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A Prospective Observational Study on Need of Clinical Pharmacist in Preventing Drug-Drug Interactions in Geriatrics at a Tertiary Care Teaching Hospital

Anjum Kausar*[1], Uzma[1], Shagufta Kausar[1], Umama Shareef[1], Ansari Javed Akhtar[2], Rafia Sultana[3]

[1]Mesco College of Pharmacy, Mustaidpura, Hyderabad, Telangana, India
[2]Department of Pharmacy Practice, Mesco College of Pharmacy, Mustaidpura, Hyderabad, Telangana, India
[3]Department of Clinical Pharmacology, Osmania General Hospital, Afzal Gunj, Hyderabad, Telangana, India

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ABSTRACT

In geriatrics, advanced aged, polypharmacy and various prescribers have been recognized as threat factors for happening of drug-drug interactions. Critical evaluation of prescriptions of each elderly patient by clinical pharmacists could out-turn in recognization and deduction of such drug-drug interactions. The aim of the study was to assess the need of clinical pharmacist in preventing drug-drug interactions in geriatric patients. A prospective observational study was carried out among geriatric patients aged 65 years and above. The data was collected using prepared case collection forms and was examined to explore the medical condition, hospital stay, co-morbidities, and drug effects through patient counselling. Out of 120 patients, 76 were male and 44 were female. Major part of them were from age 65-74 years. Co-morbidities commonly found was hypertension (27.3%) and diabetes mellitus (15.8%), number of drugs per prescription were 5-10 in 70% of patients, number of drug-drug interactions per patient was found to be 1-2 in majority (35.8%). Drug interactions based on severity range were high in moderate (51.8%). Mainly pharmacodynamic interactions (57.2%) were seen. Medication adherence scale findings revealed that 60.8% was in moderate range (3-4). Commonly occurring DDIs identified are Furosemide and Aspirin, Aspirin and Clopidogrel. It concludes that Clinical Pharmacist take part in minimizing the risk of drug-drug interactions in geriatric patients by identifying, preventing and optimizing drug therapies via findings from drug interaction alert software, also assisting the health care professionals about drug related information and patient counselling is an important aspect of clinical pharmacist.

*Corresponding Author

Name: Anjum Kausar
Phone: +91 9618560467
Email: anjumkausar96@gmail.com

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INTRODUCTION

Geriatrics is defined as the part of medicine that is perturbed with the diagnosis, management & preventing of disease in older people (age 65 and above) and the issues particular to aging. The aged body is varied physiologically from the young adult body and in the course of old age, the lowering functions of different organ systems turn out to be manifested [1]. The elderly differ from younger persons in terms of co-morbidity, polypharmacy, pharmacokinetics, and a greater susceptibility to adverse

medication responses than younger adults (ADRs). Patients beyond the age of 65 are often excluded from clinical trials. However, results from clinical trials may not be applicable to all real patients [2].

Along with age associated gradual changes, i.e. changed physiology, the pharmacodynamic and pharmacokinetic parameters of drugs in the elderly is changed. There are physiological variations that act on how medicines are controlled, including the changes in drugs absorption, volume of distribution, metabolism and clearance which can extent the half-life, increase potentiality for drug toxicity and the probability of ADRs. Along with them, there is a change in drug response or sensitivity in the elderly and it may be due to the alterations in receptor numbers, alteration in receptor affinity and age-associated impairment of homeostatic mechanisms. A drug-drug interaction occurs when the effects of one drug are altered by another drug taken at the same time. On the other hand, adverse drug reactions (ADRs) may increase and treatment outcomes may settle [2]. Various applications can be used to decrease undesirable DDIs in hospital practice, one of this is to let the clinical pharmacists vigorously screen for DDIs and carry out interventions for clinically relatable DDIs [3].

Usually, older people act adversely to medications than younger patients. Although, aging changeless the absorption rate of most drugs, it can changes the body fat and water composition. With age, body fat cache elevates while total body water reduced, changes happened in immunity, neural function, down or up regulation of different receptors and disturbances in the first pass metabolism due to reduced volume of liver to breakdown the drugs. These are vital changes that can change the therapeutic drug levels arise in greater concentration of water soluble drugs and extended half-life of fat soluble medications. Additionally, it should be remembered that the liver is responsible for the breakdown of many medications, and that age-related changes can reduce hepatic blood flow and alter drug clearance rates Age-related reductions in renal blood flow, as well as chronic disease-related changes, can also lead to excessive drug elimination. Numerous drugs are bounced to plasma proteins so that only the unbounded or free portion is biological active [4].

The existence of co-morbidities in elderly patients needs usage of multiple drug therapy, which elevates irrational prescription, use of inappropriate medications, incompliance, economic burden, ADR and drug-drug interactions [5].

Drug interactions are supposed to happen when the pharmacological activity of a drug is changed by the concurrent use of another drug or by the existence of some other substance. The drug whose activity is pretentious by such an interaction is called as the object drug and the agent which brings on such an interaction is mentioned to as the pretentious illustrated in Figure 1.

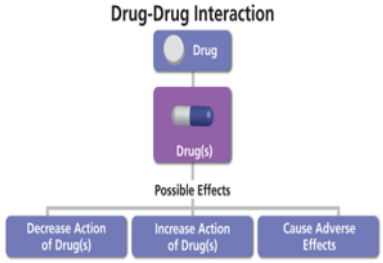

Figure 1: Drug-Drug Interaction

The net effect of a drug interaction is

1. Usually quantitative i.e. increased or reduced effect.
2. Seldom qualitative i.e. rapid or slower effect.
3. Pretentious of novel or elevated adverse effects [6].

The administration of one chemical matter (A) can change the effect of another (B) by one of the following two general mechanisms:

1. Modifying B's pharmacological impact without changing its concentration in tissue fluid (pharmacodynamic interaction). (pharmacokinetic interaction) [7].
2. Modifying B concentration at the site of action (pharmacokinetic interaction) [7].

The Role of Pharmacist in Prevention and Management of Drug Interactions

DDIs are referred as pharmacological and clinical outputs acquired from concurrent use of various combinations of drug as contrast to their use alone. They could prudent or risky. For instance, relatable use of aspirin with clopidogrel decreased the risk of myocardial infarction and ischemic stroke (advantageous effect), but also elevates the risk of bleeding (risky effect) [8]. DDIs could also acquire in dangerous life-threatening situations in an inclination to alter the therapeutic end point of drugs, especially in the elderly. Not only should DDI monitoring be used for medications that are contraindicated, but it should also be considered necessary for those combinations that are inclusively advantageous for certain illnesses. As a result, it is necessary to identify probable DDIs in clinical settings and develop a

treatment strategy for potential loss of efficacy and toxicity as a result of the use of particular drug combinations [9, 10].

Clinical pharmacists play a significant role in healthcare because they have the opportunity to work as part of a team and apply their professional skills, knowledge, and expertise to improve patient care [9]. Monitoring DRPs such as DDIs is the most significant professional service provided by pharmacists since it aids in increasing patient safety in hospital settings. Because DDIs are a significant cause of increased morbidity and death rates [11] in hospitalised geriatric patients, it is imperative to assess and avoid them.

If multiple drug therapy is always advised rationally and only when needed, the frequency with which therapeutic and other types of incompatibilities occur in the elderly can be drastically reduced. However, all members of the health care team must be vigilant in identifying and preventing therapeutically incompatible medications from reaching patients. Not only is it critical to maintain complete and accurate patient prescription records, but it is also critical to closely supervise and monitor drug therapy by assigning pharmacists in clinical settings to detect and prevent DDIs [9].

Need of the Study

1. Older age, poly-pharmacy and numerous prescribers have been recognized as risk factors for happening of potential drug interactions.
2. DDIs are more likely to occur in the elderly be as they tend to use multiple medications and have alterations in their pharmacokinetics.
3. Drug interactions are extreme inclusive cause of ADRs and hospital admission.
4. Despite the fact that the elderly patients are at high risk of occurring drug interactions and potential adverse effects, studies in this regard are scarce in settings like tertiary care teaching hospitals.
5. Critical evaluation of prescriptions of elderly patient individually by clinical pharmacists could results in recognizing and deduction of drug related problems.

MATERIALS AND METHODS

Study design: A prospective, observational study.

Location of the Study: Department of General Medicine unit (IP) Osmania General Hospital, a Tertiary care teaching hospital, Hyderabad.

Duration of the study: 6 months.

Sample Size: 120 patients.

Source of data: All the required data was collected from personal interview, case sheet record and prescriptions. Inclusion and Exclusion Criteria were tabulated in Table 1.

Selection of Study Subjects: All elderly patients (>65 years) diagnosed to have disease and undergoing treatment in the General Medicine and other units were included in the study.

Methodology

Plan of Work

The prospective observational study was conducted for a period of 6 months at Osmania General Hospital. All elderly patients (>65 years) diagnosed to have disease and undergoing treatment in the General Medicine and other units were included in the study based on the study criteria.

Ethical clearance was accorded by the Institution Ethical Committee.

Data Collection

To discover medication interactions, researchers used an automated DDI database system (Micromedex and Medscape). These programmes compile a list of all interactions and indicate whether or not information on specific medications within a pharmacological class is available. It also briefly explains the clinical importance of the interaction. When determining DDIs in prescriptions, current, new, and discontinued medicines were all considered.

Parameters that were Assessed

1. Patient characteristics (Gender, Age, Social History, Concurrent Morbidities and Length of Stay).
2. Drug characteristics (No. of Drugs, No. of Therapeutic Drug Classes), the no. of drug pairs according to the no. of drugs per prescription.

RESULT

Distribution Based on Gender

The Pie chart Figure 2 depicts that, in a sample study group of 120 geriatric hospitalized patients, 76 were male which account for 63% and 44 were female which is 37%.

Distribution of Geriatrics Based on Age Group

The Table 2 shows that the age groups of geriatrics that are hospitalized are more common from 65-74

Table 1: Inclusion and Exclusion Criteria

Inclusion Criteria	Exclusion Criteria
Patient of age group >65 years	1. Patients who are treated in the outpatients departments those who stayed <24 hours in the hospital were excluded
Patients of either gender.	2. Pregnant and lactating women.
In patients who develops DDIs.	3. Out patients

Table 2: Age Distribution of Subjects

Age	No. of Patients	Percentage
65-74 years	78	65%
75-84 years	37	10%
>85 years	5	4.1%
	Total =120	

Table 3: Co-Morbidities of Geriatric Subjects

Diseases/conditions	No. of occurrences	Percentages
Hypertension	62	27.3%
Diabetes mellitus	36	15.8%
CNS related	17	7.4%
CVS Related	27	11.8%
Liver disorders	4	1.7%
Thyroid disorders	4	1.7%
Anaemia	1	0.4%
GERD	3	1.3%
CKD	5	2.2%
Respiratory diseases	9	3.9%
	Total=227	

Table 4: Class of Drugs Prescribed

Category of Drugs	No. of Drugs
Drugs Acting on CVS (Atorvastatin, Amlodipine, Furosemide, Pantoprazole)	171
Antimicrobials (Ceftriaxone, Metronidazole, Azithromycin)	109
Drugs Acting on CNS (Mannitol, Phenytoin)	73
Analgesics and Anti-Inflammatory Drugs (Aspirin, Acetaminophen)	40
Respiratory System Drugs (Asthaline+Budecort, Budesonide)	38
Drugs Acting on Haematological System (Iron Folic Acid)	35
Drugs Acting on Endocrine System (Insulin, Levothyroxine)	25
Drugs Acting on ANS (Norepinephrine, Atropine)	14

Table 5: DDI Mechanisms

Type of DDI Mechanism	No. of Interactions	Percentage
Pharmacodynamic	243	57.2%
Pharmacokinetic	145	34.1%
Unknown	36	8.4%
	Total=424	

Table 6: List of commonly occurring drug-drug interactions

Drug-drug interaction	Effects	No. of Patients
Furosemide + Aspirin	Aspirin decreases effects of Furosemide by pharmacodynamic antagonism.	24
Aspirin + Clopidogrel	Either increases toxicity of the other by pharmacodynamic synergism.	21
Aspirin + Heparin	Either increases toxicity of other by anticoagulation.	21
Aspirin + Enalapril	Aspirin, enalapril by pharmacodynamic antagonism.	17
Heparin + Clopidogrel	Either increases effects of the other by pharmacodynamic synergism.	17
Enalapril + Furosemide	Pharmacodynamic synergism. Risk of acute hypotension, renal insufficiency.	14
Insulin + Aspirin	Aspirin increases effects of insulin by pharmacodynamic synergism.	11
Atorvastatin + Clopidogrel	Increased risk of major adverse events	9
Insulin +Furosemide	Furosemide decreases effects of insulin. (diuretic-induced hypokalaemia)	9
Metoprolol + Aspirin	Aspirin decreases effects of metoprolol by pharmacodynamic antagonism.	8
Atorvastatin + Phenytoin	Phenytoin will decrease the level or effect of atorvastatin by affecting hepatic/intestinal enzyme CYP3A4 metabolism.	8
Clopidogrel + Pantoprazole	Pantoprazole decreases effects of clopidogrel by affecting hepatic enzyme CYP2C19 metabolism.	6
Metronidazole + Ondansetron	Metronidazole decreases effects of ondansetron by inhibiting CYP3A4 metabolism.	6
Cyanocobalamin + Pantoprazole	Pantoprazole decreases levels of cyanocobalamin by inhibition of GI absorption.	5
Ondansetron + Ciprofloxacin	Both increase QTc interval.	5
Furosemide + Ceftriaxone	Ceftriaxone increases toxicity of furosemide by pharmacodynamic synergism.	4
Phenytoin + Metronidazole	Metronidazole will increase the level/effect of phenytoin by affecting hepatic enzyme CYP2C9 metabolism.	4
Heparin + Ceftriaxone	Ceftriaxone will increase the level/effect of heparin by anticoagulation.	4
Furosemide + Hydrocortisone	Pharmacodynamic synergism. Risk of hypokalaemia.	4
Ondansetron + Phenytoin	Phenytoin will decrease the level/effect of ondansetron by affecting hepatic enzyme CYP3A4 metabolism.	3
Spironolactone + Aspirin	Both increase serum potassium.	3
Spironolactone + Enalapril	Pharmacodynamic synergism. Risk of hyperkalemia [12].	3

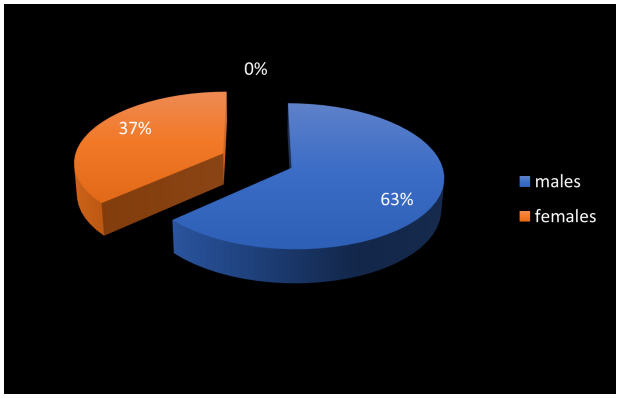

Figure 2: Gender Distribution

(65%) years of age followed by 75-84 (10%) years of age, in our sample size of 120.

Distribution of Subjects Based on Indications

Bar graph in Figure 3 shows most common indication in geriatric patients was Cardiovascular Accident (17.8%), followed by Chronic Heart Disease (14.8%), Acute Kidney Injury (9.5%) and Diabetes Mellitus (6.5%). Other diseases found were CKD, Atrial Fibrillation, COPD, Gastroenteritis and Congestive Heart Failure.

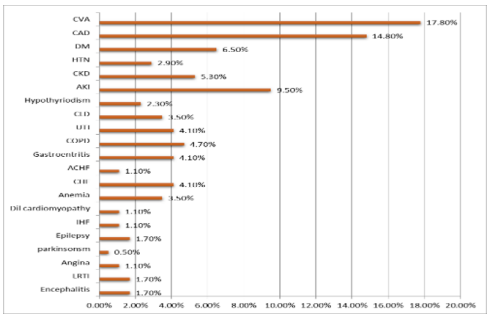

Figure 3: Indications of Subjects

Categorization of Subjects Based on Subjects

The Table 3 shows that the most common co-morbidities found in geriatric hospitalized patients were Hypertension (27%), Diabetes Mellitus (15.8%), CVS related disorders (11.8%), followed by CNS related disorders (7%).

Number of Drugs Prescribed Per Patient

Figure 4 shows the number of drugs prescribed per patient in a geriatric population of 120, in which about 70% were prescribed 5-8 drugs, followed by 26.6% of patients who were prescribed more than 10 drugs and lastly 4.1% were prescribed with less than 5 drugs.

Class of Drugs Prescribed in Geriatric Hospitalized Patients

The most commonly prescribed drugs in geriatrics were those acting on CVS, followed by Antimicrobials, drugs acting on CNS and analgesics and anti-inflammatory drugs tabulated in Table 4. Other drugs prescribed were respiratory system drugs, supplements, drugs acting on endocrine system and lastly drugs acting on ANS.

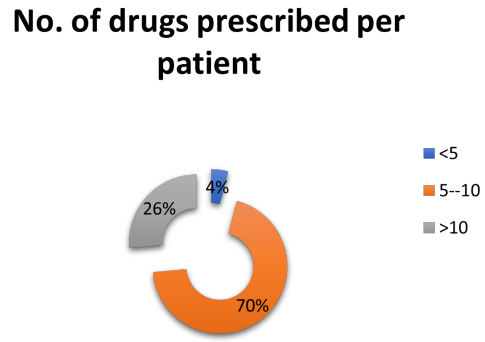

Figure 4: Number of Drugs Prescribed Per Patient

Number of Drug-Drug of Interactions per Patient

Pie chart in Figure 5 shows that the interaction range of 1-2 is in majority (35.8%), followed by a range of 3-5 (24.1%) and interaction range above 5 (22.5%). Zero interactions were found in about 17.6% of patients.

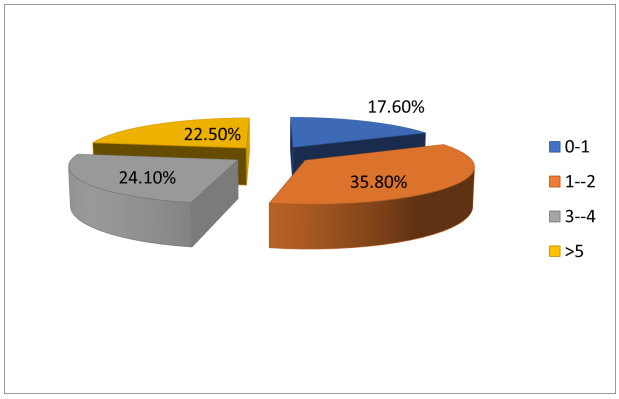

Figure 5: Drug-drug interactions per patient

Categorization of Drug-Drug Interactions Based on Severity

Bar graphs in Figure 6 shows the data representing the severity of drug-drug interactions. Of all the three types; major (40.5%), moderate (51.8%) and minor (7.5%) types of DDIs, the majority of the interactions were found to be of moderate type.

Categorization of Subjects Based on Drug-Drug Interactions Mechanisms

Table 5 showing categorization of patients based on drug-drug interaction mechanisms. Out of the 424 interactions found (n=120), pharmacodynamic

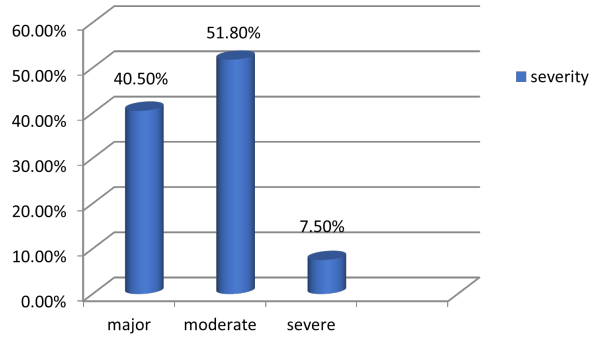

Figure 6: Severity of drug-drug interactions

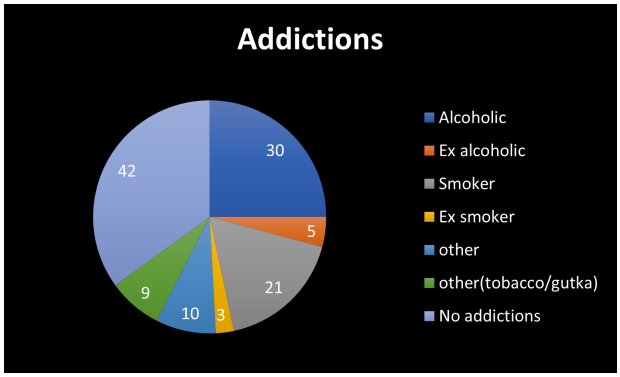

Figure 8: Addictions

drug interactions were found to be in majority, i.e. 57.2%, followed by pharmacokinetic interactions at 34.1% and lastly the interactions whose mechanism is unknown were found to be 8.4%.

Distribution of Subjects Based on Medication Adherence Scale (MMAS-8)

Bar graph in Figure 7 shows the distribution of patients based on medication adherence, following a medication adherence scale (MMAS8). It was found that 60.8% of patients had a moderate score of 3-4, whereas 20% had a low score of 0-2 and about 19% of patients had a high score of >5.

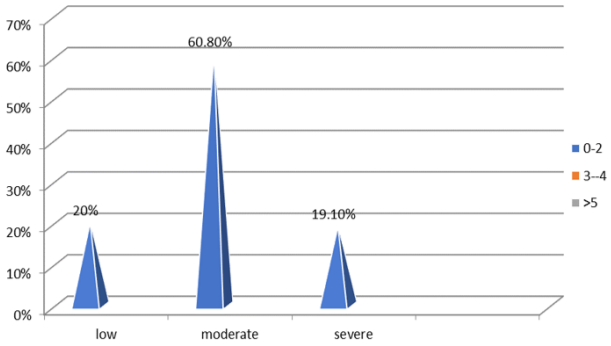

Figure 7: Distribution of Subjects Based on Medication Adherence (MMAS-8)

Distribution of Subjects Based on Addictions

Pie chart in Figure 8 showing incidence of geriatric's addiction is mainly found with Alcohol and Smoking. (Most of the patients have no history of addiction (42), and then about 10 patients have both alcohol and smoking history, followed by other addictions like tobacco/guthka chewing, which are about 9).

Commonly Occurring Drug-Drug Interactions in Geriatric Patients

Table 6 shows a list of commonly occurring drug interaction along with their occurrences. Interaction between Furosemide and Aspirin resulted in being the most frequent, in which aspirin decreases the effects of furosemide by pharmacodynamic antagonism. Aspirin and Clopidogrel also interact frequently, in which either increases the toxicity of other by pharmacodynamic synergism. Heparin and Aspirin also interact by either one increasing toxicity of other by anticoagulation.

DISCUSSION

The present study was done in an in-patient department of Osmania General Hospital, on drug-drug interactions in geriatric patients, to assess the need of clinical pharmacist in preventing DDIs. A total of 120 patient's case records were reviewed in general medicine ward during six months study period in which 76 (63.3%) were males and 44 (36.6%) were females. The age groups of geriatrics that are hospitalized are more common from 65 to74 (65%) years of age, followed by 75 to 84 (10%) years of age, in our sample size of 120. Positive association between number of DDIs and age was observed. Patients with age above 70 years had a higher risk of having drug interactions.

The most common indication found in geriatric patients was Cardiovascular Accident (17.8%), followed by Chronic Heart Disease (14.8%), Acute Kidney Injury (9.5%) and Diabetes Mellitus (6.5%). Other diseases found were CKD, Atrial Fibrillation, COPD, Gastroenteritis and Congestive Heart Failure. These findings coincide with the results found by Teka et al. [2], with majority patients having CVA (61.4%) followed by infectious diseases (58.6%).

The common co-morbidities found in this study in geriatrics were Hypertension (27%), Diabetes Mellitus (15.8%), CVS related disorders (11.8%) followed by CNS related disorders (7%). Among the comorbidities, hypertension was more prevalent in females.

Elderly patients are the largest consumers of medications. With everyday passing by, a new drug coming in market and availability of multiple options

can drag prescriber towards Polypharmacy, which increases the chances of DDIs. The number of drugs prescribed per patient in a geriatric population in this study was noted. About 70% (84) were prescribed 5-8 drugs, followed by 26.6% (32) of patients who were prescribed more than 10 drugs and lastly 4.1% (5) were prescribed with less than 5 drugs. These results overlap with the data previously published by Shivashankar V et al. [1], with majority prescribed more than 7 drugs, and Khandeparkar et al. [13], in which majority were prescribed with 6-9 drugs.

In this study, a range of drug-drug interactions were observed among geriatric patients in general medicine ward. The possible reasons for higher chance of DDIs in geriatrics could be due to the higher co-morbidities in elderly patients, increase in number of drugs in the prescriptions and decreased pharmacokinetic mechanisms.

It was found that, as the number of drugs prescribed per patient increased, the drug-drug interactions also increased with almost all the patients were prescribed more than 5 drugs. Out of all the patients, 22.5% (27) had more than 5 drug-drug interactions, whereas 24.1% (29) had 3-4 DDIs, 35.8% (43) had 1-2 DDIs and 17.6% (21) had no interactions. This shows that elderly is at high risk of drug interactions due to Polypharmacy. This argument is supported by the same results reported by Shetty et al. [14], in which 83% patients had at least 1 DDI and 18.2 % had more than 5 DDIs. Teka et al. [2], also reported 62.2 % patients having at least 1 DDI.

Analysis was carried out to assess the prevalence, severity and significance of identified DDIs using Micromedex and Medscape software. We have identified 40.5 % drug-drug interactions of major (n=172), 51.8% of moderate (n=220) and 7.5 % of minor (n=32) severity in 120 patients included on admission and/or during hospitalization. The majority of the interactions were found to be of the moderate type. Their findings also correlated with the studies conducted by Ahmad et al. [9], in which 75% were moderate DDIs, 44% were major and 20% were minor.

Out of the total 424 interactions found (n=120), pharmacodynamic drug interactions were found to be in majority, i.e. 57.2%, followed by pharmacokinetic interactions at 34.1% and lastly the interactions whose mechanism is unknown were found to be 8.4%. Felipe et al. [13] also reported pharmacodynamic interactions to be in majority.

Minor medication interactions do not have any substantial negative consequences. The majority of the time, no management of these types of interactions is required. Moderate medication interactions may exacerbate the patient's clinical condition. Treatment to deal with these kinds of interactions might be investigated. Major drug interactions may result in a life-threatening condition; therefore, it is critical to address such issues as soon as they are discovered [9, 15].

It was found that the most common classes of drugs involved in drug interactions in geriatrics were the drugs acting on CVS (n=171) such as Furosemide, Clopidogrel and Heparin; followed by Antimicrobials (n=109) like Metronidazole and Ceftriaxone, drugs acting on CNS (n=73) such as Phenytoin; Analgesics and Anti-Inflammatory drugs (n=40) like Aspirin. Other drugs prescribed were Respiratory system drugs (n=38), Supplements (n=35), drugs acting on endocrine system (n=25) like Insulin; and lastly drugs acting on ANS (n=14). These results are in contrast with Ahmad et al. [9], where majority of drugs were fever, pain prescription drugs, followed by respiratory system drugs and CVS drugs.

The most commonly occurring DDIs found in this study were Furosemide and Aspirin (24), in which aspirin decreases the effects of furosemide by pharmacodynamic antagonism. Aspirin and Clopidogrel also interact frequently (21), in which either increases the toxicity of other by pharmacodynamic synergism. Heparin and Aspirin DDI (21) is by either one increasing toxicity of other by anticoagulation. Aspirin and EnalaprilDDI (17) by pharmacodynamic antagonism and Insulin and Aspirin DDI (11), in which Aspirin increases effects of insulin by pharmacodynamic synergism, was also found. Ahmed et al. [9] found Paracetamol and pantoprazole interaction to be in majority (27), followed by Ofloxacin and Ondansetron (24), Theophylline and Budesonide (22) and Ibuprofen and Ofloxacin interaction (11). It is clear from these findings that NSAIDs, PPIs, Corticosteroids and Antibiotics constitute the commonly observed drug pairs resulting in DDIs.

It is the clinical pharmacist's responsibility to avoid drug combinations that cause DDIs. The most regularly used medicine combination to avoid was aspirin and heparin. Many drug interactions can be avoided by carefully monitoring them or using other medications or congeners that aren't linked to them. The use of NSAIDs and Heparin together may increase the risk of bleeding. Platelet aggregation is inhibited by NSAIDs, which might lead to a longer bleeding period. As a result, NSAIDs should be avoided in patients receiving Heparin, especially if administered persistently or in large doses. To avoid drug interactions, balanced usage of several med-

ications necessitates a thorough understanding of pharmacological pharmacology [16]. Patients may also use non-prescription pharmaceuticals in addition to their prescribed medications, increasing the risk of drug interactions. They are also at a higher risk of clinically significant medication interactions due to age-related pharmacokinetic changes.

One of the important roles of clinical pharmacist is preventing drug related problems through patient counselling, i.e., ensuring that patients adhere to their medications [17]. A medication adhere scale is used to determine whether the patients have high, low or moderate scores in this scale. In geriatrics, only a minority of patients had a high score (10%) whereas moderate (62.5%) and low scores (27.5%) were obtained by majority. This could be a reason for the higher incidence of DDIs in geriatrics.

The occurrence of drug interactions may influence the elderly's quality of life, and clinically undetected drug interactions may increase morbidity. To avoid drug-drug interactions, careful medication use and close monitoring are essential [12]. Drug interactions should be checked for medications used to treat the most prevalent comorbidities, such as diabetes and hypertension. To avoid the misuse of non-prescription medications, doctors and pharmacists must educate and counsel patients.

The findings of this study highlighted a crucial topic for future geriatric research. This study found that this subgroup is more susceptible to drug interactions, indicating that additional research is needed in this area in order to promote safe and effective therapies free of drug-related issues such as drug-drug interactions.

CONCLUSION

The findings of our study reveal that majority of geriatrics are at a high risk of developing at least 1 to 2 drug-drug interactions (35.8%), due to co-morbidities found such as hypertension and diabetes, and an increased number of drugs per prescription, i.e. 5 drugs (70%). Mostly, pharmacodynamic interactions (57.2%) were found, in which a better part was moderate in severity. This emphasizes the need to consider drug-drug interactions in geriatrics during therapeutic planning and protect patients from the consequences of drug interactions. The clinical pharmacist could come up with to the decrease of such drug-drug interactions by recognizing, preventing and developing the drug therapies. Beside this, other services include providing assistance to health care professionals about drug related information via drug interaction alert software, (Micromedex and Medscape), to minimise the incidence rate of DDIs. Due to low medication adherence found, patient counselling becomes another important aspect of clinical pharmacist. The abundance of drug interactions could have been fewer with a more judicial use of the drugs. Furthermore, it has been shown that interactions found by clinical pharmacist improves clinical positive outcome. As the concept of Clinical Pharmacy is still in the initial stages of development, contribution of pharmacist towards the role in hospitals is negligible at this point of time and thus, it is a needful time to explore this area to upgrade safe effective therapies without any drug related problems like drug-drug interactions. Clinical pharmacists will definitely be a crucial support to the Indian health care system in the upcoming years.

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Conflict of Interest

The authors declare that there is no conflict of interest.

Ethical Issues

We conducted our research in tertiary care hospital under the supervision of registered physician and obtained informed consent from every patient.

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