

ASSOCIATION OF GAIT IMPAIRMENT WITH FALL RISK IN GERIATRIC POPULATION

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Abstract

The geriatric population is frequently subjected to fall due to several reasons including physiological causes (aging) and pathological causes (neurological diseases) and musculoskeletal causes. The analytical cross-sectional aimed to analyze the association of gait impairments with fall risk in geriatric population. It was a cross-sectional study, with a sample size of 132 of geriatric population of Bahria Town Lahore calculated by using nonprobability convenient sampling. Two types of methods were used for data collection i.e., Dynamic Gait Index (DGI) and Timed Up and Go test (TUG). The questionnaire had demographic information and scoring of DGI and time for TUG in second. The data was analyzed by using SPSS 23.0 at the level of significance 5% and confidence interval of 95%. Association of gait impairment with fall risk in geriatric population was determined by using Chi-Square test. Results: The study analyzed 132 instances with full data and found a statistically significant correlation between DGI sum and task completion time, as demonstrated by Pearson Chi-Square ($\chi^2 = 44.254$, $df = 1$, $p < .001$) and Likelihood Ratio (LR = 38.550, $df = 1$, $p < .001$). This data reveals a high link between DGI Sum scores and task completion time. This study found a substantial connection between gait impairment and higher fall risk in older people. The findings had highlighted the importance of recognizing gait impairment as a critical predictor of falls in the elderly. For successful fall prevention in senior care, tailored rehabilitation programs focusing on gait improvement, balance, and muscular strength, as well as routine gait performance testing, are advised.

Keywords –. Gait Impairment, Fall Risk, Geriatric population, Timed Up and Go (TUG) Test, Dynamic Gait Index (DGI)..

1. INTRODUCTION

Gait was the term used to describe the method or style of walking, which includes the rhythmic movement of limbs and the synchronization of various body components. The older population was concerned about gait impairment and fall risk since falls can result in serious injuries, a decline in quality of life, and higher healthcare expenses. Falls were the second-leading cause of unintentional injury-related accidental deaths worldwide and were a severe public health concern, particularly for the elderly (1).

A fall is an event where an individual unintentionally comes to rest on the ground or a lower surface, unrelated to a major intrinsic event or external threat. Falls are strongly associated with mortality, morbidity, and functional decline, with aging contributing to altered gait patterns that compromise stability, speed, and balance. (2)

Musculoskeletal degeneration, reduced muscle strength, sensory degradation, cognitive impairment, and underlying medical disorders all contribute to fall risk and gait dysfunction in the aged population. Gait and balance abnormalities increase in prevalence from 10% in those aged 60-69 to more than 60% in people over 80, serving as antecedents to falls, which are the leading cause of serious injuries in the elderly. (3).

This study surveyed the association between gait impairments and fall risk in the elderly, emphasising current health state to reduce recollection bias. It used dual evaluation methods to discriminate fallers from non-fallers while addressing the complex nature of falls. The study produced more robust and precise results by considering age-related comorbidities and resolving demographic disparities. Neurological disorders, which had previously been emphasised, were removed to increase the specificity of the findings.

II. METHODS

The study took place over six months in Bahria Town, Lahore, and used an analytical cross-sectional design. Rao soft software was used to calculate a sample size of 132 people (4), who were selected via non-probability convenience sampling to analyze the association between gait impairment and fall risk in geriatric population. Individuals aged 65 (5) and over, of both genders, with gait difficulty and age-related comorbidities such as osteoarthritis and osteoporosis were eligible to participate. Participants with modest cognitive impairment, reduced sensory motor function, and vestibular problems were also included. Non-geriatric people (under 65 years old), diseases including Multiple Sclerosis, Parkinson's disease, and Stroke/CVA, as well as severe cognitive impairment or acute medical difficulties like cardiac problems or acute renal injury, were all excluded. Recent musculoskeletal ailments, such as fractures or joint replacements, previous history of fall was in exclusion. Score of Dynamic gait index (DGI) and

timed up and go (TUG) was used to analyze the association between gait impairment and fall risk. The data was analyzed by using SPSS version 23 quantitative variables were presented using mean, standard deviation, range, histograms. Categorical variables were presented as frequencies, percentages, cross tabulations, and bar charts. Association of gait impairment with fall risk in geriatric population was

determined by using Chi-Square test.

III. RESULTS

The study comprised 11 people aged 60-65 (8.3%) and 121 people over 65(91.7%), with 69 men (52.3%) and 63 women (47.7%) participating. In terms of DGI, 11 men (8.3%) and 12 females (9.09%), received 1-18, while 58 males (43.9%), and 51 females (38.6%) received 19-24 score. TUG took more than 12 seconds for 17 men (12.8%) and 15 females (11.3%), and less than 12 seconds for 52 males (39.3%) and 48 number of females (36.3%). The association between gait impairment and DGI and TUG revealed that 18 males (13.6%) and 14 females (10.6%) took more than 12 seconds in DGI 1-18, whereas 5 males (3.78%) and 95 females (71.9%) took less than 12.

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
DGISum Time in Seconds to Complete	132	100.0%	0	0.0%	132	100.0%

Table 1: Percentage of Sum of DGI time in second to complete

DGI Sum	Time in Seconds to Complete		Total
	Greater than 12	Less than 12	
1-18	18	5	23
19-24	14	95	109
Total	32	100	132

Table 2: DGI Sum and Time in Second to complete

	Value	df	Asymp Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	44.254 ^a	1	.000		
Likelihood Ratio	38.550	1	.000		

Table 3: The Pearson Chi-Square and Likelihood Ratio

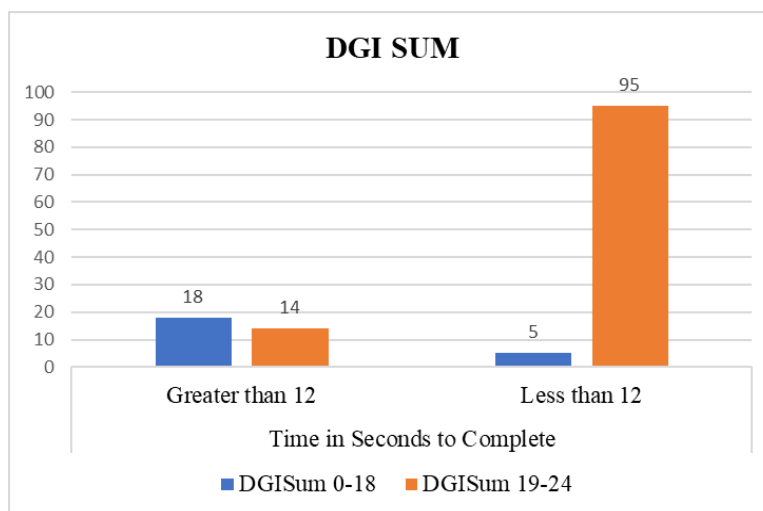


Figure 1: Time in seconds to Complete with DGI under 18 and above 18

1V. DISCUSSION

Falls were prevalent (45.3%) in a 2020 retrospective cohort study in Spain which included 2,849 patients over the age of 70 in long-term care facilities, with 51.7% reporting repeated falls. The study emphasised the importance of addressing lower Tinetti Scale scores, cognitive impairment, and polypharmacy in fall prevention interventions, as well as interventions aimed at balance, cognitive health, and regular medication reviews for the elderly population in long-term care settings (6). The current study used a DGI score to identify populations with impaired gait.

A significant relationship between fall risk in older people and variables such as age

over 70, multiple health conditions, cognitive decline, poor health, dependence, polypharmacy, weight loss, low function, depression, and frailty. Those who live alone, have specific health concerns, and indulge in practices such as prolonged Timed Up and Go tests or medication forgetting are particularly prone to falls. These findings emphasize the importance of close monitoring and fall prevention interventions, especially for the fragile elderly (7) This study also found that the fall risk ratio is more significant in older females, resulting in an increase in the timed up and go score

The relationship between walking stability and fall risk in healthy older individuals. This study used a self-assessed Dynamic Gait Index (sDGI) to measure walking capacity and fall risk in people with multiple sclerosis (MS). Preliminary participant data show that the concordance between the sDGI and clinically measured DGI is still being investigated, with a focus on the possible influence of cognitive function on validity which might provide insights for remote evaluation in people with multiple sclerosis. (8) The current investigation found that DGI merely predicted falls with poor gait in older adults without any neurological complications.

Large-scale research on older people at high risk of falling to investigate gender differences in gait stability ratio (GSR) and body balance (BB) when comparing fallers to non-fallers. Females exhibited a higher fall rate, worse balancing ability, and higher GSR readings. GSR and BB were strongly linked with a history of falls, and they mediated about 74.0% and 22.5% of the connection between sex and falls, respectively, highlighting their potential importance in understanding and preventing falls in older adults (20) The current study found a definite link between gender and fall risk, as the DGI score was optimum in men but dropped in women due to their tendency to grip the handrail when mounting stairs. Men and women have comparable TUG scores

The relationship between walking stability and fall risk in healthy older individuals. This study used a self-assessed Dynamic Gait Index (sDGI) to measure walking capacity and fall risk in people with multiple sclerosis (MS). Preliminary participant data show that the concordance between the sDGI and clinically measured DGI is still being investigated, with a focus on the possible influence of cognitive function on validity which might provide insights for remote evaluation in people with multiple sclerosis. (9) The current investigation found that DGI merely predicted falls with poor gait in older adults without any neurological complications.

the development of a predictive model for predicting fall risk following an unexpected slip in healthy older adults utilising normal gait patterns. The optimal model, which included the right thigh angle, the maximum ground reaction force of the slipping limb, and momentum change, outperformed a clinical and demographic-based model, providing valuable insights for therapeutic strategies and fall prevention interventions in populations at high risk of slip-induced falls. (10). present research showed fall risk results considering gait pattern with which individual was presented.

V. CONCLUSSION

This study demonstrated a strong correlation between gait impairment and an increased

risk of falling in the elderly. Through an in-depth investigation of gait patterns and their correlation with fall occurred, the research showed a strong link between geriatric care and fall prevention. Even after controlling age, comorbidities, and medication usage, the study found that poor gait significantly increased the probability of falling in older people. The conclusion showed that customized rehabilitation programmers concentrating on increasing gait dynamics, balance, and muscle strength were important for reducing fall risks. Routine gait performance testing in geriatric medicine was critical for early detection and timely preventative measures, had highlighted the importance of gait evaluation in complete fall prevention methods for the aged.

REFERENCES

1. Khanuja K, Joki J, Bachmann G, Cuccurullo S. Gait and balance in the aging population: Fall prevention using innovation and technology. *Maturitas*. 2018;110:51-6.
2. Appeadu MK, Bordoni B. Falls and fall prevention in the elderly. *StatPearls [Internet]: StatPearls Publishing; 2023*.
3. Pirker W, Katzenschlager R. Gait disorders in adults and the elderly: A clinical guide. *Wiener Klinische Wochenschrift*. 2017;129(3-4):81-95.
4. Naseer B, Dastgir H, Sadiq A, Salik S, Abid N, Tayyab M. Factors Associated with Risk of Fall in Elderly Population: Risk of Fall in Elderly Population. *The Healer Journal of Physiotherapy and Rehabilitation Sciences*. 2022;2(3):221-31.
5. Cassum LA, Cash K, Qidwai W, Vertejee S. Exploring the experiences of the older adults who are brought to live in shelter homes in Karachi, Pakistan: a qualitative study. *BMC geriatrics*. 2020;20:1-12.
6. Seppala L, van der Velde N. Falls and Impaired Mobility. *Optimizing Pharmacotherapy in Older Patients: An Interdisciplinary Approach: Springer; 2023*. p. 161-72.
7. Nascimento MdM, Gouveia ÉR, Gouveia BR, Marques A, França C, Marconcin P, et al. Sex differences in falls: the mediating role of gait stability ratio and body balance in vulnerable older adults. *Journal of clinical medicine*. 2023;12(2):450.
8. Chen V, Hildebrand A, Manago M, Serdar A, Cameron M. Validation of the Self-Assessed Dynamic Gait Index in People with Multiple Sclerosis. *Multiple Sclerosis and Related Disorders*. 2023;73:104636.
9. Modarresi S, Divine A, Grahn JA, Overend TJ, Hunter SW. Gait parameters and characteristics associated with increased risk of falls in people with dementia: a systematic review. *International Psychogeriatrics*. 2019;31(9):1287-303.
10. Wang S, Varas-Diaz G, Dusane S, Wang Y, Bhatt T. Slip-induced fall-risk assessment based on regular gait pattern in older adults. *Journal of biomechanics*. 2019;96:109334.