ORIGINAL ARTICLE

A Study of Fall Risk Assessment in Elderly Patients Based on Diabetes and its Significance

Tanuka Mandal[1], Sanjit Mal[2], Purbasha Biswas[3], Jyotirmoy Pal[4]

Abstract

Background: With a rise in the elderly population worldwide, falls have been seen to cause a substantial increase in mortality and morbidity in this age group. Multiple factors have been held responsible for resulting in falls, which can be broadly classified as intrinsic causes and extrinsic causes. Diabetes along with hypertension has been considered to be one of the major intrinsic causes leading to increase in incidence of fall.

Materials and methods: The objective of the study was to find out estimation of fall risk among diabetic elderly with history of fall in last 6 months and evaluation of its recurrence over the next 1 year. This prospective observational cohort study was conducted at Outpatient Department of General Medicine Department of RG Kar Medical College, Kolkata, West Bengal, India, from July 2017 to September 2018. Data were collected from 116 elderly patients.

Results: Our study demonstrated that patients on insulin along with oral hypoglycemics (OHA) had increased number of falls through the next year. Diabetes was also found to be significantly associated with intrinsic fall. Number of falls through next year was significantly associated with taking patients insulin.

Conclusion: This study reveals that diabetes along with use of antidiabetics in elderly population increased risk of fall in this population. With the elderly population increasing in West Bengal, larger studies will help to explain the increased incidence of fall in all diabetic elderly population further.

Keywords: Diabetes, Elderly, Falls, Insulin, Oral hypoglycemic agents.

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Introduction

Globally, the number of people above 60 years of age is growing at a rapid rate. In India, the elderly population that is individuals aged more than 60 years have increased from 7.6 million in the year 2001 to a staggering 104 million in 2011, constituting 8% of the population. While Kerala is the fastest ageing state in India with 12.6% of its population consisting of elderly individuals, West Bengal is not far behind with 8.2% of its population belonging to aged community. The urban proportion of population in West Bengal is much more than the corresponding rural share, which is more conducive for increased prevalence of risk factors of non-communicable diseases.

The age-related physiological changes, presence of other comorbidities, numerous medications, delayed functional recovery along with unfriendly environment around the elderly people have increased the susceptibility of fall in this population. Non-communicable diseases like diabetes, hypertension and cardiovascular diseases are more commonly found in this population, which adversely affects the risk of a fall in this population.

Falls are more common in diabetic elderly individuals.[1] Diabetes can lead to falls in elderly by different ways. They have higher prevalence of vision impairment in comparison with non-diabetic elderly individuals. Orthostatic hypotension secondary to autonomic neuropathy can also increase the incidence of falls. Apart from hypoglycemia, long-term complications of diabetes like the diabetic neuropathy, retinopathy, or chronic ulcers also predisposed the elderly population to increase number of falls. Thus, the recent guidelines of treatment of diabetes mellitus in the elderly, states the importance of treatment of hyperglycemia, while paying attention to reduce exposing the elderly individuals to hypoglycemia by over treatment or hyperglycemia by under treatment.

[1–4]Department of Medicine, RG Kar Medical College and Hospital, Kolkata, West Bengal, India

Corresponding Author: Tanuka Mandal, Department of Medicine, RG Kar Medical College and Hospital, Kolkata, West Bengal, India, Phone: +91 8013512600, e-mail: tanukamandal@ymail.com

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Materials and Methods

This institution-based prospective observational cohort study was conducted at Outpatient Department of General Medicine Department of RG Kar Medical College, Kolkata, West Bengal, India, from July 2017 to September 2018.

Inclusion Criteria

Patients aged 60 years or above having history of at least one fall in last 6 months were included in our study (attending Diabetic Clinic or Out Patient Department of General Medicine).

Exclusion Criteria

Any frail-/bed-ridden patients, any patient with history of Cerebrovascular Accident, history of Intracranial Space Occupying Lesions, history of psychiatric or any other critical illness, suffering from any systemic infections, history of major trauma or

accident leading to any limb deformity were excluded from our study.

Data were collected from 116 individuals, of whom four individuals died during the study period and two was lost to follow-up.

A predesigned and prevalidated questionnaire was presented to the individuals fulfilling the inclusion criteria and individual (one-to-one) interview based on the questionnaire was undertaken. The reliability of the screening questionnaire was established on the sample of patients both from our institution and our institutional ethical committee at West Bengal.

Clinical examination using multiple comprehensive fall risk assessment tools of these eligible elderly individuals was done. Relevant investigations were done. Telephonic follow-up were done over the next year.

The study variables included age, sex, type of fall based on cause (Intrinsic of Extrinsic) history of diabetes, history of ongoing medications like oral hypoglycemics or insulin, number of fall in last 6 months, cause of fall, Berg Balance Scale Score and number of falls through the next year.

Statistical Analysis

Data were coded and entered in MS-Excel sheet. Statistical analysis was done using SPSS version 23. Descriptive and inferential statistics were used. Categorical data were presented in percentages, pie and bar diagram. Continuous data were presented as their mean. Chi-square test was used for test of significance and logistic regression was used to predict the relationship between the variables. p-value < 0.05 was taken as significant.

Results

Data from this study which was conducted at Outpatient Department of General Medicine Department of RG Kar Medical College, Kolkata, West Bengal, India, from July 2017 to September 2018 were collected from 116 individuals, of whom four individuals died during the study period and two was lost to follow-up. Thus, 110 patients who participated in the study, 60 were males (54.55%) and 50 were females (45.45%). Age of the patients in study population ranged from 60 to 86 years. Mean age 68.76 $\pm$ 7.21358 years. From history, 72 of 110 (67.92%) patients indicated to have suffered fall due to extrinsic causes while 34 of 110 (32.07%) patients claimed to have suffered a fall due to intrinsic causes. 4 of 110 (3.77%) could not recollect the cause of the fall. 18 (16.4%) of the study population had diabetes mellitus and rest, that is, 92 (83.6%) were nondiabetics. All 18 of them (16.4%) were on oral hypoglycemics. 6 (5.5%) of the study population were on insulin as well as oral hypoglycemics. 92 (83.63%) of the population fell once during last 6 months while rest 18 (16.4%) had two episodes of fall in last 6 months.

Objectives of this study were to estimate fall risk by utilization of comprehensive fall risk assessment tools in elderly persons and to estimate long-term outcome following fall by recording the recurrence of fall in elderly over next 1 year.

Hence, Berg Balance Scale Score, one of the most common comprehensive fall risk tool, of each subject was done separately depending upon the table below.

Total Score is a maximum of 56 and the scores were classified as:

- Group A—51–56
- Group B—46–50
- Group C—<46

Function	*Score*
1. Sitting to standing	
Instructions were given to stand up. Hands should not be used for support	
Able to stand without using hands and stabilize independently	4
Able to stand independently using hands	3
Able to stand using hands after several tries	2
Needs minimal aid to stand or to stabilize	1
Needs moderate or maximal assist to stand	0
2. Standing unsupported	
Instructions given to stand for 2 mins without holding any support	
Able to stand safely 2 min	4
Able to stand 2 min with supervision	3
Able to stand 30 sec unsupported	2
Needs several tries to stand 30 sec Unsupported	1
Unable to stand 30 sec unassisted	0
If a subject is able to stand 2 min unsupported, score full points for sitting unsupported. Proceed to item 4	
3. Sitting with back unsupported but feet supported on floor or on a stool	
Instructions were given to sit with arms folded for 2 min	
Able to sit safely and securely 2 min	4
Able to sit 2 min under supervision	3
Able to sit 30 sec	2
Able to sit 10 sec	1
Unable to sit without support 10 sec	0
4. Standing to sitting	
Instructions were given to sit down from standing position	
Sits safely with minimal use of hands	4
Controls descent by using hands	3
Uses back of legs against chair to control descent	2
Sits independently but has uncontrolled descent	1
needs assistance to sit	0
5. Transfers	
Instructions were given to arrange chairs for a pivot transfer. The patient is asked to transfer one way toward a seat with armrests and one way toward a seat without armrests. Two chairs (one with and one without armrests) or a bed and a chair may be used	
Able to transfer safely with minor use of hands	4
Able to transfer safely definite need of hands	3
Able to transfer with verbal cueing and/or supervision	2
Needs one person to assist	1
Needs two people to assist or supervise to be safe	0
6. Standing unsupported with eyes closed	
Instructions were given to close the patient's eyes and stand still for 10 sec	
Able to stand 10 sec safely	4
Able to stand 10 sec with supervision	3
Able to stand 3 sec	2
Unable to keep eyes closed 3 sec but stays steady	1
Needs help to keep from falling	0
7. Standing unsupported with feet together	
Instructions were given to place his feet together and stand without holding	

Contd…

Contd…

Function	*Score*
Able to place feet together independently and stand 1 min safely	4
Able to place feet together independently and stand for 1 min with supervision	3
Able to place feet together independently but unable to hold for 30 sec	2
Needs help to attain position but able to stand 15 sec with feet together	1
Needs help to attain position and unable to hold for 15 sec	0
8. Reaching forward with outstretched arm while standing Instructions were given to lift and to 90°. The patient was asked to stretch his fingers and reach forward as far as he could. The examiner placed a ruler at the end of the fingertips when the arm was at 90°. Fingers were not to touch the ruler while reaching forward. The recorded measure was the distance forward that the patient's finger reached while the patient is in the most forward leaning position. When possible the patient should be asked to use both arms when reaching to avoid rotation of the trunk.	
Can reach forward confidently >25 cm	4
Can reach forward >12 cm safely	3
Can reach forward >5 cm safely	2
Reaches forward but needs supervision	1
Lose balance while trying/request external support	0
9. Pick up objects from the floor from a standing position Instructions were given to pick up the shoes or slippers, which were placed just in front of the patient's feet	
Able to pick up slippers safely and easily	4
Able to pick up sleepers but needs supervision	3
Unable to pick up but reaches 2–5 cm from slipper and keeps balance independently	2
Unable to pick up and needs supervision while trying	1
Unable to try/needs assistance to keep from losing balance or falling	0
10. Turning to look behind over left and right shoulders while standing Instructions were given to the patient to turn and look directly behind over the left shoulder, then repeat the same over the right shoulder	
Looks behind from both sides and weight shifts well	4
Looks behind one side only other side shows less weight shift	3
Turns sideways only but maintains balance	2
Needs supervision when turning	1
Needs assist to keep from losing balance or falling	0
11. Turn 360 degrees Instructions were given to turn completely around in a full circle, pause and then turn a full circle in the other direction	
Able to turn 360 degrees safely in 4 sec or less	4
Able to turn 360 degrees safely one side only in 4 sec or less	3
Able to turn 360 degrees safely but slowly	2
Needs close supervision or verbal cueing	1
Needs assistance while turning	0
12. Placing alternate foot on step or stool while standing unsupported Instructions were given to place each foot alternately on the step/stool. This is to be continued until each foot has touched the steps/stool four times	

Contd…

Contd…

Function	*Score*
A stopwatch, a ruler, two chairs of reasonable height and a step or stool for completing item #12	
Able to stand independently and safely and complete 8 steps in 2 sec	4
Able to stand independently and complete 8 steps in >20 sec	3
Able to complete 4 steps without aid with supervision	2
Able to complete >2 steps needing minimal assistance	1
Needs assistance to keep from falling or unable to try	0
13. Standing unsupported one foot in front Instructions and demonstration were given to the patients regarding placing one foot directly in front of the other	
Able to place foot tandem independently and hold 30 sec	4
Able to place foot ahead of other independently and hold 30 sec	3
Able to take small step independently and hold 30 sec	2
Needs help to step but can hold 15 sec	1
Loses balance while stepping or standing	0
14. Standing on one leg Instructions were given to stand on one leg as long as you can without holding	
Able to lift leg independently and hold >10 sec	4
Able to lift leg independently and hold 5–10 sec	3
Able to lift leg independently and hold = or >3 sec	2
Tries to lift leg unable to hold 3 sec but remains standing independently	1
Unable to try or needs assist to prevent fall	0

28 (50.9%) of the study population had a BBS score of 51–56 thereby falling in Group A. 18 (32.7%) of the study population had a BBS score of 46–50 thereby falling in Group B, and 9 (16.4%) had a BBS score of <46 making them fall into Group C.

It was found in Fisher's exact test (12.09) that presence of diabetes was significantly associated with the cause of fall being Intrinsic ($p = 0.018$) (Fig. 1).

It was found in Fisher's exact test (12.09) that taking oral hypoglycemic agents was significantly associated with the cause of fall being intrinsic ($p = 0.023$) (Fig. 2).

It was found in Fisher's exact test (12.09) that taking insulin was significantly associated with the cause of fall being intrinsic ($p = 0.029$) (Fig. 3).

It was found in Fisher's exact test (22.5) that the number of falls in last six months was significantly associated with taking insulin ($p = 0.016$) (Fig. 4).

It was found in Fisher's exact test (22.5) that the number of falls through next year was significantly associated with taking insulin ($p = 0.029$) (Fig. 5).

Discussion

We found that the mean age of subjects was 68.76 ± 7.21358 years with range of 60–86 years and the median age was 67.00 years. A total of 110 patients participated in the study, 60 were males (54.55%) and 50 were females (45.45%). From history, 72 of 110 (67.92%) patients indicated to have suffered fall due to extrinsic causes, while 34 of 110 (32.07%) patients claimed to have suffered

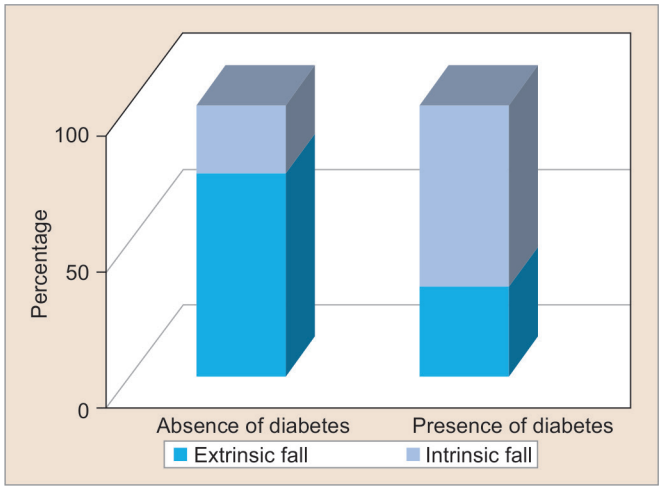

Fig. 1: 100% stacked 3D column diagram showing distribution of cause of fall with presence of diabetes in the study population

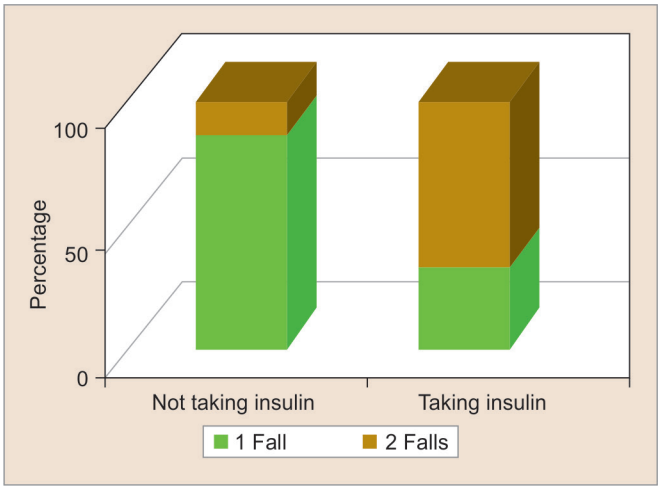

Fig. 4: 100% stacked 3D column diagram showing distribution of taking insulin with the number of falls in last six months of study population

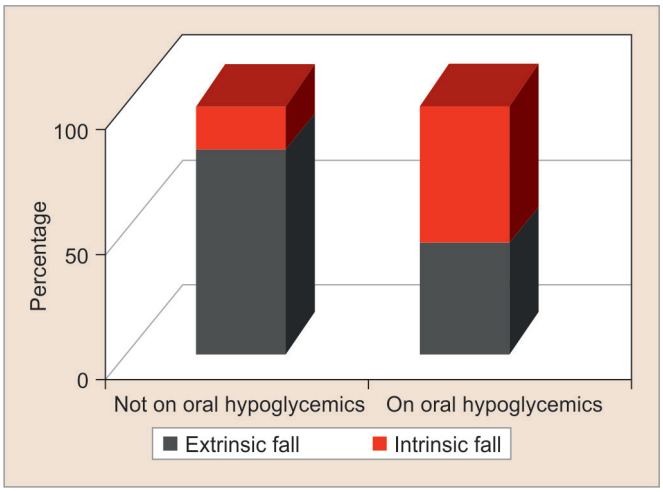

Fig. 2: 100% stacked 3D column diagram showing distribution of cause of fall with taking OHA in the study population

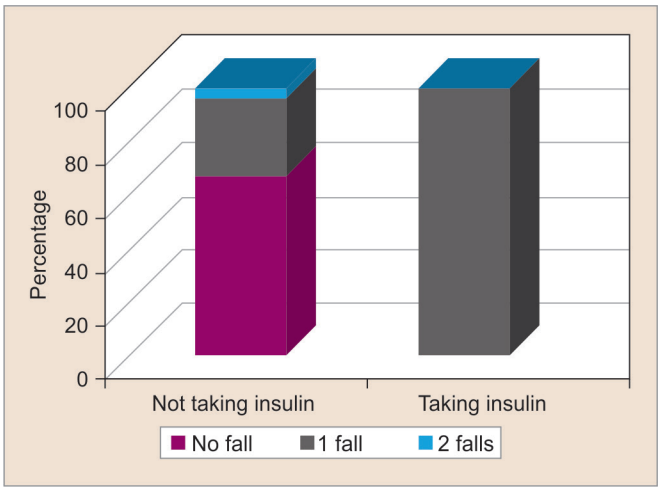

Fig. 5: 100% stacked 3D column diagram showing distribution of taking insulin with the number of falls through next year of study population

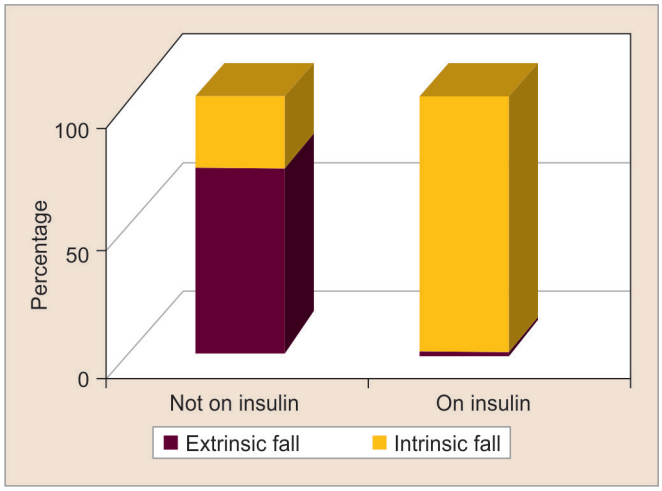

Fig. 3: 100% stacked 3D column diagram showing distribution of cause of fall with taking insulin in the study population

a fall due to intrinsic causes. 4 of 110 (3.77%) could not recollect the cause of the fall. 18 (16.4%) patients were suffering from diabetes mellitus. According to recent studies, 20% of elderly people had diabetes mellitus, while a similar portion have undiagnosed diabetes mellitus.[2] The reported frequency varies from 18 to 33%.[3] in our study, the proportion of diabetic elderly was found to be slightly lower.

Among all, 42 (38.2%) and 30 (27.3%) of the study population stated Slipped and Tripped to be the causes of fall in last 6 months, leading them to be classified as falls due to extrinsic causes. Four (3.6%) could not state the cause of their fall while the rest 32.07% claimed to have fainted, felt giddy, lost balance, stated legs gave away in an otherwise familiar environment, leading them to be classified as falls due to intrinsic causes.

Through various literature, diabetes has been shown to be significantly associated with falls in elderly.[4,5] In my study, intrinsic fall was significantly associated with presence of diabetes (Fig. 1).

Risk of falls and fall-related complications is associated with medications for diabetes also.[6] This study also showed intrinsic

causes of fall to be significantly associated with oral hypoglycemic agents and insulin (Figs 2 and 3).

Studies also show that patients on insulin therapy were found to suffer from more falls.[7] This study also showed that the number of falls in last six months and through the next year were both significantly associated with taking insulin (Figs 4 and 5).

In our study, categorized Berg Balance Scale Score was not found associated with presence of diabetes.

Conclusion

This study documented that fall is an important health hazard older population in West Bengal, a state where proportion of older persons are growing. Fall-related injuries were often serious.

With the rising incidence of diabetes in West Bengal, which is a major cause for fall due to intrinsic causes and recurrent falls, improving glycemic control in older persons without overtreatment or under treatment is urgently required.

The findings in this study will help in developing further studies to investigate other modifiable risk factors for falls and planning research to identify the role of interventions specific to our setting.

Limitations of the Study

- It is a tertiary hospital-based study. So obtained data cannot be percolated in general population.
- Sample size is smaller and based on prior studies, which did not look into all the neurological problems.
- Our screening questionnaire is not internationally accepted. Its validity and reliability were judged based on a small pilot study.
- Few investigations were not possible due to infrastructural and financial constraints.

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