PREVALENCE AND CONTRIBUTING FACTORS TO FRAILTY AND FALLS AMONG COMMUNITY-DWELLING OLDER ADULTS IN NORTH-CENTRAL NIGERIA

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ABSTRACT

Background: Frailty and falls are becoming more important health issues as the population ages. The lack of information and understanding about falls and frailty limits the benefits of general care for the elderly. The study investigated the prevalence and factors contributing to falls and frailty in North-Central Nigerian communities.

Methods: This was a cross-sectional study of 494 older adults aged 60-110 years, who were mostly Tiv residing in Benue State, Nigeria. The Fried Frailty Phenotype (FFP) scale was used to assess their frailty status, and information regarding falls (two or more times) over the past year was collected. Multivariate logistic regression was performed to determine factors that increased frailty and falls in older adults.

Results: A total of 494 older adults with mean age, 76.411.23 years participated in the study. Frailty and falls were reported to be prevalent in 62.9% and 33.2% of participants, respectively. The results of the study further indicated that the prevalence of both frailty and falls was higher in those who were older (≥85 years) and those without formal education. The risk of falling (odds ratio = 0.51; 95%CI: 0.31 to 0.86) and frailty (odds ratio = 0.39; 95%CI: 0.22 to 0.69) were also significantly lower in males as compared to females. Frailty and falls were also more prevalent in smokers and those with poor functional status.

Conclusion: Among older rural residents, frailty and falls are common, especially among women, smokers, and those with poor physical health. The aging population may require lifestyle interventions because of frailty and falls.

Keywords: Frailty, falls, older adults, community-dwelling, North-Central Nigeria.

Introduction

Chronic conditions are more likely to increasingly affect functional independence, general well-being and quality of life due to ageing of the global population.[1-4] One of the commonest chronic conditions affecting the elderly is frailty. According to Carneiro *et al*,[3] frailty is defined as a gradual disintegration of an individual's biological, psychological, and social functions leading to a reduction of their functional ability.[3] Similarly, falls are a major cause of death and a significant cause of morbidity and disability in older adults.[5] Frailty and falls are major geriatric syndromes that impact higher-order functions like ambulation[1], which can result in hospitalizations or even death.[6,7]

The prevalence of frailty among older adults in 62 countries aggregated was 12%, and females were more likely than males to be frail.[8] It is estimated that Africa (22%) has a higher prevalence of frailty than Europe (8%). In contrast, an analysis of 104 papers found that falls occur among older adults at a pooled prevalence of 26.5%, with higher prevalence rates in Oceania (34.4%) and America (27.9%).[9] In Nigeria, Ajayi and his co-authors[10] estimated the prevalence of frailty among older adults attending care facilities to be as high as 51.3% based on the Fried phenotyping, and 15.2% using the Canadian Study of Health and Aging Scale.[10] Bekibele and Gureje also report high fall rates among older Nigerians, with females (24.0%) more at risk.[11] Also, Atoyebi and others found that rural dwellers suffered lower rates of falls (25.3%) than urban dwellers (41.3%).[12] Additionally, older adults residing in assisted-living facilities have been reported to have a higher fall risk than those living in the community[13], thereby prompting the need for further evaluation among community dwelling older adults to ascertain the associating factors with old age in these individuals. Furthermore, though older people are prone to fall and frailty, women, individuals who lack formal education, smoke, drink alcohol, and use assistive devices are more likely to be frail and fall.[10,12,14-17]

A broader view of quality improvement in healthcare is receiving increasing attention and sometimes requires data collection and feedback mechanisms from broader perspectives.[18,19] In most Nigerian studies, data from hospitals are used[12,16], therefore, making quick decisions on older adults residing in communities may be challenging. As a result, these findings are expected to provide useful insight into how to improve healthcare services to older adults living in the community. The purpose of this study was to determine the prevalence of falls and frailty among older adults living in the North Central region of Nigeria and the factors that contribute to them.

Materials and Methods

Study design, setting and eligibility criteria

We conducted cross-sectional study in seven villages in Buruku Local Government Area of Benue State involving older adults (≥60 years) living in the selected locations. Buruku Local Government Area (LGA) is one of the 23 local government areas in Benue state of Nigeria, predominantly inhabited by the Tiv people and with a population of 203,721 people as at 2006 census. Due to the high proportion of older adults in this area, the setting was ideal for the study. Inclusion in this study required that the participant must be 60 years of age or older, based on WHO guidelines for older adults in developing countries.[20] Exclusion criteria for the study included older adults reporting frequent hospital visits, those who are non-ambulant, and those who had visual impairments.

Study population and sample size

Recruitment of eligible participants was conducted using the snowball sampling technique. Stata software (17.0 SE) was used to estimate the sample size using Pearson's Chi squared test proportion of 0.633 and odds ratio of 0.9560 for frailty from a previous Nigerian study[16], at alpha value of 0.05 and 80% power. According to these parameters, 374 samples are required for the analysis. Surveys were conducted from August to December 2020 to recruit participants.

Ethical Consideration

The study was approved by the Ethics Committee of Bayero University, Kano (BUK/CHS/HREC/127), and the Benue State Ministry of Health. The Buruku LGA, Benue State also granted permission for the study to be conducted in the study area. Staff of Buruku LGA secretariat were assigned the role of gatekeepers, and we also sought and obtained permission from the village heads. To ensure the well-being, safety, and protection of study participants, ethical protocols of the Helsinki Declaration were implemented[21], such as informed consent, voluntary participation, withdrawal, and privacy protections. We translated questionnaires into Tiv language (the language spoken in the study setting) to ensure consistency in the data collection process.

Data collection

Outcome Measurements

In this study, frailty and falls were both considered dependent variables, and the independent variables included socio-demographic factors, anthropometrics and clinical features, multi-morbidity, polypharmacy, and physical activity levels. All participants filled out self-developed proformas for socio-demographic, lifestyle, clinical, and anthropometric information.

Socio-demographic variables

The socio-demographic information of the participants was recorded using a self-developed study proforma, which sought information on age, gender, marital status, level of education, and financial status. If the age of a participant was unknown, it was confirmed and estimated within 5 years by asking about the participant's life history, historical events, the age of their children, or obtaining a menopausal record or an old hospital card, as previously suggested.[22]

Information regarding lifestyle was collected, including smoking status (0: no, yes =1), alcohol consumption (0: no, 1 = yes), living alone (0: no, 1 = yes), and walking with a cane (0: no, 1 =yes). Multi-morbidity was defined as the co-occurrence of at least one chronic condition (e.g., osteoarthritis, hypertension, diabetes, tuberculosis, cardiovascular disease, tumour growth, presbycusis, upper respiratory infection, lumbar spondylosis), while poly-pharmacy was defined as the use of two or more medications daily to treat chronic conditions.

Anthropometric variables

Body weight and height measurements were measured in accordance with ISAK's guidelines.[23] Body mass index (BMI) was also calculated as kilogram per-square-metre.[24] Anthropometric measurements, BMI, circumference of mid-arm and weight were used to assess nutrition status; a value of 1 indicated good nutrition, and a value of 0 indicated poor nutrition. An assessment of functional mobility was conducted using a performance-based test called Timed Up and Go (TUG).[25] During this test, participants sat in armchairs with armrests, walked three meters along a line, turned around, and returned to their chairs. An individual who took more than 14 seconds was classified as having poor functional mobility (0: poor function), while an individual who took less than 14 seconds was classified as having good functional mobility (1: good function).

Functional status

The Timed Up and Go (TUG) test assesses functional status in older adults. Among older adults, TUG tests have been reported to be reliable, with an intraclass reliability of 0.92-.99.[25] To complete the test, the participant stood up from a seated position, walked 3 meters on a drawn line, turned around, walked back to the chair and sat down. Stop watches were used to time the participant and time was stopped when seated. If needed, the participant could use an assistive device. Participants taking 14 seconds or longer were classified as being at high risk of falling (0: Poor functional status) and those taking less than 14 seconds as having low risk (1: Good functional status).

Physical Activity

The Yale Physical Activity Survey (YPAS) standardized questionnaire assesses activities across a range of intensity levels, including household, recreation, and exercise settings. The survey offers three summary indices and five subscales. The three indices are the Total Time Summary Index (TTSI), Energy Expenditure Summary Index (EESI), and Activity Dimensions Summary Score (ADSS). Its test-retest correlation coefficients are in the range of 0.42 to 0.65, which indicates relatively good repeatability.[26] The YPAS was then adapted to assess the time spent on physical activity per week.

Frailty and falls

A standardized, validated Fried frailty phenotype (FFP) questionnaire was adopted to assess frailty. Frailty is defined by the Fried frailty phenotype (FFP) as unintentional weight loss, fatigue, weak grip strength, slow walking speed, and low levels of physical activity. In order to determine frailty, individuals were asked if they experienced poor appetites three or four times a week, weakness (lifting 12 kilograms was difficult), exhaustion (individuals were asked if they felt "they couldn't get going" or " that everything they did was an effort" often or most often in the past week), slowness (difficulty walking 200 meters or 300 meters), or low physical activity (failing to engage in any outdoor activity once or twice a week). A frail individual is defined as someone who exhibits at least three elements of frailty.[27] Individuals were asked whether they had experienced two or more falls during the past year, and their responses were scored as either Yes (1) or No (0).

Statistical analysis

Descriptive statistics to describe the demographic characteristics of participants, expressed as frequency (percentage) for categorical variables and mean and standard deviation for normally distributed continuous variables. Continuous variables were checked for normality using a Kolmogorov-Smirnov test and assumed to be normally distributed if the p-value was greater than 0.05. The frequency of frailty and falls, as well as their 95% confidence intervals, were calculated. Chi-square test for independence was used to compare frailty and falls based on demographic characteristics. In addition, an adjusted multivariate logistic regression was conducted to examine the factors associated with frailty and falls. Results were presented as odds ratio and 95% confidence intervals. Statistical analyses were performed using SPSS version 25.0 and alpha was set at 0.05.

Results

Participants

Four hundred and ninety-four community-dwelling older adults were studied. Their mean age was 76.4±11.23 years. Among these participants, 52.6% were males and 209 (42.4%) did not have a formal education (Table 1). Approximately 46% of the participants reported chronic co-morbidity conditions (95% CI: 41.79-50.58%), and about two-thirds reported poor function (95% CI: 61.89-70.24%) and poor nutrition (95% CI: 56.13-64.76 The survey also reported that 21.3% reported poly-pharmacy as well as 21.1% reporting using an assistive device (cane), 24.1% reporting taking alcohol, and 27.7% reporting being a smoker.

Frailty and falls

About 62.9% of the participants of this study reported frailty (95% CI: 58.5 to 67.0), while 33.2% reported falls (95% CI: 29.2 to 37.6). Based on gender, 165 (70.5%) women compared to 145 (56.0%) in men reported frailty. Furthermore, fall rates were higher among female participants (37.6%) than male participants (29.2%). In addition, highest percentage of elderly participants (85+) reported falls (42.7%), as well as frailty (78.9%). Furthermore, it was found that participants without a formal education reported the highest prevalence of falling (36.4%) and frailty (71.8%) (Table 2).

Factors associated with frailty and falls

Based on the adjusted logistic regression model (Table 3), frailty (OR = 0.39; 95%CI: 0.22 to 0.69) and falls (OR = 0.51; 95%CI: 0.31 to 0.86) were significantly lower in males than in females. The results of the study also found that people who reported poor function were 2.45 times more likely to report falls (OR = 2.45; 95%CI: 1.40 to 4.30), and 2.75 times more likely to report frailty (OR = 2.75; 95%CI: 1.63 to 4.70). Among smokers, there was also a 1.85-fold increase in the probability of having a fall (OR = 1.85; 95%CI: 1.16 to 2.94) and a 2.19-fold increase in the probability of having frailty (OR = 2.19; 95%CI: 1.26 to 3.74) among those who smokers compared to non-smokers.

Table 1: Characteristics of the participants (N = 494)

Characteristics	Mean®SD	Frequency (N)	Percent (%)
Demographics			
Age	76.42®11.23		-
Age (%)			
60-74 years		232	47.00
75-85 years		138	27.9
85 years		124	25.1
Gender			
Male		260	52.6
Female		234	47.4
Education			
No formal education		209	42.4
Primary education		167	33.9
Secondary education		69	14.0
Tertiary education		48	9.7
Living alone			
No		484	98
Yes		10	2
Health behaviours			
Multimorbidity			
No		266	53.8
Yes		228	46.2
Polypharmacy			
No		389	78.7
Yes		105	21.3
Alcohol			
No		375	75.9
Yes		119	24.1
Smoking			
No		357	72.3
Yes		137	27.7
Function status			
Good		167	33.8
Poor		327	66.2
Nutrition			
Good		195	39.5
Poor		299	60.5
Using cane			
No		388	78.9
Yes		104	21.1
Behavioural lifestyle			
BMI (Mean®SD)	24.62®4.48	-	-
Physical Activity (hr./wk.)	11.19®9.23	-	-

hr./wk.: hour per week

Table 2: Prevalence of falls and frailty in community-dwelling older adults (N = 494)

Variables	Falls N (%)	Frailty N (%)
Overall, percent & 95% C.I	33.2% [95%CI: 29.2 – 37.6]	62.9% [95%CI: 58.5 – 67.0]
Gender (n, %)		
Female	88 (37.6)	165 (70.5)
Male	76 (29.2)	145 (56.0)
p-value	***0.048***	***0.001***
Age categories (n, %)		
60-74y	57 (24.6)	120 (51.7)
75-84y	54 (39.1)	93 (67.4)
85y	53 (42.7)	97 (78.9)
p-value	***0.001***	***0.001***
Education		
No formal education	76 (36.4)	150 (71.8)
Primary	54 (32.3)	110 (66.3)
Secondary	22 (31.9)	26 (37.7)
Tertiary	12 (25.0)	24 (50.0)
p-value	0.474	***0.001***

Proportions reported for only "yes" to falls and frailty

Table 3: Logistic regression of factors associated with falls and frailty

Variables	Falls			Frailty		
	OR	95% for OR	p-value	OR	95% for OR	p-value
Gender						
Female	Reference			Reference		
Male	.51	.31 to .86	**.011**	.39	.22 to .69	**.001**
Age						
60-74y	Reference			Reference		
75-84y	1.64	.96 to 2.79	.07	.78	.44 to 1.37	.39
85y	1.70	.90 to 3.21	.10	.71	.34 to 1.46	.35
Education						
No educ.	Reference			Reference		
Primary	1.54	.89 to 2.66	.12	2.06	1.13 to 3.75	**.02**
Secondary	2.31	1.06 to 5.03	**.04**	.89	.41 to 1.93	.76
Tertiary	.84	.35 to 2.03	.70	.90	.39 to 2.07	.80
Multimorbidity						
Yes	.68	.43 to 1.08	.10	1.74	1.06 to 2.83	**.03**
Polypharmacy						
Yes	1.14	.68 to 1.92	.61	.46	.27 to .79	**.005**
Function						
Poor	2.45	1.40 to 4.30	**.002**	2.76	1.63 to 4.70	**.001**
Living alone						
Yes	1.90	.44 to 7.9	.38	17.07	1.14 to 239.0	**.04**
Using cane						
Yes	.66	.39 to 1.13	.13	4.66	2.11 to 10.41	**.001**
BMI	1.01	.96 to 1.05	.82	.97	.93 to 1.02	.29
Alcohol						
Yes	.58	.34 to .97	**.04**	.95	.55 to 1.56	.78
Smoking						
Yes	1.85	1.16 to 2.94	**.01**	2.19	1.26 to 3.74	**.005**
Activity	.98	.94 to 1.01	.15	.95	.92 to .99	**.01**

Discussion

Frailty and falls are two of the foremost chronic conditions affecting functional status in older adults. The findings of this study indicate that about 62.9% of rural community-dwelling older adults are frail, whilst about 33.2% of elderly individuals have at least a history of fall every year. Our findings are similar to previous findings in southwest Nigeria, which reported that older women are more likely to report frailty and falls than men of the same age.[10,12] Our findings of frailty, however, were a little higher than those reported by O'Caaimh et al.[8] in a review of 62 countries.[8] Predictably, O'Caaimh et al.[8] derived their estimates from meta-analyses of several studies, nevertheless, it should be noted that studies in Africa reported a higher prevalence of frailty compared to other regions.[8] Globally, older adults are living longer and experiencing more chronic diseases.[2,28] Therefore, as an individual advances in age, pathological changes accumulate and could cause reduction in the efficiency of different body systems.[1,3] A number of geriatric syndromes are prevalent, such as frailty and falls, so early identification, comprehensive assessment, and prevention are crucial.

Several risk factors have been found to increase the vulnerability to frailty and falls in older adults. First, males were less likely than females to report both frailty and falls. A number of studies have found that women are more likely to fall and be frail than men.[10,12,28] Menopause, for instance, causes women's physiology to undergo hormonal changes, which affect their bone mineral density more than men's.[29] Moreover, females have lower muscle and bone mass than men[12], which causes a greater risk of age-related functional decline. In addition, aging is also associated with fat infiltration of muscle tissues, increasing the risk of musculoskeletal dysfunction.[6,30]

Our study also indicated that older adults who were frail and falling more often were those with poor function. As a result of pathological processes, the multisystem function of older adults gradually declines over time.[31] Thus, it is not surprising that our study findings support the reports that older adults who use assistive devices are less mobile and more likely to fall than people who do not use them.[32]

Generally, education has been shown to prevent adverse health outcomes in older adults.[6,12] In this study, people with no formal education were found to be more likely to suffer from frailty and fall. One plausible reason may be that rural communities with low levels of education face difficulties accessing medical care.[33] Moreover, education also informs people about their health choices and motivates them to seek medical attention.[6,33] Our results also indicate older adults who smoke are nearly twice as likely to fall and become frail. Probably, this is because cigarettes contain harmful chemicals that irritate the lungs and decrease gaseous exchange, leading to reduced cardiopulmonary endurance, and reduced functional capability.[30]

About 46.2% of the study participants reported having multiple comorbidities such as hypertension, arthritis, presbycusis among other degenerative conditions. Multimorbidity leads to use of 3 or more medications in older adults, which is termed polypharmacy. Those who reported use of 3 or more medications in the present study also reported frailty. This finding is supported by findings in the study by Cakmak and Ozturk,[34] among older adults in Europe and Vernese et al,[35] among older adults in the US. A lower number of medications use has been shown to decrease the risk of frailty.[36] Furthermore, medications such as those used in treating dementia and Alzheimer's disease and some laxatives are known to cause muscle weakness and weight loss in older adults, contributing to frailty states.[37] A 27% risk of frailty has been associated with one number increase in medications being used[38], similar stratification has also been associated with 15% increase risk for falls.[38] Nevertheless, the link between polypharmacy and fall was contrary to the results reported in the present study. This is probably due to the negative effect from single medication rather than combined effect, warranting the need to consider reviewing negative effects of individual medications among this population of older adults.

This study also found that active older adults face a lower frailty risk, even though their protection is minimal. Although frailty and falls are common in this setting, many participants reported participating in activities such as farming, walking to the market, washing clothes, cooking, dishwashing, brisk walking, and caring for children, elderly relatives, and disabled family members. Consequently, one would expect the estimates among the study population to be lower. Nevertheless, it is possible that these activities may, however, not have been performed at an optimum level that can yield to significant health benefits. The American College of Sports Medicine recommends at least 150 minutes of physical activity per day for maintaining optimum fitness.[39] Interestingly, we noticed that many of the indigenous activities are not captured, when measuring physical activity in a rural setting. Hence, this study used Yale Physical Activity Surveys (YPAS), which can be a more comprehensive and appropriate tool for this population. Consequently, we recommend that there is a potential to develop native tools to capture all the unique characteristics of this or a similar group of individuals.

We believe that our study was the first of its kind in this setting to explore the burden of frailty and falls in older adults from rural communities, and that our results will be helpful to older adults and stakeholders in recognizing frailty and falls as public health issues. This study is also notable for its generalizability and large sample size of older residents in rural communities. To accommodate the unique characteristics of older adults in this setting, we used YPAS to allow for variability in physical activity across age groups. However, in spite of these strengths, our study had some limitations. Some of the information collected were based on self-reports. Due to age-related cognitive decline, older adults tend to have difficulty recalling past events. Hence, it is possible that some data were over-reported or under-reported.

Conclusion

Falls and frailty are highly prevalent among older community-dwelling adults, especially among women, those who smoke, those with low educational levels, and those with poor physical health. The lack of primary healthcare facilities in our setting, where older adults can promptly seek care may contribute to the higher estimates of frailty and falls in this study population. So, proactive assessment of falls and frailty is needed, as well as targeted interventions for those living unhealthy lifestyles.

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