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A Prospective Study to Analyse the Prescription Pattern, Drug Reactions, and Drug Interactions Associated with Polypharmacy Among Geriatric Population in Gastroenterology Department - A Pilot Study



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ABSTRACT

Background:

Inappropriate Medication Use (IMU) by elderly people is a public health problem associated with adverse effects on health. Older patients often have numerous co-morbidities for which they are prescribed multiple medications, thereby increasing the risk of Adverse Drug Events.

Methods: This is a Prospective Observational Study conducted at Cosmopolitan Hospital, PG Institute of Health Sciences and Research. In this study, we analyze the drug reactions, drug interactions while taking polypharmacy and assess need for medication therapy management in geriatric persons in gastroenterology department. Drug reactions were assessed using Naranjo Scale, by conducting a review for patients after one or two weeks. Suitably designed proforma is used to assess drug interactions. Polypharmacy was assessed by questionnaire and through interviewing the patient. Medication therapy review is assessed using Beer's Criteria. **Result:** A total of 20 geriatric patients with polypharmacy fulfilling the study criteria are selected. More than half of the patients are suffering from drug reactions. From the beers criteria, proton pump inhibitors are widely used in the prescription of geriatric patients with polypharmacy. Drug interactions were also assessed using appropriate software such as Micromedex. **Conclusion:** The study suggest that 80% of patients were taking Proton pump inhibitors among the other drugs in the beers criteria. In drug interactions, only 45% of geriatric patients were reported, And 55% of geriatric patients were suffering from adverse reactions. Hence we conclude that most of the geriatric patients with polypharmacy have Adverse reactions out of which most of them are doubtful.



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INTRODUCTION

Polypharmacy is defined as the regular use of five or more medications which is common in older patients. Polypharmacy can lead to decreased medication compliance, poor quality of life, and unnecessary drug expenses. Prescription patterns explain extent and profile of drug use, quality of life, compliance with standard treatment guidelines, and use of generic drugs. Drug interactions occur when food or drug other medication conditions alter the effect of other drugs and drug reactions are unwanted effects caused by the administration of drugs. Medication Therapy Management (MTM) generally called medicine use review is a service provided typically by a pharmacist that aims to improve outcomes by helping patients. MTM helps to understand the patient about their health conditions and medications that are used to manage them.

The WHO defines an adverse drug event as a detrimental response to medication that is undesired and unintended, excluding Therapeutic failure, poisoning, and overdose although appropriate medication can alleviate symptoms and reduce elderly patients' morbidity and mortality, drugs also represent a potential danger, due to possible adverse effects. Studies in developed countries show that consumption of medication increases with age and that much elderly use at least three prescribed drugs concurrently. In developing countries, the proportion of elderly using at least one medication daily ranges from 85 to 90%. Studies show that elderly patients can present alterations in practically all pharmacokinetic processes (absorption, first-pass metabolism, bioavailability, distribution, protein binding, renal and hepatic clearance). These alterations can lead to the lower effectiveness of some drugs, such as Enalapril. On the other hand, they can also contribute to increased risk of adverse drug reactions; for example, drugs with a high hepatic-extraction ratio, such as nitrates, barbiturates, lidocaine, and propranolol. May have reduced hepatic metabolism in older adults. However physiological and physiopathological peculiarities in this age group lead to differences in the pharmacokinetics and pharmacodynamics of the medications administered, making the prescription process complex and often inappropriate.

SAMPLING STRATEGY:

A. INCLUSION CRITERIA

Age > 65 years

Patient with gastrointestinal disease conditions

Patients who are on polypharmacy.

A patient who is willing to participate in the study.

B. EXCLUSION CRITERIA

Age < 65 years

Patients whose case record files were incomplete.

Patients admitted to the emergency medicine ward.

PHARMACOKINETICS IN GERIATRICS

Absorption

There is a delay in gastric emptying, reduction in gastric acid output, and splanchnic blood flow with aging. These changes do not significantly affect the absorption of the majority of drugs. Although the absorption of some drugs such as digoxin may be slower, the overall absorption is similar to that in the young.

First-pass metabolism

After absorption, drugs are transported via the portal circulation to the liver, where many lipid-soluble agents are metabolized extensively (more than 90–95%). This results in a marked reduction in systemic bioavailability. Even minor reductions in the first-pass metabolism can result in a significant increase in the bioavailability of such drugs.

Distribution

The age-related physiological changes which may affect drug distribution are; reduced total body water, increased total body fat, lower serum albumin level, α_1 -acid glycoprotein level unchanged or slightly raised.

Increased body fat in the elderly results in an increased volume of distribution for fat-soluble compounds such as clomethiazole, diazepam, desmethyl-diazepam, and thiopental.

On the other hand, reduction in body water results in a decrease in the distribution volume of water-soluble drugs such as cimetidine, digoxin, and ethanol.

Acidic drugs tend to bind to plasma albumin, while basic drugs bind to α_1 -acid glycoprotein. Plasma albumin levels decrease with age and therefore the free fraction of acidic drugs such as cimetidine, furosemide, and warfarin will increase. Plasma α_1 -acid glycoprotein levels may remain unchanged or may rise slightly with aging, and this may result in minimal reductions in free fractions of basic drugs such as lidocaine.

The age-related changes in distribution and protein binding are probably of significance only in the acute administration of drugs because, at a steady-state, the plasma concentration of a drug is determined primarily by free drug clearance by the liver and kidneys rather than by distribution volume or protein binding.

PHARMACODYNAMICS IN GERIATRICS

Molecular and cellular changes that occur with aging may alter the response to drugs in the elderly and may be due to a reduction in homeostatic reserve and those that are secondary to changes in specific receptors and target sites.

> Reduced homeostatic reserve includes:

Orthostatic circulatory responses, Postural control, Thermoregulation, Cognitive function, Visceral muscle function, Alpha adrenoreceptors, Beta adrenoreceptors, Cholinergic system, Warfarin, Benzodiazepines

➤ Age-related changes in specific receptors and target sites include;

Alpha adrenoreceptors, Beta adrenoreceptors, Cholinergic system, Benzodiazepines, Warfarin, Digoxin

MATERIALS AND METHODS

Data source: All the relevant information regarding the study was collected from case records and direct interviews with patients and caregivers. Data from case records and caregivers were collected by using suitably designed proforma. The study was approved by the Research and Ethical Committee of Cosmopolitan hospital, Trivandrum.

Study population: Patients were taken from the gastroenterology department of Cosmopolitan Hospital. Informed consent was obtained. The study was conducted for 2 months.

Assessment of prescription pattern: prescription pattern in the geriatric population was analyzed through Beers criteria.

Assessment of side effects: Details were collected from case records of the geriatric patients and direct interviews with the patients and caregivers.

Assessment of drug interactions: Drug interactions were assessed using Naranjo scale.

RESULTS AND DISCUSSION

RESULTS:

PERCENTAGE DISTRIBUTION OF PATIENTS BASED ON THE AGE IN YEARS

The percentage distribution of patients based on the age in years is shown in the following table.

Table No. 1: The percentage distribution of patients based on the age in years

Age in years	Frequency	Percent
≤70	8	40
71 - 75	6	30
>75	6	30
Total	20	100

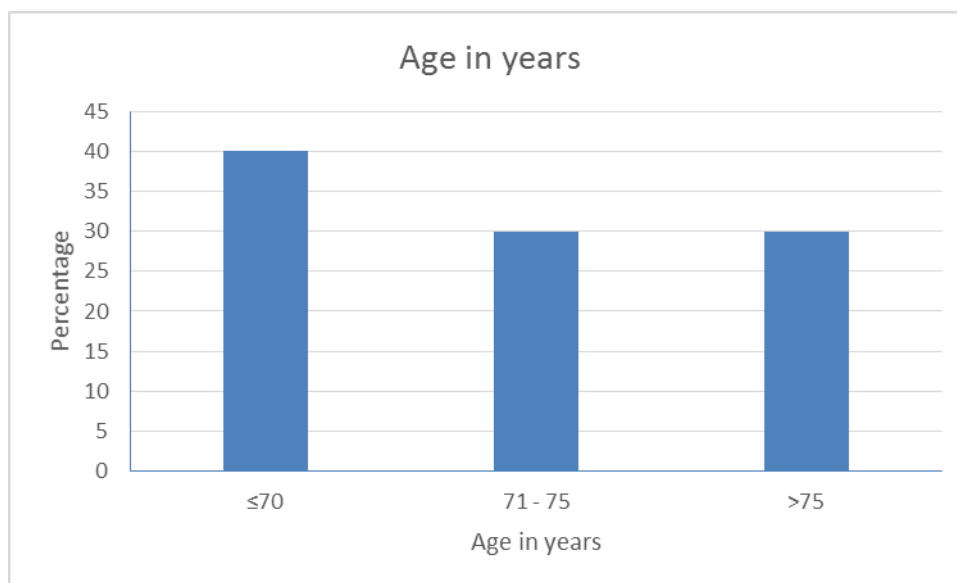


Figure No. 1: Diagrammatic representation of patients based on age in years.

From table 1, it was observed that out of the total geriatric patients having polypharmacy, 40% were from the age group of ≤ 70 , 30% each from the age group of 71 – 75, and >75 respectively. Thus, from the above table, we conclude that the higher percentage of patients are from the age group of ≤ 70 .

PERCENTAGE DISTRIBUTION OF PATIENTS BASED ON GENDER

The percentage distribution of patients based on gender is shown in the following table.

Table No. 2: percentage distribution of patients based on gender.

GENDER	Frequency	Percent
Male	8	40
Female	12	60
Total	20	100

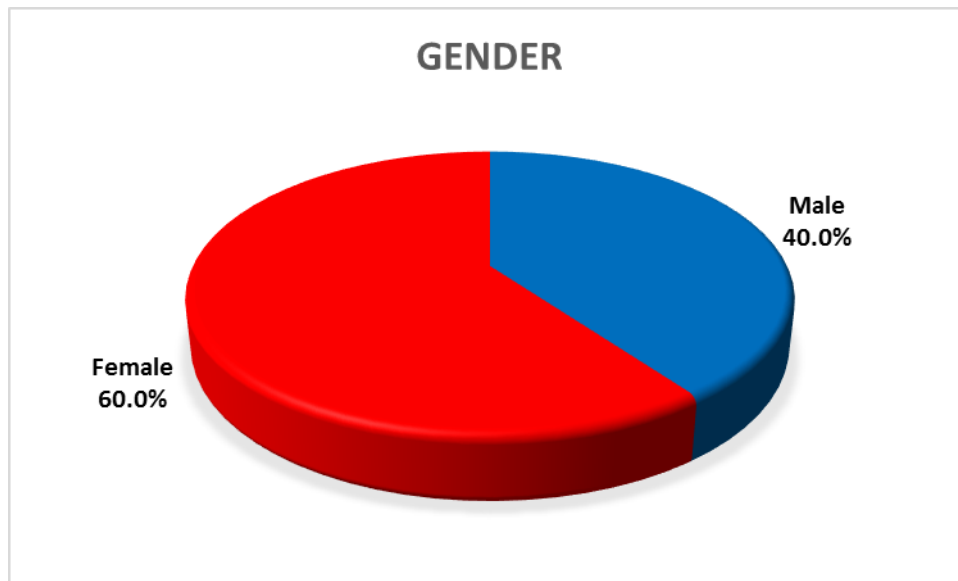


Figure No. 2: diagrammatic representation of patients based on gender

From table 2, it was observed that out of the total geriatric patients 60% were females and 40% were males. Thus, from the above table, we conclude that a higher percentage of patients are females.

PERCENTAGE DISTRIBUTION OF PATIENTS BASED ON MARITAL STATUS

The percentage distribution of patients based on marital status is shown in the following table.

Table No. 3: Percentage distribution of patients based on marital status.

MARITAL STATUS	Frequency	Percent
Married	20	100

From table 3, we can observe and conclude that 100% of patients are married.

PERCENTAGE DISTRIBUTION OF PATIENTS BASED ON THE PRESENTING SYMPTOMS

The percentage distribution of patients based on the presenting symptoms is shown in the following table.

Table No. 4: Percentage distribution of patients based on presenting symptoms.

PRESENTING SYMPTOMS	Frequency	Percent
ABDOMINAL PAIN AND DISCOMFORT	16	80
NAUSEA & VOMITING	2	10
DYSPEPSIA	7	35
WEIGHT LOSS	4	20
BLEEDING IN DIGESTIVE TRACT	4	20
ABDOMINAL CRAMPING AND BLOATING	7	35
SLEEPLESSNESS	5	25
ULCERS	3	15

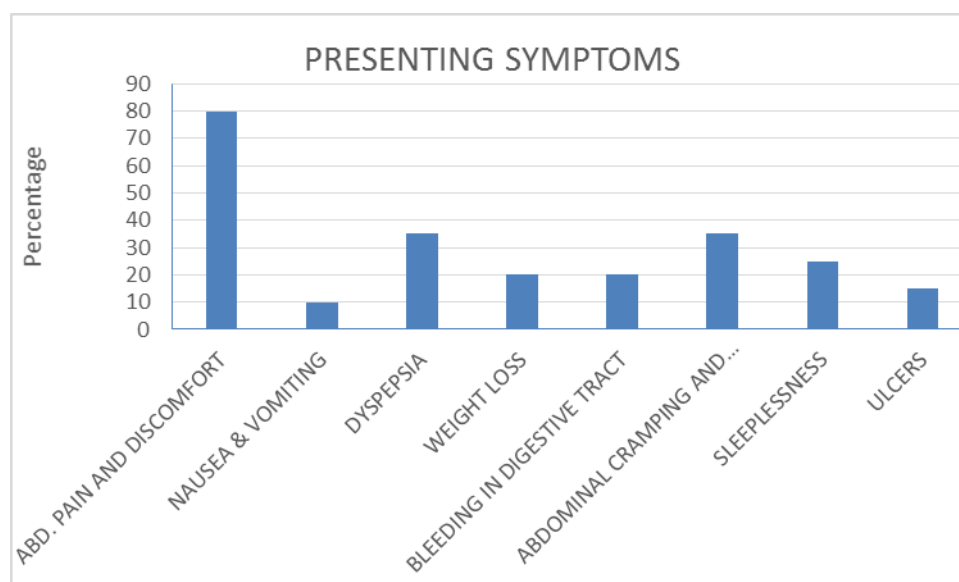


Figure No. 3: Diagrammatic representation of patients based on presenting symptoms

From table 4, it was observed that 80% of the patients are suffering abdominal pain and discomfort. 35% each suffering from dyspepsia and abdominal cramps & bloating. 25% of patients suffering from sleeplessness, 20% each suffering from weight loss and bleeding in the digestive tract, 15% suffering from ulcers, and 10% suffering from nausea & vomiting. From the above table, we can conclude that most patients are suffering from abdominal pain and discomfort.

PERCENTAGE DISTRIBUTION OF PATIENTS BASED ON PAST HISTORY OF PROBLEM

The percentage distribution of patients based on the history of the problem is shown in the following table.

Table No. 5: Percentage distribution of patients based on the history

History of PROBLEM	Frequency	Percent
No	11	55
Yes	9	45
Total	20	100

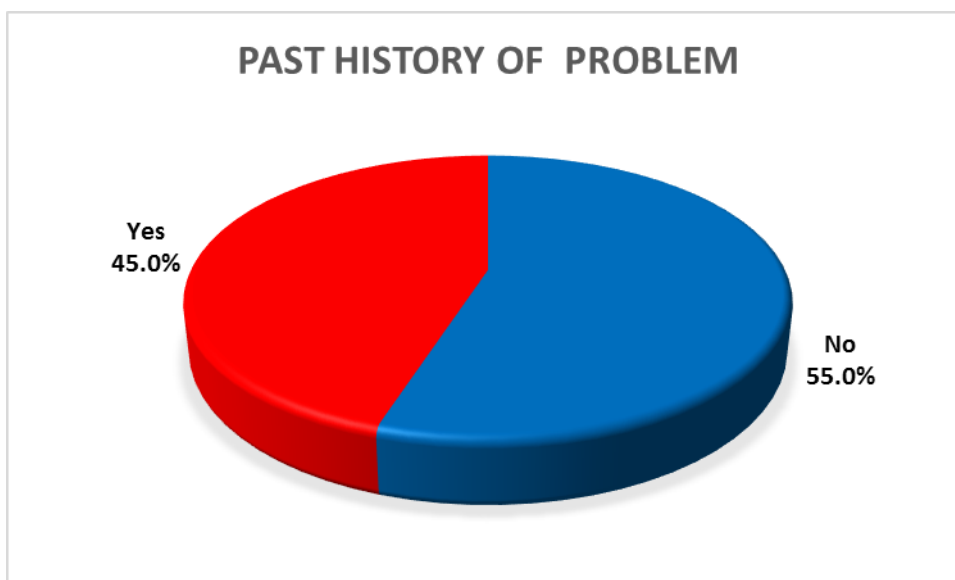


Figure No. 4: diagrammatic representation of patients based on the history of the problem.

From table 5, it was observed that 45% of the patients reported a history of the problem, and 55% of the people have not reported a history of the problem. From the above table, we conclude that 45% of the geriatric patients were reported with a history of the problem.

PERCENTAGE DISTRIBUTION OF PATIENTS BASED ON DURATION OF THE PROBLEM

The percentage distribution of patients based on the duration of the problem is shown in the following table.

Table No. 6: Percentage distribution of patients based on the duration of the problem.

Duration of PROBLEM	Frequency	Percent
Nil	11	55
1 year	5	25
2 years	4	20
Total	20	100

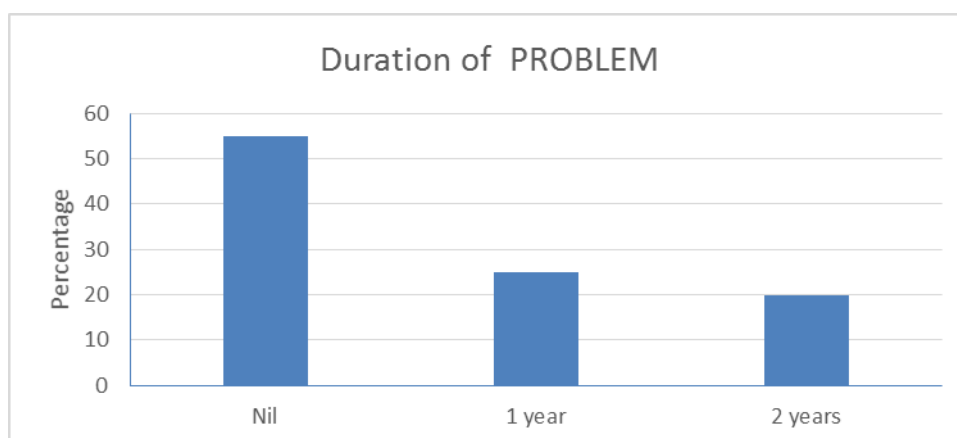


Figure No. 5: diagrammatic representation of patients based on the duration of the problem.

From table 6, it was observed that 55% of the patients were reported with no problem of duration, 25% of patients were reported with the 1-year duration of the problem and 20% of the patients were reported with the 2-year duration of the problem. From the above table, we conclude that a higher percentage of geriatric patients reported no problem.

PERCENTAGE DISTRIBUTION OF THE PATIENTS BASED ON THE PAST MEDICAL HISTORY

The percentage distribution of patients based on the past medical history is shown in the following table.

Table No. 7: Percentage distribution of patients based on past medical history.

Past medical history	Frequency	Percent
Hypertension	12	60
Respiratory disease	4	20
Diabetes	14	70
Thyroid	6	30
Dyslipidemia	8	40
Liver disease	5	25
Heart disease	6	30
Others	2	10

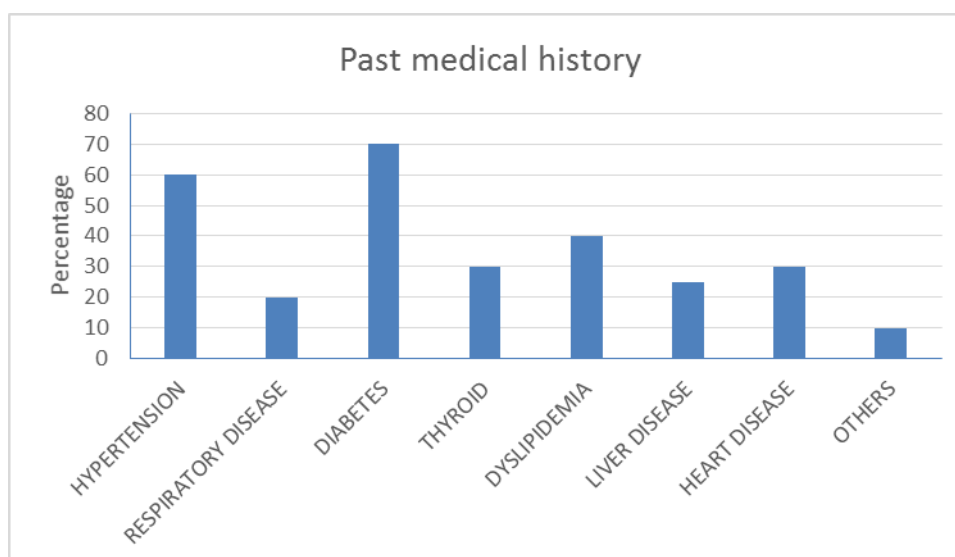


Figure No. 6: Diagrammatic representation of patients based on past medical history.

From table 7, it was observed that 70% of the patients were suffering from diabetes, 60% of the patients were suffering from hypertension, 40% of the patients were suffering from dyslipidemia, 30% each of the patients were suffering from thyroid and heart disease, 25% of the patients were suffering from liver disease, 20% of the patients were suffering from respiratory disease and 10% of the patients were suffering from other conditions. From the above table, we can conclude that higher percentages of geriatric patients were suffering from hypertension as past medical history.

PERCENTAGE DISTRIBUTION OF PATIENTS BASED ON SOCIAL HISTORY

The percentage distribution of patients based on their social history is shown in the following table.

Table No. 8: percentage distribution of patients based on social history.

Social history	Frequency	Percent
SMOKING	2	10
ALCOHOLISM	1	5
EXERCISE	3	15

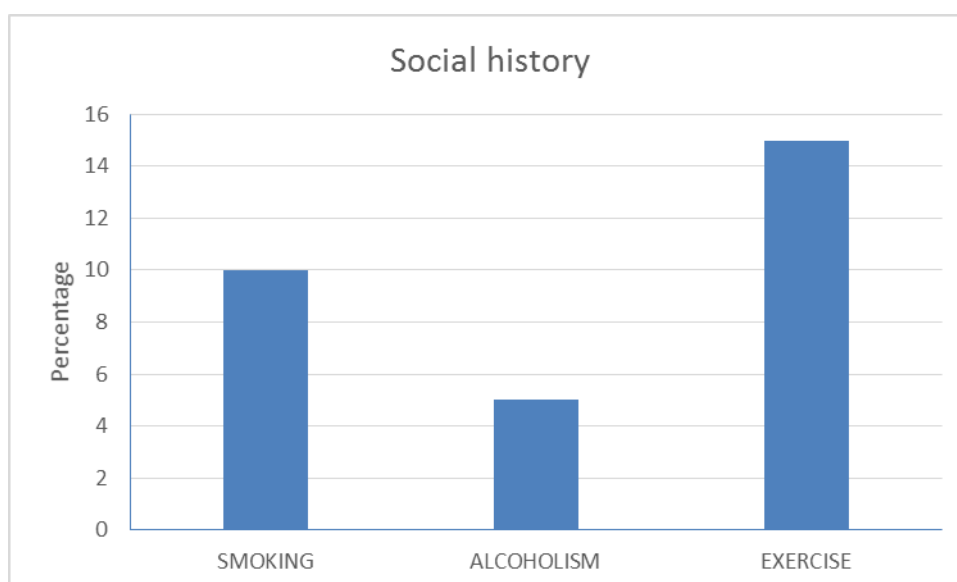


Figure No. 7: Diagrammatic representation of patients based on social history.

From the above table 8, it was observed that 15% of the patients have a social history of exercise, 10% of the reported smoking, and 5% of the patients reported alcoholism. From the above table, we conclude that a higher percentage of geriatric patients have a social history of exercise.

PERCENTAGE DISTRIBUTION OF PATIENTS BASED ON TREATMENT STRATEGIES

The percentage distribution of patients based on the treatment strategies is shown in the following table.

Table No. 9: percentage distribution of patients based on the treatment strategies

Treatment strategies	Frequency	Percent
ENDOSCOPIC RETROGRADE CHOLANGIOPANCREATOGRAPHY	8	40
COLONOSCOPY	0	0
BARIUM RADIOGRAPHY	0	0

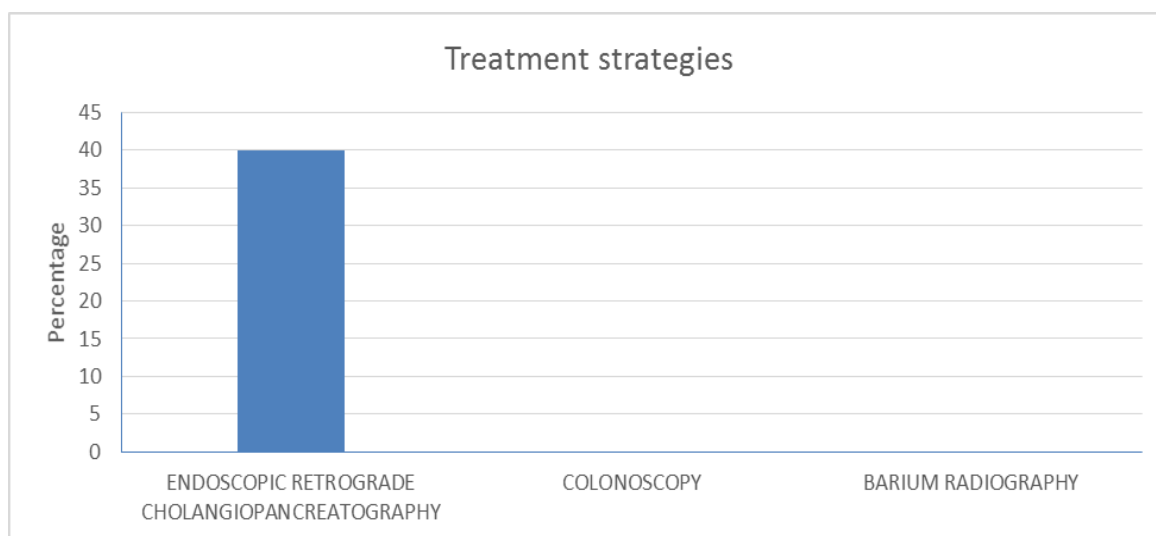


Figure No. 8: Diagrammatic representation of patients based on the treatment strategies.

From table 9, it was observed that 40% of the patients had Endoscopic retrograde cholangiopancreatography as a treatment strategy.

PERCENTAGE DISTRIBUTION OF PATIENTS BASED ON THE SYMPTOMS

The percentage distribution of patients based on the symptoms is shown in the following table.

Table No. 10: percentage distribution of patients based on the symptoms

Symptoms	Frequency	Percent
TIREDNESS	9	45
SLEEPINESS	5	25
DIARRHOEA	5	25
FALL	7	35
CONSTIPATION	11	55
LOSS OF APPETITE	7	35
URINARY RETENSION	3	15

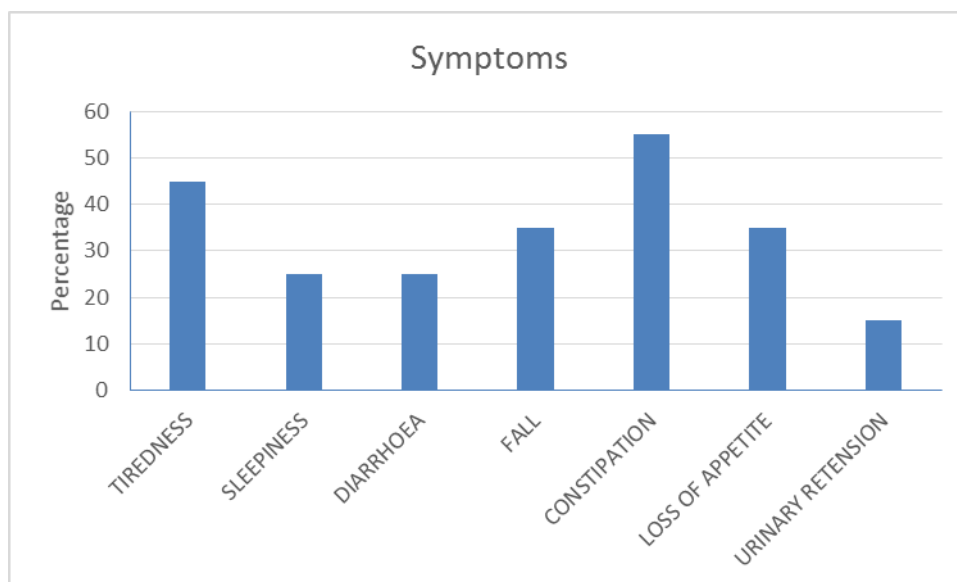


Figure No. 9: Diagrammatic representation of patients based on the symptoms

From the table 10, it was observed that 55% of the patients suffered from constipation, 45% of the patients suffered from tiredness, 35% each of the patients suffered from fall and loss of appetite, 25% each of the patients suffered from sleepiness and diarrhea and 15% of the patients suffering from urinary retention. From the above table, we conclude that a higher percentage of geriatric patients suffered constipation as a symptom.

PERCENTAGE DISTRIBUTION OF PATIENTS BASED ON DRUGS IN BEERS CRITERIA

The percentage distribution of patients based on drugs in Beers criteria is shown in the following table.

Table No. 11: percentage distribution of patients based on drugs in Beers criteria

DRUGS IN BEERS CRITERIA	Frequency	Percent
PPI	16	80
GLIMIPRIDE	3	15
SPIRINOLACTONE	8	40
NIFEDIPINE	1	5
FRUSEMIDE	6	30
SILODOSIN	1	5
PREGABALIN	1	5
AMILORIDE	1	5
INSULIN	4	20
ASPIRIN	3	15
RIVAROXABAN	1	5
ESCITALOPRAM	4	20
CLONAZEPAM	4	20

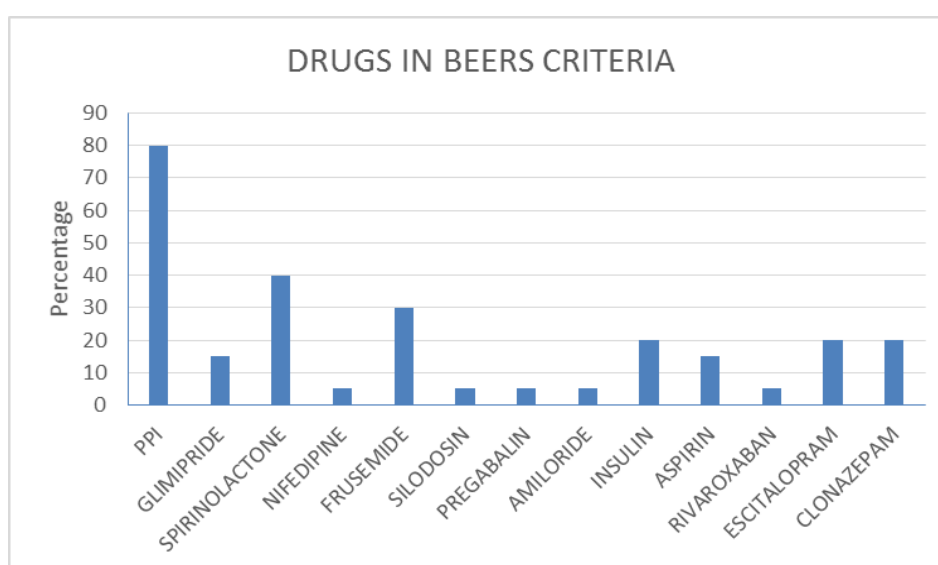


Figure No. 10: Diagrammatic representation of patients based on drugs in Beers criteria.

From table 11, it was observed that out of the total geriatric patients on polypharmacy, 80% of patients were taking PPI, 40% of the patients were taking Spironolactone, 30% of the patients were taking Frusemide.20% of the patients were taking Insulin, Escitalopram, Clonazepam. 15% each of the patients was taking Glimepiride and Aspirin. 5% each of the patients were taking Nifedipine, Silodosin, Pregabalin, Amiloride and Rivaroxaban. From the above table, we can conclude that a higher percentage of geriatric patients take PPI from the drugs in Beers criteria.

PERCENTAGE DISTRIBUTION OF PATIENTS BASED ON THE DRUG INTERACTIONS

The percentage distribution of patients based on the drug interactions is shown in the following table.

Table No.12: Percentage distribution of patients based on drug interactions

DRUG INTERACTIONS	FREQUENCY	PERCENT
Yes	9	45
No	11	55
Total	20	100

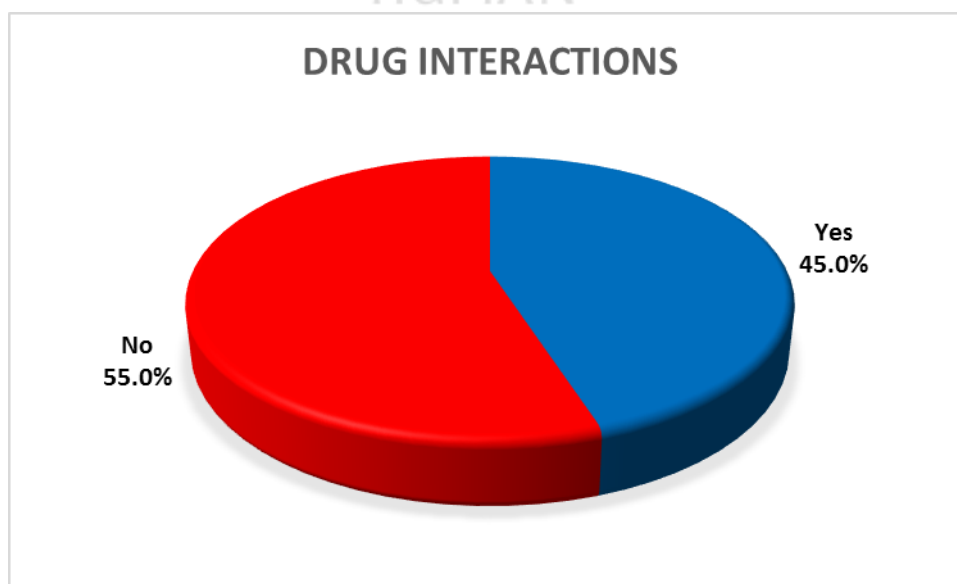


Figure No. 11: Diagrammatic representation of patients based on drug interactions

From Table 12, It was observed that 45% of the patients were reported with drug interactions.55% of the patients were not reported with drug reactions. From the above table, we concluded that 45% of the geriatric patients taking polypharmacy were reported with drug interactions.

PERCENTAGE DISTRIBUTION OF PATIENTS BASED ON OTHER TREATMENT MODALITIES

The percentage distribution of patients based on other treatment modalities is shown in the following table.

Table No. 13: Percentage distribution of patients based on other treatment modalities

OTHER TREATMENT MODALITIES	FREQUENCY	PERCENTAGE
AYURVEDA	9	45
HOMEOPATHY	2	5

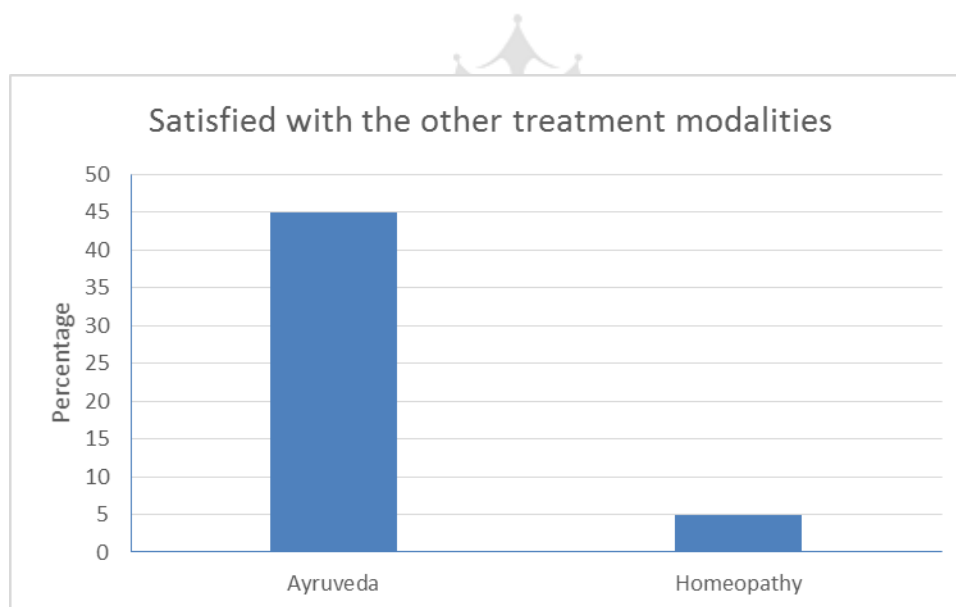


Figure No. 12: Diagrammatic representation of patients based on other treatment modalities

From Table 13, it was observed that out of the total patients, 45% of the patients were satisfied with the Ayurveda treatment and 5% of the patients were satisfied with homeopathic treatment. Thus, from the above table, we concluded that nearly half of the total geriatric patients in the

study were satisfied with the Ayurvedic treatment option, and a few of them were satisfied with the homeopathic treatment option.

PERCENTAGE DISTRIBUTION OF PATIENTS BASED ON THEIR ABILITY TO TAKE THE MEDICATION BY THEMSELVES

The percentage distribution of patients based on medication-taking behavior is shown in the following table.

Table No. 14: Percentage distribution of patients based on the ability to take medication by themselves.

TAKE MEDICATION BY SELF	FREQUENCY	PERCENTAGE
Yes	12	60
No	8	40
TOTAL	20	100

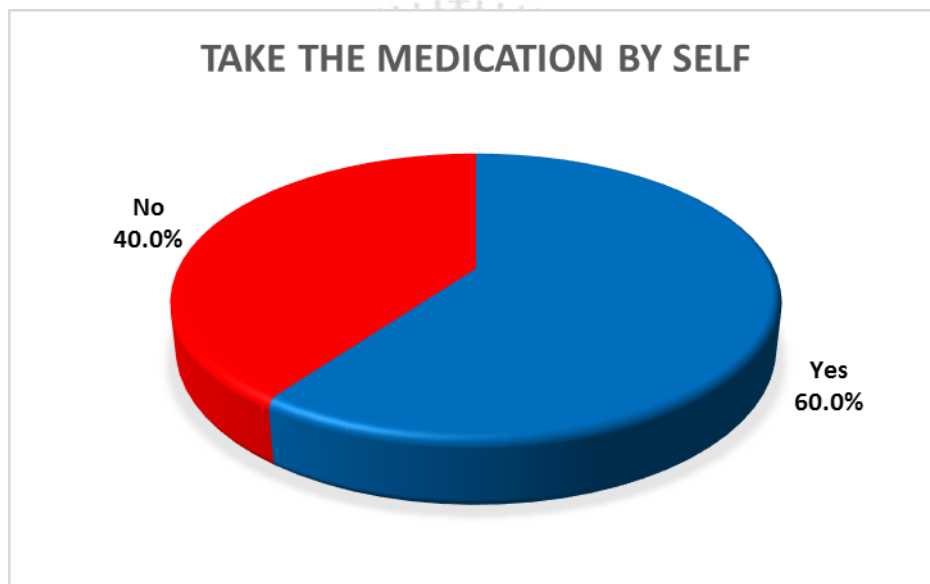


Figure No. 13: Diagrammatic representation of patients based on their ability to take medication by themselves

From Table 14, it was observed that 60% of the patients take the medication by themselves. 40% of the patients do not take the medication by themselves. Thus, from the above table, we concluded that most geriatric patients are capable to take the medication by themselves.

PERCENTAGE DISTRIBUTION OF PATIENTS BASED ON WHO GIVES YOU MEDICINE

The percentage distribution of patients based on who gives you, medicine is shown in the following table.

Table No. 15: Percentage distribution of patients based on who gives you medicine

WHO GIVES YOU MEDICINE	FREQUENCY	PERCENT
Self	13	65
Spouse	4	20
Relative	1	5
Attendant	2	10
Total	20	100

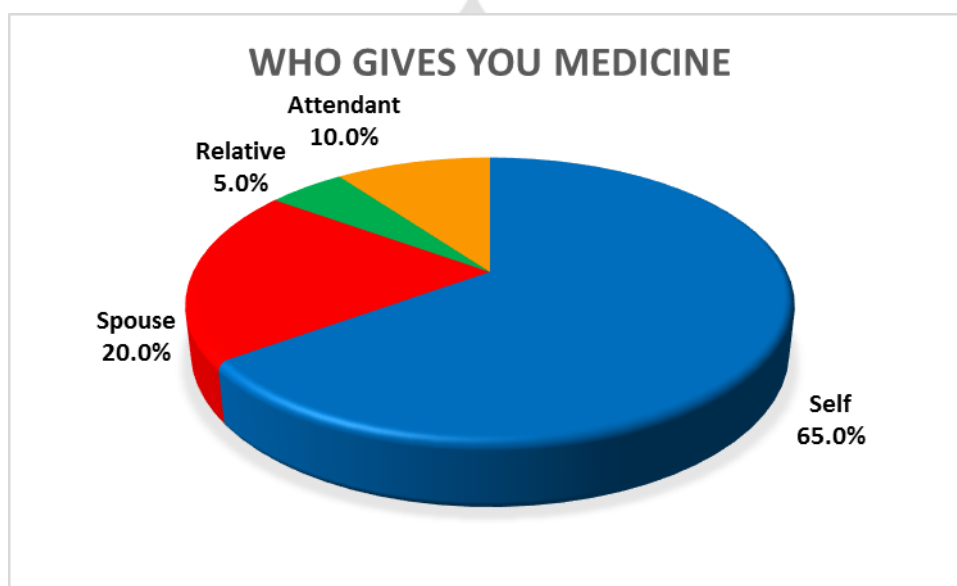


Figure No. 14: Diagrammatic representation of patients based on who gives you medicine

From Table 15, it was observed that 65% of the patients took the medicine by themselves. For 20% of the patients, the medicine was given by their spouse. For 5% of the patient's medicine was given by Relatives. For 10% of the patients, medicine was given by an Attendant. Thus from the above table, we concluded that the majority of the patients took the medications by themselves.

PERCENTAGE DISTRIBUTION OF PATIENTS BASED ON THE USE OF PILLBOX OR MEDICINE BOX

The percentage distribution of patients based on the use of pillbox or medicine box is shown in the following table.

Table No. 16: Percentage distribution of patients based on the use of pillbox or medicine box

USE PILLBOX OR MEDICINE BOX	FREQUENCY	PERCENT
Yes	12	60
No	8	40
Total	20	100

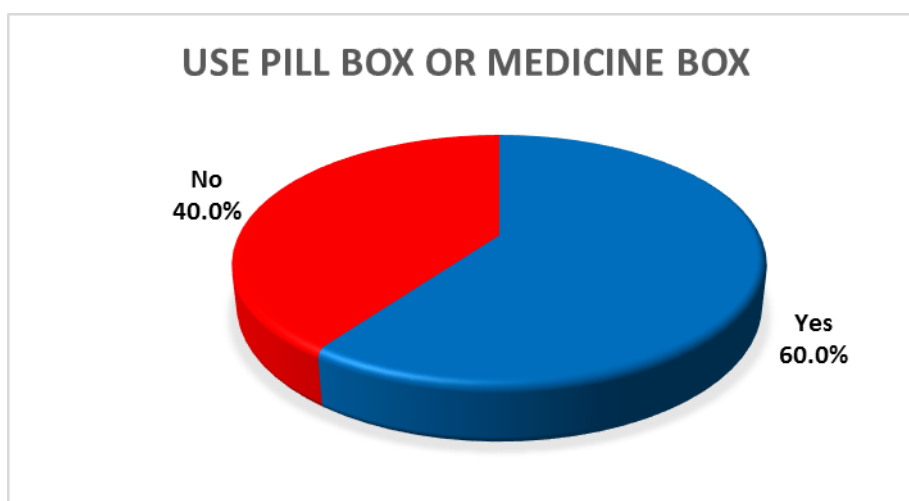


Figure No. 15: Diagrammatic representation of patients based on the use of pillbox or medicine box

From table 16, it was observed that out of the total geriatric patients taking polypharmacy, 60% were using the pillbox or medicine box and 40% were not using the pillbox or medicine box. Thus from the above table, we conclude that there is a higher chance of occurrence of medication errors reported with patients who are not maintaining their pillbox or medicine box compared to those who regularly maintain a pillbox or medicine box.

PERCENTAGE DISTRIBUTION OF PATIENTS BASED ON THE FALLS IN THE LAST YEAR

The percentage distribution of patients based on the falls in the last one year is shown in the following table.

Table No. 17: Percentage distribution of patients based on the falls in the last one year

FALLS IN THE LAST ONE YEAR	FREQUENCY	PERCENTAGE
Yes	5	25
No	15	75
Total	20	100

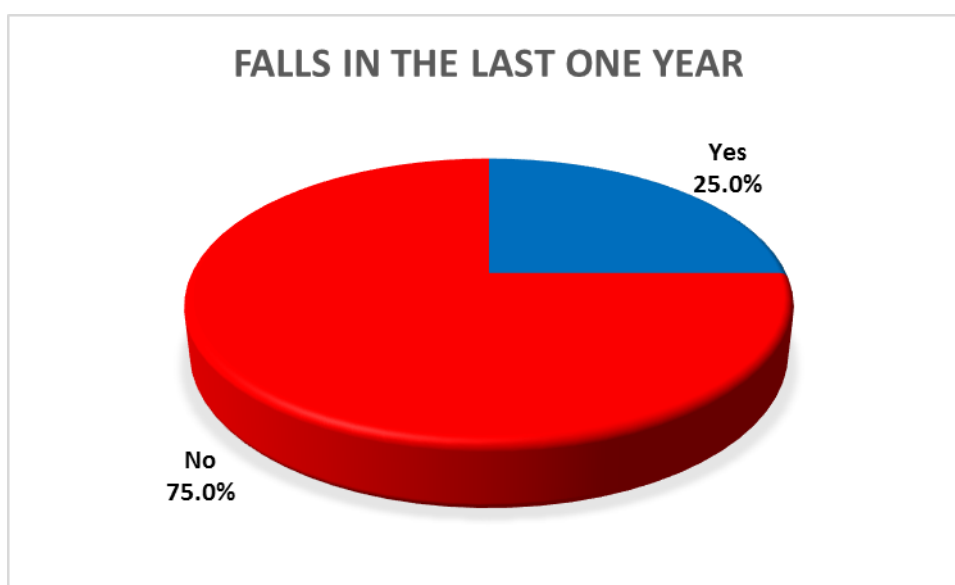


Figure No. 16: Diagrammatic representation of patients based on the falls in the last one year

From Table 17, it was observed that out of the total patients, 25% of patients were presented with complaints of falls in the last one year and 75% of the patients were not presented with complaints of falls in the last one year. Thus, from the above table, we can conclude that majority of patients were not experienced symptoms of falls in the last year.

PERCENTAGE DISTRIBUTION OF PATIENTS BASED ON THE ADVERSE DRUG REACTIONS

The percentage distribution of patients based on the adverse drug reactions is shown in the following table.

Table No. 18: Percentage distribution of patients based on the adverse drug reactions

ADVERSE DRUG REACTIONS	FREQUENCY	PERCENTAGE
Constipation or diarrhea	11	55
Problems in passing urine	4	20
Disturbance in the sleep	11	55
Skin lesions or symptoms like itching, change in colour, etc	3	15
Other possible adverse drug reactions	5	25

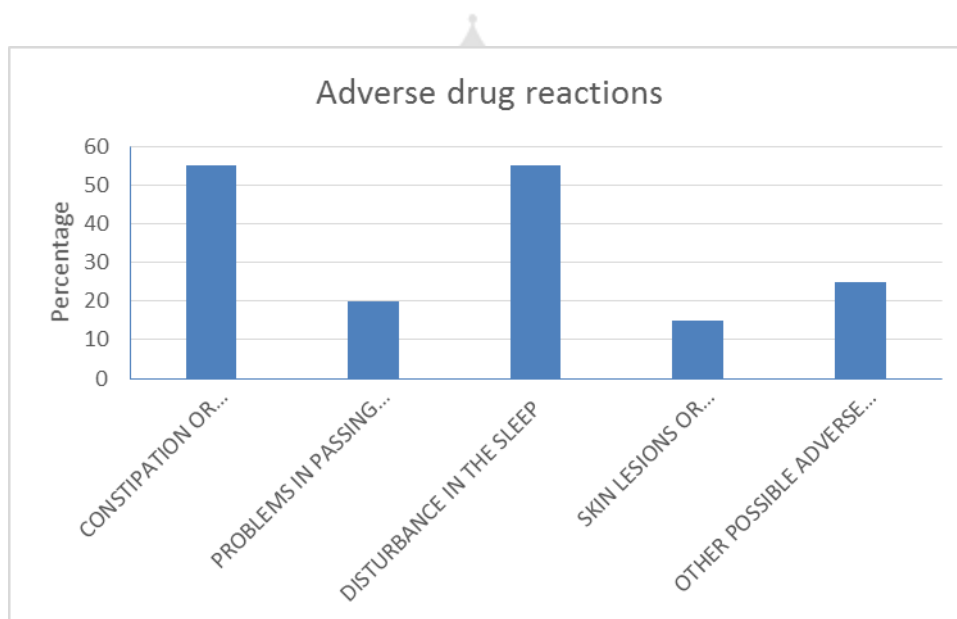


Figure No. 17: Diagrammatic representation of patients based on the adverse drug reactions

From table 18, It was observed that out of the total patients, 55% of patients were suffering from constipation or diarrhea. 20% of the patients were suffering from problems in passing urine. 55% of the patients were suffering from disturbance in sleep. 15% of the patients were suffering from skin lesions or other symptoms like itching, change in color, etc. 25% of patients were suffering

from other possible adverse drug reactions. Thus, from the above table, we can conclude that most of the patients suffer from constipation or diarrhea and disturbance in the sleep cycle.

PERCENT AGE DISTRIBUTION OF PATIENTS BASED ON THE NARENJO ADVERSE DRUG REACTION PROBABILITY SCALE

The percentage distribution of patients based on the Naranjo adverse drug reactions probability scale is shown in the following graph.

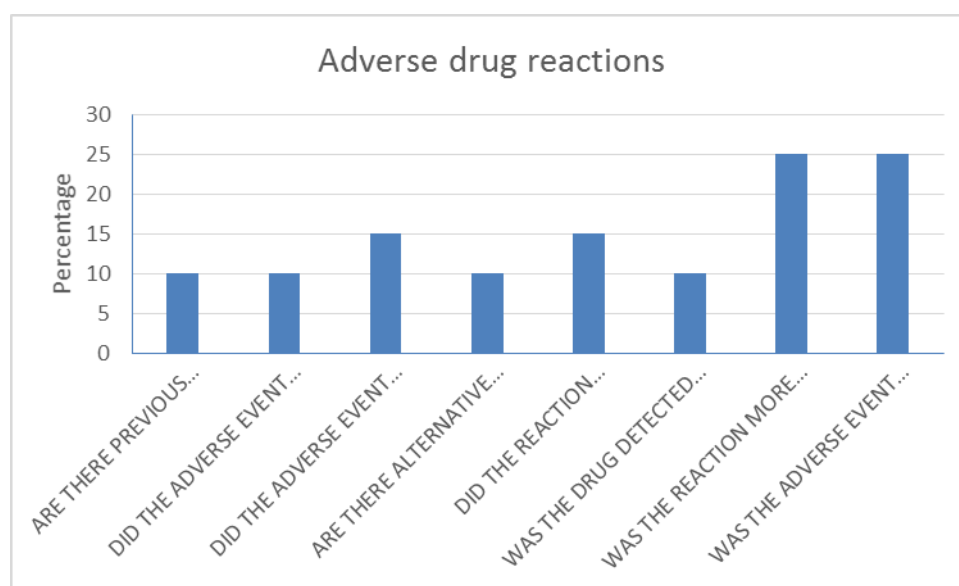


Figure No. 18: Diagrammatic representation of the distribution of patients based on the Naranjo Adverse drug reaction probability scale

Table No. 19: Percentage distribution of patients based on the Narenjo adverse drug reaction probability

Narenjo adverse drug reaction probability scale	FREQUENCY	PERCENT
Are there previous conclusive reports on this reaction	2	10
Did the adverse event appear after the suspected drug was administered	2	10
Did the adverse event reappear after when the drug was re-administered	3	15
Are there alternative causes (other than the drug) that could on their own have caused the reaction	2	10
Did the reaction reappear when a placebo was given	3	15
Was the drug detected in blood (or other fluids) in concentration known to be toxic	2	10
Was the reaction more severe when the dose was increased or less severe when the dose was decreased	5	25
Was the adverse event confirmed by any objective evidence	5	25

From table 19, it was observed that out of total patients, 10% of the patients were reported with the previous conclusive reaction. 10% of patients were reported with the appearance of an adverse event after the suspected drug was administered. 15% of the patients were reported the reappearance of the adverse event when the drug was readministered. 10% of the patients were reported with an alternative cause (other than drug) that could on their own have caused the reaction. 15% of the patients were reported with the reappearance of the reaction after the placebo was given. 10% of the patients were reported with the drug detected in blood (or other fluids) in concentration known to be toxic. 25% of the patients were reported with the more severe reaction when the dose was increased or less severe when the dose was decreased. 25% of the patients were reported with the adverse event confirmed by the objective evidence. From the above table, we concluded that the majority of the adverse drug reactions are directly proportional to the dose of the drug. i.e., The reaction becomes more severe when the dose was increased and the reaction becomes less severe when the dose was decreased. Similarly, most of the adverse event was confirmed by objective evidence.

PERCENTAGE DISTRIBUTION OF PATIENTS BASED ON DRUG REACTION

The percentage distribution of patients based on drug reactions is shown in the following table.

Table No. 20: Percentage distribution of patients based on drug reactions

DRUG REACTION	FREQUENCY	PERCENT
DOUBTFUL	10	50
POSSIBLE	5	25
PROBABLE	5	25
TOTAL	20	100

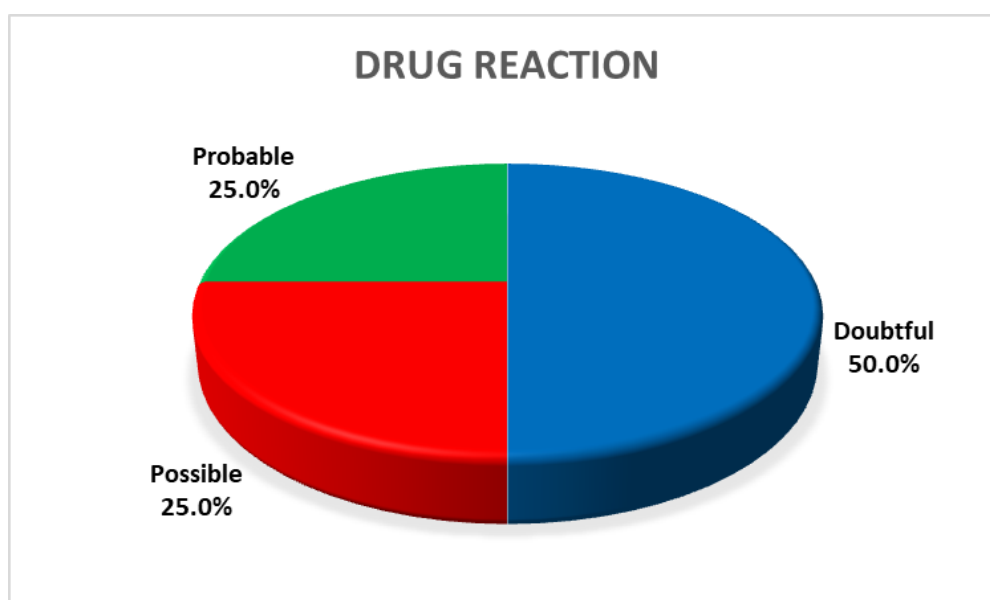


Figure No. 19: Diagrammatic representation of patients based on drug reactions

From Table 20, It was observed that 50% of the patients were with doubtful drug reaction.25% of the patients were with possible drug reaction.25% of the patients were with probable drug reactions. Thus, from the above table, it was concluded that the majority of the patients are with a doubtful drug reaction.

Table no. 21: Reported Adverse Drug Reactions

Causative Drug	Adverse Drug Reactions
Insulin	Hypoglycemia, Weight gain
Atorvastatin	Myalgia
Aspirin	Epistaxis
Atorvastatin	Rhabdomyolysis
Gliclazide	Hypohlycemia
T.Dytor Plus(torsemide+spironolactone)	Hyponatremia
T.Eliquis(apixaban)	hematuria
T Telmisartan	hyperkalemia
T Escitalopram	Insomnia
T Olmesartan	Mouth ulcer
T Cilnidipine	Rashes

Table no.22: Drug Interaction

Interacting Drugs	Severity	Mechanism
Calcium carbonate+Carvedilol	Major	Calcium carbonate decreases the level of Carvedilol by inhibition of GI absorption.
Pantoprazole+Ferrous fumarate	Major	Pantoprazole decrease the level of ferrous fumarate by increasing the gastric pH
Clopidogrel+ pantoprazole	Major	pantoprazole decreases effects of clopidogrel b affecting hepatic enzyme CYP2C19 metabolism.
Acetaminophen + metoclopramide	Minor	metoclopramide increases levels of acetaminophen by enhancing GI absorption.
Sodium bicarbonate + Aspirin	minor	Passive renal tubular reabsorption due to increased PH
Calcium carbonate+Rosuvastatin	major	Calcium carbonate decreases level of rosuvastatin by inhibition of GI absorption

DISCUSSION

The study aims to analyze the prescription pattern, drug reactions, and drug interactions associated with polypharmacy among the geriatric population in a gastroenterology department. In this study, 20 patients with polypharmacy were taken. Statistical analysis was performed using paired t-test and a detailed analysis was performed.

The study demonstrated that 80% of patients were taking proton pump inhibitors, 40% of patients were taking spironolactone, 30% of patients were taking furosemide and the remaining population take insulin, escitalopram, clonazepam, glimepiride, aspirin, etc. This concludes that a higher percentage of geriatric patients take PPI from the drugs in beer's criteria.

Among the population, around 45% of the patients taking polypharmacy were reported with drug interactions. Out of the total patients, 55% of patients were suffering from constipation or diarrhea, 55% of patients also suffering from a disturbance in sleep, 20% of the patients have difficulty in passing urine, other symptoms like itching, and other possible adverse drug reactions.

Based on the Narenjo adverse drug reaction probability scale, it is concluded that the majority of the adverse drug reactions are directly proportional to the dose of the drug i.e, the reaction becomes more severe when the dose was increased and the reaction becomes less severe when the dose was decreased. It is also observed that 50% of the patients were with a doubtful drug reaction, 25% of the patients with a possible drug reaction, and 25% of patients with probable drug reaction.

A study conducted by Luis Midao et al on the topic " Polypharmacy prevalence among older adults based on the survey of health, T aging and retirement in Europe" suggested that polypharmacy is a highly prevalent condition across the elderly population with rates between 26.3% and 39.9% in Europe and Israel which is similar to our study that the geriatric patients taking polypharmacy are within the rates of 30% and 40 % .¹

In another study conducted by Alessandro Nobili et al on the topic, "Drug utilization and polypharmacy in an Italian elderly population" is similar to our study as it concludes that there is an increasing proportion of elderly exposed to medications, chronic drug therapies, and polypharmacy.²

A study conducted by Roberto Leone et al on the topic “Identifying Adverse Drug Reactions Associated with Drug-Drug Interactions” suggested that multiple drug administration is one of the risk factors for potential drug interactions. Their study shows that the percentage of reports with potential drug-drug interactions increases to polypharmacy, they also confirm that ADR associated with drug interactions could be a problem with clinical practice. This was similar to our study that polypharmacy can increase the risks of drug interactions and associated drug reactions.³

Another study conducted by L. J. G. Veehof et al on the topic, “Adverse drug reactions and polypharmacy in the elderly in general practice” suggested that most of the adverse effects observed in general practice turn out to be rather harmless and in our study also the drug reactions are more doubtful.⁴

A study conducted by Panagiota Voukelatou et al on the topic “Predictors of Inappropriate Proton Pump Inhibitors Use in Elderly Patients” is similar to our study as their study points out that the main predictor of Proton pump inhibitors use in geriatric patients was the number of medications they took, it is more possible for a physician to prescribe a PPI when the patient receives polypharmacy. In our study, it concludes that the higher percentage of the geriatric patients taking polypharmacy were using PPI.⁵

CONCLUSION

In our study, we suggest that 80% of patients, that is a higher percentage were taking Proton pump inhibitors among the other drugs in the beers criteria. 30% of patients were taking spironolactone, furosemide and the remaining drugs in the beer’s criteria are not frequently used. In the case of drug interactions, only 45% of geriatric patients were reported. And 55% of geriatric patients were suffering from adverse reactions like constipation or diarrhea and suffering from a disturbance in sleep, 20% have problems in passing urine and skin lesions or itching. Hence from the study, we conclude that most of the geriatric patients with polypharmacy have Adverse reactions out of which most of them are doubtful. So adequate patient interviews and follow up are necessary to achieve a therapeutic outcome.

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