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Original Research Article

Conducting a Retrospective Analysis of Falls and Their Impact on Musculoskeletal Health among the Elderly Population in Our Local Community

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Abstract:

India's demographic landscape is experiencing a significant shift with the increase in its elderly population, particularly in urban areas. This demographic change brings about various healthcare challenges, including the prevalence of falls among the elderly in towns and villages.

Materials and Methods: This retrospective analysis was conducted to investigate the impact of falls on musculoskeletal health among the elderly population residing in the district of Gulbarga, Karnataka in India. The study design involved the systematic collection and analysis of historical healthcare records from multiple healthcare facilities in the designated area

Results: A total of [60286] elderly individuals aged 65 and above were included in the retrospective analysis. The study population exhibited a diverse age range(65-99), with a mean age of [76.6] years. The majority of participants were female, comprising 63.98 percent of the cohort.

Keywords: Age related, Musculoskeletal, Geographic

Introduction

India's demographic landscape is experiencing a significant shift with the increase in its elderly population, particularly in urban areas [1]. This demographic change brings about various healthcare challenges, including the prevalence of falls among the elderly in towns and villages [2]. Falls among the elderly in India are influenced not only by age-related factors but also by unique cultural, social, and environmental factors that characterize Indian communities [1].

The prevalence of falls among the elderly is influenced by various risk factors. Age is a significant factor, with rates of falls increasing with age, especially in men [3]. Frailty is also associated with a higher risk of falls and fear of falling among older people in rural areas of South India [2]. Other factors that contribute to the prevalence of falls include female gender, older age (over 80 years old), low cognitive status, and previous falls in the last six months [4].

Visual impairment has been identified as a risk factor for falls among elderly residents in "homes for the aged" in India [5]. Additionally, socioeconomic status and environmental factors play a role in falls among the elderly in rural areas of Southern Indian states [6]. Social participation has been shown to have a positive impact on the health and well-being of the elderly [7]. However, the effects of social participation on falls among the elderly in India have not been extensively studied and require further research.

The increase in the elderly population is not unique to India, as the percentage of the world population that is elderly is expected to double by 2050, with a concentration in urban areas of developing countries [8]. Sleep quality, physical activity, and environmental quality also contribute to the risk of falls in individuals with dementia [9]. Falls among the elderly have significant social and economic costs, with estimates suggesting that the social cost caused by elderly falls in China alone is between 16 billion to 80 billion annually [10].

Undoubtedly, beyond the 2030s, India's demographic structure is likely to alter from a young to an aging population. [11]

India is experiencing accelerated demographic transition. [12]

In India, there were 72 million elderly persons above 60 years of age as of 2001 and this number is likely to increase to 179 million in 2031 and hence orthopaedic care in geriatric population needs emphasis. [13]

The percentage of senior citizens among the population in Karnataka (9.2%) is slightly above the national average. [14]

The last census of Gulbarga was done in 2011 and next census of 2021 has been postponed or cancelled. But we can do projection of future Gulbarga 2023 Population on the basis likely Population Growth Rate 30.31 Lakhs [15]

To address the issue of falls among the elderly, it is important to consider both intrinsic and extrinsic factors. Intrinsic factors include age-related changes in muscular strength, flexibility, balance control, and walking stability [9]. Extrinsic factors include environmental hazards and the quality of the living environment [6]. The risk of falls is also influenced by psychological factors, such as fear of falling, cognitive impairment, and mental health [11,12,13]. Falls can have a significant impact on the quality of life of the elderly, with studies showing that falls are associated with lower quality of life [13].

As the demographic shift in India's population shifts towards an increasing elderly population, it brings about healthcare challenges, including the prevalence of falls among the elderly. Falls among the elderly in India are influenced by age-related factors as well as unique cultural, social, and environmental factors. Understanding the repercussions of falls on musculoskeletal health within the Indian town and village context is crucial. Various risk factors contribute to falls among the elderly, including age, frailty, visual impairment, socioeconomic status, environmental factors, sleep quality, physical activity, and psychological factors. Falls have significant social and economic costs and can impact the quality of life of the elderly. Hence, there is a need of research to address the issue of falls among the elderly and to develop effective prevention strategies.

Materials and Methods

Study Design

This retrospective analysis was conducted to investigate the impact of falls on musculoskeletal health among the elderly population residing in the district of Gulbarga, Karnataka in India. The study design involved the systematic collection and analysis of historical healthcare records from multiple healthcare facilities in the designated area. Ethical approval for data access and analysis was obtained from the KBNU-FOMS ethical board.

Participant Selection

The study population comprised elderly individuals aged 65 and above who sought medical care for falls and related musculoskeletal injuries during the study period.

Inclusion criteria encompassed individuals residing in the specified district, and their healthcare records needed to contain comprehensive information related to falls and musculoskeletal health. Exclusion criteria included individuals with incomplete medical records or those with falls resulting from non-musculoskeletal causes, such as syncope or neurological conditions.

Data Collection

A comprehensive search of healthcare records from the major Teaching Hospitals and PHCs in Gulbarga District was conducted. These records included electronic health records, medical charts, radiological reports, and physician notes. The data collection process involved the retrieval of information pertaining to each fall event, including the date of the fall, location (e.g., home, outdoor), circumstances surrounding the fall, and injuries sustained. Musculoskeletal health outcomes of interest included fractures, osteoporosis diagnoses, joint injuries, chronic pain, and any subsequent medical interventions.

Statistical Analysis

Data were processed and analyzed using statistical software SPSS 2.0. Descriptive statistics were employed to characterize the study population, including age, gender, and comorbidities. The incidence rate of falls per 100,000 population was calculated. Chi-square tests and logistic regression analysis were utilized to examine the association between falls and musculoskeletal health outcomes, while controlling for potential confounding variables. A significance level of $p < 0.05$ was considered statistically significant.

Ethical Considerations

This study adhered to ethical guidelines for research involving human participants. Informed consent was not required, as the analysis was retrospective and used de-identified data. All data were handled with strict confidentiality, and steps were taken to ensure compliance with data protection regulations.

Limitations

Several limitations must be acknowledged in this retrospective analysis. These include potential selection bias due to the reliance on available healthcare records, missing data, and the

retrospective nature of the study. Additionally, the results may not be generalizable to other regions in India or to populations with different demographic profiles.

Results

Demographic Characteristics

A total of [60286] elderly individuals aged 65 and above were included in the retrospective analysis. The study population exhibited a diverse age range(65-99), with a mean age of [76.6] years. The majority of participants were female, comprising 63.98 percent of the cohort. Comorbidities were prevalent among the study population, with 71% reporting at least one pre-existing medical condition.

Age Range	Number of Male Patients	Number of Female Patients	Total Patients
65-69	4182	7461	11643
70-74	3924	6980	10904
75-79	3656	6499	10155
80-84	3388	6005	9393
85-89	3134	5576	8710
90-94	2889	5101	7990
95-99	540	951	1491
Total	21713	38573	60286

Incidence of Falls

During the study period, a total of 60286 falls were recorded among the elderly population in Indian towns and villages. Therefore, the incidence of falls for the five years is approximately 21,607 per 100,000 people in the geriatric population. The annual incidence rate for falls over the five-year period, is approximately 0.0432 per person per year. The annual incidence rate of falls per 100,000 population over the five-year period is approximately 1987.73.

Patterns of Falls

The analysis revealed diverse patterns of falls among the elderly cohort. The majority of falls occurred within the home environment, constituting 47.89% of all falls. Falls in outdoor settings, such as streets or public spaces, accounted for 52.11% The circumstances surrounding falls varied, with 63.78% resulting from slips or trips, occurring during activities of daily living, and 36.22% due to environmental hazards.

Musculoskeletal Health Outcomes

Analysis of healthcare records indicated a significant association between falls and adverse musculoskeletal health outcomes among the elderly population. The most common musculoskeletal injuries sustained were fractures, accounting for 41.48% of fall-related injuries. Osteoporosis diagnoses were documented in 78.32 % of cases following falls. Joint injuries, including dislocations and sprains, were reported in 43.2%, while chronic pain complaints were noted in 37.23%

Chronic Pain and Functional Decline

Chronic pain complaints were documented in 67.23% of cases following falls.

Environmental Hazards

Our analysis identified several environmental hazards contributing to falls, particularly in outdoor settings. These hazards included uneven pavements, lack of handrails, and inadequate lighting. Our research findings underscore that falls among geriatrics in household settings are more common in washrooms, primarily due to diminished balance, muscle weakness, smooth and slippery surfaces, improper lighting and impaired vision,

Comorbidities and Falls

Comorbidities, including HTN,DM were significantly associated with falls ($p < 0.05$). This highlights the intricate relationship between underlying health conditions and fall risk. Comprehensive healthcare management for elderly individuals should prioritize not only fall prevention but also the management of comorbidities to reduce fall risk.

Length of Hospitalization

Among the fall-related injuries, fractures led to the longest hospitalization stays, with an average length of 12.8 days.

Discussion

Falls among the elderly represent a significant public health concern globally, and their impact on musculoskeletal health is a subject of growing interest. In this retrospective analysis conducted in our specific area, we examined the incidence, patterns, and consequences of falls among the elderly population, shedding light on a pressing issue that requires in-depth understanding and intervention.

The incidence rate of falls in our study, measured at 21,607 per 100,000 falls with 0.0432 percent of risk of fall per person per year emphasizes the high prevalence of falls among the elderly in Indian towns and villages. These findings align with

previous studies on falls in the elderly, both within India and globally.

The incidence of falls in the geriatric population is a significant global public health concern, leading to injuries, hospitalizations, and mortality .[16] Falls affect a substantial proportion of older adults, with studies reporting that approximately 30% of geriatric patients experience at least one fall annually, and the frequency of falls increases with age [17]. In the United States alone, the incidence of falls among individuals over 65 years old was reported to be 672 per 1000 population in 2014, with a noted increase in incidence with advancing age [18]. Furthermore, falls are the leading cause of emergency department visits and hospitalizations due to injury in individuals aged 65 years and older, resulting in a high demand for healthcare services globally [18]. Globally, falls are recognized as a major cause of injury-related disability-adjusted life years and are among the most common causes of accidental injury-related deaths in the elderly population [19]. The prevalence of falls among older adults varies across different countries, with studies reporting a range from 14% to 53% in India Srivastava & Muhammad [20] and 11.4% in Ecuador [21]. Moreover, falls are associated with a range of risk factors, including physical frailty, medication use, and chronic health conditions such as chronic kidney disease [22]. Additionally, environmental and spatial factors have been identified as contributors to falls among the elderly, highlighting the multifactorial nature of this issue [23].

The patterns of falls in our study highlighted the diverse circumstances in which falls occurred. A substantial proportion of falls took place within the home environment (47.89), emphasizing the need for comprehensive home safety assessments and interventions. Similar observations have been made in studies conducted in Western countries.

Studies have shown that falls are more common in geriatric patients, with 79% experiencing falls within the home environment Brown et al [24] . Additionally, the incidence of falls in the elderly population is primarily a geriatric syndrome, with more than three-quarters of deaths caused by falls occurring in 13% of the population older than 65, indicating the home as a primary setting for falls **[25]** ·Moreover, a study in Japan found that falls were the leading cause of trauma among the 65–79 age group (56.7%) and the ≥ 80 age group (78.9%), emphasizing the significance of falls in the home environment for geriatric trauma [26]. Additionally, falls have been associated with chronic kidney disease, with a higher prevalence of falling in the population with decreased kidney function, further highlighting the importance of addressing falls within the home environment for this vulnerable population [22]. These references collectively emphasize the substantial proportion of falls that take place within the home environment for the geriatric population, highlighting the need for targeted interventions and preventive measures in this setting to reduce the incidence of falls and mitigate associated morbidity and mortality.

Our findings align with research conducted globally where outdoor falls were a significant concern. The outdoor environment, including streets and public spaces, is a significant setting for falls among the geriatric population. Studies have reported that falls in outdoor settings accounted for a substantial proportion of fall episodes, with 73 falls occurring in outdoor settings such as the garden or public spaces, compared to 87 fall episodes in indoor settings Herssens et al. [2**7]**. Furthermore, the availability of a natural environment and attractive views of nature within an individual's living environment have been identified as important contributors to physical activity, emphasizing the significance of outdoor environments for promoting active living and potentially reducing the risk of falls [28]. Additionally, outdoor falls have been associated with anxiety about falling again, particularly in urban settings, highlighting the need to address environmental factors that may contribute to falls and associated fear of falling [29]. Moreover, environmental barriers to outdoor mobility have been linked to fear of moving outdoors and increased risk of future mobility limitations, underscoring the importance of creating safe and accessible outdoor environments for older adults [30]. These references collectively underscore the importance of improving environmental safety in outdoor settings to reduce the risk of falls among the geriatric population. Addressing factors such as neighborhood characteristics, natural environments, and safety from crime and sidewalk conditions may be crucial in promoting outdoor physical activity and mitigating the risk of falls in these settings.

Musculoskeletal Health Outcomes

The association between falls and adverse musculoskeletal health outcomes is a central theme in our analysis. Fractures emerged as the most common musculoskeletal injuries sustained following falls, making up 41.48% of fall-related injuries. The prevalence of fractures after falls in the elderly is a critical area of study due to its impact on morbidity and mortality. Studies have reported varying prevalence rates of fractures following falls in the elderly population. For instance, a follow-up study demonstrated that mild hyponatremia was more prevalent in ambulatory elderly subjects with bone fractures after incidental falls Hoorn et al. [31]. Additionally, diaphyseal fractures of the tibia in the elderly occurred predominantly in women (73%) and after a fall (61%) [32] Furthermore, fragility fractures following a fall are widely recognized as a common major health care problem in the elderly

population worldwide [33]. The prevalence of falling was higher in elderly women, and the elderly who lived alone [34]. Distal radius fractures (DRF) are common in the elderly and are typical of hand fractures during falls [35]. Such kind of fractures are a result of road traffic accidents or any kind of trauma in young and healthy individuals but in the geriatric age group, most of them are due to a trivial fall but aggravated by osteoporosis [36].

Osteoporosis diagnoses following falls were documented in [78.32%] of cases. This observation underscores the importance of early identification and management of osteoporosis. Joint injuries, including dislocations and sprains, were reported in 43.2% of cases. Chronic pain complaints were noted in 67.23%. This observation has substantial implications for the overall well-being of the elderly population. Chronic pain can lead to a decreased quality of life, reduced mobility, and increased dependency on caregivers. It emphasizes the need for multidisciplinary pain management strategies to address the physical and psychological consequences of falls.

These results emphasize the multifaceted impact of falls on musculoskeletal health and the need for tailored interventions to address the diverse spectrum of musculoskeletal injuries. Although research directly comparing these specific findings with similar studies is limited, the consistency of the broader patterns seen in this study with global research indicates that the musculoskeletal consequences of falls are a shared concern in the elderly population.

Factors Associated with Falls and Musculoskeletal Health Outcomes

Our analysis revealed that age, gender, and comorbidities were significantly associated with the occurrence of falls. Older individuals were found to be at higher risk, a finding that resonates with studies conducted as cited above, where advancing age consistently emerges as a risk factor for falls. Gender differences in fall risk also align with previous research. While age-standardized rates of falls in elderly men and women are often similar, the overall incidence is higher in women due to the larger proportion of elderly women in the population.

The association between falls and comorbidities, Previous studies, have also highlighted the influence of comorbidities on falls. These findings emphasize the importance of a holistic approach to healthcare for the elderly population, addressing not only fall prevention but also the management of underlying health conditions.

Environmental Hazards

Our analysis revealed that falls within the home environment constituted a significant proportion of all falls. This highlights the importance of home safety assessments and interventions. The finding is consistent with previous studies conducted in various countries, which have advocated for home safety assessments and modifications as effective fall prevention strategies.

Environmental hazards in outdoor settings, such as uneven pavements, inadequate lighting, and other factors, played a significant role in falls. This aligns with the findings of various studies where the influence of outdoor environmental factors on falls has been well-documented. Urban planning and infrastructure improvements are essential in addressing this aspect of fall prevention.

Cultural Factors and Reporting

It is worth noting that cultural factors may influence the underreporting of falls among the elderly population in Indian towns and villages. Stigma associated with falls or reluctance to seek medical attention for minor injuries may result in an underestimation of fall incidence. Community awareness programs should address cultural factors, the involvement of “bone setters” and the use of traditional medicines, and encourage the reporting of falls for timely intervention.

Community-Based Initiatives

While this retrospective analysis primarily focused on healthcare records, it highlights the importance of community-based initiatives for fall prevention. Engaging community health workers, volunteers, and local organizations in identifying and addressing fall risk factors can complement clinical efforts to reduce falls among the elderly population.

Limitations and Future Directions

As with any retrospective analysis, our study has limitations that must be acknowledged. The reliance on available healthcare records is subject to selection bias, missing data, and potential inaccuracies. The retrospective nature of the study inherently limits the control over data collection. Additionally, while our findings provide valuable insights into the specific region of Indian towns and villages, they may not be fully generalizable to other regions in India with different demographic profiles.

The insights gained from this study point to several directions for future research. Prospective studies that include larger and more diverse populations may provide a broader perspective on falls and their impact on musculoskeletal health in India. Additionally, in-depth investigations into cultural factors affecting the reporting of falls and interventions that account for these cultural nuances are warranted. A comprehensive evaluation of interventions, such as home safety assessments and infrastructure improvements, is essential to determine their effectiveness in the Indian context.

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