

Physical Activity and Fear of Falling: A Comparative Analysis of Geriatric Population with and without Diabetes

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ABSTRACT

Background and Need for Research: Human aging involves progressive decline in various functions of our body such as Physical, Cardiovascular and Neurological functions. People with Diabetes Mellitus tend to be inactive as compared to the general population with a great number of people not achieving minimum level of required physical activity. It is evident that poor muscle strength affects the ability of motor function and thus increases the fear of fall in older adults. So, the objective of this study is to compare the physical activity and fear of fall in older adult with and without Diabetes.

Methods: An Observational Study was conducted in the Old Age Homes of Ahmedabad City. Physical Activity Scale for Elderly (PASE) and Falls Efficacy Scale (FES) were filled by 100 people (50 with and 50 without diabetes) between the age group of 60-80 years. Ethical approval has been taken.

Result: SPSS Version 29 Software was used for Data Analysis. Mann Whitney U test was used to compare physical activity (PA) and fear of fall (FOF) in geriatric population. The result for Physical activity and Fear of Fall with and without Diabetes was significant with P value of $p=0.029$ and $p=0.008$ respectively.

Conclusion: The study revealed that in the geriatric population, participants with diabetes exhibited lower levels of physical activity compared to those without diabetes. Additionally, individuals with diabetes reported higher levels of fear related to falling.

Clinical Implications: Chair Aerobics, Physical Fitness and Balance Training.

Keywords: Physical Activity, Fear of Fall, Diabetes

INTRODUCTION

Aging is a natural and complex process affected by many factors, which can be divided into internal factors (primary aging such as genetic factors), external factors (secondary aging such as psycho-social and environmental factors) and associated with influences of the disease. ⁽¹⁾ The definition of old age is changing, especially in developing countries where the average life expectancy exceeds 80 years. Gerontologists divide the elderly into

younger older adults (60-74 years), older adults (75-85 years), and the very old adults (>85 years). ⁽²⁾ Human aging has a decline in cognitive function, cardiovascular (CV), muscle function (sarcopenia), and neuromotor function (dynapenia). Therefore, loss of independence in the elderly is associated with neurodegeneration, decreased muscle strength and increased physical fatigue. ⁽³⁾ Physical activity is thought to play an important role in maintaining health and

well-being in the elderly. ⁽⁴⁾ With aging, structural and functional deterioration occur in most organs, even in the absence of disease. These age-related physical changes affect many tissues, organs, and functions that affect the activities of daily living (ADL) and independent physical care of the elderly. ⁽⁵⁾

However, longevity comes at a cost of more serious illness, poor work and mental health, and eventual loss of independence ⁽⁶⁾, all associated with increased medical service use and reduced quality of life for the elderly. ⁽⁷⁾ The physical factors responsible for the age-related decline in muscle mass, strength and endurance are many, but can be partially eliminated by changes in skeletal muscle and function. Decreased muscle mass has been identified as the main cause of age-related loss of muscle mass (largely explained [90% of variance]). ⁽⁸⁾ Therefore, previous research supports association of muscle strength & power with exercise endurance & physical activity in older adults. ⁽⁹⁾

Senescent loss of muscle mass with age is accompanied by an increase in the intramuscular content of soft tissue, which can affect intramuscular muscle strength and endurance. ⁽¹⁰⁾ Regular physical activity increases the average life expectancy by reducing the effects of aging and preventing the development of chronic diseases. Physical activity may also limit the effects of secondary aging by restoring functional capacity in older adults. ⁽¹¹⁾ Daily physical activity is defined as regular physical activity that results in increased exertion of skeletal muscles in daily life. ⁽¹²⁾

It is clear that muscle weakness increases the fear of falling among the elderly ⁽¹³⁾ Falls are a problem for the elderly, and in the context of fall prevention in India, research has focused on the identification and management of risks, but little research has been done on the incidence of falls and their associated complications. ⁽¹⁴⁾ Falls are considered a common problem in the elderly and a prominent cause of morbidity and mortality in the elderly. ⁽¹⁵⁾ They found that

the older adults with diabetes show an accelerated decline in muscle strength and functional capacity. ⁽¹⁶⁾

According to the World Health Organization's (WHO) Global Prevention Report, approximately 28-35% of people aged 65 and over fall each year, and this value increases with age and fatigue. ⁽¹⁷⁾ The prevalence of falls in people over 60 years of age in India has been reported to be 14-53%. ⁽¹⁸⁾ Falls and their consequences are an important public health concern, as falls have been identified as the second leading cause of non-traumatic injuries, accounting for 11% of non-injury related deaths worldwide. ⁽¹⁹⁾ They found that diabetes was a strong predictor of falls in adults, with a 41% probability of falling. ⁽²⁰⁾ Studies have reported that non-traumatic complication in falls has a negative impact on the older adults and it sometimes instill fear of fall (FOF) in them. ⁽²¹⁾ In addition, falls can cause post-fall syndrome such as dependency, lack of independence, confusion, weakness, and depression that limit working every day. ⁽²¹⁾

Kavita et al. conducted a "Study of health profile of residents of geriatric home in Ahmedabad", found that the prevalence of Diabetes in geriatric population is 14.9%. ⁽²²⁾ Elderly women with diabetes are 1.6 times more likely to fall and twice as likely to experience a fall in the past year. ⁽²³⁾ Diabetes has been identified as a risk factor for fractures and fracture-related falls and injuries in number of prospective studies. ⁽²⁴⁾ Therefore, the purpose of this study was to compare physical activity and fear of falls in older adults with and without diabetes in different old age homes in Ahmedabad.

MATERIALS & METHODS

An observational study was conducted in Ahmedabad, Gujarat, India after ethics committee approval. Data was collected through purposive sampling method. Data was collected from different old age homes in different parts of Ahmedabad. A total of 100 adults, 50 older adults with diabetes and 50 older adults without diabetes, completed

the assessment form. Older adults were selected on the basis of inclusion and exclusion. Inclusion criteria were age 60-80, both men and women, ability to read and understand English, older adults with Diabetes Mellitus and willingness to participate in the study. Exclusion criteria are cardiovascular disease (angioplasty, arterial disease, etc.), severe orthopaedic disease (osteoarthritis, gout, etc.), history of previous surgery (6-8 months), neurological diseases (Stroke, Parkinson's disease, Alzheimer's disease, etc.) and adults engaged in recreational activities such as sports, participating in marathons, etc. Participants filled out a short questionnaire that included demographic information (age, gender, phone number) and details of their medical history (if diagnosed with diabetes mellitus or another illness, whether their blood sugar levels were under control, and what type of medications) and lifestyle / behavioral habits.

The Physical Activity Scale for Elderly (PASE) is a self-report tool that measures three variables of physical activity in the last 7 days. The three different areas are (i) leisure activities, (ii) household activities and (iii) work-related activities. (i) The Leisure work scale asked older adults whether they did sitting, walking, doing light to heavy work and exercise to improve strength and endurance, and whether they did any of the above, and how much time they spent doing certain tasks. (ii) The Housework task asks the older adults if they have done any housework, which can be light or heavy. (iii) Work-related activity older adults were asked if they had previously worked as paid or volunteers and, if so, for how long in the last 7 days. PASE scores are calculated from weight and frequency values for each of the 12 tasks. Answers to the first question of these activities are not scored. Weight and frequency results for each combination and

each step can be viewed from the PASE handle to calculate the PASE score. ⁽²⁵⁾ The test-retest reliability coefficient of the Physical Activity Scale for Elderly (PASE) is 0.75 for indoor and outdoor activities, regardless of who does the actual work. ⁽²⁶⁾ The Fall Efficacy Scale (FES) is designed to be used in adults to assess concerns about falling during social and physical activities inside and outside the home, and whether the person can do the activity. This is a 16-item self-administered questionnaire that asks individuals to rate their concern about falling during a task on a 4-point Likert scale, with 1 indicating "not concerned at all" and 4 showing "very concerned". Items are aggregated together to obtain a total score, and higher scores indicate greater concern about fall. Fall concerns were classified as low, moderate, and high concerns of falling, with scores of 16-19, 20-27, and 28-64, respectively. ⁽²⁷⁾ The Fall Efficacy Scale (FES) has a test-retest reliability coefficient of 0.96. ⁽²⁸⁾

STATISTICAL ANALYSIS

Statistical analysis was performed using SPSS version 29 software and data was collected from several old age homes in Ahmedabad. The Kolmogorov-Smirnov test was used to test the normal distribution of the data and found that the data was not normally distributed. Therefore, the Mann-Whitney U-test was used to compare physical activity and fear of falls in an geriatric population with and without diabetes.

RESULT

The mean age of 100 participants was 70.76 ± 6.78 years (range 60-80 years), of which 62 (62%) were female. Participants with diabetes ($n = 50$) were slightly younger than participants without diabetes ($n = 50$) with mean ages of 69.64 (SD 6.68) and 71.88 (SD 6.76), respectively. (Table I)

Table I: - Demographic Data of the Participants.

	With Diabetes (N=50)	Without Diabetes (N=50)
Age (y)	69.64 ± 6.68	71.88 ± 6.76
Gender (Male)	18(36%)	20(40%)
(Female)	32(64%)	30(60%)

Based on the analysis, it appears that individuals with diabetes (n = 50) had lower mean Physical Activity Scale for the Elderly (PASE) scores compared to participants without diabetes (n = 50). The mean PASE score for individuals with diabetes was 78.98, while it was 99.98 for those without diabetes. This difference in physical activity between the two groups was found to be statistically significant, with a p-value of 0.029. (Table II)

Additionally, the data indicates that individuals with diabetes expressed greater concern about falling compared to those

without diabetes. The mean scores on the Falls Efficacy Scale (FES) for individuals with diabetes and without diabetes were 31.14 and 28.86, respectively. The difference in fear of falling between the two groups was also found to be statistically significant, with a p-value of 0.008. (Table II)

These findings suggest that individuals with diabetes in the study were less physically active and had a higher level of concern about falling compared to those without diabetes.

Table II: - Mean value and p-value of PASE & FES among Geriatric Population with and without Diabetes

	With Diabetes (WD)	Without Diabetes (WoD)	
	Mean	Mean	p-value
PASE	78.98	99.98	0.029
FES	31.14	28.86	0.008

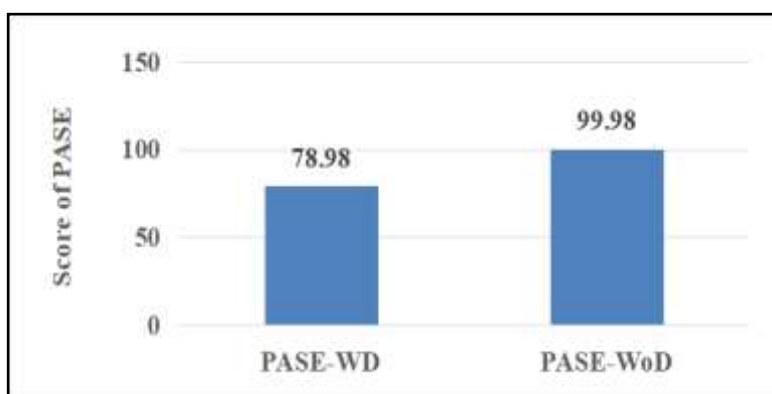


Figure 1: - Mean of PASE among Geriatric Population with and Without Diabetes

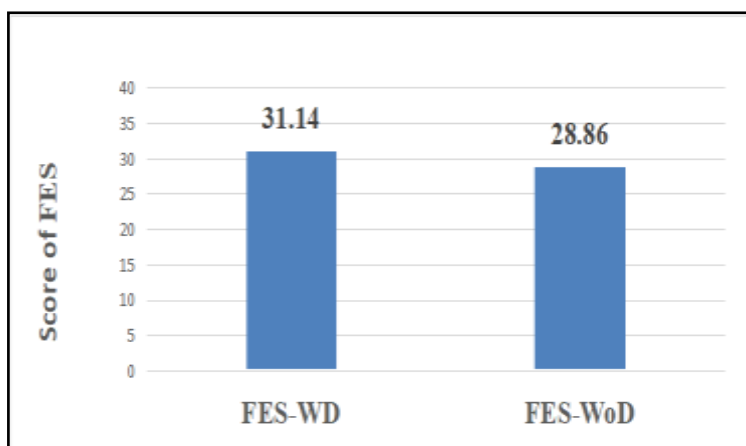


Figure 2: - Mean of FES among Geriatric Population with and Without Diabetes

DISCUSSION

This study demonstrated that in a mixed population of older persons with and without diabetes, Diabetes Mellitus has a significant impact on physical activity and

fear of falls. Out of the participants with diabetes, approximately 66% (33 individuals) exhibited significant concerns related to their fear of falling. In comparison, among the participants without

diabetes, this figure was lower at 40% (20 individuals). This suggests that individuals with diabetes are more likely to experience fear of falls. Furthermore, the study indicated that approximately 68% (34 individuals) of the participants with diabetes had low to moderate levels of physical activity. These findings suggest that diabetes has a significant impact on physical activity levels in this group.

Physical activity declines by 40% to 80% as people age, which increases the risk of metabolic disorders and other chronic illnesses such as cancer, diabetes, cerebrovascular disease, and cardiovascular disease.⁽²⁹⁾ Zoran et. al. has found that both men and women experience a decline in functional fitness as they age, which can be attributed, at least in part, to the decrease in physical activity.⁽³⁰⁾ Specifically, there is evidence suggesting that aging leads to a decline in upper-limb strength in elderly men⁽³¹⁾ and women.⁽³²⁾ Insufficient physical activity among older individuals can contribute to a variety of health issues. Chronic illnesses, including metabolic disorders, cardiovascular diseases, and diabetes, are more prevalent in individuals who are physically inactive.⁽³³⁾ In addition, inadequate physical activity has been linked to cognitive decline, poor social skills, and obesity in older adults.⁽³⁴⁾

Bruce et al. discovered that individuals with type 2 diabetes experienced a higher rate of indoor activity limitation compared to those without diabetes. This suggests that diabetes may contribute to functional limitations and reduced physical activity levels.⁽³⁵⁾ Kelly et al. conducted a study on geriatric participants and found that a significant percentage (38.2% to 44.2%) expressed moderate to high levels of concern about falling. Fear of falling can lead to activity restriction, as individuals may avoid certain activities or environments due to fear of injury.⁽³⁶⁾ Roman et al. identified diabetes as a strong predictor of falls in adults. Their study showed a 41% probability of falling in individuals with diabetes. This highlights the increased risk of falls associated with

diabetes, which can be attributed to various factors such as neuropathy, muscle weakness, and impaired balance.⁽³⁷⁾ Another study emphasized falls as a significant health problem among older adults. The study aimed to identify risk factors and circumstances surrounding falls. Understanding these factors can help develop strategies for fall prevention¹⁴. Overall, these results highlight the association between diabetes, fear of falls, and reduced physical activity in older individuals. It suggests that individuals with diabetes may face unique challenges in maintaining physical activity and managing their fear of falling compared to those without diabetes

CONCLUSION

The study revealed that in the geriatric population, participants with diabetes exhibited lower levels of physical activity compared to those without diabetes. Additionally, individuals with diabetes reported higher levels of fear related to falling. To build upon these findings, future studies could be conducted with larger sample sizes to provide more robust evidence. One potential area of investigation could be exploring the relationship between the duration of diabetes and changes in physical activity levels and fear of falling. By observing individuals with diabetes over different duration of the condition, researchers may gain insights into how these factors evolve over time. Studies can be conducted on the same groups with different outcome measures i.e., Cardiovascular Endurance, Hand Grip Strength, etc. To address the observed lower levels of physical activity and higher fear of falling in individuals with diabetes, it is crucial to develop appropriate interventions and solutions. These may include tailored exercise programs such as chair aerobics, physical fitness training, and balance training, among others. By focusing on targeted interventions, researchers and health-care professionals can aim to increase physical activity levels and reduce

the fear of falling in this population, ultimately enhancing their overall well-being and quality of life.

Declaration by Authors

Ethical Approval: Approved

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