



## Demographic Characteristics and Dietary Pattern of the Elderly in Ondo State, Nigeria

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### Authors' contributions

This work was carried out in collaboration between all authors. Author IOO designed the study, managed the literature search, supervised data collection, analysis and wrote the final draft. Author CAO, collected data, carried out the analysis and wrote the first draft while Author DAA, supervised the project work and Arigbede edited the statistical analysis. All authors are involved in editing the work.

Research Article

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### ABSTRACT

**Objective:** To investigate the demographic characteristics and dietary patterns of elderly adults (>60 years) in Ondo State, Nigeria.

**Methodology:** This was a random sampling of 400 elderly individuals (>60 years) living in Ondo State, Nigeria. Data on demographic and non-demographic variable characteristics, including food habits, dietary patterns and food frequency, were collected using an open-ended and structured questionnaire.

**Results:** Most individuals aged 60–69 years were married, with fewer than 25% having primary education and the majority of the remainder having no formal education. Most were employed in farming and their income was low (<200 USD per month). About 80% ate three meals daily, 25% skipped meals, and 39% avoid certain foods and 87% had favorite food which relates significantly with gender ( $\chi^2=7.2$ ;  $p<0.05$ ) marital status ( $\chi^2=5.7$ ;  $p<0.05$ ) and health (rate of falling sick). Dietary pattern was significantly associated with body ailments ( $\chi^2=51.9$ ;  $p<0.05$ ). Certain habits, such as alcohol ingestion, influenced the number of meals ( $\chi^2=10$ ;  $p<0.05$ ). Memory loss was significantly associated with skipping meals ( $\chi^2=7.2$ ;  $p<0.05$ ), whereas depression was significantly associated with the number of meals ( $\chi^2=6.2$ ;  $p<0.05$ ). A logistic regression model found that educational level, occupation and gender were significant independent predictors of

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dietary pattern.

**Conclusion:** Most elderly individuals in Ondo State, Nigeria, were of low socioeconomic level and illiterate, with dietary patterns influenced by age, education, occupation and gender. Age correlated inversely with bone mass, body mass index, body fat and body water.

*Keywords: Demography; pattern; Nigeria; dietary; elderly.*

## 1. INTRODUCTION

The populations of older adults are increasing in all countries throughout the world due to reduced fertility, improvements in public health and increased life expectancy. About 10% of all persons in the world are aged  $\geq 60$  years, with the percentages expected to increase to 20% in 2050 and to 33% in 2150 [1]. Moreover, the fastest growing segment of this population consists of individuals aged  $\geq 80$  years who presently constitute 11% of those aged  $\geq 60$  years, a percentage projected to grow to 19% by 2050. In addition, the number of centenarians is expected to increase 15-fold, from approximately 145,000 in 1999 to 2.2 million by 2050 [1].

Although the percentage of the population aged  $\geq 60$  years is currently increasing in all countries, up until the early 1980s this increase was a phenomenon of developed countries only [1,2]. At present, two-thirds of individuals aged  $\geq 60$  years live in the developing world, a proportion expected to increase to nearly 75% by the 2030s (UNFPA) [1,2]. It has been estimated that, by 2020, the world population will include one billion persons aged  $\geq 65$  years, with 71% living in low-income countries, including those in Africa [3]. In West Africa, including Nigeria, the numbers of people aged,  $\geq 60$  years is increasing, from 5.8 million in 2005 to a projected 16 million by 2030 and 47 million by year 2060.

Changing demographics have affected the populations of the elderly worldwide. Developed countries tend to be at the fourth stage of demographic transition, where both the birth rate and the death rate are low, and population growth slows or even stops, resulting in a larger number of elderly people within a dwindling population [4]. By contrast, the sub-Saharan region is still at the second stage of demographic transition, in which the death rate drops and the birth rate remain high. This leads to a growing population with a longer life expectancy and thus a larger population of elderly people. Although this demographic transition occurred over a long period in developing countries, the transition was much shorter in sub-Saharan African. In this transition dietary pattern, nutrition, lifestyle and overall health is vital. Elderly individuals require adequate and sufficient nutrition to maintain functional capacity, live independent lives within their own people and communities. Since the number of individuals aged  $\geq 60$  years in Nigeria is projected to double before 2020, it is necessary to understand their current dietary patterns and nutritional status to plan for this future increase. Thus, the major purpose of this study was to determine the dietary and demographic characteristics of individuals aged  $\geq 60$  years in Ondo State, Nigeria.

## 2. METHODOLOGY

This descriptive survey involved selecting a representative sample of a large population to assess the relative and interrelationships of variables [5]. It included the collection,

organization, analysis and description of these variables in a natural setting without interference.

## **2.1 Area of the Study**

The study area was Ondo State, Nigeria, an area bounded on the east by Edo State, on the north by Kogi State, on the west by Oyo and Ogun States, and on the south by the Atlantic Ocean [6].

## **2.2 Population of the Study**

A census taken in 2009 identified 201,016 individuals aged  $\geq 60$  years in Ondo State (National Population Commission, 2009).

## **2.3 Sample and Sampling Techniques**

The study sample was selected using the Yaro Yamane formula [7], a formula that reduces the standard error that would have occurred. Every subject had an equal likelihood of selection at a 0.05 level of significance. The sample consisted of 400 persons aged  $\geq 60$  years living in the three senatorial districts of Ondo State, Ondo South, Ondo Central, and Ondo North (National Population Commission, 2009).

## **2.4 Research Instrument**

An open-ended, structured questionnaire was administered to each selected individual. The questionnaire included two sections, the first consisting of items addressing the demographic and socioeconomic status of respondents, and the second consisting of addressing meal patterns food selection and anthropometry measurements.

## **2.5 Questionnaire Administration and Collection**

The questionnaires were administered directly by the researcher and research assistants. Each assistant was trained for 5 days on the purpose, objectives, and methodology of the study. Assistants were taught how to enter the name of each respondent, as well as responses to all questions.

## **2.6 Validation of Instrument**

A pilot study involving 25 individuals aged  $\geq 60$  years' living in a location outside Ondo State was performed to determine a need to modify the instrument. The data were documented and analysed with a statistical package for the social sciences (SPSS) software, and the results were used to revise the questionnaire.

## **2.7 Reliability of the Instrument**

A test re-test method was used to determine the stability and consistency of the instrument in the pilot test. Cronbach's alpha was 0.80.

## **2.8 Data Collection**

The validated questionnaires were administered directly by research assistants to individuals aged  $\geq 60$  years living in a location outside the selected areas.

Blood pressure was assessed by hospital staff and classified according to NHLB guidelines (United State standard).

## **2.9 Data Analysis**

All statistical analyses were performed using SPSS Version 17. Percentage, mean, and standard deviation (SD) were determined. Dietary pattern scores were estimated by numerically translating food frequency categories. A logistic regression model was used to analyse the associations between dietary pattern scores and demographic characteristics of the subject population. Dietary factor scores were dichotomized relative to the median. Odds ratios (OR) and 95% confidence intervals (CI) were calculated by comparing the scores in patients with upper and lower dietary pattern scores.

## **2.10 Limitation and Delimitation**

The major weakness of this research is the lack of the fund to compare dietary pattern with those in other tribes of Nigeria. However the greatest strength rest on the cooperation and response from the elders.

## **3. RESULTS**

The demographic characteristics of the study sample are shown in Table 1a. Of the 400 individuals, 208 (52%) were male, including 53.7%, 53.1%, and 49.3% from Ondo North, Ondo South, and Ondo Central states, respectively. Many of the elderly were 60–69 years of age and Christian, and 81% were married. Many of these subjects had no formal education, with <25% having a primary education and <3% having attended a tertiary institution. In addition, 73% of these subjects had more than five children, and 87% lived in households with 3–4 caregivers and had 1–4 dependent relatives (Tables 1b).

Of these 400 persons aged  $\geq 60$  years, 57% were farmers, whereas 10% were civil servants. About 76.5% earned <200 US dollars per month, with the other 23.5% earning between 200 and 500 US dollars per month (Table 2).

We found that 33% of these individuals had ready access to food, whereas 69% experienced deprivation. The majority were of moderate (41%) or low (49%) economic status (Table 2). The immediate needs of these subjects included food (25%), medical care (57%) and shelter (18%), with 77% of these individuals using their daily salaries as savings for times of need.

**Table 1a. Demographic characteristics of individuals aged ≥60 years**

Characteristic	Ondo south zone		Ondo central zone		Ondo north zone		Total
	N	%	N	%	N	%	%
<b>Gender</b>							
Male	76	53.1	67	49.3	65	53.7	52
Female	67	46.9	69	50.7	56	46.3	48
Total	143	100	136	100	121	100	100
<b>Age</b>							
60–69 yrs	57	39.9	81	59.6	60	49.6	49.5
70–79 yrs	49	34.3	32	23.5	35	28.9	29.0
80 yrs +	37	25.9	23	16.9	26	21.5	21.5
Total	143	100	136	100	121	100	100
<b>Marital status</b>							
Married	123	86.0	101	74.3	101	83.5	81.2
Widowed/	20	14.0	35	25.7	20	16.5	18.8
Total	143	100	136	100	121	100	100
<b>Education level</b>							
No formal education	76	53.1	76	55.9	76	62.8	57
Primary	30	21.0	21	15.4	27	22.3	19.5
Secondary	36	25.2	37	27.2	15	12.4	22
Tertiary	1	0.7	2	1.5	3	2.5	1.5
Total	143	100	136	100	121	100	100

**Table 1b. Family structure, numbers of children, occupation and ethnic characteristics of individuals aged ≥60 years**

Characteristic	Ondo south zone		Ondo central zone		Ondo north zone		Total
	N	%	N	%	N	%	%
<b>Family structure</b>							
Monogamy	78	54.5	59	43.4	60	49.6	49.2
Polygamy	65	45.5	77	56.6	61	50.4	50.8
Total	143	100.0	136	100.0	121	100.0	100.0
<b>No. of children</b>							
1–2	7	4.9	6	4.4	7	5.8	5.0
3–4	36	25.2	31	22.8	23	19.0	22.5
5+	100	69.9	99	72.8	91	75.2	72.5
Total	143	100.0	136	100.0	121	100.0	100
<b>Occupation</b>							
Civil servant	22	15.4	13	9.6	8	6.6	10.8
Trading/Business	26	18.2	41	30.1	45	37.2	28
Farming	80	55.9	73	53.7	63	52.1	54
Artisan	6	4.2	1	0.7			1.7
Unemployed	9	6.3	8	5.9	5	4.1	5.5
Total	143	100.0	136	100.0	121	100.0	100

**Table 2. Socioeconomic characteristics of individuals aged ≥60 years living in the three senatorial zones in Ondo State**

Characteristic	Ondo South Zone		Ondo Central Zone		Ondo North Zone		Total %
	N	%	N	%	N	%	
<b>Income per month</b>							
< N30,000 (200 USD)	116	81.1	114	83.8	77	63.6	76.75
N31,000–60,000 (200–500 USD)	27	18.9	22	16.2	44	36.4	23.25
Total	143	100.0	136	100.0	121	100.0	100.0
<b>Enough money to buy food?</b>							
Yes	43	30.1	60	44.1	21	17.4	31
No	100	69.9	76	55.9	100	82.6	69
Total	143	100.0	136	100.0	121	100.0	100
<b>Economic rating*</b>							
High	4	2.8	26	19.1	9	7.4	9.75
Moderate	45	31.5	67	49.3	54	44.6	41.50
Low	94	65.7	43	31.6	58	47.9	48.75
Total	143	100.0	136	100.0	121	100.0	100.0
<b>Coping strategy</b>							
Cooperative societies	27	18.9	38	27.9	29	24.0	23.50
Daily contributions	116	81.1	98	72.1	92	76.0	76.50
Total	143	100.0	136	100.0	121	100.0	100.0

Reference [22]\*

Assessments of dietary patterns in these subjects showed that 39% avoid food, 80% eat thrice daily, 21% skip meals, 23.5% eat between meals and 87% have favourite foods in all the zones with variations within each zone (Table 3). This food pattern relates significantly with gender ( $\chi^2=7.2$ ;  $p<0.05$ ) marital status( $\chi^2=5.7$ ;  $p<0.05$ ) and health (rate of falling sick  $\chi^2=12.1$ ;  $p<0.05$ ). Major foods avoided included Gari (cassava) (31%), yam flour (13.3%), okro soup (6.8%), fufu (cassava product) (5.8%), rice (8%), and beans (4.8%). Most reasons for avoidance involved tradition, culture and parental instruction (41%), but some subjects cited health reasons, including intestinal problems (10%), dysentery (9%), and general dislike of the food (28%).

Foods consumed included animal proteins such as beef, fish and other types of meat, dairy products (especially tinned milk), tubers, legumes, cereals, fruits and green vegetables (Tables 4a&b). There are no significant relationship in the frequency of consumption and certain demographic variables such as marital status ( $p>0.05$ ) religion ( $p>0.05$ ), cereals and gender reveal significant outcome in that females are 2.5 times more likely to consume cereals than male (95% CI: 0.94 to 3.5) (Table 4a).

High consumption of fish and meat (animal products) is likely, as 73% eat these daily. By contrast, the consumption of milk and dairy products is quite low, as only 50% of the population drink milk once in a week and others less than once a week. The other food groups are consumed once to four times per week. There was a significant correlation

between consumption of cereals and legumes ( $r=0.23$ ;  $P<0.05$ ). Dietary pattern was significantly associated with level of education, age, occupation and income.

Intake of fruit and dairy products was significantly associated with attendance at secondary school ( $P<0.05$ ), and the consumption of fruit was significantly associated with the professions of artisan and farmer ( $\chi^2=10.1$ ;  $P<0.05$ ). A multivariate regression analysis showed that individuals with secondary/tertiary education are 2.5 times (95% CI: 1.4 to 4.5) more likely to consume fruit than those without education (Table 4b).

Compared with civil servants, farmers were 0.5 times (95% CI: 0.28 to 1.2) more likely to have upper dietary pattern scores in fruit consumption, and artisans were 1.1 times (95% CI: 0.22 to 6.1) more likely to have upper dietary pattern scores in fruit consumption (Table 4b). This means that they are likely to consume fruits as much as those who are civil servants, with no difference in the fruit consumption pattern between the two categories of occupation. We also found that education influenced dairy product consumption, with individuals who completed primary education being 2.3 times (95% CI: 1.2 to 4.4) more likely to consume dairy products than those with no formal education. In addition, when compared with subjects with primary education, individuals with secondary and tertiary levels of education were 28.0 times (95% CI: 2.9 to 246.6) more likely to have upper dietary pattern scores for dairy product consumption (Table 4b).

When we assessed correlations among foods ingested, we found that the frequency of consumption of dairy products increases with the consumption of green vegetables ( $r=0.20$ ;  $p<0.05$ ), and that the latter correlates positively with health score ( $r=0.19$ ;  $p<0.05$ ) and animal protein intake ( $r=0.30$ ;  $p<0.05$ ) but correlates inversely with the frequency of legume intake ( $r=0.16$ ;  $p<0.05$ ).

We also observed a significant correlation between the frequencies of intake of cereals and legumes ( $r=0.26$ ;  $p<0.05$ ), as well as a correlation between the frequency of consumption of street foods and body ailments ( $\chi^2=51.9$ ;  $p<0.05$ ).

The psychological state of our elderly population also had significant effects on food intake. For example, we found that depression correlated positively with frequency of sickness ( $r=0.11$ ;  $p<0.05$ ) and number of meals per day ( $p<0.05$ ). The frequency and pattern of eating are also related significantly with the frequency of alcohol consumption ( $\chi^2=10.0$ ;  $p<0.05$ ).

Depression is also significantly correlated with hours of sleep ( $\chi^2=36.2$ ;  $p<0.05$ ) and recreational activity ( $\chi^2=45$ ;  $p<0.05$ ). Other psychological problems that affect dietary pattern include memory loss, which is significantly associated with skipping meals ( $\chi^2=7.2$ ) and with no food for 3 consecutive days within 1 month. ( $\chi^2=10.2$ ;  $p<0.05$ ).

The socioeconomic status of our study population was also associated with dietary pattern. A higher food budget correlated positively with consumption of animal proteins (0.12;  $p<0.05$ ) and green vegetables (0.15;  $p<0.05$ ), as well as with overall health score (0.19;  $p<0.05$ ). However, a higher food budget correlated negatively with cereal intake (0.16;  $p<0.05$ ).

Table 3. Gender-based dietary patterns in subjects aged ≥60 years living in the three senatorial zones in Ondo State

Variables	Ondo South Zone*			Ondo Central Zone*			Ondo North Zone*			Overall
	Male	Female	Total	Male	Female	Total	Male	Female	Total	Total
<b>No. of meals eaten per day</b>										
Once	3(3.9)	5(7.5)	8(5.6)	1(1.5)	1(1.4)	2(1.5)	2(3.1)	1(1.8)	3(2.5)	13(3.25)
Twice	20(26.3)	5(7.5)	25(17.5)	14(20.9)	7(10.1)	21(15.4)	12(18.5)	8(14.3)	20(16.5)	66(16.5)
.> = Thrice	53(69.7)	57(85.1)	110(76.9)	52(77.6)	61(88.4)	113(83.1)	51(78.5)	47(83.9)	98(81.0)	321(80.25)
Total	76(53.1)	67(46.9)	143(100.0)	67(49.3)	69(50.7)	136(100.0)	65(53.7)	56(46.3)	121(100.0)	400(100.0)
<b>Eat between meals</b>										
Yes	16(21.1)	16(23.9)	32(22.4)	19(28.4)	25(36.2)	44(32.4)	9(13.8)	9(16.1)	18(14.9)	94(23.5)
No	60(78.9)	51(76.1)	111(77.6)	48(71.6)	44(63.8)	92(67.6)	56(86.2)	47(83.9)	103(85.1)	306(76.5)
Total	76(53.1)	67(46.9)	143(100.0)	67(49.3)	69(50.7)	136(100.0)	65(53.7)	56(46.3)	121(100.0)	400(100.0)
<b>Skip meals</b>										
Yes	10(13.2)	8(11.9)	18(12.6)	29(43.3)	19(27.5)	48(35.3)	10(15.4)	8(14.3)	18(14.9)	84(21)
No	66(86.8)	59(88.1)	125(87.4)	38(56.7)	50(72.5)	88(64.7)	55(84.6)	48(85.7)	103(85.1)	316(79)
Total	76(53.1)	67(46.9)	143(100.0)	67(49.3)	69(50.7)	136(100.0)	65(53.7)	56(46.3)	121(100.0)	400(100.0)
<b>Favourite food</b>										
Yes	69(90.8)	64(95.5)	133(93.0)	59(88.1)	44(63.8)	103(75.7)	62(95.4)	50(89.3)	112(92.6)	348(87)
No	7(9.2)	3(4.5)	10(7.0)	8(11.9)	25(36.2)	33(24.3)	3(4.6)	6(10.7)	9(7.4)	52(13)
Total	76(53.1)	67(46.9)	143(100.0)	67(49.3)	69(50.7)	136(100.0)	65(53.7)	56(46.3)	121(100.0)	400(100.0)
<b>Avoid certain foods</b>										
Yes	26(34.2)	23(34.3)	49(34.3)	24(35.8)	38(55.1)	62(45.6)	27(41.5)	18(32.1)	45(37.2)	156(39)
No	50(65.8)	44(65.7)	94(65.7)	43(64.2)	31(44.9)	74(54.4)	38(58.5)	38(67.9)	76(62.8)	244(61)
Total	76(53.1)	67(46.9)	143(100.0)	67(49.3)	69(50.7)	136(100.0)	65(53.7)	56(46.3)	121(100.0)	400(100.0)

\* Percentages in parenthesis.



**Table 4a. Correlations between dietary patterns and age, gender, marital status and religion of subjects aged ≥60 years living in Ondo State (n = 400)**

Variables	Animal protein	Tubers	Legumes	Cereals	Fruits	Dairy products	Green vegetables	Vitamins
	OR(95% CI)	OR(95% CI)	OR(95% CI)	OR(95% CI)	OR(95% CI)	OR(95% CI)	OR(95% CI)	OR(95% CI)
<b>Age</b>								
60–69 yrs §	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
70–79 yrs	1.3 (0.74–2.3)	0.90 (0.55–1.5)	0.6 (0.29–1.3)	0.8 (0.49–1.4)	0.8 (0.48–1.4)	1.1 (0.59–1.9)	1.1 (0.66–1.8)	1.1 (0.53–2.1)
80 yrs +	1.4 (0.73–2.7)	1.1 (0.63–2.0)	0.9 (0.36–2.4)	1.0 (0.54–1.8)	1.0 (0.56–1.9)	1.2 (0.60–2.4)	2.6 (0.92–5.4)	1.0 (0.43–2.3)
p-value	>0.05	>0.05	>0.05	>0.05	>0.05	>0.05	>0.05	>0.05
<b>Gender</b>								
Male§	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Female	1.4 (0.82–2.5)	0.63 (0.39–1.0)	1.1 (0.54–2.4)	2.5(0.94,3.5)*	1.1 (0.65–1.7)	0.9 (0.53–1.7)	1.1 (0.65–1.7)	1.6 (0.85–3.2)
p-value	>0.05	>0.05	>0.05	< 0.05	>0.05	>0.05	>0.05	>0.05
<b>Marital status</b>								
Married§	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Widowed/ Separated	0.6 (0.33–1.1)	1.1 (0.61–1.9)	1.4 (0.54–3.5)	0.9 (0.50,1.6)	1.2 (0.67–2.2)	1.7 (0.89–3.3)	0.9 (0.55–1.7)	0.7 (0.33–1.59)
p-value	>0.05	>0.05	>0.05	>0.05	>0.05	>0.05	>0.05	>0.05
<b>Religion</b>								
Christianity§	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Islam	0.7 (0.39–1.3)	0.68 (0.39–1.2)		0.9 (0.53–1.7)	1.4 (0.80–2.5)	0.9 (0.46–1.7)	0.82 (0.46–1.5)	0.9 (0.42–2.1)
p-value	>0.05	>0.05	>0.05	>0.05	>0.05	>0.05	>0.05	>0.05

\*p<0.05. § Reference variable. OR = Odds ratio. CI = confidence interval.

**Table 4b. Correlations between dietary patterns and education status and occupation of subjects aged ≥60 years living in Ondo State (N = 400).**

Variables	Animal protein	Tubers	Legumes	Cereals	Fruits	Dairy products	Green vegetables	Vitamins
	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)
<b>Educational level</b>								
No formal education	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Primary Education	1.50 (0.78–2.9)	1.0 (0.58–1.8)	0.6 (0.28–1.4)	0.7 (0.36–1.2)	1.4 (0.79–2.6)	2.3 (1.2–4.4)*	0.9 (.55-1.8)	0.9 (0.41–2.1)
Secondary/ tertiary education	1.478	0.91 (0.51–1.6)	1.6 (0.60–4.5)	1.4 (0.77–2.5)	2.5 (1.4–4.5)*	28.0 (2.9–246.6)*	1.1 (0.64–2.0)	1.5 (0.72–3.3)
p-value	>0.05	>0.05	>0.05	>0.05	<0.05	<0.05	>0.05	>0.05
<b>Present occupation</b>								
Civil servant	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Trading	1.0 (0.43–2.3)	1.4 (0.64–2.9)	0.7 (0.18–2.9)	1.2 (0.57–2.5)	0.4 (0.21–0.97)	1.7 (0.65–4.5)	0.9 (0.41–2.1)	0.79 (0.26–2.3)
Farming	4.3E+09 (0.00-0.1)	2.2 (1.0–4.6)	0.7 (0.19–2.6)	1.0 (0.17–6.4)	0.5 (0.28–1.2)*	2.1 (0.86–5.2)	1.6 (0.78–3.5)	0.9 (0.32–2.6)
Artisan	0.89 (0.25– 3.2)	0.55 (0.09–3.2)	1.5E+08 (0.00–.1)	0.4 (0.11–1.5)	1.1 (0.22–6.1)*	1.1 (0.10–11.4)	0.8 (0.14–5.1)	7.6 (0.96–60.3)
p-value	>0.05	>0.05	>0.05	>0.05	<0.05	>0.05	>0.05	>0.05

\*  $p < 0.05$ . § Reference variable. OR = Odds ratio. CI = confidence interval.

Table 5. Anthropometric characteristics of subjects aged  $\geq 60$  years living in Ondo State

Variables	Male			Female		
	(Mean $\pm$ SD) n=208	Minimum	Maximum	(Mean $\pm$ SD) n=192	Minimum	Maximum
*Weight (kg)	57.00 $\pm$ 12.26	30.90	107.80	54.87 $\pm$ 12.01	28.30	94.50
*Height (m)	1.63 $\pm$ 0.09	1.11	1.90	1.57 $\pm$ 0.08	1.28	1.84
Waist (cm)	69.33 $\pm$ 24.49	10.50	124.00	72.99 $\pm$ 24.90	20.00	127.00
*Hip	73.87 $\pm$ 24.85	29.00	135.00	78.96 $\pm$ 26.80	27.30	128.00
Waist: hip ratio	0.95 $\pm$ 0.14	0.10	1.70	0.94 $\pm$ 0.22	0.19	3.19
*Body water	50.30 $\pm$ 10.88	12.30	88.00	46.71 $\pm$ 8.87	4.90	82.00
*Muscle mass	36.95 $\pm$ 10.03	6.70	88.70	27.73 $\pm$ 5.40	13.70	50.70
*Bone mass	5.63 $\pm$ 1.57	2.10	9.20	4.47 $\pm$ 1.31	1.60	10.40
*Ideal calorie intake	1540.67 $\pm$ 371.05	280.00	3621.00	1500.46 $\pm$ 508.39	146.00	7037.00
*Body fat	28.05 $\pm$ 11.84	11.20	92.00	32.55 $\pm$ 9.08	11.50	85.10
Body mass index (BMI) kg/m <sup>2</sup>	21.53 $\pm$ 5.34	10.40	53.65	22.38 $\pm$ 5.21	9.68	41.13

\*Significant differences @  $p < 0.05$  between males and females.

Anthropometric measurements, health complaints and blood pressure in subjects aged ≥60 years living in Ondo State are shown in Tables 5–7. The mean body mass indexes (BMIs) in both males and females were within normal ranges (Table 5). Most self-reported ailments were musculoskeletal and general body pains, with others including diabetes, asthma and hypertension (Table 6 ). Males had high mean systolic (157.33 ± 31.04 mmHg) and diastolic (85.53 ±17.05 mmHg) blood pressure (Table 7). Self-reported ailments showed significant correlations with food habits, such as eating thrice daily ( $\chi^2= 8.4$ ;  $p<0.05$ ) and skipping meals ( $\chi^2= 19.2$ ;  $p<0.05$ ), as well as with economic status ( $\chi^2= 43.6$ ;  $p<0.05$ ). Muscle problems were significantly correlated with body weight ( $r=0.13$ ;  $p<0.05$ ) and body water ( $r= 0.52$ ;  $p<0.05$ ), and age was significantly correlated with frequency of cereals ( $r=0.14$ ;  $p<0.05$ ) and legumes( $r=0.10$  $p<0.05$ ) as well as body ailments ( $r=0.1$ ;  $p<0.05$ ). In addition, age correlated negatively with level of education ( $r=0.18$ ;  $p<0.05$ ) and anthropometric indices such as BMI ( $r=0.12$ ;  $p<0.05$ ), bone mass ( $r=0.41$ ;  $p<0.05$ ), muscle mass ( $r=0.11$ ;  $p<0.05$ ), and hip circumference ( $r=0.10$ ;  $p<0.05$ ).

**Table 6. Distribution of self-reported ailments among subjects aged ≥60 years living in Ondo State**

Ailments	Total n= 230 (%)	Male n = 120 (%)	Female n = 110 (%)	Prevalence ratio (male vs. female)
Hypertension	19 (8.3)	8 (6.7)	11 (10)	0.74
Eye problem	26 (11.3)	17 (14.2)	9 (8.2)	1.61
Musculoskeletal (rheumatism, cramps, and arthritis)	56 (24.3)	26 (21.7)	30 (27.3)	0.74
Diabetes	6 (2.6)	2 (1.7)	4 (3.6)	0.43
Asthma	5 (2.2)	3 (2.5)	2 (1.8)	1.27
Alimentary/Digestive problem	9 (3.9)	5 (4.2)	4 (3.6)	1.06
General body pains	65 (28.3)	33 (27.5)	32 (29.1)	0.97
Respiratory problems (cough)	33 (14.3)	20 (16.7)	13 (11.8)	1.31
Other ailments (epilepsy, cancer, sickle cell anemia, etc.)	11 (4.8)	6 (5.0)	5 (4.5)	1.02
<b>Total</b>	<b>230</b>	<b>120</b>	<b>110</b>	

**Table 7. Blood pressure by gender of subjects aged ≥60 years living in Ondo State.**

Blood pressure variables	Male (mmHg)				Female (mmHg)			
	Standard values*	Mean ± SD	Min	Max	Standard values*	Mean ± SD	Min	Max
Systolic	100–120	157.33 ±31.04	120.00	210.00	105–120	136.00 ± 21.65	100.00	170.00
Diastolic	60–80	85.53 ±17.05	70.00	120.00	60–80	80.00 ± 16.04	60.00	100.00

\*Reference [23].

#### 4. DISCUSSION

This study has provided an overview of the demographic and dietary pattern of subjects aged  $\geq 60$  years living in Ondo State, Nigeria. Our finding that more males than females  $\geq 60$  years in this state is similar to the elderly overall population structure in Nigeria. In many developed countries, however, elderly men have higher mortality rate than elderly female. This trend in developed countries has led to the *feminisation of old age* [9], and will eventually result in more women spending their later life alone without partners. However, our findings were similar to those for some countries, such as Pakistan, in which the mortality rate is higher for women than men, "*as a result of the lower status of women, which increases their mortality rates relative to men over the entire life course*" [9].

We found that most individuals aged  $\geq 60$  years were married, with more men being married than women. This finding is similar to results throughout Nigeria. Two-thirds of all persons aged  $\geq 60$  years were currently married, with the percentage decreasing with age. The incidence of widowhood increases with age, with women being more likely to be widowed than men [10]. This higher ratio of women in widowhood is because many women don't remarry in Nigeria unlike men. In fact the family structure among Yoruba tribe in Nigeria reveals that men have more than one wife and some are in the habit of marrying younger women at old age.

All these apart the Gender distribution in this study revealed the nutrition situation of males and females differently. There are significant differences in body weight, height, bone mass, muscle mass and hip circumference.

Educational status was assessed by the ability to read and write in a local language. We found that about two-thirds of the subjects aged  $\geq 60$  years living in Ondo State could not read or write (i.e., were illiterate) and had no formal education. In general, older individuals in Nigeria have low levels of educational attainment.

The overwhelming majority of subjects ( $>90\%$ ) aged  $\geq 60$  years were in the labour force, working to produce goods and services that contribute to national income despite their negligence in the health and nutrition policy. In relative terms, this demographic group contributes more to agricultural production than other groups in Nigeria. Their work in farming may reflect their low educational and socioeconomic status. Similar findings have been observed throughout Nigeria, in which most individuals aged  $\geq 60$  years are employed in agriculture and related occupations. We found that the socioeconomic status of these older adults in Ondo State correlated significantly with dietary pattern, frequency of sickness ( $p < 0.05$ ), and ingestion of roots, tubers and animal protein ( $p < 0.05$ ). These findings indicate that education; occupation and health play significant roles in dietary patterns, with significant relationships between dietary intake and certain socio-demographic variables [11].

A positive correlation between food habit scores and educational level has been observed among elderly Yoruba [11,15]. Food habits have been found to predict health and nutritional status [12,13,14]. Dietary surveys must be accompanied by measurements of educational attainment and other demographic variables to design useful interventions in public health programmes [12,15,16]. Furthermore, dietary patterns are influenced by psychological and mental health in elderly subjects. Depression and memory loss have been found to correlate significantly with frequency of sickness, poor eating habits, and poor recreational activity.

In addition, drinking alcohol affects the number of meals ( $p < 0.05$ ) and dietary habits such as skipping meals and food preferences ( $p < 0.05$ ).

Dietary patterns have been found to correlate significantly with education and occupation, with socio-demographic factors being key determinants in ageing and malnutrition [16,17,18,19]. Thus, in the absence of clinical and biochemical assays, information about diet or food intake, as evaluated by socioeconomic indicators, can be used to assess the nutrition and health condition of individuals and determine potential vulnerability and functional capacity [15]. We found that dietary pattern such as number of meal times frequency of certain foods such as animal proteins, and legumes relates significantly with body ailments ( $p < 0.05$ ). Furthermore age is also a factor to food choices as frequency for cereals and legumes increased with age ( $p < 0.05$ ).

It is from data on age that demography allows one to track changes in size of population and changes to nutritional status. Age is an essential factor in recommended dietary allowances and the elderly nutritional status. For instance, age of the respondents in this study correlated negatively with body mass index, muscle mass, bone mass and hip circumference in both male and female respondents. The reason for this is not implausible as most authors had already predicted the effect of age increase on lean muscle mass, muscle mass and body fat [2,3,11,18]. Although there is need for more work to be done on Africa subjects even in Nigeria especially those from other tribes. However the current study is in line with the other Yoruba elderly studied in south west Nigeria [11].

The multi-co linearity effect of demography on dietary pattern as well as nutrition of elderly is revealed in the current study. Age, gender, marital status, family structure education occupation has effect on nutrition of this elderly group.

The food habits and dietary patterns observed in Nigeria were similar to those elsewhere in Africa, as well as in developed countries [19,20]. Dietary diversity has been found to be advantageous to the longevity of elderly subjects in Europe [21]. These individuals had diets high in vegetables ( $>300$  g/day), legumes ( $>50$  g/day), fruits ( $>200$  g/day), and cereals ( $>250$  g/day), with moderate consumption of dairy products ( $<300$  g/day of milk or the equivalent in cheese/yogurt), meat and meat products ( $<100$  g/day), and alcohol ( $<10$  g/day); in addition, their diets were high in monounsaturated fat (mainly from olive oil) and low in saturated fat, with a high mono unsaturated: saturated fat ratio. This food pattern is consistent with food patterns prevalent in Greece in the 1960s, when Greeks enjoyed the longest life expectancy in the world [21]. Subjects achieved greater mortality advantages by following the entire food pattern, as opposed to just achieving the required amounts for one or two food groups. Similarly, recommended dietary guidelines for elderly individuals in Nigeria include eating a variety of available foods, such as cereals, tubers, fruits, and vegetables; increased consumption of fish and fish-based diets; and increased consumption of fruits and vegetables.

## **5. CONCLUSION AND RECOMMENDATION**

In conclusion, we found that our group of individuals aged  $\geq 60$  years included more males than females, that these subjects tended to eat three meals daily, and that they avoided some foods. Foods consumed included animal protein, such as fish, beef and other types of meat; dairy products, especially tinned milk; tubers; legumes; cereals; fruits; and green vegetables. Dietary patterns were significantly associated with level of education, occupation and gender.

Age was inversely related to bone mass, body mass index, muscle mass and hip circumference in both males and females. Food habits were related with overall health and body ailments.

Our results suggest the need to educate individuals aged  $\geq 60$  years on food intake and the need for public health intervention programs and healthcare institutions to promote dietary plans at the community level. Dietary patterns may be improved by increasing the economic level of these subjects, either by increasing their income or by direct food distribution at the community level.

## **CONSENT**

Informed verbal consent was obtained from all subjects with witnesses present and was formally recorded.

## **ETHICAL APPROVAL**

The study conforms to the ethical review of epidemiological studies and was approved by the Ethical Review Committee of the Department of Nutrition and Dietetics. Federal University Agriculture of Abeokuta, Nigeria.

## **Experimental work with animals:**

Not applicable.

## **COMPETING INTERESTS**

Authors have declared that no competing interests exist.

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