NUTRITIONAL VULNERABILITY ASSESSMENT OF HOSPITALIZED OLDER PERSONS IN TWO MAJOR HOSPITALS IN ABIA STATE, NIGERIA

Nzeagwu O.C and Michael O.E

Department of Human Nutrition and Dietetics, Michael Okpara University of Agriculture Umudike, PMB 7267 Umuahia, Abia State. Nigeria

Author for correspondence: ogechinzeagwu@gmail.com

ABSTRACT

Background: Malnutrition in older persons is often under diagnosed. Careful nutritional assessment is necessary for both the successful diagnosis and development of comprehensive treatment plans for malnutrition in this population.
Objectives: The study assessed the nutritional vulnerability of the older persons using mini nutritional assessment (MNA) tool, evaluate their anthropometric status as well as factors affecting nutritional vulnerability of the hospitalized older patients in two major hospitals in Abia State, Nigeria.
Materials and methods: One hundred and nine hospitalized subjects (≥ 65years) who gave their informed consent participated in the study. Semi-structured questionnaire was used to elicit information on their socioeconomic/demographic characteristics, living conditions, health conditions and factors affecting nutritional vulnerability. MNA tool was used for nutritional vulnerability status. Anthropometric status was assessed by body mass index (BMI), mid upper arm circumference (MUAC), waist-hip ratio (WHR), waist circumference (WC) and calf circumference (CC) were assessed using standard procedures and compared with recommended standards. Nutritional vulnerability was assessed using MNA scores of 17-23.5 for subject at risk of malnutrition, <17 for malnourished and ≥ 24for well nourished. Pearson's correlation was used to identify the significant ($p<0.05$) relationship between variables.
Results: Majority (62.4%) of the subjects were at risk of malnutrition, 27.5% were normal and 10.1% were malnourished. While 48.6% had normal BMI, 27.5%, 20.2% and 3.7% were underweight, overweight and obese. Most had normal CC (80.7%), WC (69.7%) and moderate WHR (54.1%). The health conditions more prevalent among the older persons were diabetes mellitus (20.2%), hypertension (11.9%), stroke (10.1%), and chronic kidney disease (7.3%). Significant relationship ($p<0.05$) existed between nutritional vulnerability, age, marital status, place of residence and level of education. Sex, occupation and source of income were not significantly associated ($p>0.05$) with nutritional vulnerability.
Conclusion: Most of the subjects were nutritionally at risk of malnutrition despite the percentage that had normal anthropometric status. Nutritional vulnerability was affected by age, marital status, residence and level of education.

Keywords: Vulnerability, assessment, older persons, hospitalized, MNA

INTRODUCTION

World Health Organization (1) noted that most countries have accepted ≥ 65 years as an acceptable definition of older persons or the elderly. Nutritional needs change during ageing and many factors affect nutritional status in older persons, including illnesses that affect digestion, absorption and metabolism (2). Physical impairments such as physical immobility or the inability to feed oneself can cause difficulty in acquiring, preparing, and eating foods. Older persons also experience early satiety and physiological appetite loss (3). A nutritionally vulnerable older adult has a reduced physical reserve that limits the ability to mount a vigorous recovery in the face of an acute health threat or stressor (4). Often this vulnerability contributes to more medical complications, longer hospital stays, and increased likelihood of nursing home admission (4).

Malnutrition is becoming increasingly more common among the elderly population (5). Malnutrition poses a huge economic cost to society. The malnourished elderly is more likely to require health and social services, have more hospitalizations, and cause a burden on caregivers (6). Despite the high prevalence of malnutrition, physician awareness of the important role nutrition plays in general well-being and disease treatment is quite low (7). This results in delay or omission of appropriate nutrition intervention and leaves many people suffering the consequences of malnutrition (7). At the same time if left untreated, approximately two thirds of these patients will experience a further decline in their nutrition status during their hospitalization (8). The high prevalence and consequences of malnutrition in older adults emphasizes the need for routine nutrition assessment (9). Malnutrition has been reported in hospitalized

older persons which was shown to lead to complications as cognitive defect and dementia (10). In free-living older persons, prevalence of malnutrition has been reported to be relatively low (2 – 10%), but rises considerably in hospitalized or institutionalized older persons (10,11). Diagnosis and prevention of malnutrition in hospitalized older persons can help to prevent loss of function and functional dependence as well as decrease morbidity and mortality in this age group. The high prevalence and consequences of malnutrition in the older persons indicate the need for routine nutrition assessment. Thus to detect those at risk of malnutrition, nutrition screening for these older persons is required on admission and should be done routinely (12).

Mini nutritional assessment (MNA) is one of the tools developed for nutritional vulnerability assessment and it is a practical non-invasive tool used for rapid evaluation of older subjects which contribute to early intervention in correcting nutritional deficits (13). In earlier studies carried out in some parts of Nigeria on community dwelling older persons using MNA, majority were at risk of malnutrition and some malnourished (9, 14,15). In another study on hospitalized older persons, the nutritional vulnerability risk was still high (16). These problems necessitated this study again looking at some hospitalized older persons in yet two major hospitals in Abia State to see if there have been some changes after some years.

MATERIALS AND METHODS

Study design: The study was a hospital-based cross sectional study.

Area of study: The study was carried out in two major hospitals namely, Federal Medical Centre, Umuahia and Abia State University Teaching Hospital, Aba, all in Abia State. Abia State University Teaching Hospital (ABSUTH) started on April 20, 1994, when the then Military Administrator of the state, Colonel Ike Nwosu (Rtd) promulgated the Abia State University Teaching Hospital Management Board, Edict No. 5 of 1994. The hospital was established at the site of the former Aba General Hospital, for clinical training of Doctors for the Abia State University College of Medicine and Health Sciences, Uturu. In February and March 1996, the Hospital was accredited by both the National University Commission (NUC) and the Medical and Dental Council of Nigeria (M&DCN) for the award of degrees and graduation of medical doctors. Also, ABSUTH has been fully accredited by the Federal Ministry of Health to operate as a health care provider at all levels (Primary, Secondary and Tertiary) in the National Health Insurance Scheme(NHIS) programme. The mission and challenges of ABSUTH include provision of high level tertiary health care, training of medical and allied medical personnel and intensive research on prevalent health care needs of the society.

Federal Medical Centre, Umuahia (formerly known as Queen Elizabeth Specialist Hospital), Umuahia, is a 327-bed tertiary hospital and one of the leading health care providers in south-eastern Nigeria. The facility is centrally located and readily accessible from Enugu, Imo, Rivers, Ebonyi, Akwa-Ibom and Anambra States. The hospital clients and patients are drawn from all over the country but predominantly from the south-east and south-south part of the country. Although established in 1945 as a mission hospital and then named Queen Elizabeth Hospital, it was in 1991 taken over by the Federal Government and renamed Federal Medical Centre, with the mandate to serve the health needs of Nigerians, especially South East geopolitical zone, particularly Abia State residents where it is situated.

Population of the study: The population comprised of all patients aged ≥ 65 years who had been admitted in the two hospitals within the period of study.

Sample size: World Bank(17)reported that approximately 3% of the total population in Nigeria are aged (65years and above). This estimated population of the older persons was used to determine the sample size (N) using the formula as documented by Areoye(18)

$N = \frac{Z^2 P(100-P)}{X^2}$ where, N= sample size

Z= Confidence interval taken as 1.96 or 2 approximately.

P= Percentage of the older persons in Nigeria, which is 3.0%

X= Width of confidence interval at 5% level of probability.

Hence, N= $\frac{2^2 \times 3(100-5.0)}{5^2} = \frac{4 \times 3(95)}{25}$; $N = \frac{1140}{25} = 45.6$

The total sample size was approximated to 46 which was multiplied by the two hospitals, making it 92.

To make-up for attrition rate, 30% of the calculated sample size was added giving approximately 120.

Sampling procedure: The sample size was selected from male surgical ward, female surgical ward, male medical ward, female medical ward and some wards where older adults aged 65 years and above who consented to and were willing to participate in the study in both hospitals were admitted. Among those who were willing to participate in the study, simple random sampling using balloting method was used to select the total number of subjects used for the study. One hundred and nine subjects were eventually used for the study.

Ethical approval: Ethical approval for the use of human subjects was received from the Ethical Committee of the two hospitals. Written informed consent was also obtained from all who accepted to participate in the study. The aim of the study was clearly explained to the participants and they were

aware that their participation in the study was voluntary. All participants were informed that their transcribed information would remain confidential.

Methods: Structured, validated and pre-tested questionnaire was used to elicit information on their socioeconomic/demographic characteristics, living conditions, health conditions and factors affecting nutritional vulnerability. The questionnaire was administered by the researcher and research assistants, the questions were explained to the literate subjects and their answers ticked. However, for the illiterate subjects the questions in the questionnaire was interpreted in vernacular for clearer understanding and their answers ticked accordingly. MNA tool developed by Guigoz*et al*. (11) was used for nutritional vulnerability status.

Anthropometric measurements were taken for weight, height, mid-upper arm circumference, calf circumference, waist circumference and hip circumference. All the anthropometric measurements were done using the methods described by World Health Organization(19). The instrument for weight measurement was the Bathroom scale (Hanson model), and reading was taken to the nearest 0.1kg. Locally produced stadiometer was used for measuring height for those without kyphosis, while non-stretch flexible fibre tape was used to measure the arm span for those with kyphosis and measurement was taken to the nearest 0.1cm. Arm span was measured when the subject stood or sat against a wall with the arms extended laterally at shoulder height. The measurement was made with an assistant at each end of the tape holding the arm and taking the measurement. Non-stretch flexible fibre glass tapes were used for measuring the waist circumference taken with the tape placed midway between the upper hip bone and the uppermost border of the right iliac crest and reading taken to the nearest 0.1cm at the end of normal expiration. The hip circumference was measured with the tape placed around the buttocks in a horizontal plane and the measurement recorded to the nearest 0.1cm. The calf circumference was measured when the subject was standing with the feet apart and tape measure positioned horizontally around the calf and moved up and down to locate the maximum circumference in a plane perpendicular to the long axis of the calf and the measurement was recorded to the nearest 0.1cm. The mid-upper arm circumference (MUAC) was measured at the mid-point located after bending the left elbow at a 90° angle between the tip of the acromion process of the scapular and the olecranon process of the ulna with the arm hanging relaxed at the side using a fibre glass flexible tape. The circumference was recorded to the nearest 0.1cm. Three measures were taken for all the parameters and the mean calculated.

Data analysis; Body mass index (BMI) was calculated from weight and height measurements as reported by Wardlaw*et al.* (20) and compared with the report of WHO(21, 22) which was <18.5kg/m^2 for underweight, 18.5-24.5 kg/m^2 (normal), ≥ 25kg/m2 overweight and ≥30 kg/m^2 (obese). Mid upper arm circumference (MUAC) was compared with the standards classified as normal (males ≥23cm, females ≥22cm) and malnourished (males <23cm, females <22cm) (23,24). Waist and hip ratio (WHR) was compared for safe levels and at risk of heart disease using the standards classified as normal (male <0.90, female <0.80), at risk (male >0.90, female >0.80) (25, 26, 27). The waist circumference for men and women was compared with the relative risk standard classified as normal (male <94cm, female <80cm), at risk (male ≥94cm, female≥80cm) and increased risk (male ≥102, female ≥88) (24, 25). Waist circumference greater than 88cm for women and 102cm for men may indicate a health risk for obesity and other related disease (28).Calf circumference (CC) was assessed by the standards indicating that CC≥30.5cm provides a good/ acceptable nutritional state while<30.5cm shows malnourished state(29,30).

The nutritional vulnerability scores were stratified as 17-23.5 for those at risk of malnutrition, <17 malnourished and ≥ 24 well nourished (31).

Statistical analysis: The information gathered from the questionnaire and anthropometric measurements were coded and entered into the computer using the IBM Statistical Product Service Solution (SPSS) (for windows) version 22. Descriptive statistics such as frequency and percentage was used to analyse data on socioeconomic parameters. Pearson correlation coefficient was used to determine the significant relationship between nutritional vulnerability, nutritional status (using BMI) and socio-economic/demographic variablesand significance was judged at $p<0.05$.

RESULTS

Table 1 shows information on the socio-economic and demographic characteristics of the subjects. About 109 older persons comprising 46 males (42.2%) and 63 female (57.8%) participated in the study. About 48.6% of the subjects (males 37.0%, 57.1% females) were aged 65-69 years, 29.4% aged 70-74 years (males 34.8%, females 25.45%), 16.5% within the age of 75-79 years and 5.5% were≥80years. Data from marital status revealed that 67.9% of the subjects were married (males 76.1%, females 61.9%), 28.4% were widowed (males 17.6%, females 36.5%), 1.8% were single (males 2.2%, females 1.8%).

Most(56.9%)of the respondents resided in urban areas (males 56.5%, females 57.1%) and 43.1% resided in rural area. Trading (43.1%) was the major occupation of the subjects (males 28.3%, females 54.05%). Others were farming 24.8% (males 23.9%, females 25.4%), pensioners 16.5% (males 21.7%,

females 12.7%) and contractors 4.6% (males 8.7%, females 1.6%). Few (30.3%) of the subjects (males 30.4%, females 30.2%) had no formal education, 29.4% had primary education (males 17.4%, females 38.1%), 27.5% had secondary education (males 30.4%, females 25.4%) and 12.8% had tertiary education (males 21.7%, 6. 3%).The major source of income of the subjects were allowance from children (41.3%) comprising 39.1% males and 42.9% females, 39.4% income were from personal business and14.7% from pension.

Table 2 shows information on the living condition of the subjects. Majority(96.3%) of the subjects lived in block house while 3.7% lived inmud house. Some of the subjects (33.9%) were living with 1-3 persons, 28.4% were living with 4-6 person, 25.7% were living with 7-9 persons while 2.8% were living with 9 persons and above and 9.2% are living alone. Majority (69.7%) of the subjects used water-system type of toilet. About 24.8% used pit toilet, 1.8% used bush toilet while 3.7% used bucket system type of toilet. Few (11.9%) of the subjects lived alone with their spouse, while some (35.8%) lived with their children, 9.2% lived in their child's house.

Table 1: Socioeconomic and demographic characteristics of the older persons

	Sex					
	Male		Female		Total	
Parameter	**Freq**	**%**	**Freq**	**%**	**Freq**	**%**
Sex	46	42.2	63	57.8	109	100
Age(years)						
65-69	17	37.0	36	57.1	53	48.6
70-74	16	34.8	16	25.4	32	29.4
75-79	10	21.7	8	12.7	18	16.5
80 and above	3	6.5	3	4.8	6	5.5
Total	**46**	**100**	**63**	**100**	**109**	**100**
Marital Status						
Single	1	2.2	1	1.6	2	1.8
Married	35	76.1	39	61.9	74	67.9
Widowed	8	17.4	23	36.5	31	28.4
Separated	2	4.3	0	0	2	1.8
Total	**46**	**100**	**63**	**100**	**109**	**100**
Residence						
Urban	26	56.5	36	57.1	62	56.9
Rural	20	43.5	27	42.9	47	43.1
Total	**46**	**100.0**	**63**	**100**	**109**	**100**
Occupation						
Farming	11	23.9	16	25.4	27	24.8
Trading	13	28.3	34	54.0	47	43.1
Pensioner	10	21.7	8	12.7	18	16.5
Contractor	4	8.7	1	1.6	5	4.6
Civil servants	8	17.4	4	6.3	12	11.0
Total	**46**	**100.0**	**63**	**100**	**109**	**100.0**
Education level						
No formal education	14	30.4	19	30.2	33	30.3
Primary	8	17.4	24	38.1	32	29.4
Secondary	14	30.4	16	25.4	30	27.5
Tertiary	10	21.7	4	6.3	14	12.8
Total	**46**	**100**	**63**	**100**	**109**	**100**
Source of income						
Pension	9	19.6	7	11.1	16	14.7
Allowance from children	18	39.1	27	42.9	45	41.3
Allowance from relative	1	2.2	1	1.6	2	1.8
Income from personal business	17	37.0	26	41.3	43	39.4
Gift from people	1	2.2	0	0	1	0.9
Salary	0	0	2	3.2	2	1.8
Total	**46**	**100**	**63**	**100**	**109**	**100**

Table 2: Living Conditions of the older persons.

	Sex					
	Male		Female		Total	
Parameter	**freq**	**%**	**freq**	**%**	**freq**	**%**
Type of house						
Mud house	2	4.3	2	3.2	4	3.7
Block house	44	95.7	61	96.8	105	96.3
Total	**46**	**100**	**63**	**100**	**109**	**100.0**
No. of persons living with						
1-3 person	22	47.8	15	23.8	37	33.9
4-6 person	11	23.9	20	31.7	31	28.4
7-9 person	9	19.6	19	30.2	28	25.7
9 and above	3	6.5	0	0	3	2.8
None	1	2.2	9	14.3	10	9.2
Total	**46**	**100**	**63**	**100**	**109**	**100**
Type of toilet						
Pit toilet	11	23.9	16	25.4	27	24.8
Bush toilet	1	2.2	1	1.6	2	1.8
Water system	32	69.6	44	69.8	76	69.7
Bucket system	2	4.3	2	3.2	4	3.7
Total	**46**	**100**	**63**	**100.0**	**109**	**100**
Person living with						
I live alone	2	4.3	11	17.5	13	11.9
I live with my spouse	19	41.3	12	19.0	31	28.4
I live with my children	16	34.8	23	36.5	39	35.8
I live in my child's house	3	6.5	7	11.1	10	9.2
House helps, relatives etc)	6	13.0	10	15.9	16	14.7
Total	**46**	**100**	**63**	**100**	**109**	**100**

Table 3 shows the anthropometric status of the older persons. The BMI grade of the older persons revealed that 27.5% were underweight, those that had normal BMI were 48.6%, those overweight were 20.2% and 3.7% were obese. The calf circumference showed that 19.3% were malnourished and 80.7% were normal. Mid-upper arm circumference results revealed 3.7% underweight, 6.4% were normal and 89.9% were overweight. Result on waist circumference showed that 69.7% were normal, 13.8 at risk of heart disease and 16.5% at increased risk. Majority of the subjects had moderate waist/ hip ratio of 54.1% and 45.1% indicating an increased waist/ hip ratio.

Table 4 shows the nutritional vulnerability of the subjects which revealed that majority (62.4%) of the subjects were at risk of malnutrition, 27.5% were normal and 10.1% were malnourished. The health conditions more prevalent among the subjects were diabetes mellitus (20.2%), hypertension (11.9%), stroke (10.1%) and chronic kidney disease (7.3%).

The relationship between nutritional vulnerability and socio economic/demographic variables is shown in Table 5. There was significant relationship ($p<0.05$) between nutritional vulnerability, age, marital status, residence and level of education. Sex, occupation and source of income were not significantly associated ($p>0.05$) with nutritional vulnerability.

Table 3: Anthropometric status of the older persons.

	Sex					
	Male		Female		Total	
Parameter	**Freq**	**%**	**Freq**	**%**	**Freq**	**%**
BMI Grade						
Underweight	16	34.8	14	22.2	30	27.5
Normal	25	54.3	28	44.4	53	48.6
Overweight	5	10.9	17	27.0	22	20.2
Obese	0	0	4	6.3	4	3.7
Total	**46**	**100**	**63**	**100.0**	**109**	**100**
Calf circumference						
Malnourished	13	28.3	8	12.7	21	19.3
Normal	33	71.7	55	87.3	88	80.7
Total	**46**	**100.0**	**63**	**100**	**109**	**100**
Mid arm circumference						
Underweight	1	2.2	3	4.8	4	3.7
Normal	4	8.7	3	4.8	7	6.4
Overweight	41	89.1	57	90.5	98	89.9
Total	**46**	**100**	**63**	**100**	**109**	**100**
Waist Circumference						
Normal	43	93.5	33	52.4	76	69.7
At risk	1	2.2	14	22.2	15	13.8
Increased risk	2	4.3	16	25.4	18	16.5
Total	**46**	**100**	**63**	**100**	**109**	**100**
Waist/Hip ratio						
Moderate	34	73.9	25	39.7	59	54.1
Increased risk	12	26.1	38	60.3	50	45.9
Total	**46**	**100**	**63**	**100**	**109**	**100**

Table 4: Nutritional Vulnerability of the older persons Using MNA Scores

	Sex					
	Male		Female		Total	
Parameter	**Freq**	**%**	**Freq**	**%**	**Freq**	**%**
Vulnerability						
Malnourished (<17 points)	3	6.5	8	12.7	11	10.1
At risk of malnutrition (17- 23.5)	36	78.3	32	50.8	68	62.4
Normal (>23.5 points)	7	15.2	23	36.5	30	27.5
Total	**46**	**100**	**63**	**100**	**109**	**100**

MNA – Mini Nutritional Assessment

Table 6 which reflected the factors affecting nutritional vulnerability status revealed that those who were confined to bed or chair (63.6%) were more malnourished than those who were able to get out of chair but do not go out (18.2%) and those who go out (18.2%). More (42.6%) of the subjects who are able to go out of chair or bed but do not go out were more at risk of malnutrition, while majority (80%) who go out freely had normal MNA scores. Some (45.5%) who were unable to eat without assistance were malnourished, while 27.3% of those who were self-fed with difficulty and without difficulty were also malnourished. Most (55.9%) who could feed without any difficulty were still at risk of malnutrition. Appetite was reported as the major factor that caused food intake decline in the past three months with 45.5% being malnourished and 44.1% at risk of malnutrition. About 32.4% of those whose food intake did not decline were still at risk of malnutrition. Majority (81.8%) of the respondents with BMI less than 18.5kg/m^2were malnourished. Most (63.6%) who had physiological stress or disease were more malnourished compared to those without disease. The result revealed that mobility, mode of feeding, food intake decline and low BMI all significantly ($p < 0.05$) affected nutritional vulnerability

Table 5: Relationship between nutritional vulnerability and socio-economic/demographic variables

Parameter	Malnourished Freq(%)	At risk Freq(%)	Normal Freq(%)	Total Freq(%)	p-value
Age(years)					**0.001**
65-69	3(27.3)	29(42.6)	21(70)	53(48.6)	
70-74	4(36.4)	20(29.4)	8(26.7)	32(29.4)	
75-79	2(18.2)	15(22.1)	1(3.3)	18(16.5)	
80 and above	2(18.2)	4(5.9)	0(0)	6(5.5)	
Total	**11(100)**	**68(100)**	**30(100)**	**109(100)**	
Sex					**0.187**
Male	3(27.3)	36(52.9)	7(23.3)	46(42.2)	
Female	8(72.7)	32(47.1)	23(76.7)	63(57.8)	
Total	**11(100)**	**68(100)**	**30(100)**	**109(100)**	
Marital status					**0.03**
Single	0(0)	1(1.5)	1(3.3)	2(1.8)	
Married	4(36.4)	45(66.2)	25(83.3)	74(67.9)	
Widowed	7(63.6)	20(29.4)	4(13.3)	31(28.4)	
Separated	0(0)	2(2.9)	0(0)	2(1.8)	
Total	**11(100)**	**68(100)**	**30(100)**	**109(100)**	
Residence					**0.043**
Urban	3(27.3)	39(57.4)	20(66.7)	62(56.9)	
Rural	8(72.7)	29(42.6)	10(33.3)	47(43.1)	
Total	**11(100)**	**68(100)**	**30(100)**	**109(100)**	
Occupation					**0.547**
Farming	7(63.6)	14(20.6)	6(20.0)	27(24.8)	
Trading	2(18.2)	28(41.2)	17(56.7)	47(43.1)	
Pensioner	2(18.2)	13(19.1)	3(10.0)	18(16.5)	
Contractor	0(0)	3(4.4)	2(6.7)	5(4.6)	
Others (civil servants)	0(0)	10(14.7)	2(6.7)	12(11.0)	
Total	**11(100)**	**68(100)**	**30(100)**	**109(100)**	
Level of Education					**0.044**
no formal education	5(45.5)	23(33.8)	5(16.7)	33(30.3)	
Primary	5(45.5)	17(25.0)	10(33.3)	32(29.4)	
Secondary	1(9.1)	17(25.0)	12(40.0)	30(27.5)	
Tertiary	0(0)	11(16.2)	3(10.0)	14(12.8)	
Total	**11(100)**	**68(100)**	**30(100)**	**109(100)**	
Source of Income					**0.245**
Pension	1(9.1)	12(17.6)	3(10.0)	16(14.7)	
Allowance from children	7(63.6)	28(41.2)	10(33.3)	45(41.3)	
Allowance from relative	1(9.1)	0(0)	1(3.3)	2(1.8)	
Income from personal business	2(18.2)	25(36.8)	16(53.3)	43(39.4)	
Gift from people	0(0)	1(1.5)	0(0)	1(0.9)	
Others (salary)	0(0)	2(2.9)	0(0)	2(1.8)	
Total	**11(100)**	**68(100)**	**30(100)**	**109(100)**	

Table 6: Factors affecting nutritional vulnerability using MNA classification

Parameter	Malnourished Freq %	At risk Freq %	Normal Freq %	Total Freq %	p-value
Mobility					**0.000**
Bed/chair bound	7(63.6)	17(25.0)	1(3.3)	25(22.9)	
Able to get out of chair or bed, but does not go out	2(18.2)	29(42.6)	5(16.7)	36(33)	
Goes out	2(18.2)	22(32.4)	24(80.0)	48(44)	
Total	**11(100.0)**	**68(100)**	**30(100.0)**	**109(100)**	
Mode of feeding					**0.000**
Unable to eat without assistance	5(45.5)	12(17.6)	0(0)	17(15.6)	
Self-fed with some difficulty	3(27.3)	18(26.5)	1(3.3)	22(20.2)	
Self-fed without any problem	3(27.3)	38(55.9)	29(96.7)	70(64.2)	
Total	**11(100)**	**68(100)**	**30(100)**	**109(100)**	
Food decline in the past three months					**0.004**
Appetite	5(45.5)	30(44.1)	7(23.3)	42(38.5)	
Digestive problems	1(9.1)	8(11.8)	2(6.7)	11(10.1)	
Chewing and swallowing difficulty	3(27.3)	8(11.8)	1(3.3)	12(11.0)	
Others (None)	2(18.2)	22((32.4)	20(66.7)	44(40.4)	
Total	**11(100)**	**68(100)**	**30(100)**	**109(100)**	
Physiological stress or disease					**0.013**
Yes	7(63.6)	34(49.3)	8(26.7)	48(44.4)	
No	4(36.4)	34(50.7)	22(73.3)	60(55.6)	
Total	**11(100)**	**68(100**	**30(100)**	**109(100)**	
Body mass index (BMI)					**0.000**
BMI less than 19	9(81.8)	20(29.4)	1(3.3)	30(27.5)	
BMI 19 to less than 21	1(9.1)	18(26.5)	10(33.3)	29(26.6)	
BMI 21 to less than 23	1(9.1)	14(20.6)	9(30.0)	24(22.0)	
BMI 23 or greater	0(0)	16(23.5)	10(33.3)	26(23.9)	
Total	**11(100)**	**68(100)**	**30(100)**	**109(100)**	

MNA classification: malnourished < 17 points; at risk of malnutrition 17 – 23.5 points; normal > 23.5 points

DISCUSSION

The greater percentage of older females than males in this study has been reported by various authors (15,16, 32,33). This could be attributed to the higher mortality rate in older males than females; females live 10 years longer than males (34). Katsuiku (35) reported that biologically, women live longer than men due to the fact that the rate of decline of most T-cell and B-cell lymphocytes are faster in males than in females and also that men show a more rapid decline in two cytokines. It has also been reported that two specific types of immune system cells that attack invaders (CD4-T-cells and natural killer cells) increase in number with age, with higher rate of increase in women than in men (35). More of the subjects got their income as allowance from their children. Shubhangini (36) had earlier noted that elderly needs and burdens usually fall upon their children due to their vulnerability at this period of their lives in meeting their needs and so they depend on others to meet their day to day needs. The difference between the percentage of subjects who resided in the urban and rural was not much since the subjects were hospitalized patients who could come from the rural areas to access medical attention. The few subjects that lived in mud houses in both the urban and rural could be because mud houses are fast going into extinction in both rural and urban areas and replaced by block houses.

In almost all the anthropometric parameters assessed more of the subjects were in the normal range. This normality could be as a result of increase in average body fat associated with old age (37). The result of the anthropometric status revealed some of the respondents were underweight, others were overweight and fewer were obese from the BMI results showing levels of malnutrition. This agreed with a report published by WHO (27) which suggests that older persons are particularly vulnerable to malnutrition and from these results the older females were the most malnourished. However, a higher percentage had normal BMI which agreed with some reports from some other studies on older persons (15,31). This could be from the percentage that reported no decline in food intake in the past three

months. In this study more subjects were malnourished with BMI than with calf circumference (CC) and MUAC. This could be because BMI measures fatness and degree of malnourishment, MUAC provides index of energy and protein stores with low levels showing evidence of protein energy malnutrition (PEM) (38) and CC indicates loss of total body muscle mass which is a sensitive sign for existing malnutrition and sarcopenia (39).The percentage of subjects "at risk" and "at increased risk" of co-morbidity using waist circumference (WC) which is about 30% of the subjects is of concern and it may be due to the percentage that were in the overweight and obese category using BMI because it has been reported that individuals with a BMI greater than 35kg/m^{2}usually have their WC greater than 102cm in men and 88cm in women (40).A similar result has been reported in community dwelling older persons (41). Waist circumference has been said to assume a greater value at old age (40). Waist circumference as been confirmed as a factor in determining risk of cardiovascular disease(42). More females were at increased risk of heart disease than the males using WHR. This result of higher WHR of females than males is not at variance with earlier observations (15, 33,38). This could be because females store more fat in the abdominal region (37).Katsuiku (35) reported that an increased risk of waist/ hip ratio indicate an increased risk of heart disease. However, this also does not give much explanation to why older males die faster than older females because even though there is higher mortality rate among men than women, women still had higher hospital records of people suffering from age related diseases such as cardiovascular diseases (35). The WHR also showed that none had safe levels showing they were either moderately or at increased risk for heart disease and other problems associated with overweight. This is also a source of concern for these older persons. Calf and waist circumferences placed most of the subjects at normal nutritional status. This could be because abdominal fat tend to accumulate with age and the weight loss may be attributed to loss of muscle mass and not fat reduction.

The nutritional vulnerability results revealed that majority of the older persons in this study were at risk of malnutrition. A similar result had been reported in earlier studies with about three-quarters of the older persons studied being either malnourished or at risk of malnutrition in both hospitalized older persons (16) and in community dwelling older persons (15). Vulnerability to malnutrition has been identified as a problem in Nigeria with 50% being moderately vulnerable and 46% being highly vulnerable (43). The high risk of malnutrition in this study could be as a result of the presence of some risk factors of malnutrition (lack of adequate finance, disease condition, inadequate dietary intake, social isolation, literacy level and high dependency on others). More so, nutritional needs change during ageing and many factors affect nutritional status in older patients, including illnesses that affect digestion, absorption and metabolism (2). With aging, there are a number of factors that contribute to the risk of malnutrition. Chronic disease can be a major contributor; many diseases, such as cardiac disease, renal impairment, and malignancy contribute to inflammation that can lead to significant loss of muscle mass (44). Physical impairments such as physical immobility or the inability to feed oneself can cause difficulty in acquiring, preparing, and eating foods and older adults also experience early satiety and appetite loss (3). Identifying older adults at nutritional risk is an important step in maintaining quality of life and functional status. It had been noted that the prevalence of chronic disease increase with age and the treatment with drugs and diets have an additional impact on nutritional status (45). Some disease conditions like diabetes, hypertension and stroke were identified in some of the subjects. It had been reported that diseases have effects on nutritional status (46). Cancer may alter abilities in the cognitive and motor realms related to food and eating and if the individual is incapacitated; his or her energy needs decrease. Kidney disease alters fluid and electrolyte needs and increase risk of malnutrition (46). So it is important that the health condition of older adults be improved.

The significant relationship between nutritional vulnerability and age could be because of the factors that accompanies ageing, factors such as reduced food intake, poor immunity, reduced healing, frailty and increased dependency (43,47). Education was found to be significantly associated with nutritional vulnerability. Those who had no formal education and primary education were more malnourished than those who attended secondary and tertiary education. This relationship had been earlier reported that those who were illiterate were more likely to be under-nourished than those who were literate (48). According to Picker (49), the magnitude of the relationship between education and health varies across conditions, but is generally large. An additional four years of education lowers five-year mortality by 1.8 percentage points; it also reduces the risk of heart disease by 2.16 percentage points and the risk of diabetes by 1.3 percentage points. Four more years of schooling lowers the probability of reporting oneself in fair or poor health by 6 percentage points and reduces lost days of work to sickness by 2.3 each year (49). In terms of the relation between education and various health risk factors - smoking, drinking, diet/exercise, use of illegal drugs, household safety, use of preventive medical care, and care for hypertension and diabetes - overall the results suggest very strong gradients where the better educated have healthier behaviors along virtually every margin (49). More so, education

offers opportunity to learn more about health and health risk.

Marital status was a significant factor for under-nutrition. Those who were widowed were more likely to be malnourished than those married. The widowed are more likely to have a poorer health and have a higher morbidity and mortality risk than their married counterparts as had earlier been reported (50) that widowed persons had poorer health. A survey of 127,545 American adults found that married men are healthier than men who were never married or whose marriages ended in divorce or widowhood and men who have marital partners live longer than men without spouses(51). The significant relationship between nutritional vulnerability and residence could be that those in rural area have less nutritional knowledge and poor access to health care facilities than those in urban areas.

Disease condition could also predispose one to nutritional vulnerability. Carol (52) reported that disorders of the gastrointestinal system ranging from problems with dentition and swallowing to dyspepsia, esophageal reflux, constipation, and diarrhea are related to poor intake and mal-absorption of nutrients and many diseases (e.g., thyroid, cardiovascular, and pulmonary disease) often lead to unintentional weight loss through increased metabolic demand and decreased appetite and caloric intake. Vulnerability to infection, loss of energy and mobility, poor wound healing and confusion are reported consequences of under-nutrition (53). The significant relationship between nutritional vulnerability and BMI corresponds with the report that there is convincing evidence that mortality and morbidity risk significantly increases as BMI decreases below 18.5 kg/m^2(22).

In an earlier study on hospitalized older persons on 124 subjects, Nzeagwu and Okorocha (16) noted that 45.2% were at risk of malnutrition, 37% were malnourished and 16% were not at risk of malnutrition. However, in the present study, 62.4% were at risk of malnutrition, 10.1% were malnourished and 27.5% were not at risk. There seems to be positive change in the nutritional vulnerability status of these hospitalized older persons as the percentage that was malnourished reduced in the present study. This could be due to the time gap in the two studies because with improved health facilities and nutritional awareness through nutrition education more people may have better information that can bring about improved feeding habits, good lifestyle activities and behavioral management and consequently better nutritional state. At the same time the many that were at risk of malnutrition in the present study is an indication that more nutrition education and awareness programmes should be mounted in all spheres of life to ensure adequate nutrition that will invariably reduce the risk of malnutrition in the society at large and in the older persons in particular.

Conclusion: Most of the subjects were nutritionally at risk of malnutrition despite the percentage that had normal anthropometric status. Nutritional vulnerability was affected by age, marital status, residence and level of education. Mobility, mode of feeding, decline in food intake and BMI status affected nutritional vulnerability significantly. Older persons nutritional and health status should be monitored and evaluated periodically so as to identify those who are malnourished and those at risk of malnutrition in order to present timely intervention in the health and well-being of this important population of the society.

Limitations of the study: Some of the very frail patients could not be easily accessed and assessed for the study even when they were willing to participate.

REFERENCES

1. WHO (2012). "Definition of an older or elderly person".(http/www.who.int/healthinfo/survey/ageingdefnolder/en/index.html). Retrieved April 4, 2016.
2. NICE (National Institute for Health and Clinical Excellence) (2006). Nutrition support in adults: oral nutrition support, enteral tube feeding and parenteral nutrition. Clinical Guideline 32.
3. Visvanathan, R. and Chapman, I.M. (2009). Undernutrition and Anorexia in the Older Person. Gastroenterology Clinics of North America.. 38:393-409.
4. Kaiser, M., Kathryn, N., Shelley, R.M. and Connie, W.B. (2015). Nutritional Vulnerability in Older Adults: A Continuum of Concerns. Current Nutrition Report. 4(2): 176–184.
5. Maher, D. and Eliade, C. (2013). Malnutrition in the elderly: An unrecognized health issue. Registered Nurse Journal Online. http://rnjournal.com/journal-of-nursing/malnutrition-in-the-elderly-an-unrecognized-health-issue. Accessed October 30, 2013.
6. DiMaria-Ghalili, R. N and Guenter, P. A. (2008). How to try this: The mini nutritional assessment. American Journal of Nursing 108 (2): 50-59.
7. Norman, K., Pichard, C., Lochs, H. and Pirlich, M. (2008). Prognostic impact of disease-related malnutrition. Clinical Nutrition 27: 5–15
8. Tappenden, K. A., Quatrara, B., Parkhurst, M. L., Malone, A. M., Fanjiang, G. and Ziegler, T. R. (2013). Critical role of nutrition in improving quality of care: an interdisciplinary call to action to address adult hospital malnutrition. Journal of the Academy of Nutrition and Dietetics 113: 1219 –1237.
9. Nzeagwu, O.C. and Uwuaegbute, A.C (2010). Assessment of nutritional vulnerability of the elderly using mini nutritional assessment (MNA) tool. Nigeria Journal of Nutritional Sciences. 31(2): 40-46.
10. Gariballa, S. E. (2001). Malnutrition in hospitalized elderly patients: When does it matter? Journal of Clinical Nutrition 20: 487 – 491.

11. Guigoz, Y., Vellas, B. and Garry, P. G. (1996). Assessing the nutritional status of the elderly. The Mini Nutritional Assessment as part of the geriatric evaluation. Nutrition Review 54: 559 – 565.
12. Kondrup, J., Allison, S.P., Elia, M.,Vellas, B. and Plauth, M. (2003). ESPEN guideline fornutrition screening 2002. Clinical Nutrition 22: 415 – 421.
13. Vellas, B., Villars, H., Abellan, G., Soto, M.E., Rolland, Y., Guigoz, Y., Morley, J.E., Chumlea, W., Salva, A., Rubenstein, L.Z. and Garry, P. (2006). Overview of the MNA®-Its History and challenges. Journal of Nutrition in Health and Aging 10(6): 456 – 46.
14. Olayiwola, I. O. and Ketiku, A. O. (2006). Socio-demographic and nutritional assessment of the elderly Yorubas in Nigeria. Asia Pacific Journal of Clinical Nutrition 15: 95 – 101.
15. Nzeagwu, O. C and Ebere, U. C. (2016). Assessment of nutritional vulnerability of the elderly using mini nutritional assessment (MNA) tool and malnutrition universal screening tool (MUST). Journal of Dietitians Association of Nigeria7:44 – 51.
16. Nzeagwu, O.C and Okorocha, C.G. (2012). Assessment of nutritional vulnerability of hospitalized elderly in university of Nigeria Teaching Hospital (UNTH), Enugu and Federal medical centre (FMC), Umuahia, Abia State. Journal of Dietetic Association of Nigeria3: 21 – 35.
17. World Bank (2014). http://www.tradingeconomics.com/nigeria/age-dependency-ratio-old-percent-of-working-age-population-wb-data.html (Accessed June 20, 2014)
18. Areoye, M.O. (2003). Research methodology with statistics for health and social sciences. Nathadex Puplishers, Nigeria. Pp.117-119
19. World Health Organization (WHO) (1995).The use and interpretation of anthropometry. WHO technical report series. World Health Organization, Geneva.854: Pp375-409.
20. Wardlaw G. M., Hampl J. S. and Di Silvestro A. R. (2004). Nutrition during adulthood. In: Perspectives in Nutrition 6th ed. McGraw Hill Higher Education, USA, 647 –680.
21. World Health Organization (WHO). (1998). Obesity: Preventing and managing the global epidemic of obesity. Report of the World Health Organization Consultation of Obesity. WHO, Genera, June, 1998.
22. WHO (World Health Organisation) (2006) "BMI Classifications" World Health Organisation, Geneva.http://www.who.int/bmi/index.jsp?introPage=intro_3.html (Assessed July 10, 2015).
23. Golden, M.H.N. and Golden, B.E. (2001). Severe malnutrition. In: Human Nutrition and Dietetic, J.SGarrow, W.F.IJame and A Raph (Eds.) 10th ed. Churchill Livingstone. Harcourt Publishers Ltd. Uk. Pp. 515-526.
24. Alisha J. R. and Babette Z. (2009). Growth and physical maturation: In Andrew E.M., Steven A. S. and John N. V. (eds) 2nd ed. John Wiley and sons, New Jersey, 370.
25. Thiam, I., Samba, J. and Lwanga, D. (2006). Diet related chronic disease in the West Africa region and the double burden of malnutrition in West Africa. SCN News 33:6-10.
26. Center for Disease Control (CDC). (2013). Racial/ethnic disparities in prevalence, treatment and control of hypertension – United States. Morbidity and Mortality weekly Report 62 (18): 351-355.
27. WHO. (2011). Waist circumference and waist-hip ratio. Report of a WHO Expert Consultation. Geneva. 39 pages.
28. Lee, R.D. and Nieman, D.C (2003). Nutritional assessment (3rd edition). McGraw-Hill Company, New York, 164-167.
29. Bonnefoy M., Jauffret M., Kosika T. and Jusot, J. F. (2002). Usefulness of calf circumference measurement in assessing the nutritional state of hospitalized elderly people. Gerontology 48: 162 – 169.
30. Thomas, D.R. (2007). Loss of skeletal muscle mass in aging: examining the relationship of starvation, sarcopenia and cachexia. Clinical Nutrition26:389–399.
31. Vellas, B., Villars, H., Abellan, G., Soto, M.E., Rolland, Y., Chumlea, W., Salva, A., Rubenstein, L.Z. and Garry, P. (2006). Overview of the MNA(R) –Its history and challenges. The Journal of Nutrition, Health and Aging10(6): 456-465.
32. Asiedu, S.M., Pelenah, J.M., Amao, B.B. and Danguah, A.O (2010). The nutritionsituation of the elderly in Ghana. A case study. Asian Journal Medical Science 2(3): 95-103.
33. Nzeagwu, O.C. and Uwaegbute, A.C. (2013). Assessment of the nutritional status of the elderly in two local government areas of Abia state, Nigeria. Nigerian Journal of Nutritional Sciences 34 (1):63 - 72.
34. Thomas, P. and Fretts, R. (1998).Why women live longer than men.http://www.sciam.com/1998/0698womens/0698perls.html. (AccessedSeptember 12, 2015).
35. Katsuiku, H. (2013). Biological clue to why women live longer than men-BBC News http://www.bbc.com/news/health-22528388 (Accessed September 19, 2015).
36. Shubhangini, A. J. (2010).Nutrition and Dietetics with Indian case studies: Tata McGraw Hill education private limited, New Delhi. Pp180-181.
37. Rossman, I. (1997). Anatomic and body composition changes with ageing. In: Finch, C. E. Handbook of the biology of ageing. New York, Van Nostrend Reinhold,Pp 189 – 221.
338. Mitchel-Eady, C. O. and Chernoff, R. (2006). Nutritional assessment of the elderly. In: Geriatric Nutrition. The Health Professional's Handbook. 3rd ed. Jones and Bartlett Publishers Inc. USA. 427 - 458.
339. Sieber C. C. (2006). Nutritional Screening Tools-How does the MNA ® Compare? Proceedings of the session held in Chicago May 2-3, 2006. (15 years of Mini Nutritional Assessment). Journal of Nutrition, Health and Aging. 10(6), 488 – 494.
440. Lutz, C. and Przytulski, K. (2008). Nutrition and diet therapy. Evidence-Based Applications 4th ed. Brothers Med. Pub. Ltd New Delhi, 261- 283.

441. Nzeagwu, O. C. (2016). Evaluation of nutritional status using anthropometry and biochemical indices of community dwelling older persons in Nigeria. Current Research in Nutrition and Food Science 4 (Special Issue Elderly October). http://www.foodandnutritionjournal.org/?p=2491.
42. WHO (World Health Organisation) (2008). WHO Report on the global tobacco epidemic: the MPOWER package, Geneva. 342 pages.
43. Abidemi, R. A. (2005). Elderly family care situation, daily activities, housing and physical well being in Nigeria. Paper presented at the International Union for the scientific study of population (IUSSP/NIESPP) xxv. International Population Conference Tours, France p 23.
44. Jensen, G.L. (2006). Inflammation as the key interface of the medical and nutrition universes: a provocative examination of the future of clinical nutrition and medicine. Journalof Parenteral and Enteral Nurition30(5):453-463.
45. Feldman, E.B (2002). Handbook of Nutrition and food. C.D. Berdenier (ed). CRD Press Washington Pp. 319-336.
46. Institute of Medicine (1992). The second fifth years: promoting health and preventing disability (Washington, D.C. National Academy Press) Pp. 168-69
47. Anderson, A. L., Harris, T. B., Tylavsky, F. A., Perry, S. E., Houston, D. K., Hue, T. F., Strotmeyer, E. S., Sahyoun, N. R. (2011). Dietary patterns and survival of older adults. Journal of American Dietetic Association 115: 84 – 91.
48. Thapa, R., Amatya, A., Pahari, D. P., Bam, K. and Newman, M.S. (2015). Nutritional status and its association with quality of life among people living with HIV attending public anti-retroviral therapy sites of Kathmandu valley, Nepal. Aids Research and Therapy 12: 14 - 23.
49. Picker, L (2016). The Effects of Education on Health. National Bureau of Economic Research. 1050 Massachusetts Ave., Cambridge.
50. James, R., Maria, E., Jane, F., Athina, V. (2012). Marital status, health and mortality.Maturitas73(4): 295–299.

www.health.harvard.edu/newsletter_article/marriage-and-mens-health (2010)
52. Carol, E. (2005). Malnutrition in the Elderly: A Multifactorial Failure to Thrive challenge. Permanente Journals 9(3): 38–41.
53. Kenkmann, A., Price, G.M., Bolton, J. and Hooper, L. (2010). Health, wellbeing and nutritional status of older people living in UK care homes: An exploratory evaluation of changes in food and drink provision. Biomed Central Geriatrics 10: 28 – 44. http://www.biomedcentral.com/14/1-2318/10/28.