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Assessment of role of FRIDs and PIMS in medication related fall in geriatric population

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Abstract
Background: Falls are the leading cause of injuries among older adults. Pharmacological factors that place the elderly at greater risk of drug-related side effects include changes in body composition, serum albumin, total body water, and hepatic and renal functioning. Drug use is one of the most modifiable risk factors for falls and falls-related injuries. The simultaneous use of several medications is an important risk factor for injurious falls in older people.
Aim: To assess the role of fall risk increasing drugs and potentially inappropriate medications in medication related fall in geriatric population. To identify and to prepare a report about the drugs causing fall.
Methods: A prospective observational study was conducted in general medicine, cardiology, orthopedics and surgery department of a tertiary care hospital. The study included both male and female patient aged above 65 years taking fall risk increasing drugs as past medications. The study population included 109 patients. The documented data were analyzed by statistical, graphical method.
Result and Discussion: The study showed that fall risk increasing drugs is a major risk for falls. Demographic and clinical data was collected and medication reviewed using John Hopkins fall risk assessment tool and STOPP criteria. The mean age of patients were 73 years. Most significant risk of fall was found in cardiovascular and antihypertensive drugs. Other major risk factors in elderly are age, female gender, fall history, poly pharmacy. Potentially inappropriate medication was found to be a contributing factor for falls in elderly.
Conclusion: The study has clearly demonstrated that fall risk increasing drugs and potentially inappropriate medication increases the risk of fall in geriatric population. This study helped to identify the risk factors leading to fall in geriatric population like age, gender, poly pharmacy. Female gender, fall history, use of patient care equipment, limited mobility, altered cognition.

Keywords: Fall risk, geriatric population, medications, inappropriate prescription

Introduction
Falls are one of the leading causes of death, injury and hospitalization among the elderly. According to a CDC report, one in four Americans over the age of 65 falls every year. Not only are seniors more likely to fall, but they're also more likely to sustain injuries. Of the nearly 36 million falls that occur among this age group each year, over 8 million result in a fall-related injury, such as a broken hip or a head trauma. Understanding why older people are more likely to fall can help family caregivers take the right steps to keep them on their feet. Older people fall more frequently for a number of reasons, including changes in their physiology and physical functioning, as well as the use (and abuse) of medications needed to manage their multiple conditions. Some of the pharmacological factors that increase the elderly's risk of drug-related adverse reactions are changes in body composition and serum albumin, total body water, and liver and renal functioning [1].
Drug use is one of the most modifiable factors for falls and fall-related injuries. PIM (Potentially Inappropriate Medication) and FRID (Fall Risk Increasing Drugs) have been associated with injurious falls. FRIDs include drugs for cardiovascular disease (digoxin, type 1aanti-arrhythmic, and diuretics), benzodiazepines, antidepressants, antipsychotics, antiparkinsonian drugs, opioids, and antihypertensive drugs. The use of PIMs is a major health issue. Older adults who use PIMs are more likely to experience adverse drug reactions, falls, hospitalizations, emergency treatment and associated medical costs [1].

Table 1: Fall Risk Increasing Drugs

FRIDs	Examples
Benzodiazepines	Alprazolam, Diazepam, Lorazepam
Antipsychotics	Risperidone, Olanzapine, Clozapine
Anticonvulsants	Valproic acid, Phenytoin, Carbamazepine
Antidepressants	Citalopram, Fluoxetine, Escitalopram, Amitriptyline
Antihypertensives	Thiazide diuretics, ACE inhibitors, ARB blockers, CCB, Beta Blockers
BPH Drugs	Silodosin, Prazosin
Cardiovascular drugs	Digoxin, Cardiac Glycoside

Falls in elderly are the most common cause of injury and lead to high levels of healthcare demand for direct medical care, long term rehabilitation, and social consequences. Most falls are minor, resulting in bruising and superficial injuries that do not require medical treatment or are treated in the primary care setting; however, approximately one in ten falls require medical treatment in an ED. Fractures are the most common injuries observed in the ED after a fall, with fractures occurring at 59.6%, superficial injuries at 20.9%, and head injuries at 8.7%. The three most commonly diagnosed fractures are hip fractures at 27.5%, wrist fractures at 19.8%, and upper arm fractures at 7.2% [2, 3]. In addition to the high cost of healthcare, falls can also have a significant impact on quality of patient's life [4].

Materials and Methods

Study Design

This is a prospective observational study whose major consideration is to determine the objectives such as to evaluate the role of FRIDs and PIMs in medication-related falls in the geriatric population, to identify the drugs and other factors causing falls in the geriatric population. The data were collected from 109 patients from general medicine, cardiology, and orthopedics and surgery department in a 450 bedded tertiary care hospital. The inclusion criteria include both male and female inpatients age ≥65 years who are independent or partially dependent ambulatory patients and also taking fall risk- increasing drugs as past medications. The study was conducted for 6 months.

Study Sample Size

Data records of 109 elderly patients (aged ≥65) from general medicine, cardiology, and orthopedics and surgery department in a 450 bedded tertiary care hospital were collected under the study.

Study Material

Case file of inpatients, Analytical software, Journals, Questionnaire, STOPP Criteria

Collection of data

The study was conducted by firstly collecting data files of the inpatients from general medicine, cardiology, and orthopedics and surgery department. Patient demographic details, history of other illness, current complaints, past medical and medication history and drug therapy were collected in the specially designed data entry form along with responses of JOHN HOPKINS fall risk assessment tool. All data files and self-medications were collected and recorded for the analysis of data.

Analysis of data

All recorded data was then analyzed on the basis of various variables and characteristics on a software for obtaining the required statistical data. Mean standard deviation, frequency, percentage values are obtained by the statistical data then used to concluding the final result of the study.

Results

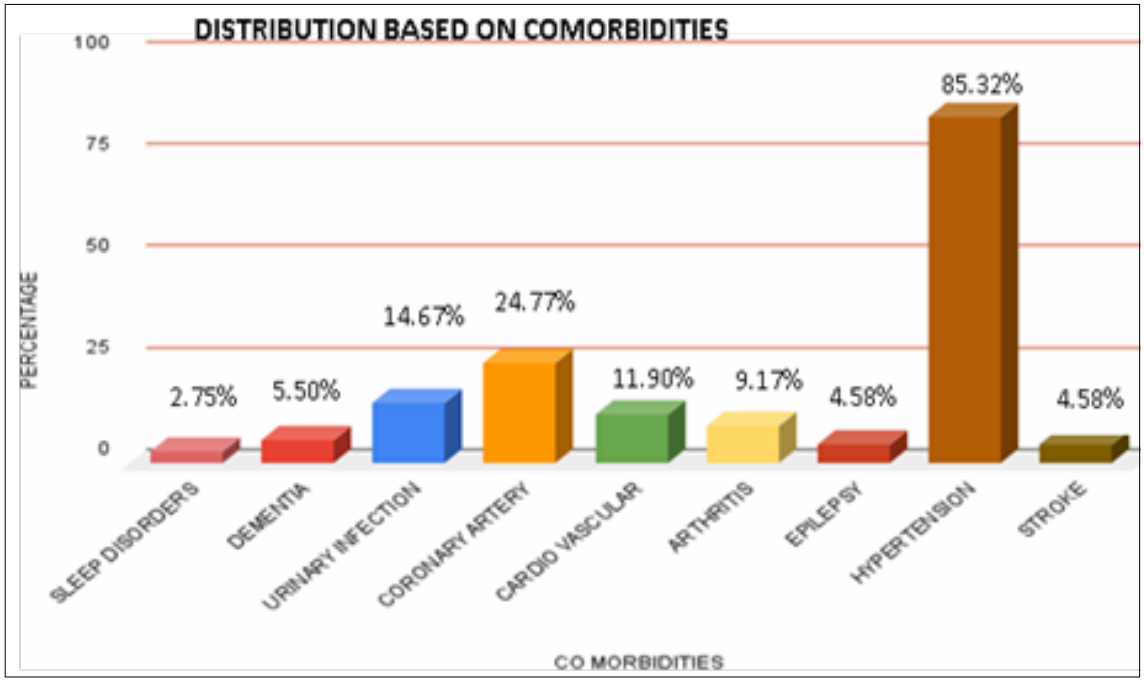

Fig 1: Distribution Based On Comorbidities

The graph based on risk of fall related to comorbidities despites that hypertension was seen as the most common comorbidity.

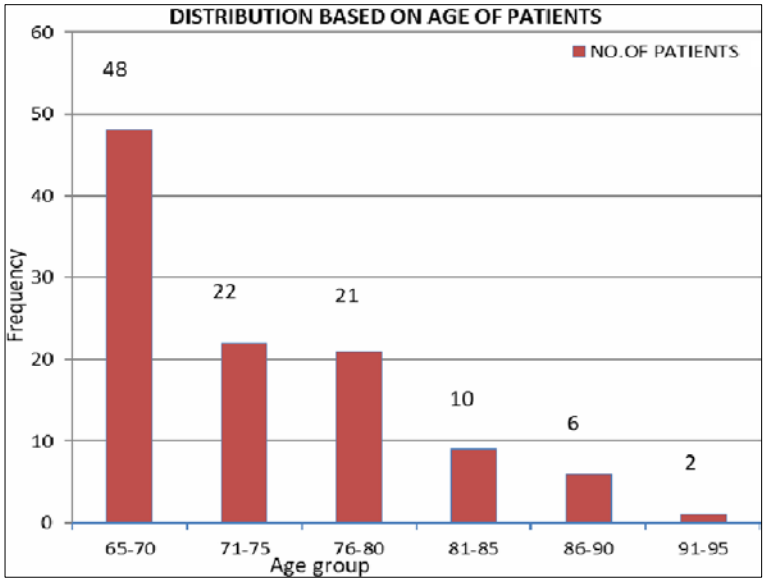

Fig 2: Distribution of patients based on Age.

The above graphical representation shows that patients in age category 65-70, 48 out of 109 participants had more risk of fall.

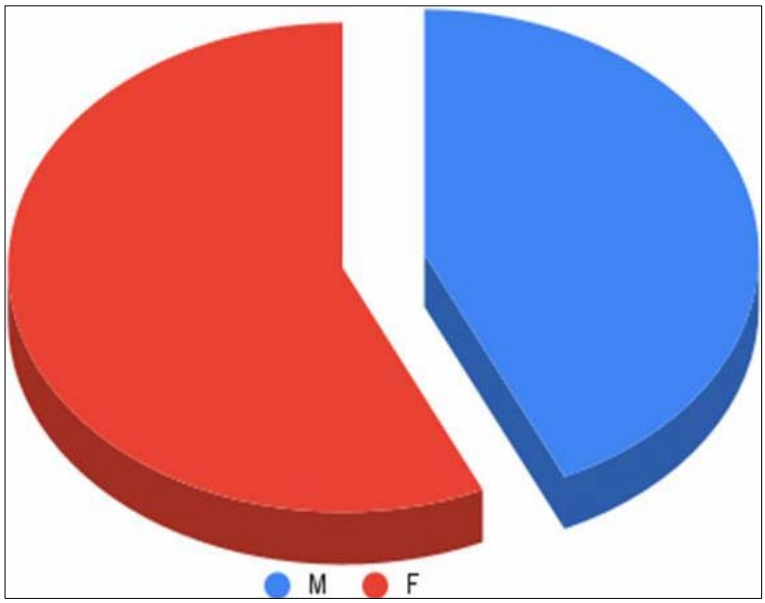

Fig 3: Distribution based on gender.

The graph based on gender distribution represents that 56% of the participants were female who had more risk of fall.

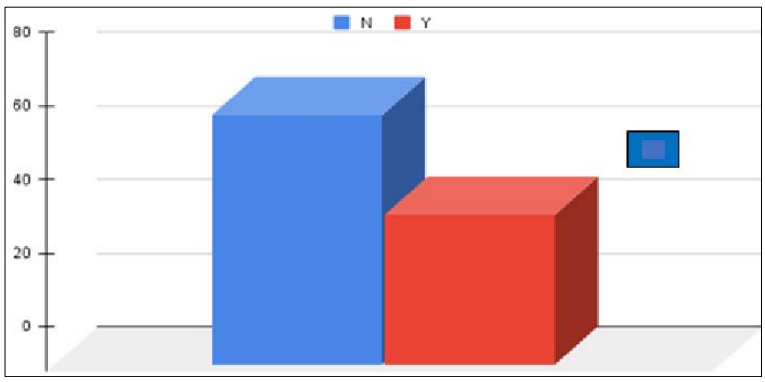

Fig 4: Distribution based on complaints of fall.

The above figure shows that patients who had past history of fall was having more risk of fall.

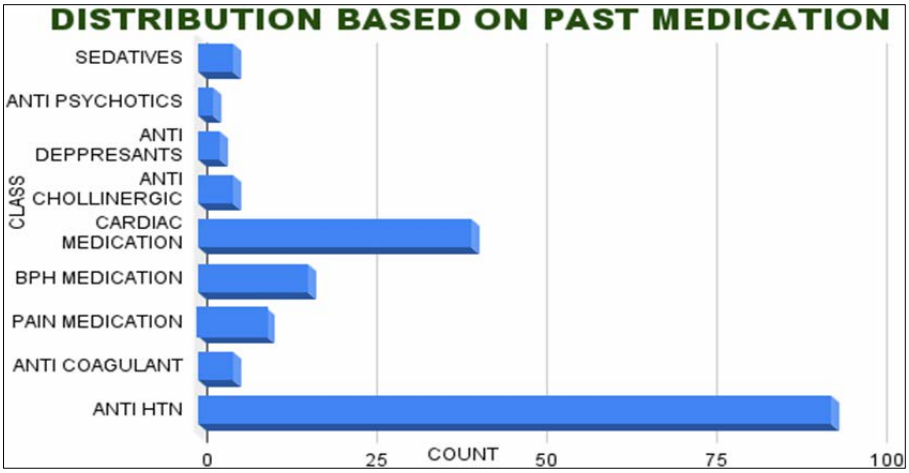

Fig 5: Distribution based on fall risk increasing drugs.

The above graph represents the commonly used medication by patients and found that anti- hypertensive medications cause increased risk of fall followed by cardiac medication.

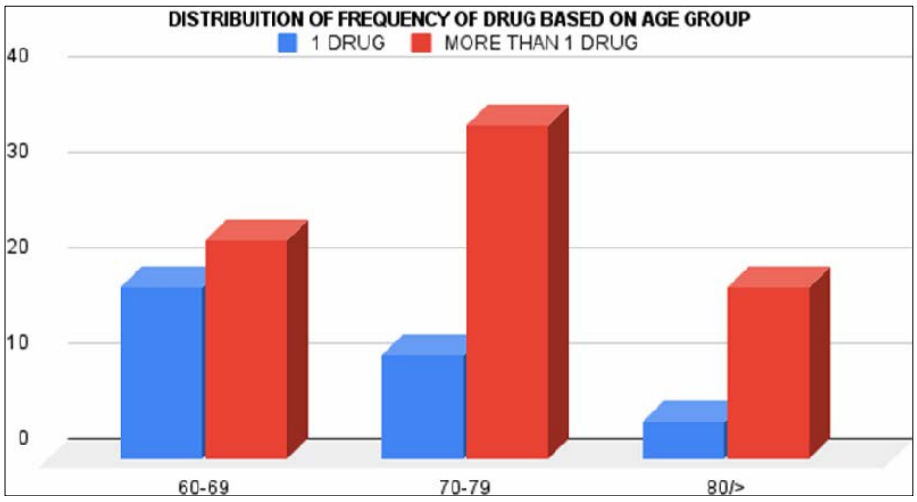

Fig 6: Distribution of frequency of drug used based on age group.

The graph depicts the number of drugs taken by patients in different age groups and showed that patients in age group 70-79 taking more than one drug have increased risk of fall

Potentially Inappropriate Medication

Table 2: Potentially inappropriate medication found in the patients

Drug identified	Potentially inappropriate criteria	Reason	No of patients
Torsemide (loop diuretics)	Loop diuretics are given for treatment of hypertension along with urinary incontinence.	May exacerbate urinary incontinence.	2
Etizolam (Benzodiazepines)	Benzodiazepines given as sedative	Risk of reduced sensorium, impaired balance, fall.	4
Pregabalin (Neuroleptics)	Given as hypnotics unless sleep disorder is due to psychosis/ dementia.	Riskof confusion, hypotension, Extrapyramidal side effects, fall.	3
Citalopram (SSRI)	Given with current hyponatremia.	Risk of exacerbating hyponatremia.	1
Propiverine (Anti muscarinic)	Given for over reactive bladder with chronic prostatism.	Risk of urinary retention.	1
Glimepiride (Sulphonyl urea)	With type 2 DM	Risk of hypoglycemia.	10
Hydralazine (Vasodilator)	Given in patients with recurrent postural hypotension.	Risk of syncope, fall.	5
Amitriptyline (TCA)	Givem along with constipation	Risk of exacerbation of constipation.	7
Verapamil (CCB)	Given along with prostatism.	Risk of urinary retention.	1
Prazosin (Alpha blockers)	Given in male patient with frequent incontinence	Risk of exacerbation of incontinence.	1

Discussion

A prospective observational study entitled “Assessment of role of FRIDs and PIMs in medication- related fall in geriatric population” was conducted in the Surgery, General Medicine, and Orthopedics department of a 45 bedded tertiary care hospital for a period of 6 months. The present study aimed to assess the role of FRIDs and PIMs in medication-related falls in the elderly population using the

John Hopkins fall risk assessment tool and STOPP criteria. We also analyzed the drug use pattern and fall risk in elderly patients aged 65 or more. The study population included 109 patients. Patient demographics, history of falls, past medication history, Laboratory investigations, and Drugs prescribed were collected in the specially designed data entry form. From the study, we have seen that the majority of patients who participated in the study were Females 56% and 43% were males. Also, the majority of patients were in age group 65-70 (n=48), followed by 71-75 (n=22), 76-80 (n=21), 81-85 (n=10), 86-90 (n=6) and 91-95 (n=2).Patients at high fall risk had higher adjusted odds of using two or more FRIDs from each category than residents at low fall risk. It indicates that fall risk increases with increased FRID use in the elderly. A study conducted by Kate N Wang in 2019 on "Use of Falls Risk Increasing Drugs in Residents at High and Low Falls Risk in Aged Care Services" supports the result by evidencing that fall risk increases with more consumption of fall risk Increasing drugs.

The findings of the present study indicate that, compared to non-fallers fallers are more functionally impaired, taking more medications, weaker in the lower extremities, and more unstable gait and balance, altered cognition. The study conducted in 2000 on "Causes and Correlates of Recurrent Falls in Ambulatory Frail Elderly" states that fallers were more functionally impaired compared to non-fallers.

From the study we found out that the most prescribed drug was Antihypertensive i.e. 93 patients (85%), followed by cardiac medication 40 (37%), BPH drugs 16 (14%), pain medication 10 (9%), Sedatives 5 (5%), anticoagulant 5 (5%), anticholinergics 5 (5%), antidepressants 3 (3%), and Antipsychotics 2 (2%).

From the study we found out the most frequent comorbidities associated with elderly are hypertension 93(85%), followed by coronary artery disease 27 (24.7%), UTI 16 (14%), CVA 13(12%), arthritis 10 (9.17%), stroke 5 (4.5%), epilepsy 5 (4.58%), dementia 3 (2.75%).

From the study it was observed that female patients had increased fall risk, were suffering more multiple diseases, had more fall history and were more functionally impaired compared to male patients. The study Conducted in 2017 on "Falls-Related Drug Use and Risk of Falls among Older Adults: A Study in a US Medicare Population" found that female had more risk of fall compare to men.

The study also found out that patients with fall history, use of patient care equipment's, limited mobility, altered cognition had more risk of. From the study we also found out the Antihypertensive drugs and cardiac drugs have significant association with risk of fall compared to other drugs.

From the study it was observed that prevalence of fall increased with patients having potentially inappropriate medication. In fallers there were 23 (63%) inappropriate medication identified and in in non-fallers 12 (37%) were identified. It indicated the significance of PIM causing falls in elderly. The study conducted in 2014 on "STOPP/START criteria for potentially inappropriate prescribing in older people: version 2" stated that potentially inappropriate medication can increase risk of adverse effects of drugs including fall.

We also observed that risk of fall is increased double folds in patients who were having history of fall. The study conducted in 2021 on "Correlation between fall risks increasing drugs (FRIDs) and fall events at a rehabilitation hospital" stated that fall history is an important contributing factor that increases the risk of fall in geriatric care.

Conclusion

Medication related fall are common in geriatric population and the role of fall risk increasing drugs and potentially inappropriate medication are high. The study has clearly demonstrated that past history of fall increases the risk of fall and the fall prevalence is high for females than males. The study also found out that patients with fall history, use of patient care equipment, limited mobility, and altered cognition had more risk of fall. The risk of fall also increases with the increase in number of medications. The study identified that patients taking more than one number of drugs have increased risk of fall. The study also identified the potentially inappropriate medication in 34 patients. The most commonly seen medications were Glimepiride, Amitriptyline and hydralazine. The risk of fall is increased due to potentially inappropriate medication (PIMs). The study identified that there were 63% inappropriate medication among fallers and 37% among non-fallers. In our study, we are able to identify the fall risk increasing drugs and other risk factors like age, gender, poly pharmacy etc. The study concludes that there is greater role for FIRDs and PIMs in medication related fall in geriatric population.

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