ISSN No:-2456-2165

Assessment on Prevalence of Polypharmacy in Geriatric Patients with Cardiovascular Diseases

Dr. K. Sechana, A.Rashmi
Department of Pharm-D,
Mallareddy Institute of Pharmaceutical Sciences (MRIPS),
Affiliated to Jawaharlal Nehru Technological University Hyderabad [JNTUH],
Hyderabad, India.

Abstract:- Polypharmacy is the consumption of five or more drugs at the same time. Cardiovascular disease is difficult to diagnose and be treated in geriatric patients. Objectives: The objective of the present study is to assess the prevalence of polypharmacy in cardiovascular diseases among geriatric patients. Other objectives include evaluation of the common reasons of admission, comorbidities, and echocardiography and to assess this polypharmacy using ARMOR TOOL. Methods: A 6 months prospective study was conducted at a tertiary hospital with 150 ambulatory geriatric patients (60yr or above and of either sex). We followed two methods in the study. In method-1, the etiology and frequency of polypharmacy, comorbidities, reasons of admission and the nature of drug treatment were taken into consideration. In method-2, ARMOR TOOL was used to evaluate the polypharmacy in geriatric patients. Result: Of the total 150 prescriptions received, 75.34% (n=113) were males and 24.66% (n=37) were females. The polypharmacy among patients were calculated, 14.68% (n=22) were noted as minor polypharmacy, 62.66% (n=94) were noted as moderate polypharmacy and 22.64% (n=34) were found to be serious polypharmacy. Beers criteria list of drugs were identified and monitored using ARMOR TOOL. The drug interactions were found in 93.33% (n=140) of the total prescriptions and in 6.67% (n=10) had no interactions. The total number of ADRs found were 8.67% (n=13). Conclusion: Careful and thoughtful drug prescription strategy seems to be able to eliminate most of the cases of polypharmacy and drug related problems even in patients who are suffering from multiple disorders. Hence, our study emphasized on the need of informing doctors about the problems associated with polypharmacy. The results obtained provided support for development of new drugs that take into account compatibility with other medication, especially in geriatric population.

Keywords:- *Cardiovascular diseases, Comorbidities, ADRs, Polypharmacy, ARMOR TOOL, Geriatrics.*

I. INTRODUCTION

Polypharmacy is the usage of 5 to 10 prescription drugs concomitantly for the treatment of diseases. Thus, it is a prescription, administration or use of medications in increased numbers than that are clinically indicated [1]. This is of much more important in case of geriatric population, because elderly patients are at a higher risk of developing adverse drug reactions due to their physiological and metabolic changes and decreased clearance which is seen with aging. Also in geriatrics presence of other concomitant clinical conditions is also responsible for increased prescribed drugs. The risk is further more increased with the increased number of medications used [2]. World Health Organization (WHO) evaluated that one elderly people with the age 60 years or more in every nine people. Polypharmacy can also cause problems with the adherence to medications especially in the older patients [3]. This eventually is responsible for greater health-care costs, increased risk of drug-drug interactions, adverse drug reactions (ADR's), non-compliance, increase in hospitalizations and substantial rise in the incidence of morbidity and mortality [4]. Non-adherence to the medications that are prescribed are estimated at 79%, 69%, 65%, and 51%, for once, twice, three, and four times daily administration, respectively [5] [6]. This non-compliance with the medications may be responsible for 125,000 deaths annually and approx. 177 billion dollars increased health care costs in America [7]. Different tools are used to assess prescription appropriateness in elderly including Beers criteria [8], medication appropriate index (MAI) [9], ARMOR tool [10]. The factors that may be responsible for polypharmacy development are new drug therapies available in the market for treating chronic illness, low thresholds for addressing the risk factors in preventive medicine and new indications for older drug treatments [11].

➢ *Classification of Polypharmacy:*

Polypharmacy is classified according to the number of drugs prescribed-

- Minor polypharmacy : Prescription contains <5 drugs
- Moderate polypharmacy : Prescription contains 5-9 drugs
- Serious polypharmacy : Prescription contains >9drugs

ISSN No:-2456-2165

The present study aimed at assessing of prevalence of polypharmacy in geriatric patients with cardiovascular diseases.

II. METHODOLOGY

We have conducted a prospective study for a period of six months at a tertiary care hospital in Hyderabad. Through review, medical records of 150 hospitalized geriatric patients admitted to cardiac department are randomly selected during the period of September 2019-February 2020. Inpatient case notes and medical records were used in the data collection. In this study use of more than 5 drugs is described as polypharmacy. A total of 150 patient prescriptions were found to be 'polypharmacy containing prescriptions', out of which 34 come under serious polypharmacy, 94 come under moderate polypharmacy and 22 prescriptions come under minor polypharmacy.

➢ *Data Collection:*

Case notes were reviewed for information about each resident age, gender, principal diagnosis, concomitant disease states, medical history, concurrent medication and dosage. Other data collected included biochemistry and hematology results and normal laboratory values during their hospital inpatient stay. The suspected drugs from these were extracted and evaluated for possible drug interactions. All oral, IV medications, tablets and capsules given on a long term basis were counted as prescribed medications. After analyzing the data, the necessary interpretation is done and the outcome of the study was assessed.

➢ *Inclusion criteria:*

- Prescription containing five or more drugs.
- Age of patient(s) above 60 years.
- Prescription meant for cardiovascular disorders with or without co-morbidities
- In patient prescriptions only.

➢ *Exclusion criteria*

- Topical and herbal medications.
- Patient who died during study.
- Patients age less than 60 years.
- Out-patient prescriptions.

A. METHOD - 1

- Collected data of patients (n=150) and medication prescribed by the physician has been noted and compared for each patient.
- Polypharmacy has been assessed based on the age, sex and other criteria.
- Consider patients with age 60 and above because polypharmacy is mostly seen in geriatric population due to the presence of other comorbid conditions.
- During the study we focus on most frequently prescribed drugs, assess the prescribed combinations, check for gender difference in prescription, and find the prevalence of polypharmacy by reviewing patient case sheet that is

✓ Echocardiography
✓ Reasons of admission
✓ Comorbidities
✓ Polypharmacy with treatment
✓ Discharge

B. METHOD – 2

➢ *The ARMOR Tool:*

The ARMOR tool (Assess, Review, Minimize, Optimize, Reassess) is a functional and interactive tool which tries to balance evidence-based practice with altered physiological reserves taking into account the patient's clinical profile and functional status, and. ARMOR is an attempt to approach polypharmacy in a systematic and organized fashion. The primary outcome goals are functional status, its restoration, and maintenance. This tool also emphasizes quality of life as a key factor for making decisions on changing or discontinuing medications. Use of a certain medication is weighed against its impact on primary biological functions such as bladder, bowel, status and mobility is held up and appetite. Functional as the essential final outcome measure for any medication change using ARMOR.

➢ *Implementation of ARMOR-*

We used ARMOR with an interdisciplinary team-based approach. Each patient and his/her chart was reviewed to provide recommendations on a monthly basis to all clinicians on appropriate dosing, potential ADRS, and regulatory guidelines mandated by state and federal compliance rules. Pharmacists were also invited to join the interdisciplinary team, so as to discuss the care plan and each recommendation made with reference to our goals for a particular patient. If any changes being considered, pharmacists were involved to make these necessary changes. In cases where a difference of opinion arose, all team members deliberated, with function and cognition as primary outcomes for guidance. The team consisted of a medical director, director of nursing, assistant director of nursing, physical/occupational therapy director, recreational therapist, and social worker. The nursing director is responsible for contacting clinicians for implementing the proposed changes. To discuss clinical impact or concerns regarding the recommendations, the medical director once in a quarter meets the clinicians. Clinicians are encouraged to adopt the proposed recommendations. The application of this tool may lead to notable reduction in polypharmacy and reduced cost of care with decrease in hospitalization.

ARMOR is an approach made stepwise for assessment of a geriatric patient who is: (1) receiving nine or more medications; (2) seen for initial assessment; (3) seen for falls and/or behaviors; and/or (4) admitted for rehabilitation. A physician assessment and physical examination is followed is done which is followed by the following steps:

ISSN No:-2456-2165

Step 1 A = ASSESS every subject for total number of medications and for certain medications that has potential for adverse outcome:

- Beta blockers
- Antidepressants
- Antipsychotics
- Other psychotropics
- Pain medications
- Other medications in the Beers Criteria list
- Vitamins and supplements

Step 2 R = REVIEW for possible

- Drug-drug interactions
- Drug-disease interactions
- Drug-body interactions (pharmacodynamics)
- Subclinical ADRS
- Weigh individual medication benefits against primary body functions (appetite, weight, pain, mood, vision, hearing, bladder, bowel, swallowing, and activity level).

Step 3 M=MINIMIZE nonessential medications:

- Eliminating of medications that clearly has no evidence for their usage.
- Eliminate medications whose risks outweigh benefits and that have high potential for negative impact on primary functions (appetite, weight, pain, mood, vision, hearing, bladder, bowel, skin, swallowing, and activity level).

Step 4 0=OPTIMIZE by addressing

- Duplication
- Redundancy
- Adjust renal cleared medications to creatinine clearance (glomerular filtration rate)
- Adjust oral hypoglycemics to blood sugar target and HbAlc.
- Consider gradual dose reduction (GDR) for antidepressants
- Adjust beta blockers for physiological heart rate response
- Adjust beta blocker dose for pacemakers.
- Adjust anticoagulants for international normalized ratio (INR) guidelines and possible DDIS.
- Adjust seizure medications with free phenytoin level.

Step 5 R =REASSESS heart rate, blood pressure (postural), oxygen saturation rate (>92%) at REST and ACTIVITY. Also reassess

- Functional status
- Cognitive status (Folstein Mini-Mental State Examination)
- Clinical status (clinical exam by physician for compensation of pre-existing diseases)
- Medication compliance.

III. RESULTS AND DISCUSSION

A. METHOD 1-

The prevalence of polypharmacy in cardiovascular disease was found either sex that is 75.34% (n=113) in males which is more when compared to females that is 24.66% (n=37) as shown in table no. 1 and graph no. 2.

In this study, we have classified the **age group** into four categories that is 60-69, 70-79, 80-89 and 90-99 years respectively as shown in table no. 1. In 60-69 years age group, the percentage of males was 27.34% (n=41) and the percentage of females was 14% (n=21). In 70-79 age group, the percentage of males was 26% (n=39) and percentage of females was 5.36% (n=8). In the age group 80-89, the percentage of males was 16% (n=24) and percentage of females was 4.63% (n=7). In 90-99 age group, the percentage males was 6 % (n=9) and the percentage of females was 0.67% (n=1) and plotted in a graph no. 1 respectively.

AGE IN YEARS	NO. OF MALES	% OF MALES	NO. OF FEMLALES	% OF FEMALES
60-69	41	27.34	21	14.00
70-79	39	26.00	8	5.36
80-89	24	16.00	7	4.63
90-99	9	6.00	1	0.67
TOTAL	113	75.34	37	24.66

Table 1:- Demographic characteristics of the study population

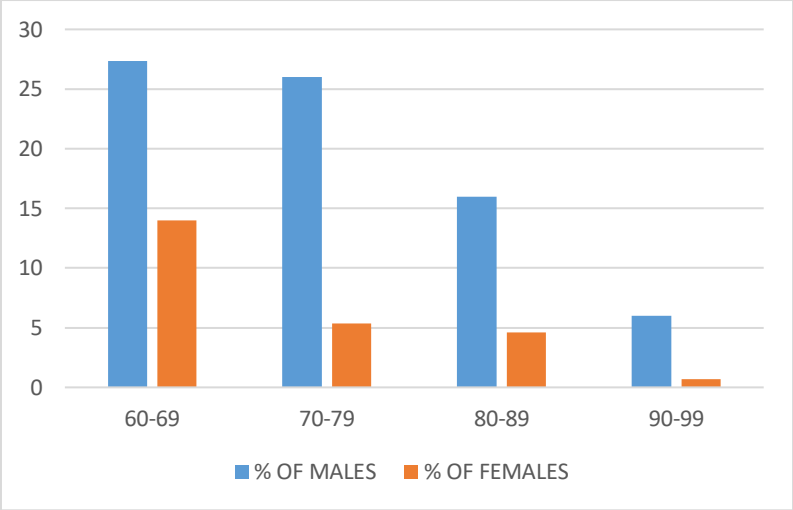

Fig 1:- Demographic details (Age)

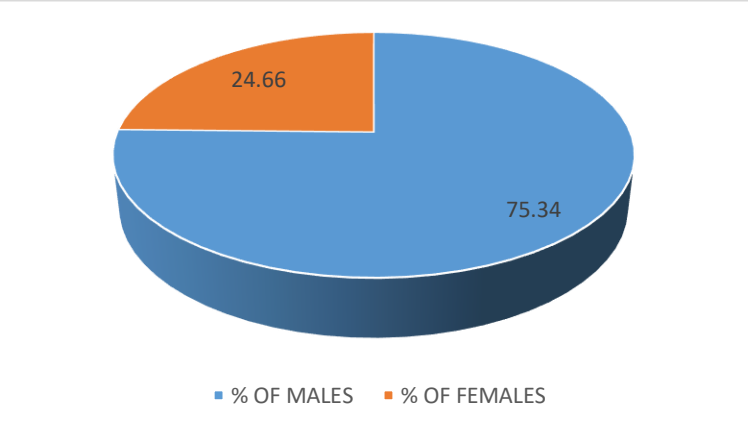

Fig 2:- Demographic details (Gender)

Table no.2 shows the ambulatory patients with **common reasons of admission** according to **method-I**. The percentage of most common reason of admission was plotted in graph no. 3. Common reasons were found to be chest pain with shortness of breath in patients 22.66% (n=34), only chest pain in 18.66% (n=28), chest pain with sweating in 11.33% (n=17), chest pain with sweating and shortness of breath in 8% (n=12), chest pain with cough and shortness of breath in 4.66% (n=7) and only shortness of breath in 9.33% (n=14).

REASON OF ADMISSION	NO. OF PATIENTS	PERCENTAGE
CHEST PAIN	28	18.66
SOB	14	9.33
CHEST PAIN, SOB	34	22.66
CHEST PAIN, SWEATING	17	11.33
CHEST PAIN, SOB, COUGH	7	4.66
CHEST PAIN, SOB, SWEATING	12	8
SOB, COUGH	6	4

Table 2:- Common reasons of admission

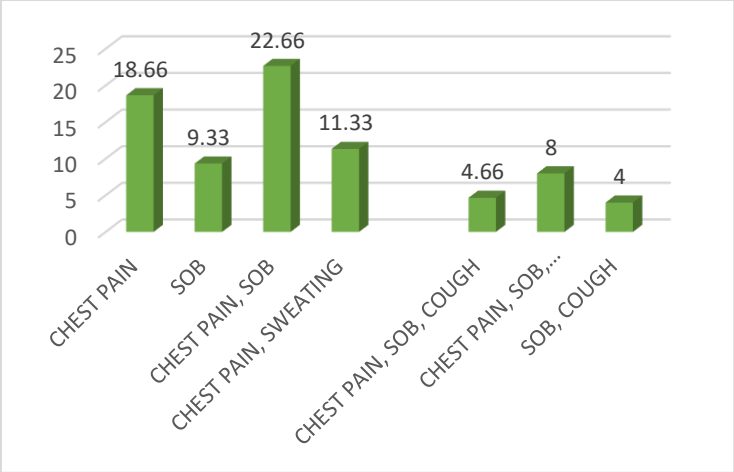

Fig 3:- Common reasons of admission

Table no. 3 shows the patients with the presence of common comorbidities. The percentage of patients with no comorbid conditions were 37.33% (n=56), whereas the percentage of patients with comorbid conditions were 62.67% (n=94). The **common comorbidities** were found to be HTN in 12% (n=18), DM in 6 % (n=9), CAD in 8.66% (n-=13), HTN with CAD in 3.33% (n=5), CAD with HTN and DM in 2.66% (n=4), both HTN and DM in 10% (n=15) respectively plotted in graph no. 3 and shown in table no.4.

COMORBIDITIES	NO. OF PATIENTS	PERCENTAGE
TOTAL COMORBIDITIES	94	62.67
NO COMORBIDITIES	56	37.33
CAD	13	8.66
HTN, CAD	5	0.33
CAD, HTN, DM	4	2.66
HTN	18	12
DM	9	6
HTN, DM	15	10

Table 3:- Common comorbidities

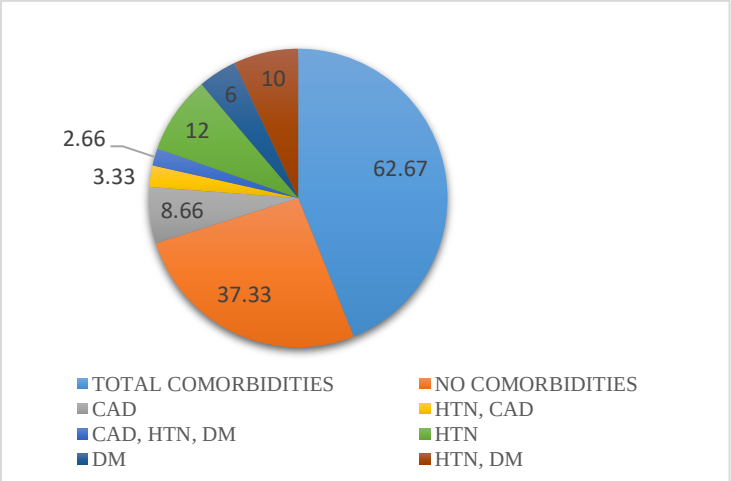

Fig 4:- Common comorbidities

Table no. 4 is the classification of subjects acoording to their electrocardiography results. **Echocardiography** is the main laboratory test used to know the cardiac dysfunction. In the study we have divided the patients into four types as shown in table no. 4 in order to know how many inpatients are diagnosed with one common type. The calculated percentage of patients diagnosed with normal echocardiography were 32.66% (n=49), patients with systolic dysfunction were 17.34% (n=26), patients diagnosed with diastolic dysfunction were 20.67% (n=31) and patients diagnosed with both systolic and diastolic dysfunction were 29.33% (n=44) was plotted in the graph no. 5.

ISSN No:-2456-2165

ECHOCARDIOGRAPHY	NO. OF PATIENTS	PERCENTAGE
NORMAL	49	32.66
SYSTOLIC DYSFUNCTION	26	17.34
DIASTOLIC DYSFUNCTION	31	20.67
SYSTOLIC & DIASTOLIC DYSFUNCTION	44	29.33
TOTAL	150	100

Table 4:- Echocardiography results

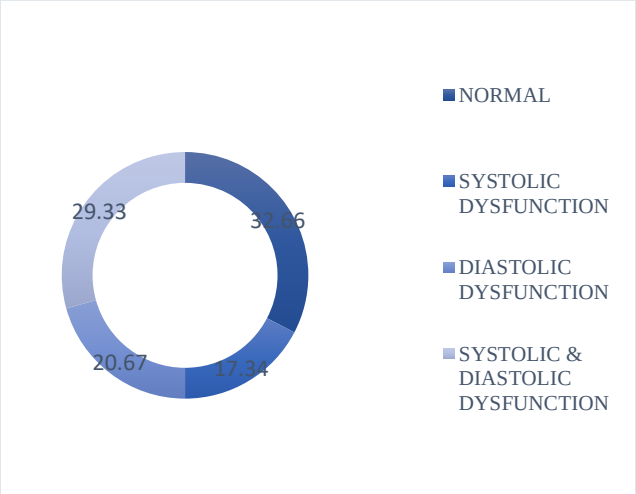

Fig 5:- Pictorial representation of echocardiography results

In table no. 5, we have classified **polypharmacy** into three categories i.e., minor, moderate and serious. The polypharmacy was found in 100% (n=150) patients in that the minor (<5) polypharmacy was observed in 14.68% (n=22) of the patients, moderate (5-9) polypharmacy was observed in 62.66% (n=94) and serious (>9) polypharmacy was observed in 22.66% (n=34) and plotted in a graph no. 6.

POLYPHARMACY	NO. OF PATIENTS	PERCENTAGE
MINOR (<5)	22	14.68
MODERATE (5-9)	94	62.66
SERIOUS (>9)	34	22.66
TOTAL	150	100

Table 5:- Distribution of different categories of polypharmacy

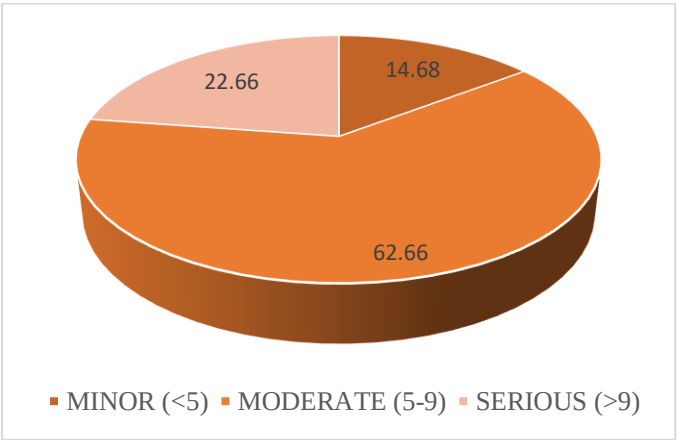

Fig 6:- Pictorial representation of different categories of polypharmacy

Table no. 6 represents the **commonly prescribed drugs at discharge**. The percentage of the mostly prescribed drugs at discharge was 72% (n=108) and the drug was clopidogrel which is an antiplatelet. The other drugs were aspirin, an antiplatelet was found in 50.66% (n=76) of the prescriptions; pantoprazole, a proton pump inhibitor was found in 49.33% (n=74) of the prescriptions; paracetamol, an analgesic and antipyretic was found in 34% (n=51) of the patients; atorvastatin, HMG COA

ISSN No:-2456-2165

reductase inhibitor was found in 51.33% (n=77) of patients prescription; furosemide+ spironolactone (brand name: lasilactone), a diuretic was found in 27.33% (n=41) of prescriptions; metoprolol, a beta blocker was found in 30% (n=45) of the prescriptions; ranitidine, a H2 blocker was found in 36 % (n=54) of the patients and ferrous ammonium citrate, a vitamin was found in 12% (n=18). The same was plotted in the graph no. 7.

NAME OF DRUG	CATEGORY	NO. OF PATIENTS	PERCENTAGE
CLOPIDOGREL	ANTIPLATELET AGENT	108	72
ASPIRIN	ANTI[LATELET AGENT	76	50.66
PANTOPRAZOLE	PROTON PUMP INHIBITOR	74	49.33
PARACETAMOL	ANALGESIC, ANIPYRETIC	51	34
ATORVASTATIN	HMG COA REDUCTASE INHIBITOR	77	51.33
FUROSEMIDE+ SPIRONOLACTONE	DIURETIC	41	27.33
METOPROLOL	BETA BLOCKER	45	30
RANITIDINE	H2 BLOCKER	54	36
FERROUS AMMONIUM CITRATE	VITAMIN	18	12

Table 6:- Commonly prescribed drugs

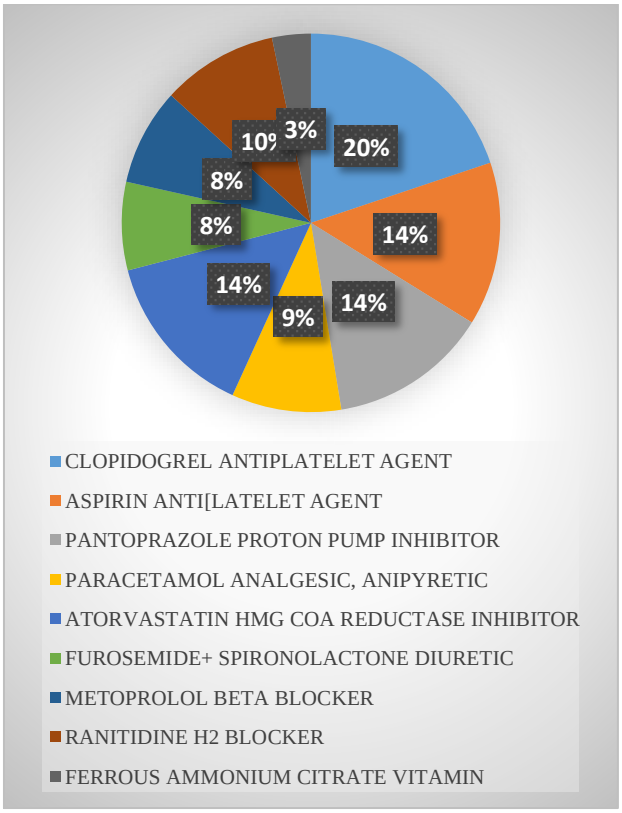

Fig 7:- Pictorial representation of commonly prescribed drugs

B. METHOD-II – ARMOR TOOL

Stepwise Approach Using Armor Tool-

➢ *STEP 1: A-ASSESS*

The **method-II** used in the study is ARMOR TOOL which is a stepwise approach used in the evaluation of polypharmacy in geriatric patients. In the **step-1,** we **assessed** the patients who are taking **more than 9 medications per day** (serious polypharmacy) and percentage was found to be 22.66% (n=34) of the total 150 prescriptions. The **beta blockers** found in the prescriptions were metoprolol, atenolol and carvedilol.

Pain medications used for the patients were paracetamol, diclofenac, pramoxine, Tramadol, Ketorolac, Piroxicam, Fentanyl, Thiocholchicoside and Aceclofenac. The **antipsychotic** and **other psychotropic drugs** were not prescribed in the study.

The following table no.7 is the list of **beers criteria drugs** which are being observed in the prescriptions. These are the drugs which should be avoided or used cautiously while treating geriatric patients.

DRUG	RECOMMENDATION (AVOID)
Prazosin	Avoid use as an antihypertensive. High risk of orthostatic hypotension; not recommended as routine treatment for hypertension; alternative agents have superior risk/benefit profile.
Amiodarone	Avoid antiarrhythmic drugs as first-line treatment of atrial fibrillation. Data suggest that rate control yields better balance of benefits and harms than rhythm control for older adults. Amiodarone is associated with multiple toxicities, including thyroid disease, pulmonary disorders, and QT interval prolongation.
Digoxin>0.125m g/Day	In heart failure, higher dosages associated with no additional benefit and may increase risk of toxicity; decreased renal clearance may increase risk of toxicity
Spironolactone >25 mg/day	Avoid in patients with heart failure or with a CrCl<30 mL/min. In heart failure, the risk of hyperkalemia is higher in older adults if taking >25 mg/day.
Alprazolam Chlordiazepoxide Clonazepam	Avoid benzodiazepines (any type) for treatment of insomnia, agitation or delirium. Older adults have increased sensitivity to benzodiazepines and decreased metabolism of long-acting agents. In general, all benzodiazepines increase risk of cognitive impairment, delirium, falls, fractures, and motor vehicle accidents in older adults.
	May be appropriate for seizure disorders, rapid eye movement sleep disorders, benzodiazepine withdrawal, ethanol withdrawal, severe generalized anxiety disorder, periprocedural anesthesia, end-of life care.
Insulin sliding scale	Higher risk of hypoglycemia without improvement in hyperglycemia Scale management regardless of care setting.
Pheniramine	Highly anticholinergic; clearance reduced with advanced age, and tolerance develops when used as hypnotic; increased risk of confusion, dry mouth, constipation, and other anticholinergic effects/toxicity. Use of diphenhydramine in special situations such as acute treatment of severe allergic reaction may be appropriate. QE High (Hydroxyzine & Promethazine), Moderate (All others)
Aspirin>325mg/ Day Diclofenac Ibuprofen Piroxicam	Avoid chronic use unless other alternatives are not effective and patient can take gastro protective agent (proton-pump inhibitor or misoprostol). Increases risk of GI bleeding/peptic ulcer disease in high-risk groups, including those 275 years old or taking oral or parenteral corticosteroids, anticoagulants, or antiplatelet agents. Use of proton pump inhibitor or misoprostol reduces but does not eliminate risk. Upper GI ulcers, gross bleeding, or perforation caused by NSAIDS occur in approximately 1 % of patients treated for 3-6 months, and in about 2%-4% of patients treated for 1 year. These trends continue with longer duration of use.
Ketorolac	Increases risk of GI bleeding/peptic ulcer disease in high-risk groups (See Non-COX selective NSAIDS) Of all the NSAIDS, indomethacin has most adverse effects. QE Moderate (Indomethacin), High (Ketorolac)

QE = High; SR= Strong

Table 7:- Beers Criteria List of Drugs found in the cases

➢ *STEP 2: R=REVIEW*

- *Drug-Drug Interactions-*

Among minor, significant and serious interactions, the commonly found drug interactions were drawn in the table no. 8. The interacting drugs clopidogrel+aspirin were found in 56.66% (n=85) prescriptions, clopidogrel+ pantoprazole interaction was found in 47.33% (n=71) patients prescription, aspirin+ heparin interaction was found in 20% (n=30) patients prescription. The above mentioned drug-drug interactions come under significant interactions. The common minor interaction was found between drugs aspirin+ furosemide and the percentage was found to be 12% (n=18). The common serious interaction found between drugs cefuroxime+ enoxaparin and the percentage was found to be 4.66% (n=7) as drawn in the figure 8.

DRUG INTERACTION	NO. OF PATIENTS	PERCENTAGE
CLOPIDOGREL+ASPIRIN	85	56.66
CLOPIDOGREL+PANTOPRAZOLE	71	47.33
ASPIRIN+HEPARIN	30	20
ASPIRIN+FUROSEMIDE	18	12
CEFUROXIME+ENOXAPARIN	7	4.66

Table 8:- Commonly found drug-drug interactions

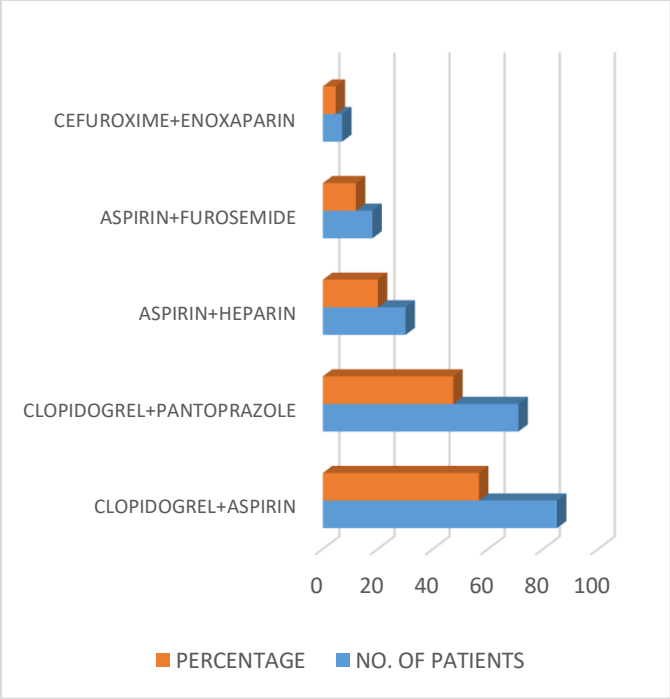

Fig 8:- Graphical representation of commonly found drug-drug interactions

- *Drug-Disease Interaction According To Beers Criteria-*

The **drug-disease interactions** according to beers criteria were found in the patients prescribed drugs due to their disease conditions. The recommendation in order to avoid or use cautiously in different disease conditions, the list of drugs along with diseases are shown in the table no. 9.

DISEASE	DRUG	RECOMMENDATION (AVOID)
Heart Failure	Diltiazem	Potential to promote fluid retention and/or exacerbate heart failure. QE=Moderate (NSAIDS, CCBS, Dronedarone), Failure High (Thiazolidinediones (glitazones)), Low (Cilostazol)
Syncope	Ramipril Enalapril Prazosin	Increases risk of orthostatic hypotension or bradycardia. QE High (Alpha blockers), Moderate (AChEls, TCAS and antipsychotics); SR Strong (AChEls and TCAS), Weak (Alpha blockers and antipsychotics)
Chronic Seizure/Epilepsy	Tramadol	Lowers seizure threshold; may be acceptable in patients with well controlled seizures in whom alternative agents have not been effective.
Delirium	Dextromethorphan Ipratropium FormetrolFumnerate Budesonide Ranitidine Alprazolam Chlordiazepoxide Clonazepam	Avoid in older adults with or at high risk of delirium because of inducing or worsening delirium in older adults; if discontinuing drugs used chronically, taper to avoid withdrawal symptoms.
Dementia & Cognitive Impairment	Dextromethorphan Ipratropium FormetrolFumnerate Budesonide Ranitidine Alprazolam Chlordiazepoxide Clonazepam	Avoid due to adverse CNS effects. Avoid antipsychotics for behavioral problems of dementia unless non-pharmacologic options have failed and patient is a threat to themselves or others. Antipsychotics are associated with an increased risk of cerebrovascular accident (stroke) and mortality in persons with dementia.

History of Falls or Fracture	Alprazolam Chlordiazepoxide Clonazepam Piracetam Phenytoin	Avoid unless safer alternatives are not available; avoid anticonvulsants except for seizure. Ability to produce ataxia, impaired psychomotor function, syncope, and additional falls; shorter-acting benzodiazepines are not safer than long-acting ones.
Insomnia	Theophylline	CNS stimulant effects
Chronic Constipation	diltiazem Pheniramine Dextromethorphan Ipratropium Formetrol Fumerate	Avoid unless no other alternatives. Can worsen constipation; agents for urinary incontinence: anti muscarinic overall differ in incidence of constipation; response variable; consider alternative agent if constipation develops. QE=High (For Urinary Incontinence), Moderate/Low (All Others); SR= Strong
History of Gastric or Duodenal Ulcers	ASPIRIN (>325mg/Day)	Avoid unless other alternatives are not effective and patient can take gastro protective agent (proton pump inhibitor or misoprostol). May exacerbate existing ulcers or cause new/additional ulcers.
Lower Urinary Tract Symptoms, Benign Prostatic Hyperplasia	Ipratropium Formetrol Fumerate Dextromethorphan	Avoid in men. May decrease urinary flow and cause urinary retention. QE = Moderate; SR Strong (Inhaled agents), Weak (All others)

Table 9:- List of Drug-Disease Interactions

- *Adverse Drug Reactions-*

Out of 150 prescriptions, the total adverse drug reactions found were 8.67% (n=13) and the prescriptions with no ADR were 91.33% (n=137) as shown in table no. 11. The common ADR was found to be with aspirin that is 4.66% (n=7) of the patients, ADR with ramipril was found to be 1.33% (n=2), ADR with telmisartan, spironolactone, levofloxacin, carvedilol were found to be same i.e., 0.67% (n=1) respectively and plotted in the graph no.10.

- ✓ Aspirin - Deterioration of renal function
- ✓ Spironolactone - Increase serum potassium
- ✓ Levofloxacin - Hypersensitivity
- ✓ Carvedilol - Decrease Blood pressure
- ✓ Ramipril Decrease Heart rate
- ✓ Telmisartan-Thrombocytopenia

ADVERSE DRUG REACTION	NO. OF PATIENTS	PERCENTAGE
ASPIRIN	7	4.66
TELMISARTAN	1	0.67
RAMIPRIL	2	1.33
SPIRONOLACTONE	1	0.67
LEVOFLOXACIN	1	0.67
CARVEDILOL	1	0.67
TOTAL	13	8.67

Table 10:- Classification of adverse drug reactions (ADR's)

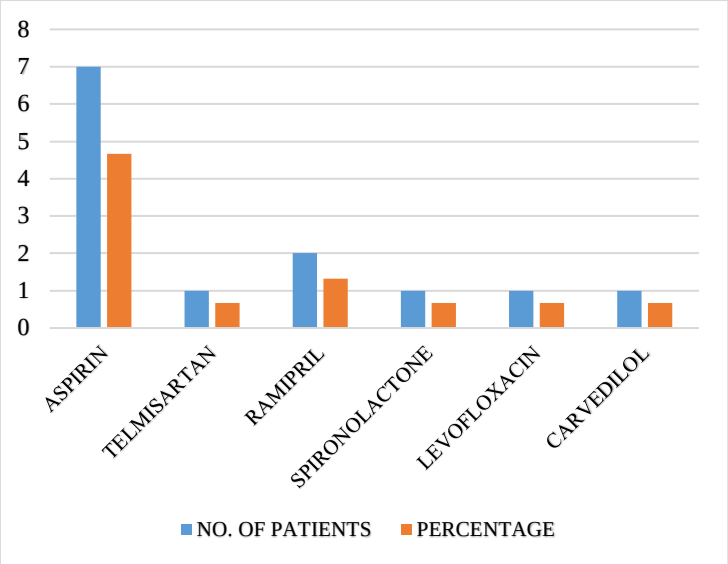

Fig 9:- Graphical representation of commonly found adverse drug reactions

➢ *STEP 3: M-MINIMIZE*

In the **step-3 minimize**, the medications were minimized according to functional status rather than evidence-based medicine.

- **Carvedilol** was discontinued for 3 days in one patient as it decreased blood pressure <96/60mmHg. **Ramipril** was discontinued for 2 days due to decreasing heart rate <60bpm. After recovery of the patient, the medication was again prescribed.
- **Nebulizer Asthalin** was discontinued for few days due to sudden decreasing levels of K+ <3.5mEq/L. After recovery, the medication was again prescribed.
- **Ivabridine** was discontinued for 2-3 days due to decreasing heart rate <60bpm in a patient.
- **Levofloxacin** developed angioneurotic edema as an allergic reaction and the drug was discontinued and the patient got recovered by treatment with other alternative drug.
- **Penicillin** was discontinued as the patient showed hypersensitivity and after the withdrawal, patient got recovered.

➢ *STEP 4: 0-OPTIMIZE*

In the **step-4 optimize**, the patient conditions were being optimized according to their comorbid conditions such as-

- The diabetic patients were treated according to the **GRBS** sliding scale and in some cases patients without diabetes were also monitored for GRBS.
- The **prothrombin time** and **partial thromboplastin time** were monitored well with either nicoumalone or warfarin especially in surgery cases.
- The **duplication** of drugs was found in three prescriptions and the drugs are Enalapril, Paracetamol and pramoxine.

➢ *STEP 5: R-REASSESS*

In the **step-5 reassess**, patients were reassessed for their **clinical** and **functional status**. The patients were reassessed 1 week or 10 days after discharge and the improvement was observed.

- One patient came with sudden nose bleeding and was given treatment. The recovery in the patients was reassessed by examining their clinical and functional status by the respective physicians.
- The medication compliance also plays an important role in geriatric patients which was also observed by asking few questions directly to the patient or patient's attender.

IV. CONCLUSION

In this study, 150 patients were reviewed after IRB/IEC (Institutional Review Board/Independent Ethics Committee) approval and the informed consent form was obtained from individual patients.

The study showed a high prevalence of polypharmacy in geriatric patients with CVD. It was found more in males than females. Among 150 patients, 22 had minor polypharmacy, 94 had moderate and 34 had serious polypharmacy. The present study showed that there are irregularities in dealing with medication in geriatrics patients. The example of unnecessary drug therapy was pantoprazole and ranitidine which was prescribed to prevent side effect/prophylactic therapy in low dose aspirin even for patients without peptic ulcer history.

The most frequent cause and threat associated with polypharmacy comes primarily from the quality of drug-drug interactions and not the total number of drugs prescribed. Most of the dangerous consequences of polypharmacy came from the interaction of Clopidogrel with either Aspirin or PPIs which was noticed more in this study.

A systematic approach with ARMOR TOOL was able to effectively improve patient care and outcome. Routine evaluation of adverse drug reactions from commonly used pharmacological agents should be done. The results of our study indicate that to avoid clinically significant harmful consequences, elderly patients should be closely monitored for ADRS. Increased awareness among physicians about the risk factors of ADRS can help them identify elderly patients with greater risk of ADRs.

ARMOR TOOL supports the dictum of optimizing and re-evaluating the risk- benefit profile of any pharmacological agent and potential drug-body and drug-drug interaction. Elderly people pose unique questions. The role of beta blockers is well known in hypertension and in most myocardial infarctions. However, physiology in this population is fragile. Commonly used agents can easily change this equilibrium, resulting in severe compromise in functioning.

The mean number of medications being used is growing most rapidly in older patients especially among men. Results showed that among patients with polypharmacy, gender may not be as important as number of drugs prescribed as predictors of experiencing a drug related problem. Prevention of unnecessary drug therapy prescribed can be done by reduction of drug use (it is recommended to eliminate all medications without therapeutic benefit, goal or indication). Prevention of unnecessary drug therapy will also contribute for cost effective treatment among geriatric patients.

Our study highlights the need of informing doctors more about the problem of polypharmacy. Careful and thoughtful drug prescription strategy seems to be able to eliminate most of the cases of polypharmacy even in patients who are suffering with multiple disorders. The results also provide support for development of new drugs that take into account compatibility with other medications, especially in geriatric population.

REFERENCES

[1]. Golchin N, Frank SH, Vince A, Isham L, Meropol SB. Polypharmacy in the elderly. Journal of research in pharmacy practice. 2015 Apr;4(2):85.
[2]. Dagli RJ, Sharma A. Polypharmacy: a global risk factor for elderly people. Journal of international oral health: JIOH. 2014 Nov;6(6):i.
[3]. Manouchehr Saljoughian. Polypharmacy and Drug Adherence in Elderly Patients. *US Pharm*. 2019;44(7):33-36.
[4]. Rakesh KB, Chowta MN, Shenoy AK, Shastry R, Pai SB. Evaluation of polypharmacy and appropriateness of prescription in geriatric patients: A cross-sectional study at a tertiary care hospital. Indian journal of pharmacology. 2017 Jan;49(1):16.
[5]. Veehof L, Stewart R, Haaijer-Ruskamp F, Jong BM. The development of polypharmacy. A longitudinal study. Fam Pract. 2000;17:261–7.
[6]. Callahan CM, Weiner M, Counsell SR. Defining the domain of geriatric medicine in an urban public health system affiliated with an academic medical center. J Am Geriatr Soc. 2008;56:1802–6.
[7]. Veehof L, Stewart R, Haaijer-Ruskamp F, Jong BM. The development of polypharmacy. A longitudinal study. Fam Pract. 2000;17:261–7.
[8]. By the American Geriatrics Society Beers Criteria Update Expert Panel. American Geriatrics Society 2015 updated Beers criteria for potentially inappropriate medication use in older adults. J Am Geriatr Soc 2015;63:2227-46.
[9]. Hanlon JT, Schmader KE, Samsa GP, Weinberger M, Uttech KM, Lewis IK, *et al.* A method for assessing drug therapy appropriateness. J Clin Epidemiol 1992;45:1045-51.
[10]. Haque R. ARMOR: a tool to evaluate polypharmacy in elderly persons. Annals of Long-Term Care. 2009 Jun;17(6):26-30.
[11]. Vrettos I, Voukelatou P, Katsoras A, Theotoka D, Kalliakmanis A. Diseases linked to polypharmacy in elderly patients. Current gerontology and geriatrics research. 2017;2017.