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Association between obesity, physical activity and falls among elderly patients attending the family medicine clinics of a teaching hospital in Southern Nigeria

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Abstract

Background Falls are a leading cause of morbidity and mortality among the elderly, often resulting in injury, disability, and loss of independence. Obesity and physical inactivity are believed to impact the risk of falls among the elderly, yet the relationship remains poorly understood, especially in Nigeria. This study aimed to evaluate the association between obesity, physical activity, and falls among elderly patients attending the Family Medicine Clinic of Irrua Specialist Teaching Hospital (ISTH), Edo State, Nigeria.

Methods Using a cross-sectional design, 288 elderly patients were systematically sampled. Data collection included socio-demographic information, fall history, physical examination, and anthropometric measurements of obesity using body mass index (BMI) and physical activity using World Health Organization (WHO) criteria. Chi square test and logistic regression analysis were used to determine associations between variables. Level of significance was set at P value < 0.05%.

Result Among participants, 25.9% reported at least one fall in the previous year. Obesity prevalence was 14.4%, with a significantly higher number (77.5%) of obese participants reporting falls compared to non-obese (17.2%) participants ($p < 0.0001$). Physical inactivity was also associated with increased fall risk, though this was not statistically significant. Logistic regression analysis revealed that obese participants had a significantly higher risk of falling (adjusted odds ratio (aOR = 16.55; 95%CI = 7.33,37.38; $p < 0.001$), while physical inactivity showed no significant association with falls (aOR = 0.52; 95%CI = 0.21,1.71; $p = 0.297$).

Conclusion Obesity appears to be a strong predictor of fall risk among elderly individuals. There is need for incorporating weight reduction and physical activity programs into the elderly people's care to mitigate fall risk. Further research, particularly interventional studies, is recommended to establish effective preventive measures tailored to the elderly populations.

Clinical trial number Not applicable.

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Introduction

Falls are among the leading causes of injury and mortality in elderly persons, often resulting in moderate to severe injuries that impair independence and quality of life [1]. In fact, each year, one in three adults aged 65 and above experiences a fall, with incidence increasing significantly with age [1–3]. Falls among the elderly is a growing concern in Africa with a prevalence of 23% among community dwelling elderly in Nigeria and 26.4% in South Africa [4, 5].

To better capture the unique health dynamics of aging populations in low- and middle-income countries, the United Nations classifies individuals aged 60 and above as elderly, further subcategorized as young old (60–74 years), older old (75–84 years), and oldest old (85 + years) [6].

Physical activity in the elderly is linked to a range of health benefits, including reduced risk of cardiovascular disease, type 2 diabetes, cancer, improved mental health, and a decreased likelihood of falls [7]. Yet, studies on the relationship between physical activity and falls show mixed findings; while some suggest that increased activity may elevate fall risk due to compromised gait and balance, others find that a sedentary lifestyle, with reduced muscle strength and bulk, is a more significant risk factor for falls [3, 8–11]. For many elderly persons, the fear of falling limits physical activity, paradoxically increasing the risk of falls and obesity, both of which are closely tied to other health complications [4, 12–14].

Obesity is a critical concern among older adults, affecting approximately 40% of this population globally [15]. This high prevalence is often linked to a sedentary lifestyle, which, beyond increasing obesity risk, also contributes to muscle weakness and reduced muscle mass; factors known to elevate fall risk [16]. On the other hand, some studies indicate that a lower body mass index (BMI) may increase the likelihood of falls and fall-related fractures in elderly persons, likely due to lower bone mineral density associated with lower body weight [5, 17, 18]. These insights highlight the need for a clear understanding of how body composition impacts fall risk in the elderly, especially within healthcare settings focusing on prevention.

Despite the relevance of these findings, there is limited research on obesity, physical activity, and fall risk among elderly populations in Nigeria and Africa. This study aims to address this gap by assessing these associations among elderly patients attending the Family Medicine Clinic (FMC) of Irrua Specialist Teaching Hospital (ISTH), with the goal of informing evidence-based preventive measures.

Methods

This was a hospital-based cross-sectional study conducted among elderly patients presenting to the family medicine clinic of ISTH, Irrua, Edo State, Southern Nigeria. The FMC is primary care unit within the tertiary hospital setting with an average daily attendance of 100 patients, of whom approximately 40% (or 40 patients) are elderly patients.

The inclusion criteria consisted of elderly patients who presented to the clinic during the study period. Patients who declined to provide consent, as well as those who were critically ill or had a history of seizure disorders or stroke episodes, were excluded from the study.

Sample size

The Sample size was calculated to be 288 using the Cochrane formula below: [19]

$N = Z\alpha^2pq/d^2$, N = minimum sample size, Zα = standard normal deviate corresponding to a 5% level of significance (1.96), p = 23% (prevalence of falls among elderly in a similar study done in Ibadan, Southern Nigeria = 0.23),[4] q = 1-0.23 = 0.77, d = level of precision which was set as 5%. This gave 272.14 which was rounded up to 273. Using a projected response rate of 95%, the sample size was then calculated using the formula sample size = N/95 which gave 287.4 which was again rounded up to 288.

Sampling method

A systematic sampling technique was employed to recruit 288 older patients from a total sampling frame of 2,400 (calculated as 200 × 12), with a sampling interval of 8 (2400/288). The first respondent was randomly selected through balloting on the initial day, and thereafter, every eighth older patient who met the inclusion criteria was included in the study.

Data collection

Data was collected using a structured interviewer-administered questionnaire which was developed for this study (questionnaire uploaded as Supplementary File). The questionnaire was pretested at a nearby General Hospital among 28 elderly patients prior to commencement of the study. Both the elderly patients and their care givers (for those who were accompanied by their caregivers) were interviewed. The questionnaire included information on socio demographic data, fall history, physical examination and anthropometric assessment. Fall history over the past 12 months was ascertained by asking for the occurrence, frequency, location, preceding circumstances, activities, any associated injuries and other consequences of the falls and time of occurrence. The

Table 1 Socio-demographic characteristics of the participants

Variables	Frequency ($n=278$)	Percentage
Age (Years)		
60–74	193	69.4
≥ 75	85	30.6
Sex		
Male	132	47.5
Female	146	52.5
Marital status		
Married	145	52.1
Unmarried[#]	133	47.9
Religion		
Christianity	244	87.8
Islam	32	11.5
Traditional Religion	2	0.7
Occupation		
Farmer	91	32.8
Trader	101	36.3
Paid Worker	71	25.5
Unemployed	15	5.4
History of Fall		
Yes	72	25.9
No	206	74.1

[#]Single, Divorced, Widowed

Table 2 Body Mass Index of the participants

Variables	Frequency ($n=278$)	Percentages
Body Mass Index (Kg/m^2)		
Normal weight	113	40.6
Overweight	125	45.0
Obesity	40	14.4

Table 3 Physical activity level of the participants

Variables	Frequency	Percentage
Physical activity($n=278$)		
Yes	19	6.8
No	259	93.2
Type of physical activity ($n=19$)		
Brisk walking	16	84.2
Jogging	2	10.5
Gardening	1	5.3
Location of Physical activity ($n=19$)		
Inside the house	7	36.8
Within the compound	8	42.1
Outside the compound	4	21.1

period of 12 months was chosen to reduce recall bias. The weight was measured to the first decimal (kg) using a weighing scale manufactured by Seca Corporation® (Germany). The zero mark was checked after every reading for accuracy and was adjusted appropriately when necessary. The height was measured to the first decimal centimeter, using a stadiometer manufactured by Seca Corporation® (Germany), and converted to equivalent value in meters. The body mass index (BMI) was calculated as weight/height^2 (kg/m^2). The values following, was noted as stated 18–24.9 kg/m^2 (normal), 25–29.9 kg/m^2 (overweight) and ≥ 30 kg/m^2 (obese).

Physical activity was determined using the WHO criteria of moderate to intense physical activity for a minimum of 30 min every day for at least five days a week or a cumulative 150 min of moderate to intense physical activity weekly. Such activities included brisk walking, jogging, running, swimming, cycling, dancing, gardening etc [7]. Respondents who met the above WHO criteria were categorized as 'Active' while those who did not were categorized as 'Inactive'.

Statistical analysis

Data was analyzed using the IBM SPSS (Statistical Product and Service Solutions) version 20.0 software. Results were presented using tables, charts, frequency distribution and simple percentages. Chi square was also used to test for association between the associated factors and occurrence of fall in the study group. Logistic regression was used to control for confounders. The level of significance was set at a p-value < 0.05.

Results

The study was conducted from November 2018 to March 2019. Out of a total of 288 older patients recruited, 278 completed the study giving a response rate of 96.5%. The sociodemographic characteristics of the participants are as shown in Table 1 below. The mean age of respondents was 71.6 ± 8.3 years. They were mostly females 146 (52.5%), married 145 (52.1%) and Christians 244 (87.8%). Trading was the predominant occupation among the participants which constituted 101 (36.8%). Concerning history of fall, 206 (74.1%) of participants had no history of falls while 72 (25.9%) had fallen at least once.

Majority of the participants 125 (45.0%) were overweight and this was closely followed up by 113 (40.6%) participants who were normal weight. A total of 40 participants were obese giving an obesity prevalence of 14.4%. The mean body mass index of the participants was 25.8 ± 4.1 kg/m^2. Table 2.

The physical activity level of the participants are shown in Table 3. Majority of the participants 259 (93.2%) were not physically active. Of those involved in physical activity, 16 (84.2%) carried out brisk walking only, while 2(10.5%) were involved in jogging, and 1(5.3%) in gardening. With respect to the location of physical activities, 15 (78.9%) of the participants carried out their physical activities within their compound while 4 (21.1%) were carried out outside their compound.

Among the 40 obese participants, 31 (77.5%) experienced falls, whereas, of the 259 physically inactive participants, 69 (26.6%) experienced falls. This indicates that

the prevalence of falls was about four times higher among obese participants (77.5%) compared to non-obese participants (17.2%), with a statistically significant difference ($p < 0.001$). Additionally, the prevalence of falls among physically inactive participants (26.6%) was nearly double that of active participants (15.8%), though this difference was not statistically significant ($p = 0.297$). Table 4.

When the results were subjected to logistic regression, respondents who were obese were above 16 folds more likely to fall compared to those who were not obese, and the difference was statistically significant (aOR = 16.55; 95% CI = 7.33–37.38; $p < 0.001$). Also, respondents who were physically inactive were 48% times less likely to fall compared to those who were active, the difference was however, not statistically significant (aOR = 0.52; 95% CI = 0.21–1.71; $p = 0.297$). Table 5.

Table 4 Association between obesity, Physical Activity and Falls among respondents

Variables	Falls ($n = 72$)	No falls ($n = 206$)	χ^2	*p*-value
BMI			64.823	< 0.001*
Not Obese	41 (17.2)	197 (82.8)		
Obese	31 (77.5)	9 (22.5)		
Physical Activity			1.086	0.297
Active	3 (15.8)	16 (84.2)		
Inactive	69 (26.6)	190 (73.4)		

*Statistically significant

Table 5 Predictors of fall among study participants

Variable	Adjusted odds ratio	95% CI	*p*-value
BMI			
Not Obese	Reference		
Obese	16.55	7.33–37.38	< 0.001
Physical Activity			
Active	Reference		
Inactive	0.52	0.21–1.71	0.297

Discussion

The findings of this study indicate that obesity among elderly patients is a significant risk factor for falls, with a markedly higher prevalence of falls observed in obese individuals compared to their non-obese counterparts. This aligns with previous studies [3, 16–18, 20–23]. G R Neri et al. reported that the strong association between higher body mass index (BMI) and fall risk among the elderly was likely due to factors like decreased reaction time and reduced muscle strength in obese individuals [3]. This relationship was further confirmed by logistic regression analysis, which showed that obese respondents had a more than 16-fold increased likelihood of experiencing falls. This finding emphasizes the critical need for fall-prevention strategies tailored specifically to overweight and obese elderly populations.

Contrary to other research [2, 4, 5], this study did not find a significant association between physical activity and fall risk, although the prevalence falls among the inactive elderly persons almost doubled their active counterpart. This is in line with evidence from a systematic review by Sherrington et al., which demonstrated that physical activity reduces fall rates by approximately 21% among the elderly [24]. Physical activity enhances muscle strength, balance, and endurance, all of which contribute to stability and reduce the risk of falling. Despite the lack of statistical significance, this study's findings support the potential benefit of encouraging physical activity to mitigate fall risk in the elderly.

This study has several limitations. Caution should be exercised when generalizing the findings due to the hospital-based setting, and causality between obesity, physical activity and falls cannot be established due to the temporal nature of the study. Since falls were evaluated retrospectively, recall bias may be present, potentially more pronounced among participants with cognitive impairment or those who have changed caregivers one or more times.

Conclusion

This study found that obesity is a significant risk factor for falls among the elderly, with obese individuals having a substantially higher fall risk than their non-obese peers, highlighting the need for tailored fall-prevention strategies in this group. While no significant association was found between physical activity and fall risk, the findings suggest potential benefits of promoting physical activity to improve stability, though limitations like recall bias and the hospital-based setting warrant cautious interpretation.

Abbreviations

aOR	Adjusted Odd Ratio
BMI	Body Mass Index
CI	Confidence Interval
FMC	Family Medicine Clinic
IBM	International Business Machines
ISTH	Irrua Specialist Teaching Hospital
Kg	Kilogramme
m	Metres
SPSS	Statistical Product and Service Solutions
WHO	World Health Organisation

Supplementary Information

The online version contains supplementary material available at https://doi.org/10.1186/s12877-025-05746-7.

Supplementary Material 1

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Author contributions
TIAO, AOI, and FNF conceived and designed the study. TIAO, AOI, ALO, ESI, CUA, BOA and FNF conducted the study, wrote the initial draft, and edited and approved the final manuscript.

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Data availability
All data generated or analysed during this study are included in this published article.

Declarations

Ethics approval and consent to participate
Ethical approval was sought from the Ethics and Research Committee of ISTH which was granted (ISTH/HREC/2017/MARCH/0102) and a written informed consent was obtained from participants after the aim and objectives of the study was explained to them and those who could not write were made to thumbprint the consent form. The study protocol conformed to the ethical guidelines of the 1975 Declaration of Helsinki. The research was funded by the researchers.

Consent for publication
Not Applicable.

Competing interests
The authors declare no competing interest whatsoever in preparing this article.

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