COMPARING THE RISK OF FALLS IN OLDER ADULTS WITH FALL HISTORY AND WITHOUT FALL HISTORY USING THE TINETTI PERFORMANCE ORIENTED MOBILITY ASSESSMENT SCALE.

An Observational-Comparative study

1st **Sheetal Chandrabahadur Gharti,** 2nd **Dr Neha Deshpande**

2nd Associate Professor & HOD
Of Community Physiotherapy Department.
LSFPEF's College Of Physiotherapy, Nigdi, Pune, India.

Abstract: Background- In people older than 65 years, falls are a major cause of morbidity and mortality. A single fall leads to the loss of confidence, activity restrictions, increased dependence and fear of falling. Individuals with more than one episode of fall may have functional decline, depression and decreased quality of life. A prior history of falls is the most potent predictor of future falls. POMA scale is brief and reliable to measure gait and balance for early detection of the risk of falls in the elderly with no history of falls and to prevent recurrence in individuals with a history of falls.
Methodology- Ethical approval has been obtained. The subjects chosen ranged in age from 65-75 years old. We then divided the population into 2 groups. Group A- Elderly with fall history (Maximum one episode of fall in previous 6 months). Group B- Elderly with no fall history (History of fall before past 6 months). We then used the Tinetti POMA scale to compare the risk of falls in both groups. Individuals' static and dynamic balance ability in a chair and also in standing was scored and then the individuals' gait in a 15 feet even walkway was scored. Both the scores of balance and gait were noted and the risk of fall of the individuals according to the POMA scale was predicted.
Result- A total population of 116 elderly were taken between the age of 65-75 including both groups. Elderly with fall history have 29.31% high risk, 51.72% medium, 18.9% low and Elderly with no fall history have 8.62% high risk, 50% medium, 41.37% low.
Conclusion- The study concluded that the risk of falls in the elderly with a fall history is significantly higher than in those without a fall history.

KEY WORDS: Fall, Elderly, Risk of fall, POMA scale, Confidence, Fear.

INTRODUCTION

Each year, 30% of community-dwelling elders and 60% of institutionalized elders older than 65 years face falls. Due to falls, there is an increased morbidity and mortality rate in older adults more than 65 years. A single fall results in fear of falling, loss of confidence in one's ability to perform a routine task, activity restriction, seclusion and increased dependency which leads to the weakness of muscle, joint stiffness, mobility restrictions and causes more fall. There are various risk factors associated with falls and are classified as Intrinsic (host), Extrinsic (Environmental), and Stressors. Falls due to intrinsic factors are dizziness, weakness, difficulty walking and confusion whereas Extrinsic factors include slippery surfaces, loose rugs, poor lighting, obstacles etc. [1] Stressors include the susceptibility of a person to fall and it depends on how close to a falling threshold a person sits. Older people are closer to the threshold. It can be internal (orthostatic hypotension causing transient dizziness) or external (a gust of wind, nudge in a crowded shop). [2]

Elderly having a history of falls may have fear of falls, a decline in functional activities, depression and reduced quality of life.[1] The elderly with gait or balance problems are at higher risk of falls.[3] Multiple studies suggest that the strongest risk factors for falls are (a) previous falls (b) decreased muscle strength (c) gait and balance impairment (d) specific medications used.[4] Medications like hypnotics, sedatives, tricyclic antidepressants and antihypertensive drugs can cause more risk of falls due to their side effects.[3] Older adults with a fear of falls have reduced stability and gait changes (decreased stride length, reduced speed, increased stride width, increased double support time).[5]

BALANCE- The body's position is maintained in equilibrium (either at rest) static equilibrium or (in motion) dynamic equilibrium by a dynamic process called Balance. When the body's centre of mass (COM) or centre of gravity (COG) is maintained over its base of support (BOS) the balance is greatest. A wide BOS increase stability whereas a narrow BOS or walking reduces stability. As long as the COG is maintained within the limit of BOS the person will not fall. [5]

A person must receive information about his body position or trajectory in space through his Sensory Systems. The vision system detects the subtle differences in shapes, and letters through acuity, shading patterns through contrast sensitivity, able to see the side objects by peripheral vision, and able to distinguish distance through depth perception. CNS must receive information about the head movement and positions provided by the Vestibular system mainly otoliths and semicircular canal. The somatosensory system provides proprioceptive inputs to the CNS from joint, tendon and muscle receptors.[1]

CNS receives information from sensory systems processes it with previously learned responses and executes an automatic postural response. EMG findings of normal adults have a latency of 100-120 m sec whereas in healthy older adults the

latencies are delayed by approximately 20-30 m sec. Studenski and colleagues reported evidence of delayed latency in healthy adults and the latency is further delayed in older adults with a history of unexplained falls. [1]

Musculoskeletal systems carry the response through the effectors about the strength, range of motion, flexibility, endurance etc. Studenski reported that elderly fallers have a weaker lower extremity torque compared to non-fallers.[1]

GAIT- When comparing the kinematic and temporal variables of elderly people with younger groups, they found that in the elderly there is, a decrease in natural walking speed, shorter stride and step length, increased double support time, a smaller ratio of swing to support phases which increases stability. A Significantly higher heel velocity at initial contact and not picking their feet up as high increases the tendency of slip-induced fall or trip.[7] Elderly men have a wide-base, short-stepped gait, women have a narrow-based, waddling gait. These changes are seen due to the white matter changes in the brain. [8]

POMA- The Performance Oriented Mobility Assessment Scale developed by Tinetti measures both balance and gait. [9] The sensitivity and specificity are 64% and 66% respectively. [5] Two subtests calculating Balance and Gait. Balance includes sitting balance, sitting to stand, standing to sit, standing with eyes closed and nudging on the sternum, and Turning 360 degrees. Gait includes initiation of gait, missed path or steps, turning and timed walk. Items are scored on a two-point (0-1) or three-point (0-2) scale. The total score is 28. Individuals below 19 are at higher risk, 19-24 at moderate, and 25-28 at low risk.[9]

OBJECTIVES-
To check the risk of falls in older adults with a fall history
To check the risk of falls in older adults without a fall history.
To compare the risk of falls in older adults with fall history and without fall history.

METHODOLOGY-
The study was an observational-comparative study. The setup was in a nearby area. The sampling technique was purposive. The sample size was 116. Study duration 6 months. Inclusion criteria groups were under 65-75years of age. Both elderly males and females were included. Group A was elderly having a maximum of 1 fall in the previous 6 months. Group B elderly has no fall history. Exclusion criteria groups were elderly having Musculoskeletal, Psychological and Neurological disorders, recent eye surgery, and history of surgery in the past 6 months, Group A elderly having more than 1 episode of fall in previous 6 months were excluded, Group B elderly having fall history before past 6 months were excluded.

OUTCOME MEASURE- Tinetti performance-oriented mobility assessment scale.

PROCEDURE-
Permission from the ethical commission and consent from elders was taken. Elders as per the inclusion criteria were chosen. We then divided the populations into 2 groups. A total of 116 subjects were taken.
Group A- Elderly with a fall history.
Group B- Elderly without a fall history.
POMA scale subtests - Measures Balance in sitting and standing and other measures gait in 15 feet even walkway.
BALANCE- Individuals were asked to sit on a chair and then asked to rise and stand. The patient then turns 360^0 and sat back down. While testing evaluator will look at several points including how the individual rise up and sits down. Whether they sit or stand upright. What happens when individuals close their eyes and are given a push on their sternum?
GAIT- Individuals were asked to walk a 15 feet walkway at normal speed followed by turning and returning and sitting back on the chair. The evaluator here looks for the smoothness, length, height, symmetry and continuity of the steps and also straightness of the trunk.

DATA ANALYSIS AND INTERPRETATIONS
GENDER-WISE DISTRIBUTION OF ELDERLY POPULATIONS-
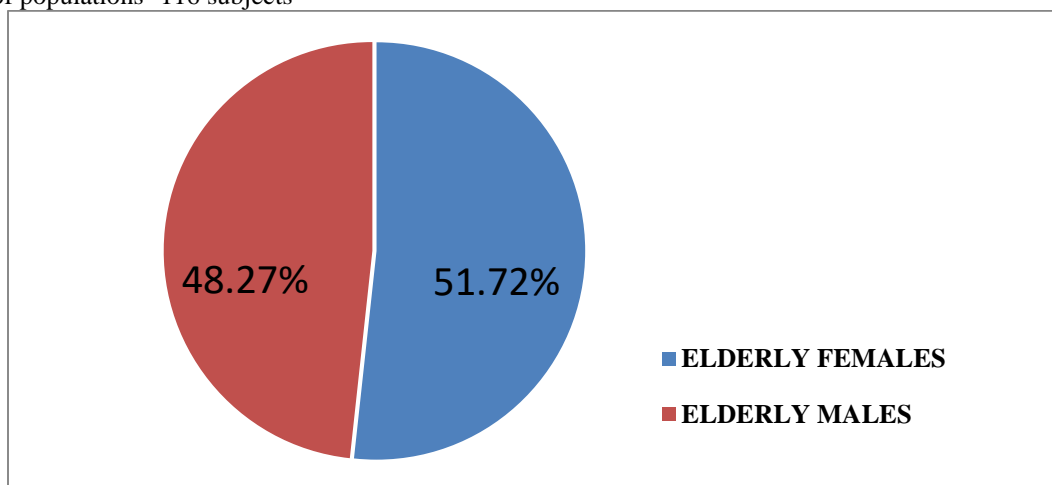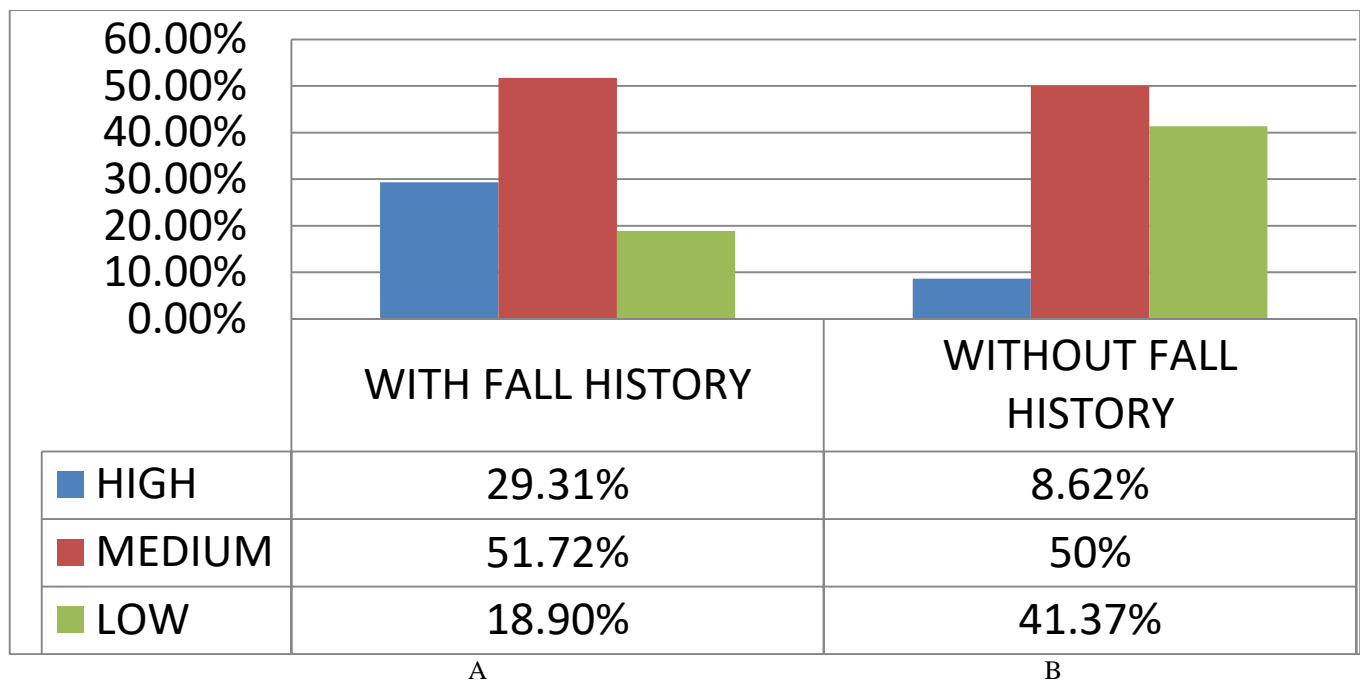Total number of populations- 116 subjects

FIGURE 1

Figure 1 shows that out of 116 subjects,
51.72% are elderly female subjects with and without a fall history.
48.27% are elderly male subjects with and without a fall history.

COMPARISON OF RISK OF FALL IN OLDER ADULTS WITH AND WITHOUT FALL HISTORY.

	WITH FALL HISTORY	WITHOUT FALL HISTORY
■ HIGH	29.31%	8.62%
■ MEDIUM	51.72%	50%
■ LOW	18.90%	41.37%

A   B

GRAPH 1

Graph 1.A. shows that out of 58 elderly subjects with fall history,
- 29.31% of elderly subjects with a fall history are having a high risk of falls.
- 51.72% of elderly subjects with a fall history are having a medium risk of falls.
- 18.9% of elderly subjects with a fall history are having low risk of falls.

Graph 1.B. shows that out of 58 elderly subjects with no fall history,
- 8.62% of elderly subjects with no fall history are having a high risk of falls.
- 50% of elderly subjects with no fall history are having a medium risk of falls.
- 41.37% of elderly subjects with no fall history are having low risk of falls.
-

DISTRIBUTION OF POPULATION ACCORDING TO THEIR FALL HISTORY.

LEVEL OF RISK OF FALL IN ELDERLY WITH FALL HISTORY	NO. OF SUBJECTS
HIGH	17
MEDIUM	30
LOW	11

TABLE 1

Table 1 shows that out of 58 elderly subjects with fall history,
- 17 elderly subjects with a fall history are having a high risk of falls.
- 30 elderly subjects with a fall history are having a medium risk of falls.
- 11 elderly subjects with a fall history are having low risk of falls.

LEVEL OF RISK OF FALL IN ELDERLY WITH NO FALL HISTORY	NO. OF SUBJECTS
HIGH	5
MEDIUM	50
LOW	24

TABLE 2

Table 2 shows that out of 58 elderly subjects with no fall history,

- 5 elderly subjects with a fall history are having a high risk of falls.
- 50 elderly subjects with a fall history are having a medium risk of falls.
- 24 elderly subjects with a fall history are having low risk of falls.

RESULT

Our study focuses on the elderly population to check their risk of falls. A total number of 116 samples were taken in this study, which included both elderly males and females having a history of falls and having no history of falls between the ages of 65-75 years. To compare both the groups' risk of falls we divided the groups into equal populations. Based on the above study,

Figure 1 shows the Gender wise distribution of the population of elderly males and females, which shows that out of 116 elderly subjects, 51.72% are elderly female subjects with and without fall history. 48.27% are elderly male subjects with and without a fall history.

Graph 1 shows the Comparison of the risk of falls in older adults with and without fall history, in which Graph 1.A. shows that 29.31% of elderly subjects with fall history are having a high risk of falls. 51.72% of elderly subjects with a fall history are having a medium risk of falls. 18.9% of elderly subjects with a fall history are having low risk of falls and Graph .1.B. shows that out of 58 elderly subjects with no fall history, 8.62% of elderly subjects with no fall history are having a high risk of falls. 50% of elderly subjects with no fall history are having a medium risk of falls. 41.37% of elderly subjects with no fall history are having low risk of falls.

DISCUSSION

This study determined the risk of falls in older adults with a fall history and without a fall history. A single fall results in fear of falling, loss of confidence in one's ability to perform a routine task, activity restriction, seclusion and increased dependency which leads to the weakness of muscle, joint stiffness, mobility restrictions and causes more fall. Elderly having a history of falls may have fear of falls, a decline in functional activities, depression and reduced quality of life. [1]

In the study done by **VP, Wakefield DB, Hall CB, Wolfson LI**., Mobility assessment: sensitivity and specificity of measurement sets in older adults - POMA scores. These measures the superior sensitivity in predicting injury due to falls and also sensitive and specific prediction of multiple falls'.[10]

Seifolah Jahantabinejad et.al, Diagnostic accuracy of Performance Oriented Mobility Assessment in community-dwelling older adults. The results of the current study indicated that POMA is a suitable and sensitive measure for predicting the risk of falls in inactive/low physically active older adults and may reveal balance deficits that could cause falls in sufficiently physically active older adults.[11]

MELZER et.al, Postural stability in the elderly: a comparison between fallers and non-fallers, Results suggest that control of balance in a narrow base stance may be an important tool in identifying elderly fallers. The findings show an increase in mediolateral sway in narrow base stance in older people who experienced recurrent falls. [12]

Thurmon E. Lockhart et.al, Effects of Obesity and Fall Risk on Gait and Posture of Community-Dwelling Older Adults, says that there are significant differences observed in a multitude of postural and gait stability measures comparing obese/non-obese fallers and non-fallers. Obese fallers fell significantly more than non-obese fallers Significant differences were observed in a multitude of postural stability measures between fallers and non-fallers as well as obese and nonobese individuals. The study suggests that the body-weight influences postural balance and gait stability in obese older individuals utilizing traditional biomechanical parameters.[13]

Ginette Azizah Mbourou et.al, Step length variability at gait initiation in elderly fallers and non-fallers and young adults, elderly fallers have small step length and increased double support time this variability is almost twice greater than observed in non-fallers.[14] **Tiffany F Hughes et al.,** In their article Executive function, predicts the decline in mobility after a fall: The MYHAT study shows that there is a decline in mobility in fallers significantly in sedentary and over body mass index elders.[15]

N Swiatoniowska-Lonc et al, concluded in their study Falls among patients with hypertension - preliminary study, that Patients having HTN are at a high risk of falls. The risk of falls in patients with HTN is the use of diuretics and the co-occurrence of ischemic heart disease or heart failure, while beta-blockers and a higher DBP value are factors reducing the risk of falling.[16]**Mary E. Tinetti**, et al in her study Antihypertensive Medications and Serious Fall Injuries in a Nationally Representative Sample of Older Adults states that Antihypertensive medications were associated with an increased risk of serious fall injuries, particularly among those with previous fall injuries.[17] **Ryan T. Crews**, et al, A Growing Troubling Triad: Diabetes, Aging, and Falls says that There is a significant and troubling link between diabetes (DM) and falls in the elderly. Individuals with DM are prone to falling for reasons such as decreased sensorimotor function, musculoskeletal/neuromuscular deficits, foot and body pain, and pharmacological complications. Additionally, there is some concern that DM patients are prone to have more severe problems with falls than non-DM individuals. Fractures, poorer rehabilitation, and an increased number of falls are all concerns.[18]

YU YANG et al, in their study Diabetes mellitus and risk of falls in older adults: a systematic review and meta-analysis concluded that older adults with diabetes are associated with an excessive risk of falls compared with non-diabetes. Moreover, the increased risk appears to be greater in insulin-treated patients. Hypoglycemia induced by intensive glycemic control or peripheral neuropathy and retinopathy induced by loose glycemic control may increase the risk of falls. [19]

CONCLUSION

This study concluded that the risk of falls in the elderly with a fall history is significantly higher than in those without a fall history.

REFERENCES:

1. Andrews A. Guccione, Geriatric Physical Therapy, 2nd edition, published by Mosby, An imprint of Elsevier, pages 280-284.
2. Lesley K. Bowker, James D. Price, Sarah C. Smith, Oxford Handbook of Geriatric Medicine, 2nd edition, published by Oxford University Press, page 102.
3. Halter J.B, Ouslander J.G, Tinetti M.E, Studenski S, High K.P, Asthana S, Hazzard's Geriatric Medicine and Gerontology, 6th edition, published by Mc Graw Hill Education, page 116-663.

4. Brie A. Williams, Anna Chang, Current Diagnosis and Treatment: Geriatrics, 2nd edition, published by Mc Graw Hill Education, page 151.
5. Carolyn Kisner, Lynn Allen Colby, John Borstad, Therapeutic Exercise Foundations and Techniques, 7th edition, published by Jaypee Brothers, pages 264-274.
6. Bharati Bellare, Textbook Of Preventive Practice & Community Physiotherapy, 1st edition, published by Jaypee Brothers, page 361.
7. Pamela K. Levangie, Cynthia C. Norkin, Joint Structure and Function A Comprehensive Analysis, 5th edition, published by Jaypee Brothers, pages 525-559.
8. Robert L Kane, Joseph G Ouslander, Itamar B Abrass, Barbara Resnick, Essentials of Clinical Geriatrics, 7th edition, published by Mc Graw Hill Education, page 230.
9. Susan B. O'Sullivan, Thomas J. Schmitz, George D. Fulk, Physical Rehabilitation,6th edition, published by Jaypee Brothers, page 234.
10. VP, Wakefield DB, Hall CB, Wolfson LI. Mobility assessment: sensitivity and specificity of measurement sets in older adults. Arch Phys Med Rehabil 2011; 92:905-912.
11. Seifolah Jahantabinejad, Akram Azad, Robab Sahaf, Babak Mohammadi, Ghorban Taghizadeh, Diagnostic accuracy of Performance Oriented Mobility Assessment in community-dwelling older adults. Journal of Clinical Gerontology & Geriatrics 2018;9(3):105-111.
12. MELZER, N. BENJUYA, J. KAPLANSKI, Postural stability in the elderly: a comparison between fallers and non-fallers, Age and Ageing, 2004; 33: 602–607.
13. Thurmon E. Lockhart, Christopher W. Frames, Rahul Soangra, Abraham Lieberman, Effects of Obesity and Fall Risk on Gait and Posture of Community-Dwelling Older Adults, Int J Progn Health Manag, 2019; 10(1): 019.
14. Ginette Azizah Mbourou, Yves Lajoie, Normand Teasdale, Step Length Variability at Gait Initiation in Elderly Fallers and Non-Fallers, and Young Adults, Gerontology 2003;49:21–26
15. Tiffany F. Huges,   Joanne C. Beer, Erin Jacobsen, Mary Ganguli, Chung-Chou H. Chang Caterin Rosano, Executive Function Predicts Decline in Mobility after a Fall: The MYHAT Study, Published in final edited form as Exp Gerontol. 2020 August; 137: 110948
16. N Swiatoniowska-Lonc, E Jaciow, J Polanski, B Jankowska-Polanska, study Falls among patients with hypertension – a preliminary study, European Journal of preventive cardiology, Volume 28, 1 May 2021.
17. Mary E Tinetti, Ling Han, David S H Lee, Gail J McAvay, Peter Peduzzi, Cary P Gross, Bingqing Zhou, Haiqun Lin, Antihypertensive medications and serious fall injuries in a nationally representative sample of older adults, JAMA Intern Med. 2014 Apr: 174(4): 588-595.
18. Ryan T. Crews, Sai V. Yalla, Adam E. Fleischer and Stephanie C. Wu, A Growing Troubling Triad: Diabetes, Aging and Falls, Journal of Aging Research Volume, 2013, Article ID 342650, 6 pages
19. Yu Yang Xinhua Hu, Qiang Zhang, Rui Zou, Diabetes mellitus and risk of falls in older adults: a systemic review and meta-analysis, Age Ageing, 2016 Nov; 45(6): 761-767.