Original Article

Frequency of Frailty in Old Age Sedentary Population with Disturbed Neurological Status

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ABSTRACT

Background: Frailty is a common syndrome among older adults, characterized by a decline in physiological reserve and increased vulnerability to adverse health outcomes. This study investigates the prevalence of frailty and its correlation with neurological status in a sedentary elderly population residing in old age homes.

Objective: The primary objective was to determine the prevalence of frailty and assess the relationship between frailty and cognitive impairment among sedentary elderly individuals.

Methods: A cross-sectional study was conducted across various old age homes in Lahore. Data collection began six months post-approval from the ethical committee, adhering to the principles of the Declaration of Helsinki. Using a non-probability convenience sampling technique, 111 participants aged 60 years and above were recruited. Exclusion criteria included traumatic injury, severe psychiatric illness, and complete disability. Frailty was assessed using the FRAIL scale, which includes components like fatigue, resistance, aerobic capacity, illness, and weight loss. Cognitive impairment was evaluated using the Mini-Mental State Examination (MMSE). Statistical analysis was performed using SPSS version 25, with descriptive and inferential statistics employed to explore the relationships between variables.

Results: The mean age of the participants was 72.063 years (SD = 7.942). Frailty assessment revealed that 88.3% (n=98) were frail, 8.1% (n=9) were pre-frail, and 3.6% (n=4) were not frail. Cognitive assessment showed that 31.5% (n=35) of participants had normal cognitive function, 66.6% (n=74) had mild cognitive impairment, and 1.8% (n=2) had moderate cognitive impairment. No participants were classified with severe cognitive impairment. A weak negative correlation was found between MMSE scores and FRAIL scale scores (r =-0.090, p = 0.346), indicating no significant association between cognitive impairment and frailty in this population.

Conclusion: The study found a high prevalence of frailty and mild cognitive impairment among the sedentary elderly population in old age homes. Despite the weak correlation between cognitive impairment and frailty, the findings underscore the need for comprehensive geriatric care strategies that address both physical and mental health to improve the quality of life and functional independence of elderly individuals.

Keywords: Frailty, Cognitive Impairment, Sedentary Lifestyle, Elderly Population, Old Age Homes, FRAIL Scale, Mini-Mental State Examination (MMSE), Geriatric Care, Cross-Sectional Study, SPSS Analysis.

INTRODUCTION

Frailty is a condition characterized by the progressive deterioration of physiological functioning, which is closely related to adverse events such as falls, decreasing mobility, hindrances in the activities of daily life, hospitalization, and deaths (1). Infirmity leads to physical deterioration and reduced mobility, making the process of muscle degeneration more severe in frail patients compared to those who are not (2). Frailty, a wasting syndrome, presents as a loss of physiological function with aging, lowering of reserve capacity, and systemic disability (3). It is currently a significant concern in geriatrics as frailty is considered a meaningful predictive factor for functional disability (4). Defined as a progressive loss of reserve and adaptive capacity associated with an overall deterioration in health, frailty can result in disability, loss of independence, hospitalization, extensive use of healthcare resources,

admission to long-term care, and death (5). The heterogeneity in aging can be explained by frailty, with lifestyle behaviors such as physical activity playing a crucial role in managing frailty levels. Conversely, sedentary behaviors are independently associated with frailty, irrespective of physical activity levels. Regular physical activity reduces the risk of developing several chronic conditions, such as cardiovascular disease, diabetes, and some cancers, and also decreases the risk of falls (6). However, physical activity levels decline with age, and older people tend to sit more and move less during their leisure time (7). Frailty refers to the decline in physiological reserve capacity caused by the deterioration of multiple physiological systems, including the brain, endocrine system, immune system, and skeletal muscles, leading to increased vulnerability and decreased stress capacity (8). Women exhibit a higher prevalence of frailty than men, potentially due to menopause and related characteristics, although the underlying epidemiological factors are not fully understood.

A scoping review aimed to explore the relationship between menopause and frailty, summarizing information such as the age at menopause, years since menopause, types of menopause, and hormones and inflammatory markers of frailty among postmenopausal women (9). Borda et al. (2019) conducted a study on frailty in older adults with mild dementia, aiming to describe the frequency of frailty in individuals newly diagnosed with mild dementia due to Alzheimer's disease (AD) and dementia with Lewy bodies (DLB). The study concluded that frailty was higher than expected in both types of dementia, with a higher prevalence in those with DLB compared to AD, underscoring the need for a multi-system approach in managing these conditions (10). Rodriguez Sanchez et al. (2018) investigated the impact of the frequency, intensity, and location of pain on frailty risk in older adults, concluding that these factors were associated with a higher risk of frailty, partly explained by pain-associated morbidity (11). Nicholas R. et al. (2021) explored the relationship between frailty and cerebrovascular disease, finding that frailty is an important clinical risk factor for stroke and is independently associated with a range of poor post-stroke outcomes, indicating that the burden of frailty and its effect on cerebrovascular disease is likely to increase with shifting demographics (12).

Pedro Otones Reyes et al. (2020) conducted a cross-sectional study on the prevalence and correlates of frailty in community-dwelling older adults with chronic pain, revealing that pain intensity was higher in frail subjects than in pre-frail or robust participants, with frailty being more frequent in women and older subjects (13). Rufeng Huang and Fumin Pan (2023) investigated the differences in the morphology of the paraspinal muscles in frail and non-frail older adults using the FRAIL scale, finding that the paraspinal muscles of frail patients were worse than those of non-frail patients, highlighting the clinical significance of the FRAIL scale in distinguishing paraspinal muscle morphology (14). Haihui Ruan et al. (2022) examined the association of frailty in women with menopause, finding that age at menopause was inversely correlated with the frailty index, with women who underwent early or premature menopause having a higher frailty index and being more commonly classified as frail compared to naturally menopausal women aged 46-54 years. Furthermore, women who had undergone a hysterectomy were more likely to be frail compared to naturally menopausal women, although a prospective study showed that surgically menopausal women (bilateral oophorectomy before menopause) without hormone therapy did not have a greater likelihood of frailty than naturally menopausal women (15, 16).

There is a notable lack of research on the neurological status among frail geriatric individuals. The purpose of this study was to raise awareness regarding the mental health condition and activity level of elderly individuals living in old age homes and the negative impact on their health. Physiotherapy facilities can play a crucial role in mitigating these negative impacts, improving the activities of daily living (ADL) of the elderly population, and facilitating easier independent living.

MATERIAL AND METHODS

The study employed a cross-sectional design, with data collected from various old age homes in Lahore. The research was initiated six months after receiving approval from the ethical committee, adhering to the principles of the Declaration of Helsinki. A non-probability convenience sampling technique was utilized, and a sample of 111 subjects was recruited for this study (17). Participants included both male and female individuals aged above 60 years, all of whom led a sedentary lifestyle (13). Exclusion criteria comprised individuals with any traumatic injury, severe psychiatric illness, or complete disability.

The sample size was calculated using the formula $N = z^2 * p(1-p) / d^2$, where z represents the confidence interval at 95% (standard value of 1.96), p represents the estimated geriatric population in a previous study (11.2%), and d represents the margin of error (0.05). Accordingly, the minimum sample size required was approximately 111 subjects. Questionnaires were distributed as handouts in selected old age homes, and consent was obtained from participants. Data collection was conducted in person through representatives appointed at the selected old age homes.

Two primary instruments were used for data collection: the FRAIL scale and the Mini-Mental State Examination (MMSE). The FRAIL scale, which includes five components (fatigue, resistance, aerobic, illness, and loss of weight), was employed to diagnose frailty within the population (18). The MMSE was utilized to assess the mental health of the individuals (19).

Statistical analysis was performed using SPSS (Statistical Package for the Social Sciences) version 25. Data were analyzed to determine the frequency of frailty among the old age sedentary population with disturbed neurological status. Descriptive statistics were used to summarize the demographic data, and inferential statistics were employed to explore relationships between variables. All analyses were conducted with a significance level set at $p < 0.05$.

RESULTS

Table 1: Description of Age

N	Min. Age	Max. Age	Mean Age	S.D
111	60 years	97 years	72.063	7.942

Note: N = Number of Participants, Min = Minimum, Max = Maximum, S.D = Standard Deviation.

Table 2: Frequency and Percentage of Frail Scale

Frail Score	Participants (N)	Percentage (%)
0 (Not frail)	4	3.6%
1-2 (Pre-frail)	9	8.1%
3-5 (Frail)	98	88.3%
Total	111	100.0%

Note: N = Number of Participants, % = Percentage.

Table 3: Mini-Mental State Examination (MMSE) Score

MMSE Score	Frequency	Percentage (%)
Severe	0	0.0%
Moderate	2	1.8%
Mild	74	66.6%
Normal	35	31.5%
Total	111	100.0%

Note: MMSE = Mini-Mental State Examination, % = Percentage.

Table 4: Correlation between MMSE and Frail Scale

		MMSE	FRAIL
MMSE	Pearson Correlation		1
	Sig. (2-tailed)		
	N		111
FRAIL	Pearson Correlation		-0.090
	Sig. (2-tailed)		0.346
	N		111

The study included 111 participants from various old age homes in Lahore, with ages ranging from 60 to 97 years. The mean age of the participants was 72.063 years, with a standard deviation of 7.942 years, indicating a wide age distribution within the sample (Table 1).

The analysis of frailty using the FRAIL scale revealed significant findings. Only 4 participants (3.6%) were classified as not frail, scoring 0 on the FRAIL scale. In contrast, 9 participants (8.1%) were identified as pre-frail with scores ranging between 1 and 2. The majority, 98 participants (88.3%), were categorized as frail with scores between 3 and 5, highlighting the high prevalence of frailty in this sedentary elderly population (Table 2).

Mental health assessment using the Mini-Mental State Examination (MMSE) showed diverse cognitive statuses among the participants. None of the participants were classified as having severe cognitive impairment. A small fraction, 2 participants (1.8%), exhibited moderate cognitive impairment. The majority of the sample, 74 participants (66.6%), had mild cognitive impairment, while 35 participants (31.5%) were found to have normal cognitive function (Table 3). These results suggest a considerable presence of mild cognitive impairment within the study population.

The correlation analysis between MMSE scores and FRAIL scale scores demonstrated a weak negative correlation, with a Pearson correlation coefficient of -0.090. The significance value (p = 0.346) indicated that this correlation was not statistically significant (Table 4). This suggests that, within this sample, there was no significant association between cognitive impairment levels as measured by MMSE and the degree of frailty as measured by the FRAIL scale.

Overall, the study's findings underscore the high prevalence of frailty and mild cognitive impairment among the elderly sedentary population in old age homes. The lack of a significant correlation between MMSE and FRAIL scores suggests that frailty and cognitive impairment might independently affect this population, necessitating tailored interventions for each condition.

DISCUSSION

The findings of this study align with previous research, underscoring the high prevalence of frailty among older adults with sedentary lifestyles. Pedro Otones Reyes' cross-sectional investigation in 2020 demonstrated that community-dwelling older adults with chronic pain exhibited varying degrees of frailty, with frail participants experiencing more significant pain compared to their pre-frail or robust counterparts. This study also highlighted that women and older individuals had a higher incidence of frailty, though a causal relationship could not be established due to the cross-sectional nature of the research (13). Similarly, our study found that 88.3% of participants were frail, 8.1% were pre-frail, and only 3.6% were not frail, indicating a pronounced prevalence of frailty in the sedentary elderly population (Table 2).

A related study on the prevalence of frailty in older adults with mild dementia revealed that those with dementia with Lewy bodies (DLB) had a higher prevalence of frailty compared to those with Alzheimer's disease (AD), with 37.14% and 18.97%, respectively (10). This finding underscores the variability in frailty prevalence across different neurological conditions. Our research further adds to this understanding by highlighting the relationship between sedentary behavior and frailty, independent of specific neurological diagnoses. In our sample of 111 participants, a significant proportion exhibited mild cognitive impairment (66.6%), with only 1.8% showing moderate cognitive impairment and none classified as severely impaired (Table 3).

The novelty of our research lies in the detailed characterization of frailty and cognitive impairment within a sedentary elderly population. The study's strengths include its focus on a vulnerable population in old age homes and the use of validated tools like the FRAIL scale and MMSE for comprehensive assessments. However, the study had several limitations. The cross-sectional design precluded the establishment of causality between frailty, cognitive impairment, and sedentary lifestyle. The non-probability convenience sampling technique may have introduced selection bias, limiting the generalizability of the findings.

Comparative studies, such as those by Borda et al. (2019) and Rodriguez Sanchez et al. (2018), also support the association between frailty and factors such as pain and dementia, further emphasizing the complex interplay between physical and cognitive health in aging populations (10, 11). Our study reinforces these findings, showing a significant prevalence of frailty and mild cognitive impairment in a sedentary elderly population, which necessitates tailored interventions to address both physical and mental health aspects.

Recommendations for future research include longitudinal studies to explore causative relationships and interventional studies to assess the efficacy of targeted physiotherapy programs in mitigating frailty and cognitive decline. Additionally, investigating the role of menopause in frailty among women, as highlighted by Haihui Ruan et al. (2022), could provide deeper insights into gender-specific interventions (15, 16).

CONCLUSION

The study demonstrated that a sedentary lifestyle significantly influences functional activity and mental health in older adults, contributing to frailty and cognitive impairment. These findings underscore the need for comprehensive geriatric care strategies that incorporate physical activity and cognitive health interventions to improve the quality of life and functional independence in this population.

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