

## A Prospective Study on Drugs Leading To Increase in Risk of Fall in Geriatric Patients At A Tertiary Care Hospital

**Sradha S Vinod, Blessy K George, Balakeshwa Ramaiah, K. Deekshitha**

*Department of Pharmacy Practice, Karnataka College of Pharmacy, Rajiv Gandhi University of Health Sciences, Bengaluru, Karnataka India- 560064*

**Correspondence:** Dr Sradha S Vinod

*Department of Pharmacy Practice, Karnataka College of Pharmacy, Rajiv Gandhi University of Health Sciences, Bangalore-560064, Karnataka, India*

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### ABSTRACT

**Background:** Falls in older adults are a major health risk, with nearly 29% of individuals aged 65 and older falling annually. These incidents are often worsened by medications known as Fall Risk Increasing Drugs (FRIDs). However, there is a lack of systematic reviews on the prevalence of FRIDs and effective interventions for hospitalised older adults, highlighting the need for further research.

**Aims:** The study aims to identify drug classes that increase fall risk among geriatric patients in a tertiary care hospital. It also seeks to assess patient demographics, categorise drugs contributing to fall risk, identify associated risk factors, and evaluate fall risk using the Morse Fall Scale.

**Materials and method:** This six-month prospective observational study was conducted in a tertiary care hospital, focusing on patients aged 60 and above at risk of falls. Data collected included demographic information, treatment charts, and fall risk factors, with fall risk assessed using the Morse Fall Scale.

**Results:** The study included 50 patients and common medications included antibiotics (86%), hypoglycemics (58%), and analgesics (34%). Comorbidities such as diabetes (62%) and hypertension (56%) were prevalent. Fall risk assessments revealed that 64% of patients were at high risk, and 36% were at moderate risk. Notably, 36% had an increased fall risk after starting drug therapy, 20% had a decreased risk, and 44% showed no change.

**Conclusion:** This study emphasises the importance of careful medication management in older adults, particularly with drugs that increase fall risk. It also highlights the need to monitor comorbidities, such as diabetes and hypertension, to reduce the risk of falls.

**Keywords:** fall risks, geriatric, fall risk-increasing drugs

### I. Introduction

Falls are a significant health concern for the elderly, defined as sudden, unintentional movements from standing or seated positions.<sup>1</sup> Medications are also considered as one of the risk factors for fractures.<sup>2</sup> Approximately 29% of people aged 65 and older experience a fall annually.<sup>3</sup> In hospitals, fall rates range from 2.6 to 7 per 1000 patient days, with 23% to 42% resulting in injuries, and 2% to 9% serious injuries.<sup>4</sup> Medications, particularly Fall Risk Increasing Drugs like antihypertensive, antipsychotics, sedatives, and opioids, significantly contribute to falls due to side effects such as sedation, dizziness, and impaired balance.<sup>5,6,7</sup> Despite their importance, systematic reviews on fall risk-increasing drug prevalence and interventions in hospitalised older adults are lacking.<sup>8</sup> Fall risk assessments are crucial for in-patients with recent falls or conditions like dementia, diabetes, and osteoporosis.<sup>7</sup> Tools like the Morse Fall Scale assess risk based on factors like fall history and mobility issues, though predictive validity varies.<sup>9,10</sup> Integrating medication-related risks into fall prevention programs can improve their accuracy.<sup>11</sup> This study aims to identify drug classes that increase fall risk in a tertiary hospital, informing precautionary measures like fall risk bands, side rails, daily fall score checks, and notifying physicians of potential drug adjustments.<sup>12</sup>

### II. Objectives

#### PRIMARY OBJECTIVES:

To investigate the drugs contributing to fall risk in geriatric patients.

**SECONDARY OBJECTIVES:**

- To assess the demographic details of patients involved in the study.
- To categorising drugs leading to fall risk
- To identify risk factors associated with fall risk
- To assess the risk of fall with Morse Fall Score

**III. Study Design**

**Study type and site:** This is a prospective observational study of Fall Risk Increasing Drugs (FRIDs), which was conducted in the geriatric population of a tertiary care hospital over six months.

**Study Population:** The study population included geriatric patients admitted to a tertiary care unit.

**Sample size:** A sample size of 50 was concluded based on population size, time and resource constraints.

**Source of data and Materials:**

- Patient’s case notes and demographics
- Treatment Charts
- Morse fall scale

**Method of data collection and study procedure:**

A prospective observational study was conducted in general wards. The criteria for inclusion were patients above 60 years of age, patients with one or more risks of falls based on the Morse fall score and patients with or without co-morbidities. The criteria for exclusion from the study were patients in critical care units and bedridden patients. Demographic details (age, sex, weight, date of admission, history, complaints) and treatment information (therapy details, administration route, frequency, dose, timing) were collected. Laboratory values and fall risk, assessed using the Morse Fall Scale, were recorded. The study focused on identifying drug adversities and patient-related risk factors contributing to falls. As in Fig.01.

**The flowchart:**

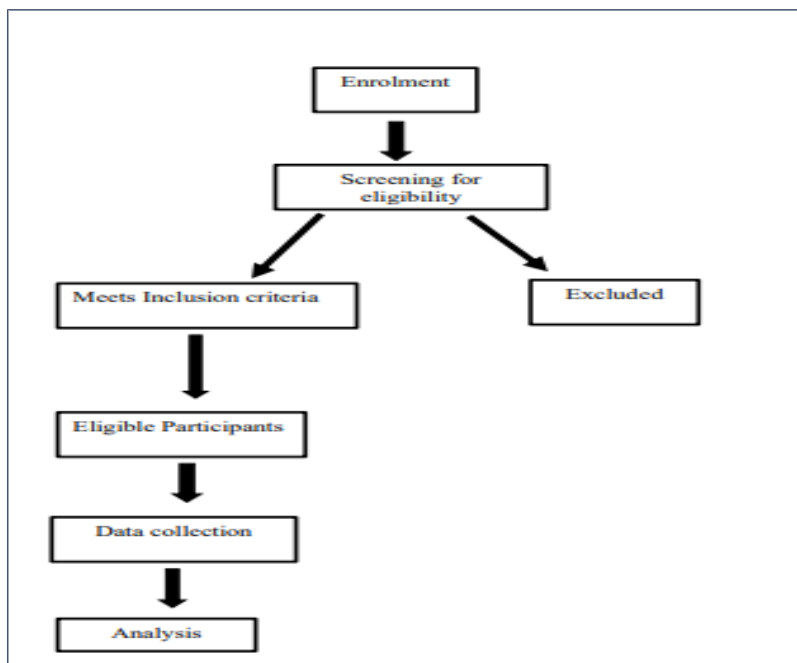


Fig. 01. The flow chart summarises the method of data collection and study procedure.

**Ethical Considerations:**

- Confidentiality: The medical data collected was handled in a manner that ensures patient privacy and confidentiality, in full compliance with ethical standards and regulations.
- Informed consent: This is an observational study, and as there are no interventional steps involved, an informed consent form was not required. Furthermore, only medical details were collected from the patients, and no personal or identifiable information was gathered.

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- Sample size:
- **Study duration:** From January 2023 to June 2023

### IV. Results

#### Socio-demographic details:

The study included 50 patients, with an equal distribution of 25 males and 25 females. Age distribution showed that 72% of patients were between 60-70 years, 8% were between 71-80 years, 14% were between 81-90 years, and 6% were between 91-100 years, depicted in Table 1.

| Table 1: Socio-demographic details |                 |                |      |        |
|------------------------------------|-----------------|----------------|------|--------|
| Age (in Years)                     | No. of Patients | Percentage (%) | Male | Female |
| 60-70                              | 36              | 72             | 18   | 18     |
| 71-80                              | 4               | 8              | 2    | 2      |
| 81-90                              | 7               | 14             | 4    | 3      |
| 91-100                             | 3               | 6              | 1    | 2      |
| Total                              | 50              | 100            | 25   | 25     |

#### List of medications and number of patients and percentage it was prescribed in 50 patients:

The medication distribution among the 50 patients was as follows: ACE inhibitors (2%), ARBs (14%), analgesics (34%), anti-inflammatories (22%), anti-Parkinson's drugs (6%), antibiotics (86%), antidepressants (10%), antiepileptics (16%), antipsychotics (4%), benzodiazepines (2%), beta-blockers (18%), CCBs (36%), diuretics (6%), respiratory condition drugs (24%), hypoglycaemics (58%), hypolipidemic (36%), and steroids (4%), details depicted in Table 2.

| Table 2: list of medications and number of patients and percentage prescribed in 50 patients |                            |            |
|--|----------------------------|------------|
| Medications  | No. of Patients Prescribed | Percentage |
| ACE inhibitors   | 1                          | 2          |
| ARBs   | 7                          | 14         |
| Analgesics   | 17                         | 34         |
| Anti-inflammatory  | 11                         | 22         |
| Anti-Parkinson's   | 3                          | 6          |
| Antibiotics  | 43                         | 86         |
| Antidepressants  | 5                          | 10         |
| Antiepileptics   | 8                          | 16         |
| Antipsychotics   | 2                          | 4          |
| Benzodiazepines  | 1                          | 2          |
| Beta-blockers  | 9                          | 18         |
| CCB  | 18                         | 36         |
| Diuretics  | 3                          | 6          |
| Drugs for respiratory conditions   | 12                         | 24         |

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|               |    |    |
|---------------|----|----|
| Hypoglycemics | 29 | 58 |
| Hypolipidemic | 18 | 36 |
| Steroids      | 2  | 4  |

**Percentage of risk factors in patients included in the study:**

The distribution of risk factors among the 50 patients was as follows: 62% had diabetes mellitus, 56% had hypertension, 10% had asthma, and 10% had ischemic heart disease. Arthritis, dementia, and Parkinson's disease were each present in 6% of patients. Chronic hyponatremia, chronic liver disease, tuberculosis, and hypothyroidism were each found in 4% of patients, while chronic kidney disease, cerebrovascular accident, and hyperthyroidism were each present in 2% of patients, details depicted in Table 3.

| Risk factors         | Number of patients | Percentage |
|----------------------|--------------------|------------|
| Arthritis            | 3                  | 6%         |
| DM                   | 31                 | 62%        |
| HTN                  | 28                 | 56%        |
| Asthma               | 5                  | 10%        |
| Chronic Hyponatremia | 2                  | 4%         |
| CKD                  | 1                  | 2%         |
| CLD                  | 2                  | 4%         |
| CVA                  | 1                  | 2%         |
| Dementia             | 3                  | 6%         |
| Hypothyroidism       | 2                  | 4%         |
| Hyperthyroidism      | 1                  | 2%         |
| IHD                  | 5                  | 10%        |
| PD                   | 3                  | 6%         |
| TB                   | 2                  | 4%         |

**Number and percentage of the patients having fall risk assessed by Morse Fall Scale:**

As shown in Table 4 the current study involved 50 patients. Out of these, 64% scored 45 above in the MFS assessment, and 36% scored 25-44 in the MFS assessment. None of them showed a low risk of falls in the MFS assessment.

| FALL RISK     | No. OF PATIENTS | PERCENTAGE |
|---------------|-----------------|------------|
| MODERATE RISK | 18              | 36%        |
| HIGH RISK     | 32              | 64%        |
| TOTAL         | 50              | 100%       |

**Number of patients and percentage of fall risk in relation to the risk factors DM and HTN.**

Table 5 shows the risk of falls in patients with diabetes mellitus and hypertension which was found to be the two conditions for which patients were under therapy the most. In patients having Diabetes Mellitus 42% have a moderate risk of fall and 58% have a high risk of fall. Of patients having hypertension, 32% have moderate risk and 68% have high risk.

**Table 5: Number of patients and percentage of fall risk in relation to the risk factors DM and HTN.**

| RISK FACTOR | MODERATE RISK (%) | HIGH RISK (%) |
|-------------|-------------------|---------------|
| DM          | 13 (42%)          | 18(58%)       |
| HTN         | 9(32%)            | 19(68%)       |

**The status of the fall risk assessed before and after the initiation of drug therapy in the patients**

As shown in table no. 06 and the fall risk score using the Morse Fall Scale was measured before and after the initiation of drug therapy. It was found that in 36% per cent of the patients it was found to increase the risk of falls, in 20% of the patients it was found to decrease the risk of falls and in 44% of the patients it was found that the risk of fall was unchanged, neither increased nor decreased the risk of fall.

**Table 6: The status of the fall risk assessed before and after the initiation of drug therapy in the patients**

| Status of Fall Risk | No. of patients | Percentage  |
|---------------------|-----------------|-------------|
| Increased           | 18              | 36%         |
| Decreased           | 10              | 20%         |
| Unchanged           | 22              | 44%         |
| <b>TOTAL</b>        | <b>50</b>       | <b>100%</b> |

**Statistical Analysis:** statistical analysis was performed using IBM SPSS statistics software for Windows, version 22 (Armonk, NY, USA). Data Analysis

- Descriptive Statistics: To summarize Socio-demographic characteristics of the study populations
- Inferential Statistics: The **McNemar test** was used to analyze the relationships between fall risk among patients before and after therapy.

**Socio-demographic details**

In a study of 50 patients, the majority (72%) were aged 60–70 years, with smaller proportions in the 71–80 (8%), 81–90 (14%), and 91–100 (6%) age groups. The gender distribution was equal, comprising 25 males and 25 females. The overall mean age was 70.54 years, with a standard deviation of 9.63 years, indicating a moderately varied age range. Subgroup mean ages corresponded to their respective age ranges, highlighting a concentration of patients in the younger elderly population.

| Age Group (Years) | No. of Patients | Percentage (%) | No. of Males | No. of Females | Mean Age | Standard Deviation |
|-------------------|-----------------|----------------|--------------|----------------|----------|--------------------|
| 60-70             | 36              | 72             | 18           | 18             | 65       | 9.63               |
| 71-80             | 4               | 8              | 2            | 2              | 75.5     | 9.63               |
| 81-90             | 7               | 14             | 4            | 3              | 85.5     | 9.63               |
| 91-100            | 3               | 6              | 1            | 2              | 95.5     | 9.63               |
| Total             | 50              | 100            | 25           | 25             | 70.54    | 9.63               |

**Fall of Risk before and after Medication, McNemar test:**

The changes in fall risk among patients before and after therapy were analyzed using the McNemar test. There was a statistically significant reduction in the "Increased Fall Risk" category, dropping from 36% to 20% ( $p < 0.05$ ), and a significant increase in the "Decreased Fall Risk" category, rising from 20% to 36% ( $p < 0.05$ ). The "Unchanged Fall Risk" group remained at 44%, showing no significant change ( $p > 0.05$ ). These findings support the hypothesis that medication effectively reduces fall risk.

| Category            | Before Therapy (n, %) | After Therapy (n, %) | Change Observed       | p-value |
|---------------------|-----------------------|----------------------|-----------------------|---------|
| Increased Fall Risk | 18 (36%)              | 10 (20%)             | Significant reduction | < 0.05  |

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|                     |          |          |                       |        |
|---------------------|----------|----------|-----------------------|--------|
| Decreased Fall Risk | 10 (20%) | 18 (36%) | Significant increase  | < 0.05 |
| Unchanged Fall Risk | 22 (44%) | 22 (44%) | No significant change | > 0.05 |

### **Interpretation**

- The **p-value < 0.05** indicates a statistically significant reduction in fall risk after therapy.
- This supports the hypothesis that medication reduces the fall risk.

## **V. Discussion**

The study highlights the significant role of medication in influencing fall risk among elderly patients. After initiating medical therapy, a substantial portion of patients experienced an increase in fall risk, with 36% showing an increased risk, 20% showing a decrease, and 44% experiencing no change. These findings align with previous research, which highlighted the importance of considering medication-related fall risk in geriatric care units. In this study, several comorbidities, including diabetes mellitus (62%), hypertension (56%), and arthritis, were prevalent and contributed to the increased fall risk. Other significant conditions such as asthma, chronic kidney disease, dementia, and Parkinson's disease also play a role in heightening fall risk, as they impair mobility and balance. Additionally, cognitive impairment was noted in over half of the patients, further exacerbating the fall risk. The study also found that medications, particularly antibiotics (86%), analgesics (34%), anti-inflammatory drugs (22%), and hypoglycemic agents (58%), were commonly prescribed. While necessary for managing various health conditions, these medications can cause side effects such as dizziness, sedation, or hypotension, which increase the likelihood of falls. The presence of multiple comorbidities and medications creates a complex risk profile for elderly patients, highlighting the need for individualized care. The Morse Fall Scale (MFS) assessment showed that the majority of patients had a high or moderate fall risk, with 64% classified as high risk and 36% as moderate risk, reinforcing the vulnerability of this population. Medications, especially antipsychotics and cardiovascular drugs, such as beta-blockers, calcium channel blockers, and renin-angiotensin system (RAS) agents, were found to contribute significantly to fall risk due to their potential side effects of dizziness and hypotension. These findings emphasize the need for careful monitoring and management of medications, as well as regular fall risk assessments to reduce the risk of falls in elderly patients. With the growing elderly population, it is crucial to address these risks through targeted interventions and comprehensive care plans to improve patient outcomes and prevent falls.

## **VI. Result**

This prospective observational study investigated the impact of fall risk-increasing drugs (FRIDs) on geriatric patients at a tertiary care hospital, to inform healthcare practices for fall prevention in older adults. The majority of patients (72%) were aged 60–70 years, a group particularly susceptible to falls due to age-related functional decline and multiple comorbidities. Medications prescribed included antibiotics (86%), reflecting the high prevalence of infectious diseases, analgesics (34%), anti-inflammatory drugs (22%), and hypoglycemic agents (58%), highlighting the significant burden of diabetes in this population. Diabetes mellitus (62%) and hypertension (56%) were the most common comorbidities, both known to contribute to balance issues and increased fall risk. Based on Morse Fall Scale assessments, 64% of patients were at high risk of falling (scores  $\geq 45$ ), while 36% were at moderate risk (scores 25–44), with no patients categorized as low risk. The study found that 36% of patients experienced an increase in fall risk after medication therapy, 20% showed a decrease, and 44% had no change, emphasizing the complex relationship between medication regimens and fall risk. These findings highlight the multifaceted nature of fall risk in geriatric patients, driven by age, polypharmacy, and comorbidities, and underscore the need for cautious medication management and vigilant monitoring to minimize adverse outcomes.

## **VII. Conclusion**

This prospective observational study emphasizes the complex relationship between age, medication use, and comorbid conditions in determining fall risk among geriatric patients. The findings reveal that older adults, particularly those aged 60-70, are highly vulnerable to falls due to a combination of age-related physical changes, polypharmacy, and the presence of chronic conditions such as diabetes and hypertension. The medication data reveals a diverse treatment regimen that aligns with the patients' prevalent conditions, such as diabetes, hypertension, infections, and pain management. Understanding these medication patterns can help in tailoring healthcare approaches for similar populations and provide insight into the common health concerns of older patients in this cohort. With a significant proportion of patients showing a high fall risk, the study underscores the need for healthcare providers to be proactive in assessing and adjusting medication regimens to prevent falls. Overall, the results advocate for a more comprehensive and individualized approach to fall prevention in geriatric care, considering both pharmacological and non-pharmacological factors.

**Declaration:**

- Ethics confirmation- Approval from the ethical committee is not application is not applicable as it is an observational study.
- Informed consent: This is an observational study, and as there are no interventional steps involved, an informed consent form was not required. Furthermore, only medical details were collected from the patients, and no personal or identifiable information was gathered.
- Confidentiality: The medical data collected was handled in a manner that ensures patient privacy and confidentiality, in full compliance with ethical standards and regulations.
- Consent for publication is not applicable.
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- Conflicting interest: “The authors declare that they have no conflicting interest”.
- Funding – there was no funding provided for this study

Abbreviations:

|       |                             |
|-------|-----------------------------|
| DM    | Diabetes Mellitus           |
| HTN   | Hypertension                |
| CKD   | Chronic kidney disease      |
| CLD   | Chronic liver disease       |
| CVA   | Cerebrovascular disease     |
| IHD   | Ischemic Heart disease      |
| PD    | Parkinson’s disease         |
| TB    | Tuberculosis                |
| FRIDs | Fall risk increasing drugs. |
| MFS   | Morse fall score            |
| RAS   | Renin angiotensin system    |

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