

## Nutritional Quality of Meals, Food Intake, Physical Activity and Length of Stay Predict Nutritional Status of Institutionalised Elderly Filipinos

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### ABSTRACT

**Introduction:** Increasingly, the threat of malnutrition in geriatric institutions is affected by several factors such as cognition, immobility, oral problems, and psychological status. Low food intake is seen to be the primary cause of geriatric malnutrition. Further, greater length of stay and higher physical activity were significantly associated with reduced body weight and good health status, respectively. This study aimed to identify how nutritional quality of meals, food intake, physical activity and length of stay affect the nutritional status of institutionalised elderly in the Philippines. **Methods:** Data for this study were obtained using food weighing records, 24-hour food recall, Physical Activity Scale for Elderly (PASE), and Mini Nutritional Assessment (MNA) among 100 purposively recruited institutionalised elderly. Macronutrients were computed based on the Philippine Food Composition Table (FCT) while adequacy was evaluated based on the Philippine Dietary Reference Intake (PDRI). **Results:** The use of Partial Least Square (PLS) regression analysis revealed that of the variables, only food intake ( $\beta=0.17$ ;  $p=0.04$ ), physical activity ( $\beta=0.16$ ;  $p=0.04$ ) and length of stay of elderly in the institution ( $\beta=0.18$ ;  $p<.01$ ) had a weak positive effect on the nutritional status of the institutionalised elderly. **Conclusion:** This study showed the role of food intake, physical activity and length of stay in the nutritional status of elderly in home care settings. This implies that assessment of the nutritional status and its associated factors remains vital in the development of nutrition intervention and the provision of quality food planning and service in institutionalised settings.

**Key words:** Elderly, food intake, length of stay (LOS), nutritional quality of meals, nutritional status, physical activity,

### INTRODUCTION

The threat of malnutrition continues to increase in residential homes (Ongan & Rakicioglu, 2015). Factors such as cognitive and functional impairment (Carvajal *et al.*, 2015), oral feeding, deteriorated swallowing and digesting function (Wu *et al.*, 2011), and psychological well-being (Muurinen *et al.*, 2010) contribute to malnutrition. Rambouskova *et al.* (2013),

in their study reported that 10.2% of the institutionalised elderly in Prague were malnourished and 39.4% were at risk of malnutrition. Such a trend may be due to poor food intake (Vikstedt *et al.*, 2011; Verbrugghe *et al.*, 2013). Daily caloric intake of underweight residents was significantly lower as compared to normal and overweight residents (Wu *et al.*, 2011). On one hand, intake of elderly people with

normal nutritional status was known to be higher in energy, protein, carbohydrate, fat, saturated fat, vitamins A, B<sub>2</sub>, B<sub>6</sub>, and C. Intake of malnourished elderly people, on the other hand, was lower in protein, PUFA, fibre, vitamin B1, folate, iron, zinc (Ongan & Rakicioglu, 2015). Crogan, Alvine & Pasvogel (2006), for their part, averred that nutritional deficiencies are usually unrecognised and known to be the primary causes of severe clinical problems and most of the time not treated or corrected despite availability of preventive measures.

Arjuna *et al.* (2016), in a retrospective study, found that a greater length of stay in the nursing home is significantly associated with a reduction in body weight during the 6 months before the baseline. However, it is possible that those admitted to the nursing homes earlier started with more disabilities and poorer nutritional status, hence, the longer they live at the nursing homes, the more weight they lose irrespective of intervention provided at the nursing home (Arjuna *et al.*, 2016).

Reporting good health status is strongly associated with higher levels of physical activity although physical activity significantly declined with advancing age (Persson & While, 2011). In a study conducted in Malaysia, 41.5% of older adults with type 2 diabetes mellitus were found to have low levels of physical activity (Ismail *et al.*, 2015). A study by de Guzman *et al.* (2015) shows that better physical activity can be achieved with high levels of cognition. Another study found that the perception of being healthy greatly affects certainty to perform activities, specifically ambulation and walking, despite being in a poor nutritional state (de Guzman *et al.*, 2013).

Malnutrition can be slowed down through the process of adequate food consumption (Ongan & Rakicioglu, 2015). Thus, adequate food intake may be

essential in maintaining good nutritional status that can contribute to reducing the mortality rate and promoting better long term care among the institutionalised elderly (Vikstedt *et al.*, 2011; Verbrugghe, *et al.*, 2013). While there are numerous studies that dwell on the nutritional status of institutionalised elderly and its associated factors globally, there seems to be dearth of literature involving institutions in the context of a developing country like the Philippines. The purpose of this study was to identify the factors affecting the nutritional status of institutionalised elderly in the Philippines. This study suggests that monitoring nutritional status for early detection of malnutrition and paying greater attention to food quality service by including specific eating strategies and physical activity programs should bring about improved health care, quality of life and well-being of institutionalised elderly Filipinos.

## METHODS

### *Study site and subjects*

A total of 100 elderly participants from various private geriatric institutions in San Juan City, Marikina City and Montalban, Rizal in the Philippines were conveniently selected based on the following criteria: (1) male and female aged 60 years and above, (2) no nutritional/feeding support, (3) not bedridden, (4) at least 30 days admission in the nursing home, and (5) no major disease. Most of the respondents were from Camillus Medhaven in Marikina City and Anawim nursing home in Montalban, Rizal which provide long-term care and rehabilitative therapies, and cater to poor and abandoned elderly, respectively. Other respondents were recruited from Little Sisters of Abandoned Elderly in San Juan City, and Good Samaritan Nursing Home in Marikina City. All 100 participants met the inclusion criteria.

## Dietary assessment

### Weighed food record

In this study, food weighing was conducted for one day prior to consumption by weighing one serving of each meal of breakfast, lunch, dinner, and morning and evening snacks provided by the institution since meals are given in equal amounts. Macronutrients were calculated using the Philippine Food Composition Table (FCT) and evaluated as adequate, inadequate or excessive based on the Philippine Dietary Reference Intake (PDRI). The weighed food record contained columns for the date of record, the type of meal consumed, whether it is breakfast, morning snack, lunch, evening snack, dinner or bedtime, and another column for the weighed food in grams or per serving (Chellappah *et al.*, 2012). Food weighing is more precise in terms of recording food intake since it is not based on memory (Fatinah *et al.*, 2015).

### 24-h food recall

The 24-h dietary recall is one of the commonly used methods especially in large-scale surveys that estimate the food and nutrient intakes of an individual (Fiedler, Martin-Prével & Moursi, 2013). This dietary form is administered through an interview between a trained interviewer and the respondent (Engle-Stone & Brown, 2015). The form records all the dietary intake of an individual for 24 h for 3 consecutive days (Mohsen, Safaan & Ali, 2016) which relies on the respondent's accurate memory and also requires a good ability to estimate the portion sizes of the consumed food item (Wrieden *et al.*, 2003). In this study, some interviews for 24-h food recall were directly conducted between the respondents and the trained interviewers while others were between the respondents' caregivers and the interviewers. This was done only for one day due to time constraints. The validity

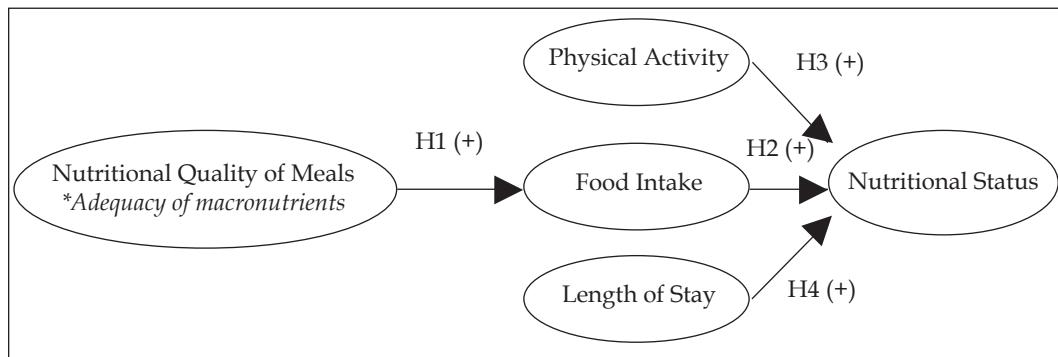
of the 24-h food recall is known to have a coefficient alpha reliability of 0.92 (Mohsen *et al.*, 2016). For the purpose of practicality, the 24-h food recall was solely used to quantify the food intake of the respondents since conducting weighed food record for 100 respondents would be impractical and time consuming. However, the weighed food record was used to quantify the nutritional quality of meals provided by the institutions prior to consumption since they provide equal amounts of meals for all their residents.

### Physical Activity Scale for Elderly (PASE)

The Physical Activity Scale for Elderly (PASE), developed by Washburn *et al.* (1993), was used to measure the level, frequency and duration of the activity of the elderly. The questionnaire was obtained from the New England Research Institute (NERI), a copyright owner of the PASE. It consists of 10 questions with three domains of activity such as leisure, household and work-related over the past 7 days. In this study, PASE was used to identify the presence of physical activity among the respondents through an interview with the elderly and the researchers. It has a Cronbach's alpha of 0.75 indicating a good reliability index of the tool (Ismail *et al.*, 2015).

### Mini Nutritional Assessment (MNA)

The Mini Nutritional Assessment (MNA) was developed by practising geriatricians in the United States and Europe and scientists with the Nestlé Research Center to provide a simple, reliable screening tool specifically for the elderly to assess their nutritional status. (Guigoz, Vellas & Garry, 1994). It is an 18-item questionnaire reflecting anorexia, weight loss, anthropometric parameters, dietary and subjective assessment and geriatric particulars such as mobility, living situation, cognitive and mood disorders, acute disease, and drug intake (Diekmann *et al.*, 2013). In this



**Figure 1.** The hypothesised model

study, the MNA was administered through interview and clients were classified as normally nourished (24 to 30 points), at risk for malnutrition (17 to 23.5 points), or malnourished (less than 17 points) using a 30-point system. Reliability of the scale was high with an internal consistency of 0.78 Cronbach's alpha value (Bleda *et al.*, 2002).

#### Data gathering procedures and ethical consideration

Institutions were initially given a letter of request for approval. Upon approval, the research survey participation consent form was distributed to one hundred (100) participants, a minimum sample size based on the chosen statistical method (PLS). Data collection was conducted through a one-on-one interview between the researchers and the participants. Each participant was expected to accomplish the following: demographic profile, mini nutritional assessment (MNA), physical activity scale examination (PASE), and a 24-h recall form. The interview lasted for about 30 min to 1 h per participant. Taking part in the study was voluntary and participants had the liberty to withdraw at any time. There was no anticipated risk associated with participation beyond those encountered in everyday life. The legal rights of the participants who were

included in the study were not affected nor violated. Moreover, the records and personal information gathered from this study were kept confidential.

#### Data analysis

Data gathered from the survey-questionnaire were entered and processed using the Statistical Package for Social Sciences (SPSS) software for Windows version 20. The statistical methods used included frequency, percentage, mean and standard deviation (S.D.) for descriptive analysis. A p-value of less than 0.05 was set to indicate the statistical significance. Additionally, Partial Least Square (PLS) regression analysis was performed to estimate the path coefficients (standardised regression weight,  $\beta$ ) associated with nutritional status. Correlation was used to test the relationship of nutritional quality of meals, food intake, physical activity, and length of stay of elderly residing in the institution with their nutritional status (Figure 1).

#### RESULTS

The demographic profile of institutionalised elderly ( $n=100$ ) are presented in Table 1. Respondents were categorised into three age groups: young old (65-74 y), middle old (75-84 y), and old (85+ y) (Susman & Riley, 1985 as cited by Saka *et*

**Table 1.** Demographic profile of institutionalised elderly (N=100)

Component	Frequency	%
Age		
Young old: 60-69	28	28
Middle old: 70-79	27	27
Old old: 80 and above	45	45
Gender		
Female	67	67.0
Male	33	33.0

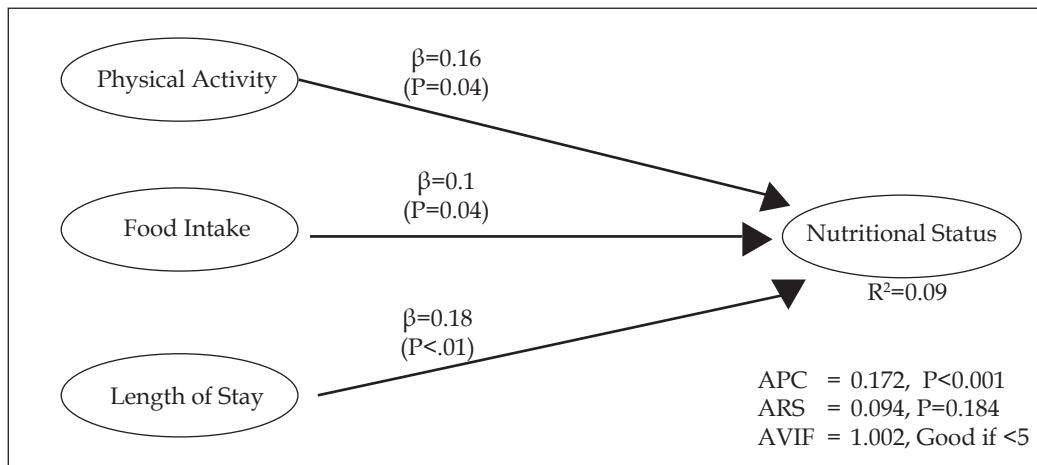
**Table 2.** Factors predicting the nutritional status of institutionalised elderly (N=100)

Component	Mean	SD	Distribution %	PDRI AMDR (%)
Nutritional quality of meals				
Carbohydrate (g)	250.4	0.4	62	55-75
Protein (g)	59.4	1.5	15	10-15
Fat (g)	43.0	4.5	24	15-30
Energy (kcal)	1626	38		
Food intake				
Carbohydrate (g)	182.7	71.6	45	55-75
Protein (g)	42.6	14.6	10	10-15
Fat (g)	24.4	15.9	14	15-30
Energy (kcal)	1124	381		
Physical Activity Scale for Elderly (PASE)	16.65	26.99		
Length of stay (mos.)	28.72	44.97		
Mini Nutritional Assessment				
	Frequency	%		
Normal nutritional status: 24-30 points	43	48		
At risk of malnutrition: 17-24.5 points	9	43		
Malnourished: < 17 points	48	9		

al., 2010). However, age range was adjusted based on the Philippine retirement age of 60 which is categorised as elderly. Among the respondents, there was a preponderance of female respondents (67%) within the age range of 80 and above (47.5%).

Table 2 presents the factors predicting the nutritional status of institutionalised

elderly. The computed percent macronutrient distribution of the meals provided from the weighed food record shows that carbohydrates (62%), protein (15%), and fat (24%) are within the Acceptable Macronutrient Distribution Range (AMDR) based on the 2015 Philippine Dietary Reference Intake (PDRI). As to



**Figure 2.** Emerging model of the factors affecting nutritional status

the respondents' food intake, results from the 24-h food recall show an inadequate percent distribution of carbohydrates (45%) and fat (14%), whereas protein has an adequate percent distribution rate of 10% based on the same reference standards. The food intake of the remaining 31% of the respondent is represented by their leftovers according to the meals provided by the institution. This also represents the nutrients that are not obtained by the respondents since they did not completely consume what was given. Among all the respondents, a mean total PASE score of 16.65 ( $SD=26.99$ ), and a mean length of stay of 28.72 ( $SD=44.97$ ) months was computed. Most of the respondents were at risk of malnutrition (48%) based on the mini nutritional assessment. Surprisingly, 43% of the respondents had normal nutritional status and only 9% were malnourished.

As shown in Figure 2 which illustrates the emerging model of the factors affecting nutritional status, the independent variables, food intake ( $\beta=0.17$ ;  $p=0.04$ ), physical activity ( $\beta=0.16$ ;  $p=0.04$ ) and length of stay of elderly in the institution ( $\beta=0.18$ ;  $p<.01$ ) have a weak positive effect on nutritional status. This indicates that as the rate of the variables increases, nutritional status also improves. The

emerging model indicates a good fit if  $p$  value is  $<0.05$ . In this study, all variables except for nutritional quality of meals are supported by the emerging model. Additionally, the  $R^2$  value indicates that 9% of the variability in nutritional status can be explained by food intake, physical activity and length of stay.

## DISCUSSION

The focus of this study was to examine how factors such as nutritional quality of meals, food intake, physical activity and length of stay affect the nutritional status of institutionalised elderly. As indicated by the results of the MNA, nearly half (48%) of the respondents were at risk of malnutrition. Surprisingly, 43% had normal nutritional status and only 9% were malnourished. Among the variables, only nutritional quality of meals was found to have no significant effect on food intake that could affect the nutritional status. A study conducted by Suominen *et al.* (2005) shows that institutional care-related factors such as weight control and provision of nutritional supplements may not directly cause residents' malnutrition. However, in a study conducted in Finland, residents were found to have poor diet quality as a large number

of them received protein and micronutrients lower than the recommended amounts (Vikstedt *et al.*, 2001) possibly due to limited variations of diets in nursing homes because of the central menu planning of the food service (Suominen *et al.*, 2005). In the present study, although nutritional quality of meals provided were adequate based on the percent distribution of macronutrients obtained from the weighed food record, it does not assure adequate food intake of the residents since our data from 24-hour food recall revealed a carbohydrate and fat intake of less than their AMDR while there was a low intake of protein. Limited studies have observed age and sex differences at the level of nutritional risk and dietary adequacy in relation to the recommended dietary intake (Johnson & Begum, 2008). Moreover, the impact of nutritional care on the nutritional status of the elderly is still yet to be known (Suominen *et al.*, 2005). Thorough assessment of dietary adequacy and effective intervention can be achieved through regular visits of professional dieticians in elderly homes.

Findings of this study also revealed that food intake has a significant effect on the nutritional status of the institutionalised elderly which runs parallel with the findings of Olin *et al.* (2005), which showed that subjects who were classified as malnourished had energy intakes that were below the estimated energy requirements while those subjects who were well-nourished managed to achieve their energy requirements. Prolonging adequate food intake may have a positive effect towards the betterment of nutritional status among institutionalised elderly. Morley, Thomas & Kamel (2004) mentioned that food intake represents a potentially important tool in monitoring persons at risk for malnutrition in the nursing home.

Our study found a significant effect of physical activity on elderly nutritional status. According to Mora *et al.* (2016), a low level of physical activity can increase Body Mass Index (BMI) which results in

overweight or obesity. This may be due to restrictions set by institutions where the elderly are not allowed to do any light to moderate housework like dusting and ironing. Additionally, institutionalised elderly have scheduled activities that may also hinder them from performing spontaneous physical activity. A high level of fear of falling also decreases the physical activity of elderly (de Guzman *et al.*, 2015). In contrast, physical activity may decrease mortality (Carlsson *et al.*, 2006), risk of dementia (Taaffe *et al.*, 2008) and chronic diseases such as coronary heart disease, cardiovascular disease, stroke, and colon cancer (Blair, Cheng & Holder, 2001) with improved nutritional status.

In this study, LOS has a significant effect on nutrition status. Prolonged LOS in nursing homes has an unfavorable result that is associated with poor nutritional status (Suominen *et al.*, 2005). Institutionalised elderly under long-term care often present with poor nutrition or become undernourished during their stay in nursing homes (Culp & Cacchione, 2008). Possibly, various physiological and non-physiological factors are associated with, and probably contribute to weight loss of elderly during their stay in nursing homes. It includes depression, dementia, reduced functional status, dysphagia, poor dentition, medical condition and medication (Soenen & Chapman, 2013). Clearly, during their stay, a large number of residents lose weight and their association with adverse outcomes is still often not recognised regardless of intervention provided at nursing home.

## CONCLUSION

This study attempted to identify how factors such as nutritional quality of meals provided by the institution, food intake, physical activity and length of stay affect the nutritional status of a select group of institutionalised elderly. Among the variables, only nutritional quality of meals

was found to have no significant impact on food intake while the remaining variables positively affected their nutritional status. By and large, detection of poor nutritional status in the institutions is crucial in the prevention of malnutrition and implementation of appropriate nutrition interventions. Specifically, monitoring of food intake and regular assessment of nutritional status must be considered to improve or maintain proper nutritional status. However, in a developing country like the Philippines, there have been limited studies on the factors that predict the nutritional status of the aged population under institutionalised care. The current study has initially established a portrait of how a select group of factors predict nutritional status. Information yielded in the study is vital in the development of nutrition intervention in nursing homes. Additionally, this study could serve as basis for providing quality food planning and service in the institutions.

The limitations of this study relate to the dietary information recalled by the elderly during the interview which may differ from what was actually eaten. Additionally, 24-h food recall was only executed for one day to quantify food intake of the respondents while weighed food record was used to evaluate the nutritional quality of each meal served in the institution. Future research may conduct a 3-day 24-h food recall to generate more accurate results. Further, other variables such as cognitive, emotional and co-morbidity factors may be incorporated to produce interesting findings that would increase the level of understanding regarding geriatric nutrition since these factors may also affect the nutritional status in nursing homes. Lastly, since malnutrition is multi-faceted, a multi-disciplinary approach and collaborative efforts of different health allies is needed to provide holistic interventions and treatment.

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