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Nutritional Status of the Aged (≥60 Years) in Nsukka Urban, Nsukka Local Government Area, Enugu State, Nigeria

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Abstract

The study assessed nutritional status of the aged (≥60 years) in Nsukka Local Government Area of Enugu state, Nigeria. Specifically, the study assessed the anthropometric indices, fasting blood glucose, blood pressure, nutrient intake and determined malnutrition indicator score of respondents. Three hundred and fifty-four respondents were selected from three communities by systematic random sampling. Questionnaire, bathroom weighing scale, height metre, measuring tape, M2 Basic Sphygmomanometer and Accu-check glucometer were used for data collection. Data collected were analysed using mean, percentages, t-tests and chi-square. $P < 0.05$ was accepted as the level of significance. Overweight (28.8%), mild obesity (19.5%) and moderate obesity (1.7%) existed among respondents. Prevalence of diabetes mellitus was 12.8% whereas 10.0% had impaired fasting blood glucose. Severe and moderate systolic hypertension existed in 5.0% and 26.2% of respondents. Mean energy, fats, calcium and vitamin A intake of males and females were 2385.06kcal vs. 2343.41kcal, 78.01g vs 71.58g, 398.47mg vs 383.15mg and 524.76µg vs 421.52 µg, respectively. Calcium intake contributed only 34.65% and 29.47% of the males' and females' (Recommended Nutrient Intake (RNI). It is recommended that family members should pay attention to the nutrient needs of the aged to ensure adequate nutrient intake.

Keywords: Nutrition, Anthropometric, Dietary Intake, Diabetes, Hypertension.

Introduction

The ageing process is a biological reality which has its own dynamics, largely beyond human control (WHO, 2019). With advancing age, the lean components, such as total body water, skeletal muscle, organ mass, and bone mineral, tend to decrease, while total body fat increases and becomes redistributed more in the abdominal than in the peripheral adipose tissues (Borkan and Norris, 1977; Forbes and Reina, 1970). Some health and nutritional challenges that the aged face are dental and digestive problems, altered sensations of taste smell, thirst, hunger, and satiety, loss of appetite, chronic diseases, hearing impairment, cardiovascular diseases, reduced immune function and mobility impairment. Loneliness, depression, dependence on care and no support from the healthcare system also hinders the health and nutrition of the aged making them particularly at risk of malnutrition.

Thus, the nutrition and health of the elderly is often neglected and most aged persons in developing countries enter old age after a life of poverty, deprivation, poor access to health care, and a diet

inadequate in quality and quantity (Adebusoye, Ajayi and Dairo, 2012). This predisposes them to malnutrition which is an important issue to be considered in the aged. Malnutrition is a great hazard to which the aged appears to be more vulnerable than the younger age groups due to problems relating to ignorance on appropriate food choices, loneliness, social isolation which often times lead to depression, apathy, lack of appetite, physical disabilities, cardiovascular problems and poverty (Afolabi, Olayiwola, Sanni and Oyawoye, 2012). Overnutrition and undernutrition are the types of malnutrition majorly seen among the aged. A major section of the aged population faces the problem of undernutrition, whereas others face overweight and obesity related issues. According to a study done by Afolabi et al. (2018) prevalence of undernutrition was low (2.9%) among the aged in south-western Nigeria, however, overweight (pre-obesity) was high (men 20%; women 22.8%). Many aged people in Nsukka urban are at risk of underweight, obesity and chronic non-communicable diseases such as diabetes mellitus and hypertension as a result of changes in diet and dietary pattern, lifestyle, physical activity and decreased metabolism. Most depends on caregivers for the purchase and preparation of meals and this may affect their nutrient intake. An assessment of nutritional status of the aged is important for the creation of a database to assist with the initiation of important programs and formulation of policies. Unfortunately, there is a dearth of information on the nutritional status of aged in Nsukka urban, Enugu State, Nigeria. It is on this premise that this study was designed.

Objectives of the study: The objective of this study was to assess the nutritional status of the aged (≥60 years) in Nsukka urban, Nsukka Local Government Area, Enugu State, Nigeria. Specifically, the study:

1) assessed anthropometric indices of the respondents;
2) assessed fasting blood glucose level of the respondents;
3) assessed blood pressure of the respondents;
4) assessed nutrient intake of the respondents; and
5) determined malnutrition indicator score of the respondents.

Methodology

***Study design*:** The study adopted a survey design.

***Study area*:** This study was carried out in the urban area of Nsukka located in Enugu state, a south-eastern state in Nigeria. The University of Nigeria, Nsukka is situated in this area. Nsukka lies within the coordinates of 6°24N longitude and 7°23E latitude. Christianity is the major religion while farming, transportation and trading are the major commercial activities. Nsukka urban is made up of three prominent communities: Nkpunanor community, Ihe n' Owere community and Nru community. The aged in Nsukka urban are usually found in their homes with their relatives playing the role of caregivers. It is an urban community where some of the aged who were once civil servants are pensioners who earn retirement benefit and some were never civil servants as a result were not entitled to any retirement benefits.

***Population for the study*:** The study population consisted of male and female aged who were ≥ 60 years of age and resides in Nsukka urban. Some were educated whereas others were uneducated. Prior to the retirement age (60 years), the aged engaged majorly in civil service, trading and farming. The aged in Nsukka urban usually live with caregivers although majority are not disabled and their source of income is from personal occupation (usually for the unemployed), pension and allowance from children.

***Sample for the study*:** Sample size for the study was 354 (138 males and 216 females). Twenty per cent of the sample size (70) was used as sub-sample for fasting blood glucose and weighed food intake.

Multistage sampling technique was used to select the respondents.

Stage one: The three communities (Nkpunanor, Ihe n'Owerre and Nru) in Nsukka urban were selected for the study.

Stage two: Three villages were selected from each community by balloting without replacement.

Stage three: The number of aged in the selected villages was gotten from the representative of the aged in each village.

Stage four: From the total number of subjects in each village, proportionate sampling was used to determine the number of respondents sampled in each village.

Stage five: In each village, one out of every 5 households was selected for the study. In a situation where no aged was seen in the selected household, the next household was used. In a situation where ≥ 2 aged were seen in a household, balloting without replacement was used to identify the respondent to sample.

***Instruments for data collection*:** The following instruments were used for data collection; questionnaire, modified mini-nutritional assessment (MNA) question-naire, bathroom weighing scale, height metre, measuring tape, M2 basic sphygmomanometer, Accu-check gluco-meter and kitchen scales (5 kg and 20kg).

A structured questionnaire was developed considering the objectives of the study. It was validated by three lecturers in the Department of Home Science, Nutrition and Dietetics. Information on the demographic data of the respondents their food consumption pattern, family and medical history of diseases, health status and alcohol habits were elicited using the questionnaire. Mini-nutritional assessment questionnaire was used to obtain the malnutrition indicator score of the respondents. The questionnaires were interviewer-administered.

Microtoise height meter calibrated in centimetres was used for height measurement. Hanson bathroom scale calibrated in kilogram with 120kg capacity was used for weight measurement. The waist and hip circumference was measured using a flexible non-stretchable tape calibrated in centimetres. Blood pressure measurement was done using M2 basic automatic sphygmomanometer. Accu-chek glucometer with the measuring range 10-600mg/dl was used for fasting blood glucose measurement. Kitchen scales (5 kg and 20kg) were used for weighing food.

***Data collection methods*:** Anthropometric measurements obtained from the respondents were height, weight, waist

circumference and hip circumference measurements.

***Height measurement*:** The respondents were asked to stand erect, barefooted on the foot board of the height meter. Their feet were held parallel to each other, their heels, shoulder and back of head held comfortably erect and both arms hanging at their sides in a natural manner. The head piece was lowered, crushing their hair and making contact with the top of their head. The height was read and recorded to the nearest 0.1centimeter according to WHO (2004).

***Weight measurement*:** The respondents were asked to stand erect, bare-footed on the centre of the weighing scale without touching anything. Head, back and knees were held comfortably erect. All heavy objects such as necklace, cell phones and bunch of keys were removed. Both arms hung at the side in a natural manner. The weight was read and recorded at the nearest 0.1 kilogram according to WHO (2004).

Body mass index (BMI) of the respondents was calculated as the ratio of weight (in kilogram) to the square of height (in meters) and classified according to WHO (2004).

Waist circumference measurement: The respondents were asked to stand erect, abdominal muscles relaxed, arms at the side and feet together. The flexible non-stretchable tape was placed on the small area below the ribcage and at the level of umbilicus according to WHO (2011). A waist circumference greater than 102cm (40inches) for men and greater than 88cm (35inches) for non-pregnant women indicated abdominal adiposity which is an independent risk factor for disease associated with obesity (WHO, 2011).

Hip circumference measurement: The respondents were asked to stand erect, arms at the sides and feet together. The non-stretchable tape was placed at the point of greatest circumference round the hip region. The tape makes close contact with the body without indenting the soft tissue (leaving a mark on the body). The hip circumference was read and recorded to the nearest 0.1centimeter (WHO, 2011).

Waist-hip ratio (WHR): Waist-hip ratio (WHR) of the respondents was calculated as the ratio of the waist circumference (in centimetre) to the hip circumference (in centimetre) and classified according to WHO (2011) classification.

Blood pressure measurement: Blood pressure recordings were obtained from the left arm of the respondents in a sitting position after 30minutes of rest. The cuff was wrapped above the antecubital fossa of the respondents and was connected to the monitor of the sphygmomanometer. The sphygmomanometer was switched on and this rapidly inflated the cuff pressure above systolic pressure. After some seconds, the sphygmomanometer displayed the systolic and diastolic blood pressure in mmHg. WHO (2005) blood pressure classification was used to categorize the blood pressure of the respondents.

Fasting blood glucose measurement: The fasting blood glucose level of the respondents was measured after 8-10 hours' post-absorptive fast using an Accu-check glucometer. Accu-check active glucose test strip was inserted into the glucometer to automatically turn the glucometer on. Each of the respondent's thumb was cleaned with cotton wool dipped in methylated spirit, pricked with a lancet and massaged so that a small drop

of blood was formed. This drop of blood was then applied on the orange-coloured square application area of the test strip after a dropping sign was displayed on the glucometer. The glucometer measured and displayed the level of glucose in the respondent's blood which was then recorded in mg/dL. WHO (2006) fasting blood glucose classification was used to categorize the fasting blood glucose levels of the respondents.

Weighed food intake: A 3-day weighed food intake study of the sub-sample was conducted in their homes. Dietary scales of 5kg and 20kg capacity were used for the exercise. Edible portions of raw ingredients used in preparing meals, empty pots and plates were weighed and recorded. The meals were prepared and the total cooked weight of the dishes recorded. The weight of the meal to be consumed by each respondent was recorded. Actual weight of meal consumed was obtained by subtracting the weight of the plate leftover from weight of the food to be consumed. Food composition tables by Platt (1985) and Food and Agricultural Organization (2012) were used to estimate the nutrient composition of meals consumed by the respondents. From this, their nutrient intake was derived and compared with reference standard.

Data analysis technique: Information obtained from the questionnaire was coded and analysed using the computer software, Statistical Product and Service Solution (IBM -SPSS) for windows, version 20. Data obtained from the questionnaire was analysed using frequencies and percentages. Data obtained from anthropometric indices, fasting blood glucose and blood pressure measurements were presented as means, standard deviation, frequencies and percentages, t-test was used to compare the difference between means of two groups. Chi-square was the inferential statistics used to determine the relationship existing among variables such as: anthropometry, blood pressure and fasting blood glucose at $p < 0.05$ which was considered the level of significance.

Results

Table 1: Mean anthropometric indices, blood pressure and fasting blood glucose level of the respondents by sex

Variables	Male	Female	Group mean	T value	df	P-value
Anthropometric indices						
Height (cm)	157.58±9.31	153.13±8.18	154.87±8.90	4.72	352.00	0.000*
Weight (kg)	61.12±17.72	57.97±13.80	59.20±15.50	1.88	352.00	0.060
Body mass index (kg/m^2)	24.44±5.08	25.55±4.7	25.12±4.91	2.08	352.00	0.004*
Waist circumference(cm)	96.05±7.45	74.14±477	36.33±6.04	21.8	352.00	0.060
Hip circumference(cm)	135.26±8.36	125.11±5.12	36.39±6.62	2.58	352.00	0.001*
Blood pressure (mmHg)						
Systolic	138.39±27.00	156.00±32.98	149.13±32.98	-5.066	352	0.000*
Diastolic	81.07±6.12	80.32±7.01	80.61±6.68	1.031	352	0.303
Fasting blood glucose (mg/dl)	100.14±41.15	00.05±33.59	101.51±38.32	0.010	68	0.992

*=$p < 0.05$ Mean ± standard deviation

Table 1 shows the mean anthropometric indices, blood pressure and fasting blood glucose level of the respondents by sex. Males had a significantly ($p < 0.05$) higher mean height (157.58 ± 9.31m) than females (153.13 ± 8.18m). Mean body mass index of the females (25.55 ± 4.76kg/m²) were significantly ($p < 0.05$) higher than that of the males (24.44 ± 5.08kg/m²). Group mean body mass index, waist circumference and waist-hip ratio were 25.12±4.91kg/m², 36.33±6.04cm and 1.11±0.08, respectively. Mean systolic blood pressure of the males (138.3 ± 27.00 mmHg) were significantly ($p < 0.05$) lower than that of the females (156.00 ± 34.64 mmHg). Group mean diastolic blood pressure was 80.61 ± 6.68mmHg. Mean fasting blood glucose of male respondents was 100.14±41.15mg/dl whereas that of females was 100.05±33.59mg/dl.

Table 2: Cross-tabulation of Anthropometric Indices, Blood Pressure and Fasting Blood Glucose Level of the Respondents by Sex

Variables	Males F (%)	Female F (%)	Total F (%)
Body Mass Index (kg/m²)			
Underweight (<18.5)	29(8.19)	11(3.0)	40(11.2)
Normal (18.5-24.9)	49(13.8)	88(24.8)	137(38.6)
Overweight (25.0-29.9)	48(13.5)	54(15.3)	102(29.0)
Mild obesity (30.0-34.9)	6(1.69)	63(17.79)	69(19.5)
Moderate obesity (35.0-29.9)	6(1.69)	0(0.0)	6(1.7)
Total	**138(100.0)**	**216(100.0)**	**354(100.0)**
x^2 = 58.285	df =4	p = 0.000*	
Waist Circumference (cm)			
Normal	138(100.0)	216(100.0)	354(100.0)
	χ^2 = a	df = 4	p = a
Waist-Hip ratio			
Normal	138(100.0)	216(100.0)	354(100.0)
Systolic blood pressure (mmHg)			
Optimal (<120)	48(35.0)	31(14.3)	72 (22.3)
Normal (<130)	24(17.3)	8(3.7)	32(9.0)
High normal (130-139)	12(8.0)	10(4.6)	110(31.0)
Mild hypertension(140-159)	18(13.0)	92(42.5)	22(6.2)
Moderate hypertension(160-179)	30(22.0)	63(29.1)	93(26.2)
Severe hypertension (≥180)	6(4.3)	12(5.5)	18(5.0)
Total	**138 (100.0)**	**216 (100.0)**	**354 (100.0)**
$x^2 = 61.112$	**df = 5**	**p = 0.000***	
Diastolic blood pressure (mmHg)			
Optimal (<80)	58(42.0)	107 (49.5)	165 (46.6)
Normal (<85)	35(25.3)	53 (24.5)	88 (24.8)
High normal (85-89)	40 (28.9)	42(19.4)	82 (23.1)
Mild hypertension (90-99)	5(3.6)	14 (6.4)	19 (5.3)
Total	**138 (100.0)**	**216 (100.0)**	**354 (100.0)**

$x^2 = 5.632$	**df = 3**	**p = 0.131**	
Fasting blood glucose (mg/dl)			
Normal (79-99)	21 (80.7)	33(75.0)	54 (77.1)
Impaired (100-125)	2(7.6)	5(11.3)	7(10.0)
Diabetes mellitus (≥126)	3(11.5)	6(13.6)	9(12.8)
Total	**26 (100.0)**	**44(100.0)**	**70(100.0)**
$x^2 = 0.347$	**df = 2**	**p = 0.841**	

* p = < 0.0.5 a = No statistics were computed because waist circumference (WC) were constant
WC >102cm for men and >88cm for non-pregnant women, indicate abdominal adiposity
Waist-Hip ratio > 0.95 for men and > 0.80 for women indicates android obesity.

Table 2 presents the cross-tabulation of anthropometric indices, blood pressure and fasting blood glucose level of the respondents by sex. Few (11.3%) of the respondents were underweight. Over weight existed more in males (34.7%) than females (25.0%). More females (29.1%) than males (4.3%) were significantly ($p < 0.05$) mildly obese. Overweight, mild and moderate obesity existed in 28.2%, 19.5% and 1.7% of the respondents, respectively. All (100.0%) of the respondents has normal waist circumference and waist-hip ratio. Mild systolic hypertension existed significantly ($p < 0.05$) in more females (42.5%) than males (13.0%). High normal and mild diastolic hypertension existed in 23.1% and 5.3% of the respondents, respectively. Majority (77.1%) of the respondents had normal fasting blood glucose. Diabetes mellitus existed in 11.5% and 13.6% of the males and females, respectively.

Table 3: Mean energy, macronutrients and micronutrients intake of the respondents by sex

Variables	Males	Male RNI	% Contribution to RNI	Females	Female RNI	% Contribution to RNI
Energy(kcal)	2385.06±530.31	264.01	90.31	2343.41±538.35	2294.46	102.14
Protein (g)	49.87±13.61	72.50	68.79	48.92±13.90	51.50	94.98
Fat (g)	78.01±10.91	69.00	113.05	71.58±15.90	53.00	135.05
Carbohydrate (g)	401.50±62.60	398.13	100.90	402.10±65.40	325.00	123.70
Calcium (mg)	398.47±119.44	1150.00	34.65	383.15±114.23	1300.00	29.47
Iron (mg)	38.65±14.62	8.00	483.09	35.72±8.59	8.00	446.53
Vitamin A (µg)	524.76±139.29	600.00	58.31	421.52±164.24	6 00.00	60.22
Vitamin B_1(mg)	1.39±0.89	1.20	115.78	1.65±1.59	1.10	150.37
Vitamin B_2 (mg)	1.32±1.02	1.45	90.83	1.38±1.11	1.20	114.87
Niacin (mg)	24.14±15.00	16.00	150.84	23.91±13.68	14.00	170.76
Vitamin C(mg)	77.41±45.11	45.00	172.02	63.66±44.99	45.00	141.46

Mean ± standard deviation; RNI from WHO/FAO (2003).

Table 3 shows the mean energy, macronutrients and micronutrients intake of the respondents by sex. Females had greater intake of carbohydrate (402.1±65.4g), vitamin B_1 (1.654±1.59mg) and vitamin B_2 (1.3785±1.11mg) while

males had greater intake of energy (2385.06±530.31kcal), protein (49.8733± 13.61g), fat (78.004±10.91g), calcium (398.4667±119.44mg), iron (38.6474± 14.623mg), vitamin A (524.7594±139.29µg), niacin (24.1346±15.00mg) and vitamin C (77.4095±11mg).

Table 4: Malnutrition indicator scores of the respondents

Variables	Male F (%)	Female F (%)	Total F (%)
Screening score			
Malnutrition	65(47.1)	62(28.7)	127(35.9)
Normal	73(52.9)	154(71.3)	227(64.1)
Total	**138(100.0)**	**216(100.0)**	**354(100.0)**
	$x^2 = 12.389$, **df =1, p=0.000***		
Assessment Score			
Malnourished	37(26.8)	18(8.3)	55(15.6)
At risk of malnutrition	28(20.3)	44(20.4)	72(20.4)
Normal nutritional status	73(52.9)	154(71.3)	226(64.0)
Total	**138(100.0)**	**216(100.0)**	**354(100.0)**
	$x^2 = 23.362$, **df =2, p=0.000***		

* = p < 0.05; Screening score (maximum of 14 points): Malnutrition (≤ 11 points); Normal (≥ 12 points) Assessment score (maximum of 16 points): Malnourished (less than 17 points); At risk of malnutrition (17 to 23.5 points); Normal nutritional status (24.0 – 30.0 points)

Table 4 shows the malnutrition indicator score of the respondents. There was a significant (p < 0.05) difference in the screening score of the respondents with males (47.1%) being more malnourished than the females (28.7%). Significant (p < 0.05) difference in the assessment score of the respondents revealed that females (71.3%) were of normal nutritional status than the males (52.9%).

Discussion of Findings

Diabetes mellitus (DM) is an aetiologically multifactorial metabolic disorder, characterised by chronic hyperglycaemia (Ejike, Uka and Nwachukwu, 2015). Diabetes mellitus escalates the risk of other common aged disorders, such as melancholy, mental dysfunction, chronic ache, adverse falls and urinary incontinences. Prevalence of diabetes and impaired diabetes was high among the respondents and this is different from the findings of Shittu, Kasali, Biliaminu and Odeigah (2017) who reported 4.6% (93.70% for females and 6.30% for males) and 6.0% (85.00% for females and 15.00% for males) prevalence of diabetes and impaired diabetes, respectively. It was also different from the findings of Ejike, Uka and Nwachukwu (2015) which showed that the prevalence of diabetes was 3.0% (3.6% for females and 2.3% for males) and impaired diabetes was 4.1% (5.2% for females and 2.9% for males). The high prevalence of diabetes mellitus among the aged could be as a result of the aging factor (Kalyani and Egan, 2013). It could also be due to decline in physical activity and diet consumption pattern of the aged in Nsukka which consisted mostly of staple foods. Most aged people suffer from diabetes mellitus, but due to poverty and lack of access to adequate health care,

several incidents of diabetes are undiagnosed. According to Ronald and Klien (2005) poor glycaemic control is associated with diabetes complications especially microvascular complications.

The anthropometric status of the respondents showed that few of the respondents were underweight, this is similar to the findings of Adebusoye, Ajayi and Dairo (2012) which showed that the prevalence of undernutrition among participants was 7.8%. This could be as a result of malnutrition which is an inevitable side effect of getting old. The elderlies are susceptible to malnutrition because of the changes that their body undergo, such as loss of dentition, wasting and loss of appetite. Over-weight existed more in males than females and this is different from the finding of Vinod and Ashabanu (2018) considering the overweight category females 8.3% were more as compared to males 15.5%. According to Jyväkorpi (2016), overweight or even mild obesity can be shielding for people over 70 years of age. Overweight may keep older persons from loss of weight, bone mass, and death.

Mean systolic and diastolic blood pressure of the subjects were significantly higher in females than males contrary to the findings of Suleiman, Amogu and Ganiyu (2013) who reported high mean systolic and diastolic blood pressure among males (133.3/86.20mmHg) than females (9+8+3127.40mmHg). It is also different from the findings of Ukegbu, Akhimien, Onwubere and Okpechi (2013) who reported that mean systolic blood pressure was significantly higher in men (136.00 ± 24.80 mmHg) than women (130.3 ± 31.2mmHg) in rural areas, men(136.10 ± 21.1mmHg) and women (127.1 ± 17.5mmHg) in urban areas, while for diastolic blood pressure, the difference was only significant in the urban setting for men (77.9 ± 13.8mmHg) than women (74.5 ± 17.5mmHg). The reason for high prevalence of high blood pressure among the aged women compared to that of aged men could be as a result of the loss of oestrogen during menopause which protects the cardiovascular system (Raji, Abiona and Gureje, 2017). This is also similar to the report of Akinlua, Meakin, Umar, and Freemantle (2015) which showed that prior to menopause, the prevalence of high blood pressure was higher in men than women of the same age group.

Dishes consumed by the aged in Nsukka urban were mostly starchy staples and this could be the reason for the low protein intake of the aged males. It is surprising that the nutrient intake of the respondents met the recommendations, however, the bioavailability of these nutrients and retention in the meals are issues to be considered since these are some of the limitations of weighed food intake. Afolabi, Olayiwola, Sanni and Oyawoye (2018) reported that the mean intake of energy (2044 kcal/day), carbohydrate (388.3g), protein (27.7g) and fat (42.2g) for men was significantly ($p < 0.05$) higher than that of the women similar to the findings of this study. Inadequate protein and micronutrient intake may weaken the immune system of the aged and expose them to infections that may reduce absorption of essential nutrients thereby compounding the cycle of under-nutrition and infection. The low calcium intake seen among the respondents is worrisome because these aged are at an increased risk of

osteoporosis, a bone disease in which the bones become fragile and can easily break.

Health problems commonly seen among the aged could have contributed to the prevalence of malnutrition and those at risk of malnutrition seen in the study group. Malnutrition in elderly occur when there is lack of stability between nutritional intake and nutritional needs (Adejanju, 2016). Results of this study is similar to the findings of Agarwalla *et al.* (2015) who reported 15% prevalence of malnutrition among the elderly and 55% prevalence at risk of malnutrition. It was, however, different from the findings of Ramya, Ranganath, Jadhav and Swetha (2017) which showed that 21.33% were malnourished while 47.33% were at risk of malnutrition. Malnutrition was more among the males than females which is different from the findings of Ramya *et al*. (2017) who reported that both genders were equally susceptible to malnutrition. The role of women in the society as home makers in most African society and in Nigerian homes where women prepare family foods and are closer to food could explain the lower prevalence of malnutrition in the females than males. The aged frequently suffer from numerous diseases and this could lead to nutrient deficiencies. Nutrient deficiencies may worsen functional degeneration and contribute to additional health decline of the aged.

Conclusion

This study has shown that overweight, obesity, diabetes mellitus and hypertension were prevalent among the respondents. A significant ($p < 0.05$) relationship existed between the sex of the respondents and their BMI and systolic blood pressure with males being more underweight and moderately obese than the females. More females than males were overweight, mildly obese, mildly, moderately and severely hypertensive than the males. Calcium and vitamin A intake of the aged were inadequate. More males than females were malnourished and this differed significantly ($p < 0.05$).

Recommendations

1. The aged and their caregivers should ensure that nutritionally adequate meals are prepared and consumed so as to ensure that they attain and maintain good nutritional status.
2. Nutritionists and Dieticians should provide nutrition education for the aged and their caregivers on the nutrient needs of the aged and on how to achieve adequate nutrition.
3. Periodic assessment of the nutritional status of the aged is needed so as to prevent, detect and manage some of the health and nutrition challenges that the aged face.
4. The Local Government Administration should empower the community health workers, Nutritionists and Dieticians, Home Economists and Extension workers to design intervention programs which would include food demonstration sessions and radio talks in local languages to help solve malnutrition and health problems of the aged in Nsukka urban.
5. Health services should ensure that strategies are in place to address malnutrition in the community.

References

Adebusoye, L., Ajayi, I. O., & Dairo, M. D. (2012). Nutrition in Gerontology and Nutritional Status of Older Persons

Presenting in a Primary Care Clinic. *Journal of Nutrition in Gerontology and Geriatrics*, *31*(June 2016), 71–85. https://doi.org/10.1080/21551197.2012.647560

Adejanju, S. (2016). Malnutrition in Elderly , Possible Causes and Nurses Intervention.

Afolabi, W. A. O., Olayiwola, I. O., Sanni, S. A., & Oyawoye, O. (2018). Nutrient Intake and Nutritional Status of the Aged in Low Income Areas of Southwest , Nigeria. Retrieved from http://www.jarcp.com/938-nutrient-intake-and-nutritional-status-of-the-aged-in-low-income-areas-of-southwest-nigeria.html

Aganiba, B. A., Owusu, W. B., Steiner-Asiedu, M., & Dittoh, S. (2015). 4 3 2 1. *African Journal of Food, Agriculture, Nutrition and Development.*, *15*(4), 10198–10216.

Agarwalla, R., Saikia, A. M., & Baruah, R. (2015). O riginal Article Assessment of the nutritional status of the elderly and its correlates. *Journal of Family and Community Medicine*, *22*(1), 39–44. https://doi.org/10.4103/2230-8229.149588

Akinlua, J. T., Meakin, R., Umar, A. M., & Freemantle, N. (2015). Current Prevalence Pattern of Hypertension in Nigeria : A Systematic Review Current Prevalence Pattern of Hypertension in Nigeria : A Systematic Review. *Plos one*, *10*(10), 1–19. https://doi.org/10.1371/journal.pone.0140021

Borkan, G., Norris A. (1977) Fat redistribution and the changing body dimensions of the adult male. *Human Biology* 49:495–514.

Chaitra Vinod, K., & Ashabanu, S. (2018). Current Research in Nutrition and Food Science Nutritional Status of Elderly in the Old Age Homes : A Study in Pune city. *Current Research in Nutrition and Food Science*, *06*(1), 234–240.

Ejike, C. E. C. C., Uka, N. K., & Nwachukwu, S. O. (2015). Diabetes and pre-diabetes in adult Nigerians : Prevalence , and correlations of blood glucose concentrations with measures of obesity. *African Journal of Biochemistry Research*, *9*(3), 55–60. https://doi.org/10.5897/AJBR2015.0817

FAO. (2001). Human energy requirements (Vol. 1). Rome.

FAO. (2012). Table de composition des aliments d´Afrique de l´Ouest, West African Food Composition Table (first). Rome: The food and Agriculture Organization of the United Nations (FAO).

Forbes GB, Reina JC (1970) Adult lean body mass declines with age: some longitudinal observations. *Metabolism* 19:653–663.

Jyväkorpi, S. (2016). Nutrition of Older People and the Effect of Nutritional Interventions on Nutrient Intake, Diet Quality and Quality of Life.

Kalyani, R., & Egan, J. M. (2013). Diabetes and Altered Glucose meabolism with aging. *Endocrinology and Metabolism Clinics of NA*, *42*(2), 333–347. https://doi.org/10.1016/j.ecl.2013.02.010

National Population Commission. (2017). Demographiic Statistics. *Demographic Statistics Bulletin*. National Bureau of Statistics. https://doi.org/10.1016/b978-0-12-527850-8.50022-5

Ogundahunsi, G. A., & Akinrinmade, R. (2017). Dietary Intake , Anthropometric Characteristics and Clinical Assessment of Elderly in Ondo State , Nigeria. *Journal of Nutrition and Health Sciences*, *4*(3), 1–8. https://doi.org/10.15744/2393-9060.4.303

Platt, B. S. (1985). *Table of representative values of foods commonly used in tropical countries.* London: London School of Hygiene and Tropical Medicine (Department of Human Nutrition).

Ramya, M. S., Ranganath, T. S., Jadhav, J., & Swetha, N. B. (2017). To assess the nutritional status among elderly and factors influencing it , in an urban area , Bengaluru - a cross sectional study. *International Journal of Community Medicine and Public Health*, *4*(5), 1727–1732.

Ronald, H. and Klein, J. (2005). Hyperglycemia and microvascular and macrovascular diseases in diabetes. *Diabetes Care,* 18, 253-268.

Shittu, R. O., Kasali, F. O., Biliaminu, S. A., & Odeigah, L. O. (2017). iMedPub Journals Prevalence of Diabetes and Pre-Diabetes in Oke-Ogun Region of Oyo State , Nigeria Abstract. *Journal of Medical Research & Health Education archivos de medicina I*, *1*(4), 1–7.

Suleiman, I. A., Amogu, E. O., & Ganiyu, K. A. (2013). Prevalence and control of hypertension in a Niger Delta semi urban community , Nigeria. *Pharmacy Practice*, *11*(1), 24–29. https://doi.org/10.4321/S1886-36552013000100005

Ukegbu, A. U., Sc, B. M., Akhimien, M. O., Onwubere, B. J. C., & Okpechi, I. G. (2013). Prevalence and Determinants of Hypertension in Abia State Nigeria : determine the prevalence of hypertension in Abia State , in any of its urban or rural areas ; these data are needed in the state to guide health policy Study Area and Participants. *Ethnicity & Disease*, *23*, 161–167.

Vinod, K., Ashabanu, S. (2018). Current Research in Nutrition and Food Science Nutritional Status of Elderly in the Old Age Homes: A Study in Pune city. *Current Research in Nutrition and Food Science Journal, 6(1), 234-240*

Volkert, D. (2008). Malnutrition in the elderly — prevalence, causes and corrective strategies. *Clinical Nutrition*, *21*, 110–112. https://doi.org/10.1016/s0261-5614(02)80014-0

Volkert, D., Cashman, K., & Rizzoli, R. (2010). Nutrient Needs of the Older Adult. In *Symposium A Quarterly Journal In Modern Foreign Literatures* (pp. 1–6).

WHO. (2015). WHO | Nutrition for older persons. Retrieved from http://www.who.int/nutrition/topics/ageing/en/index1.html

WHO (2005). Clinical guidelines for the management of hypertension. Egypt.

WHO (2006). Definition and Diagnosis of diabetes mellitus and intermediate hyperglycaemia. *WHO Press*. Geneva.

WHO (2011). Waist Circumference and Waist-Hip Ratio*: Report of a WHO Expert Consultation*. https://doi.org/10.1038/ejcn.2009.139

WHO (2019). Health statistics and information systems: Proposed working definition of an older person in Africa for the MDS Project. https://www.who.int/healthinfo/survey/ageingdefnolder/en/.

Wilma, L., & Hankey, C. (2015). Aging, Nutritional Status and Health. *Healthcare*, *3*(7), 648–658. https://doi.org/10.3390/healthcare3030648.