundation of Alternative and Integrated Medicine (2017) that the low-fat diet is dangerous and not good for the health due to the fact that lipid building blocks in the body are being starved which leads to the decrease of cognitive performance level and may increase the risk of Alzheimer's disease and finally malnutrition. Also, in the Study of Gray (2012) that high fat intake can increase the risk of chronic disease like a cardiovascular disease which resultsin the risk of malnourishment among older people.

Hence, the intake of fat must be in the right amount, a 20-25 % from the total caloric requirements (Jamorabo-Ruiz & Serraon-Claudio, 2012) because a high or low intake of fat can affect the overall health of the older population (Pan, Smith, Batis, Popkin, & Kenan, 2014).

Nutritional status has a positive relation with two macronutrients but different degrees carbohydrates being the positive-moderate, and protein as positive weak. Nutritional status has a negative-weak relationship with fat intake. The intake of adequate amount of the three macronutrients has shown the effect on the health of elders. Carbohydrate-rich types of food are the main source of energy for daily activities. Protein helps in replenishing body fluids and helps in muscle-building

because older people experienced a reductioninfat-free mass and muscle strength (Amarya, Singh & Sabharwal, 2015) Also fats contribute to the absorption of fat-soluble vitamins such as A, D, E, and K.

On the other hand, saturated fats must be avoided due to the fact that it may result in other illnesses (Gonzales *et al.,* 2013) and may bring implications of cardiovascular diseases (Amarya *et al.,* 2015).

Based on Table 3, it shows that the dietary pattern of the elders are high in protein and fat and low in carbohydrates. Carbohydrates rich types of food include the potatoes and pizza, protein and fat rich foods which includecanned fish, chicken, corned beef, and egg. FFQ results were validated by estimated food record method that carbohydrate-rich food is consumed at a low amount. (Danit, Drora, Iris, & Hillel Vardi, 2017

Table 3. Food groupings used in determining dietary pattern

Food Groups	Foods included
Beverage	Whole milk, Sugar (in tea and coffee), Milkshake, Coca-cola, Pepsi, other cola, Tea (not herbal)
Dairy Products	Egg (boiled or poached), Egg (fried, scrambled, omelette), Coffee Whitener (non-dairy), Cheese, regular fat (cheddar cheese, processed), Cream (coffee, whipping, sour or regular)
Mixed Dishes	Pizza with meat, Meat dishes with potatoes and carrots, Pasta with meat sauce (spaghetti), Soup (creamed), Soup (non-creamed)
Vegetables	French fries or Fried Potatoes, Onions (raw or cooked), Tomatoes (fresh), Corn, Eggplant
Meats and Fish	Fried Fish, Canned fish (tuna), Chicken, skin removed, Corned beef, Sausage
Cereals and grains	Cereals and grains, Rice, Pancakes, waffles, Crackers (snacks, or soda type), Crisp Snacks (pretzels, potato chips, popcorn), White bread
Fruits	Banana, Mango, Papaya, Grapes, Watermelon
Desserts and sweets	Ice cream, Cookies, Candy (without chocolate), Chocolate bar/chocolate candy), Donuts and sweet rolls
Miscellaneous	Oil (in cooking), Ketchup, Peanut butter, Butter (on vegetables or bread; exclude used in baked and mixed dishes), Chocolate spreads

The FFQ results show that most of the food consumed by the elders residing in Barangay 655 Intramuros, Manila were high in protein and fats and low in carbohydrates. The low carbohydrate intake of elders was the main cause of malnutrition reported based on the MNA among elders because it was the only macronutrient that has a positive relationship-moderate with nutritional status. But the current study suggests that the balanced intake of the three macronutrients should be taken into consideration in giving right diet to elders since the intake among the three macronutrients was inadequate.

CONCLUSION

The current study found out that the malnutrition is rampant among elders in Barangay 655 Intramuros, Manila. Nutritional status has a positive-moderate relationship to carbohydrates and positive-weak relationship for protein, while fat has a negative-weak relationship. The current study reveals that the main cause of malnutrition is the inadequate intake among elders specifically carbohydrate intake. The reported cases of malnutrition were based on the MNA conducted by the researchers. Since the intake of three macronutrients was inadequate the researchers suggest considering fat and protein in the diet of the elders. In this light, the researchers were able to come up with the ten dietary guidelines based on the findings of the current study.

Figure 5. Food Base Dietary Guidelines

RECOMMENDATION

The researchers suggest to the policy makers and health advocate of the Barangay 655, Intramuros, Manila to use the guidelines in creating micro level planning for

nutrition and health programs for the elders. Moreover, the researchers suggest associatingmicro- nutrient and nutritional status. Micronutrient can be a factor in absorbing some macronutrient. Micronutrient can be computed using Food Composition Table (1997) designed by the Food and Nutrition Research Institute. For the future researchers, the food-based dietary guidelines must be measured in order to test the effectiveness.

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