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**ANTHROPOMETRIC PARAMETERS AND THE PATTERN OF MORBIDITIES AMONG
ELDERLY PATIENTS IN THE GENERAL OUT-PATIENT CLINIC, UNIVERSITY OF
ILORIN TEACHING HOSPITAL, ILORIN, KWARA STATE, NIGERIA.**

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ABSTRACT

Introduction: Most elderly people suffer from various chronic medical diseases whose can be evaluated by anthropometric parameters, but these parameters are not sufficiently used by healthcare givers during clinical evaluation. This study is aimed at determining the anthropometric parameters and the pattern of morbidities among elderly patients in the General Out-Patient Clinic in the University of Ilorin Teaching Hospital (UITH), Ilorin, Kwara State, Nigeria.

Methods: This was a cross-sectional descriptive study carried out among 307 elderly participants. They were assessed using an interviewer-administered questionnaire and the anthropometric parameters (BMI, MUAC, and Calf Circumference) measured following standard guidelines. The data analysis was done using Version 21 of the Statistical Products and Service Solutions (SPSS-21). Chi-square was used to test associations and p-value < 0.05 was considered statistically significant.

Results: About a quarter of the elderly (26.7%) were overweight while 12.4% were obese. Close to one third of the respondents (29.3%) had low calf circumference, while 3.9% among the respondents had low MUAC. The most prevalent disease among the respondents was hypertension (53.0%),

followed by diabetes (13.3%) and osteoarthritis (10.3%). Majority of the respondents (78.2%) were taking multiple medications while 39.1% of the respondents reported history of multi-morbidity. BMI showed a statistically significant relationship with hypertension, diabetes, osteoarthritis, and psychological problems, age, sex, MUAC and CC.

Conclusion: Anthropometric measurements are important tools to assess the clinical status of the elderlies during their routine visit for care.

Keywords: Anthropometric, Body Mass Index, Calf circumference, Mid-Upper Arm Circumference, Polypharmacy, Elderly, Morbidity pattern

INTRODUCTION

Anthropometric parameters such as Body Mass Index (BMI), Calf Circumference (CC), and Mid-Upper Arm Circumference (MUAC) have been shown to be of easy use in assessing chronic medical conditions among the elderly.^{1,2,3} Anthropometric parameters are good indicators to identify individuals who are at risk of developing non-communicable diseases.⁴ The parameters are simple, portable, non-invasive, cheap, and simple to

use in geriatric populations for early diagnosis and prompt medical interventions.⁴ On account of the difficulty in measuring the height of the elderly due to some anatomical issues, MUAC and CC are more preferred to BMI, however they are not frequently used in the developing countries.⁵

Elderly people are prone to poor nutrition which increases the risk of infections, disease conditions and prolong hospital stay.⁶ Most elderly patients are placed on multiple medications on account of these conditions and comorbidities.⁷

The data of anthropometric measures among the elderly especially in the out-patient clinic is scarce especially in low-income countries.⁸ A study done by Agarwal et al. showed that malnutrition increases the risk of mortality among the elderly.⁹ The negative effects of malnutrition adds more stress on health care facilities requiring more nursing care and prolong hospital stay which indirectly increase hospital costs.^{10,11} This study aimed to assess the anthropometric measurement (Mid-Upper Arm Circumference, Body Mass Index and Calf circumference) and the morbidity pattern among the elderly in the General Out-Patient Clinic in UITH, Ilorin.

METHODS

Study design and setting

This was a hospital-based descriptive cross sectional study conducted in the Geriatric clinic of the Family Medicine Department of University of Ilorin Teaching Hospital Ilorin (UITH), Ilorin. Kwara State has 16 local government areas (LGA) with Ilorin being the largest city. The people of the state are farmers, traders, self-employed, artisans, private employees and civil servants. The major religions are Islam and Christianity. The Department of Family Medicine in UITH provides a comprehensive, coordinated, continuous and primary care to all patients irrespective of their age, gender or diseases. The study population comprised of elderly people aged 60 years and above. The data collection time was done within 3 months (between July and September) in 2017.

Inclusion and Exclusion Criteria

The inclusion criteria were all elderly (60 years and above) patients who had given written informed consent. The exclusion criteria were the elderly requiring hospital admission, those with emergencies necessitating immediate attention, patients too weak to stand erect and individuals with clinically demonstrable ascites and edema.

Sample Size Estimation

In order to determine the minimum sample size (n), the study by Adebuseye et al. which reported

61.9% as the prevalence of nutritional problems among elderly patients presenting at General

Outpatients Department (GOPD) Clinic of University College Hospital (UCH), Ibadan, Nigeria

was used.¹² For precision, the desired degree of accuracy (d) or margin of error allowed was

0.05. To ensure that the results obtained from the sample population had a 95% confidence level

(z) of representing the true population, a value of 1.96 was used. The statistical formula (Lesley

Kish's formula) for determining minimum sample size for health studies used by Fisher and his

colleagues was used.¹³

$$n = \frac{z^2 pq}{d^2}$$

n = desired sample size (when population >10,000)

z=standard normal variate (at 5% type 1 error (P<0.05) or 95% confidence level. It is 1.96.

p = Expected proportion in population based on previous studies or pilot studies;

$$q = 1.0 - p = 1 - 0.619 = 0.38$$

d= Absolute error or precision (use 0.05)

$$\text{Thus, } n = \frac{1.96^2 \times 0.62 \times 0.38}{0.05 \times 0.05}$$

Therefore, minimal sample size used was 362. However, the study population was less than 10,000 (1,500) therefore, the sample size was adjusted using the formula,

$$n_f = n / 1 + \left(\frac{n}{N}\right)$$

n_f = the desired sample size when population is less than 10,000

n = estimated sample size = 362

N = the estimated population size = 1500

$n_f = 362/1 + (362/1500) = 291.7$ Approximately 292

In taking care of incomplete or missing data; 95% response rate was assumed. Hence the final sample size was adjusted to compensate for the response rate using the formula;

$ns = n/r$

Where ns = adjusted sample size of the response rate

n = calculated sample size = 292

r = response ratio = 0.95

$ns = 292/0.95 = 307$

Thus, a sample size of 307 was used for this study.

Pretest

Thirty-one elderly patients (10% of the estimated sample size) were used to pretest the instruments at the General Outpatient Clinic of the Kwara State General Hospital Ilorin in order to determine the acceptability of the instruments, its logical sequence and the average time required to administer them. The research assistants were Junior Resident Doctors from the Department of Family Medicine. They were trained a month prior to the conduct of the research. Effort was made to ensure they were proficient in interviewing patients during the pilot study. They administered the questionnaires to the patients, and were supervised by the researcher. Appropriate corrections were made to the instruments after pretesting.

Sampling Technique

Patients that met the inclusion criteria from the study population were recruited into this study using the systematic random sampling technique. Data collection time was 3 months from July through September 2017. According to the Medical Records Department of the hospital, an estimate of 500 elderly patients was seen monthly. Total number of elderly patients expected to be seen during this 3-month period was 1500 with an average of about 125 patients per week (5 working days) and 25 patients per day. The sampling interval (sampling frame/sample

size) with a recruitment plan of 307 patients was $1500/307$ which gave 4.89 which is approximately 5.

Every folder was assigned a number from 1 to 25. The first patient was chosen from the sampling frame by simple balloting from a box of sealed numbers, numbered 1 to 5, thereafter every 5th folder was chosen if the patient met the inclusion criteria. However, if the patient did not meet the inclusion criteria or had previously been recruited or patient refused further participation, the next qualified consenting elderly patient was recruited till the number required for that day was met.

Data Collection

Data was collected by the researcher and two trained research assistants. Respondents' folders were serialized with numbers written on them to avoid multiple administrations. Information from the interview, clinical measurements and laboratory results were recorded in the participants' questionnaires.

The instruments used were:

- Semi-structured questionnaires designed by the researchers
- Flexible non-elastic measuring tape
- Seca 274 free-standing Stadiometer

Anthropometric Parameters

- Calf Circumference (CC): The participant was seated with the left leg hanging loosely and the calf exposed. The Flexible non-elastic measuring tape was wrapped around the calf at the widest part and the measurement was noted. Additional measurements above and below the point were taken to ensure that the first measurement was the largest. It was recorded to the nearest 0.1cm. Each measurement was taken twice, and the average was calculated. Interpretation: Low when CC less than 31cm, Normal when CC was greater than 31cm.
- Mid-Upper Arm Circumference (MUAC): Each subject stood with weight distributed evenly on both feet and right arm bent to 90° at the elbow. The arm length of the upper arm was

measured from the lateral projection of the acromion process of the scapula to the inferior margin of the olecranon process of the ulna. The mid-way of the arm length was determined and marked. Circumference measurement was performed with a measurement flexible non-elastic measuring tape positioned perpendicular to the length of the arm, at the marked location. It was recorded to the nearest 0.1cm. Each measurement was taken twice, and the average was calculated. Interpretation: MUAC less than 21, score = 0; 21 – 22, score = 0.5; 22 or greater, score = 1.

- c. Body Mass Index (BMI): BMI (kg/m^2) was calculated by dividing the subject's weight in kilogram by the square of the subject's height in meters using a Seca 274 free Standing Stadiometer (made in the United Kingdom). Using the BMI, the subjects were grouped into categories. BMI of less than 18.5kg/m^2 = underweight; $18.5 - 24.9\text{kg/m}^2$ = Normal weight; $25.0 - 29.9\text{kg/m}^2$ = Overweight; 30kg/m^2 and above = Obesity.

Data Analysis

The collected data was analyzed using the Version 21 of the Statistical Products and Service Solutions (SPSS-21). Frequency distribution presented in tables was generated to reveal percentages and proportions of the various variables. Chi-square test was used to find the level of significance of association between categorical variables. The level of significance of this study was set at 5% ($p < 0.05$).

Ethical Considerations

Ethical approval was received from the Ethical Review Committee of University of Ilorin Teaching Hospital (Reference number: UITH/CAT/189/19A/082). The study was introduced to prospective subjects (elderly patients) at presentation. Participants were adequately informed about the study and a written informed consent was obtained before being recruited into the study. The

participants were informed that participation was voluntary and that they could decide not to participate or even withdraw from the study at any time.

RESULTS

Socio-demographic characteristics of the respondents

The highest number of respondents, 120 (39.1%) were in the 60 to 64 age group. Females were more in the study (76.50%) and most (43.0%) were unemployed. Among the respondents, 8.5% and 3.6% were ex-smokers and former alcoholic respectively (Table 1).

Table 1: Socio-demographic characteristics of the respondents (n=307)

Variables	Frequency (n)	Percentage (%)
Age groups in years		
60 – 64	120	39.10
65 – 69	108	35.10
70 – 74	42	13.70
75 – 79	30	9.80
≥ 80	7	2.30
Gender		
Male	72	23.50
Female	235	76.50
Occupation		
Unemployed	132	43.00
Self-employed ^a	104	33.90
Civil servant	8	2.60
Retired	63	20.50
Cigarette Smoking		
Current	1	0.3
Ex-smoker	26	8.5
None	280	91.2
Alcohol intake		
Current	2	0.7
Former	11	3.6
None	294	95.7

* ^a traders, artisans, drivers, farmers

Morbidity pattern and Drug Histories among respondents

The most prevalent disease condition among the respondents was hypertension (53.0%), followed by Diabetes Mellitus (18.5%), osteoarthritis (14.3%), psychomotor disorders

(11.7%) and body pains (4.2%). Over one-third of the elders (39.1%) had more than one chronic disease while majority (78.2%) were taking more than one medication (Table 2).

Table 2: Morbidity pattern and Drug Histories among respondents (n=307)

Variables	Frequency (n)	Percentage (%)
Morbidities		
G I diseases	9	2.9
Hypertension	227	73.0
Diabetes	57	18.5
Osteoarthritis	44	14.3
Psychological	36	11.7
Asthma	2	0.7
Cataract	8	2.6
COPD	2	0.7
Dental pain	11	3.6
Seizure	1	0.3
Malaria	6	2.0
Body pains	13	4.2
BPH	2	0.7
Others ^a	12	3.9
Morbidity responses		
Single disease	184	60.9
multimorbidity	123	39.1
Admitted within 3 months		
Admitted	10	3.3
Not admitted	297	96.7
Drug history		
Multiple drugs (polypharmacy)	240	78.2
Single (mono) drug	67	21.8

a-incomplete or non specific diagnosis (cancer, skin disease, fever, chest pain, non-specific pain), GI-Gastrointestinal, COPD-Chronic Obstructive Pulmonary Disease, BPH-Benign Prostatic Hyperplasia

Association between Age group, Sex and Diseases

The male to female ratio was 1:8 in the age group 60-64years; however, there was a slight switch as the age advanced (M:F = 2.5:1) which was statistically significant ($p=0.001$). Osteoarthritis ($p = 0.034$), dental pain (0.001) and Benign Prostatic Hyperplasia (0.005) were statistically significant in the elderly (Table 3).

Gender differences in disease presentations

Some chronic diseases like hypertension (76.7%), diabetes (82.5%), osteoarthritis (90.9%) and musculoskeletal pain were prominent among females, while cataract (62.5%), Chronic Obstructive Pulmonary Disease (COPD) (100%), and dental pains (54.6%) were higher among males. Among the diseases, osteoarthritis, psychological problems, Chronic Obstructive Pulmonary Disease (COPD), cataract and dental pain were statistically significance ($p<0.005$) (Table 4).

Anthropometric parameters of respondents

Slightly above a quarter (29.3%) had low Calf Circumference (CC) while a small number of the respondents 3.9% had low MUAC. About a quarter of the respondents (26.7%) were overweight while 12.4% of the participants were obese (Table 5).

Relationship between Body Mass Index and other variables

The ages at risk of overweight and obesity are between 60 to 64 years and 70 to 74 years old respectively; meanwhile advanced age group was more malnourished. The elders with lower CC (37.8%) and MUAC (83.3%) showed more underweight or undernourished values. The association of BMI with age, sex, cigarette smoking, MUAC and CC were statistically significant (p values = 0.002, 0.012, 0.028, 0.001, 0.001 respectively). Most diseases in this study were related to overweight and obesity. Hypertension, osteoarthritis, diabetes and psychological disorders were more associated with high BMI with statistical significance (p -value = 0.011, 0.003, 0.002, 0.007 respectively).

DISCUSSION

In the current study, we examined the anthropometric parameters and the morbidity pattern of 307 elderly participants who visited the General out-patient Clinic in the Department of Family Medicine, UITH, Ilorin. Elderly women were more than their male counterparts and this could be due to a better health-seeking behavior among women which is similar to the findings from the

Table 3: Association between Age group, Sex and Diseases

	Age groups					P value	df	95% CI
	60 -64	65 – 69	70 - 74	75 – 79	≥ 80			
Sex								
Male	14 (19.4)	33(45.8)	10 (13.9)	10(13.9)	5 (7.0)	0.001	4	0.020 – 0.160
Female	106(45.1)	75(31.9)	32(13.6)	20(8.5)	2(0.9)			
Diseases								
G I diseases	3(33.3)	6(66.70)	0(0.00)	0(0.0)	0(0.0)	0.279	4	0.020 – 0.218
Hypertension	88(38.8)	73(32.2)	36(15.9)	24(10.6)	6(2.5)	0.212	4	0.147 – 0.161
Diabetes	18(31.6)	24(42.1)	6(10.50)	6(10.5)	3(5.3)	0.263	4	0.126 – 0.140
Osteoarthritis	26(59.0)	13(29.6)	3(6.80)	1(2.3)	1(2.3)	0.034	4	0.032 – 0.39
Psychological	10(27.8)	16(47.4)	5(13.9)	4(1.3)	1(0.33)	0.743	4	0.182 – 0.197
Cataract	1(12.5)	2(25.00)	3(37.5)	2(25.0)	0(0.0)	0.122	4	0.039 – 0.047
COPD	1(50)	1(50.00)	0(0.00)	0(0.0)	0(0.0)	0.951	4	0.412 – 0.431
Dental pain	1(9.1)	3(27.30)	1(9.10)	2(27.3)	3(27.3)	0.001	4	0.000 – 0.000
Malaria	3(50)	1(16.70)	2(33.3)	0(0.0)	0(0.0)	0.517	4	0.429 – 0.449
Body pains	4(30.7)	7(53.90)	1(7.70)	1(7.70)	0(0.0)	0.669	4	0.435 – 0.455
BPH	0(0.0)	0(0.00)	0(0.00)	2(15.0)	0(0.0)	0.005	8	0.356 – 0.375

Table 4: Gender differences in disease presentations

Variables	Gender distribution		P value
Diseases	Male n(%)	Female n(%)	
G I diseases	2 (22.2)	7(77.8)	0.930
Hypertension	53 (23.3)	174(76.7)	0.999
Diabetes	10 (17.5)	47(82.5)	0.243
Osteoarthritis	4 (9.10)	40(90.9)	0.015
Psychological	15 (41.7)	21(58.3)	0.004
Asthma	0 (0.00)	2(100)	0.001
Cataract	5 (62.50)	3(37.5)	0.008
COPD	2 (100.0)	0(0.0)	0.010
Dental pain	6 (54.60)	5(45.4)	0.006
Malaria	1(16.7)	5(83.3)	0.171
Musculoskeletal pain	3(23.1)	10(76.9)	0.969
BPH	2(100.0)	0(0.0)	0.340

GI: gastrointestinal, COPD: chronic obstructive pulmonary disease, BPH: Benign Prostatic Hyperplasia

Table 5: Anthropometric parameters of respondents

Variables	Frequency (n)	Percentage (%)
CC		
< 31	90	29.3
≥ 31	217	70.7
MUAC		
Low (<21)	12	3.9
Intermediate (21-22)	11	3.6
Normal (≥ 23)	284	92.5
BMI		
Underweight	35	11.4
Normal	152	49.5
Overweight	82	26.7
Obese	38	12.4

CC: Calf Circumference, MUAC: Mid Upper Arm Circumference, BMI= Body Mass Index

Table 6: Relationship between Body Mass Index and other variables of the respondents

Variables		BMI n(%)				χ^2	Df
P	95% CI	Underweight	Normal	Overweight	Obese		
Age							
60 – 64	6(5.7)	54(45.0)	40(33.3)	20(16.0)			
65 – 69	13(12.1)	55(50.9)	31(28.7)	9(8.3)			
70 – 74	8(19.0)	21(50)	5(11.9)	8(19.1)			
75 – 79	5(16.7)	18(60.0)	6(20.0)	1(3.3)			
≥ 80	3(42.9)	4(57.1)	0(0.0)	0(0.0)	30.121	12	
0.002	0.006-0.010						
Sex							
Male	8(11.1)	44(61.2)	15(20.8)	5(6.9)			
Female	27(11.5)	108(46.0)	67(28.5)	33(14.0)	6.023	3	
0.012	0.030-0.037						
Cig. Smoking							
Current	0(0.0)	1(100.0)	0(0.0)	0(0.0)			
Ex-smoker	4(15.4)	11(42.3)	4(15.4)	7(26.9)			
None	31(11.1)	140(50.0)	78(27.8)	31(11.1)	7.911	6	
0.028	0.288-0.306						
MUAC							
Low	10(83.3)	2(16.7)	0(0.00)	0(0.0)			
Intermediate	4(36.4)	6(54.6)	1(9.0%)	0(0.0)			
Normal	21(7.4)	144(50.7)	81(28.5)	38(13.4)	75.137	6	
0.001	0.000-0.000						
CC							
Low	34(37.8)	52(57.8)	4(4.4)	0(0.0)			
Normal	1(1.0)	100(46.0)	78(36.0.)	38(17.0)	118.855	3	
0.001	0.000-0.000						
Diseases							
G I diseases	0(0.0)	5(55.6)	3(33.3)	1(11.1)	1.290	3	
0.682	0.367-0.386						
Hypertension	23(10.1)	107(47.6)	65(28.6)	31(13.7)	4.526	3	
0.011	0.410-0.429						
Diabetes	3(5.3)	31(54.4)	13(22.8)	10(17.5)	4.557	3	
0.003	0.002-0.004						
Osteoarthritis	4(9.1)	20(45.5)	15(34.0)	5(11.4)	1.501	3	
0.002	0.481-0.500						
Psychological	6(16.7)	20(58.3)	7(19.4)	2(5.6)	3.690	3	
0.007	0.015-0.020						
Cataract	1(12.5)	5(62.0)	2(25.5)	0(0.0)	1.314	3	
0.316	0.248-0.265						
COPD	0(0.0)	2(100.0)	0(0.0)	0(0.0)	2.053	3	
1.000	0.071-0.082						
Dental pain	3(27.3)	6(54.5)	1(9.1)	1(9.1)	5.726	3	
0.188	0.002-0.004						

* χ^2 : Chi square test Df: Degree of freedom p value <0.05 (Statistically Significant); 95CI: 95% confidence interval; CC: Calf circumference MUAC: Mid Upper Arm Circumference

studies done by Suominen-Taipale et al., Cameron et al. and Adebuseye et al.^{14,15,16} However, this is in contrast to the study of Sahoo et al.¹⁷ With advancing age, male gender dominates significantly similar to the studies by Adebuseye et al., Lee et al., and Alharbi et al.^{16,18,19}

In this study, most of the diseases in the elderly are Non-Communicable Diseases (NCD) which is similar to the study done by Alharbi et al. and Udoh et al.^{19,20} Hypertension was found to be the most common morbidity among the elderly in this study, followed by Diabetes, osteoarthritis and psychological problems. Meanwhile, over one-third of the elders (39.1%) had multiple morbidities; majority among elderly patients were on polypharmacy. This finding varies from region to region possibly due to the different study areas and tools used.^{16,21-24}

A large proportion of the elderly patients use more than one medication on account of multiple chronic diseases. The multiple morbidities presented by the elders could cause irrational prescription of drugs by healthcare givers which was found in the study by Kwan et al.^{25,26}

The risk of obesity among the elderly and the high proportion of overweight in this study is worrisome especially between 65 and 74 years. This finding is close to the result seen in a study done by Amany et al. in Mansoura City and Fakhouri et al. in USA.^{27,28} Females were found to be more obese than their male counterparts which is similar to the study done by Kim IH et al., Muhammad T et al. and Ashley J Cooper et al.^{29,30,31} This could be as a result of the hormonal changes in females, which has made female gender prone to higher risk of developing obesity-related co-morbidities as reported by Kapour et al.³²

Most diseases among the elderly in this study were related to high Body Mass Index (BMI) similar to the findings in other studies.³³⁻³⁵ The findings from different related studies have shown that overweight and obesity are the main modifiable risk factors of Non-Communicable Diseases.^{36,37} Undernourished

elderly in this study revealed an association with lower Calf Circumference (CC) and Mid Upper Arm Circumference (MUAC) which is similar to the reports from the study of Bonnefoy et al. and Cuervo et al.^{38,39} The BMI was significantly associated with MUAC and CC, similar to some studies.⁴⁰⁻⁴¹ It has been found that MUAC and CC are easy to measure, correlates with BMI and they can be routinely used in the community or clinics in assessing the elderly.⁴²

CONCLUSION

The risk of overweight and obesity among the elderly in relation to some Non-Communicable Diseases is alarming and requires urgent attention. Early assessments with simple anthropometric parameters like Body Mass Index, Calf Circumference and Mid Upper Arm Circumference are encouraged in the assessment of the elderly to improve their quality of care.

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