International Journal of Pharmaceutical Research and Applications
Volume 8, Issue 3 May-June 2023, pp: 3471-3490 www.ijprajournal.com ISSN: 2249-7781

An Audit on Polypharmacy in an Out Patient Pharmacy at Tertiary Care Hospital

Siavash Ebrahimi[1], Balakeshwa Ramaiah [2]
[1]*Pharm.D Intern, Karnataka College of Pharmacy, Bangalore.*
[2]*Head of Pharmacy Practice, Karnataka College of Pharmacy, Bangalore.*

Submitted: 25-06-2023 Accepted: 05-07-2023

ABSTRACT: Objective: The present study is aimed to study an audit on polypharmacy in an outpatient pharmacy at tertiary care hospital.
Methodology: The study was conducted in the Out-patient pharmacy department of tertiary care hospital Bangalore, India. In this method, the inpatient case sheets and prescriptions will
be screened for analysis of prescriptions for various effects of polypharmacy on daily basis. All the prescribed medications along with other medications and relevant information will be noted in a customized data collection form to find out the polypharmacy and other. The study patients will be followed daily until their discharge. The Micromedex, Medscape, articles and relevant references books will be used as tools to review the collected data. The prescribed medication will be checked for their existence in the hospital and also the relevant dosing calculation and polypharmacy. Check for any error in prescription such as doses, frequency and route of administration and analysis of prescription for any polypharmacy etc.
Result: In our study population out of 300 patients' prescriptions contains polypharmacy, which that 159 were male and 141 were female and in pediatrics population 53% were male and 47% were female. and thus, the average number of drugs per patient was 7, Extensive (70%) polypharmacy was observed in study population. In our study
KEYWORDS: polypharmacy, drug interactions, Out-patient pharmacy

I. INTRODUCTION

A high rate of polypharmacy, often defined as taking five or more medications, is in part a consequence of the increasing rate of multi-morbidity in the ageing population worldwide.1 This has direct negative unintended consequences. Investigating the effectiveness and safety as well as side effects of new medications is traditionally achieved mainly through randomized controlled trials, where patients with multiple chronic conditions or frailty are usually excluded.

Population aging is a global phenomenon that poses various health care challenges. With the expected increase in multi-morbidity and associated high consumption of drugs among older adults, understanding the quality of drug use for this population is essential. Although several indicators have been developed to evaluate the quality of pharmacotherapy in older adults, such as polypharmacy, 8 potentially inappropriate medications 2,5 and anticholinergic burden, several various classes of drug like pantoprazole, asprin, paracetamol, levocetrizine etc. were prescribed. According to 300 prescriptions analyzed, 142 prescriptions comprised of potential drug interactions and it was found that 235 drug interactions were present. From drug interactions, aspirin/clopidogrel and clopidogrel/atorvastatin were most common drug interaction pairs observed among prescribed medications. Out of the 235 interventions proposed, the most frequent suggestion was on monitoring for adverse effect (44.01%) followed by dose adjustment (15.81%). 25.64% of interventions were accepted and therapy was changed. During the study period, a total of 28 adverse drug reactions were recorded among 234 DDIs identified. The incidence rate of adverse drug interactions was found to be 20%.
Conclusion: As the population ages, polypharmacy increases. The elderly often requires multiple medications to treat multiple health-related conditions. The demographic details of study population shown that 70 % of polypharmacy occurred in elderly people. Because they use 6 or more medicine. Out of the patients evaluated, 69.18% are prescribed 6 or more concurrent drugs, 15.7%, or 199 patients, are prescribed one or more potentially inappropriate drugs, and 9.3% meet both definitions of polypharmacy used in this study.

International Journal of Pharmaceutical Research and Applications
Volume 8, Issue 3 May-June 2023, pp: 3471-3490 www.ijprajournal.com ISSN: 2249-7781

questions remain as to their utility in clinical practice.

Considerations often associated with thoughtful, therapeutic Polypharmacy include:
1. Drugs given for a single somatic locale act on biochemical mechanisms present throughout the body such that their nonlinear
interactions can produce an (unknown except empirically) global physiological state of health;
2. The more independent variables to manipulate, the greater the likelihood of finding and stabilizing a small available
parametric space of healthy function while minimizing unwanted effects.
3. Often certain medications can interact with others in a positive way specifically intended when prescribed together, to achieve a greater affect that any of the single agents alone. This is particularly prominent in the field of anesthesia and pain management – where atypical agents such as antiepileptics, antidepressants, muscle relaxants, NMDA antagonists, and other medications are combined with more typical analgesics such as
opioids, prostaglandin inhibitors, NSAIDS and others. This practice of pain management drug synergy is known as an analgesia sparing effect. As another example, in anesthesia (particularly IV anesthesia and general anesthesia) multiple agents are almost always required – including hypnotics or analgesic inducing/maintenance agents such as Versed or Diprivan, usually an opioid analgesic such as morphine or Demerol, a paralytic such as vecuronium, and in inhaled general anesthesia generally a halogenated ether anesthetic such as sevoflurane or desflurane.

The use of polypharmacy is correlated to the use of potentially inappropriate medications. Potentially inappropriate medications are generally taken to mean those that have been agreed upon by expert consensus, such as by the Beers Criteria. These medications are generally inappropriate for older adults because the risks outweigh the benefits.

Examples of these include urinary anticholinergics, which can prevent up to one episode of incontinence every 48 hours on average. However, they can also cause constipation, dry eyes, dry mouth, impaired cognition, and increase the risk of falls. Polypharmacy is associated with an increased risk of falls in the elderly. Certain medications are well known to be associated with the risk of falls, including cardiovascular and psychoactive medications. The use of four or more of these medicines is known to be associated with a significantly higher, cumulative risk of falls. Although often not practical to achieve, withdrawing all medicines associated with falls risk can halve an individual risk of future falls. Every medication has potential adverse side-effects. With every drug added, there is an additive risk of side-effects. Also, many medications have potential interactions with other substances. 15% of older adults are potentially at risk for a major drug-drug interaction. [16] When a new drug is prescribed, the risk of interactions increases exponentially. Doctors and pharmacists aim to avoid prescribing medications that interact; often, adjustments in the dose of medications need to be made to avoid interactions, such as with warfarin, as it may lose its effect. Patients at greatest risk for negative polypharmacy consequences include the elderly, psychiatric patients, patients taking five or more drugs concurrently, those with multiple physicians and pharmacies, recently hospitalized patients, individuals with concurrent comorbidities, low educational level, and those with impaired vision or dexterity. It is not uncommon for those dependent or addicted to substances to enter or remain in a state of polypharmacy misuse. Note, however, that the term polypharmacy and its variants generally refer to legal drug use as-prescribed, even when used in a negative or critical context. Measures can be taken to limit polypharmacy to its truly legitimate and appropriate needs. This is an emerging area of research; frequently called deprescribing. This reduction in medications has been shown to reduce the number of medications and is safe as it does not significantly alter health outcomes. Clinical pharmacists can perform drug therapy reviews and teach physicians and their patients about drug safety and polypharmacy, as well as collaborating with physicians and patients to correct polypharmacy problems. Similar programs are likely to reduce the potentially deleterious consequences of polypharmacy. Such programs hinge upon patients and doctors informing pharmacists of other medications being prescribed, as well as herbal, over-the-counter substances and supplements that occasionally interfere with prescription- only medication. High pill burden decreases compliance with drug therapy, resulting from the need to take a large quantity of pills or other forms of medication on a regular basis. It also increases the possibility of adverse medication

International Journal of Pharmaceutical Research and Applications
Volume 8, Issue 3 May-June 2023, pp: 3471-3490 www.ijprajournal.com ISSN: 2249-7781

reactions (side effects) and drug-drug interactions. High pill burden has also been associated with an increased risk of hospitalization, medication errors, and increased costs for both the pharmaceuticals themselves and for the treatment of adverse events. Finally, pill burden is a source of dissatisfaction for many patients. High pill burden was once commonly associated with antiretroviral drug regimens to control HIV, but now is more often seen in other patient populations. For instance, adults with multiple common chronic conditions such as diabetes, hypertension, lymphedema, osteoporosis, constipation and clinical depression can often be prescribed more than a dozen different medications daily. The adverse reactions of these combinations of drugs are not reliably predictable. Obesity is implicated in many of the aforementioned conditions, and it is not uncommon for a clinically obese patient to receive pharmacologic treatment for all of these. Because chronic conditions tend to accumulate in the elderly, pill burden is a particular issue in geriatrics. Reducing pill burden is recognized as a way to improve medication compliance. This is done where the risks and benefits are weighed when considering whether to continue a medication.

This includes drugs such as bisphosphonates (for osteoporosis) where it is often used indefinitely although there is only evidence to use it for five to ten years. The selection of long-acting active ingredients over short-acting ones may also reduce pill burden. For instance, ACE inhibitors are used in the management of hypertension. Both captopril and lisinopril are examples of ACE inhibitors. However, lisinopril is dosed once a day, whereas captopril may be dosed 2-3 times a day. Assuming that there are no contraindications or potential for drug interactions, using lisinopril instead of captopril may be an appropriate way to limit pill burden.

The most common intervention in polypharmacy patients is deprescribing, which includes the identification and discontinuance of medications when the benefit no longer outweighs the harm. In elderly patients, this can commonly be done as a patient becomes frailer and treatment focus needs to shift from preventative to palliative.

Several tools exist to help physicians decide when to deprescribe and what medications can be added to a pharmaceutical regimen. The Beers Criteria and the STOPP/START criteria help identify medications that have the highest risk of adverse drug events (ADE) and drug-drug interactions. PRIMA-eds is an algorithm that takes many patient factor into its calculations and can offer medication and dosing recommendations to the provider. Parameters of PRIMA-eds include diagnoses, medications, ADEs, symptoms, body mass index, vital signs, laboratory results, and medical studies performed in the elderly.

A team approach is a relatively new method gaining popularity due to its effectiveness in managing patient care and obtaining the best outcomes. A team can include a primary provider, pharmacist, nurse, counselor, physical therapist, chaplain and others involved in patient care. Combining the ideas and points of view of the different providers allows a more holistic approach to the health of a patient. In 2013, the United States legislature mandated that every Medicare D patient receive an annual Medication Therapy Management (MTM) review by a team of healthcare professionals. As stated above, a major reason for polypharmacy is that a patient has many co-existing medical conditions receiving treatment. In addition, in the case of diseases such as heart failure and high blood pressure, combinations of two to three different medications are common and recommended. If medications for symptomatic relief are added, it is easy to see why patients end up with a large number of medications. Sometimes a new medication is prescribed to treat the adverse effects of another drug, often when stopping or changing the dose of the offending drug would solve the problem. A contributing factor is that patients see different physicians for their medical problems, and being under the care of several specialists is a major reason for polypharmacy. This can be true because specialists often focus on their area of expertise rather than on the patient as a whole. There is often a need for a primary care physician - a general internist, a family practitioner or a pediatrician - to coordinate the use of multiple medications. Another reason for polypharmacy is that the documentation of why a medication was prescribed initially is often missing in the medical record, making decisions to consider termination of a treatment difficult to make later. As a result, there is a tendency for doctors to let patients continue the medications they are taking, especially if the indications are unclear or unknown. In addition to medications lacking an indication, other medications may be of limited value or are therapeutic duplications.

The major consequence of polypharmacy to a patient is a much higher risk of adverse drug effects. This risk increases based on the number of

International Journal of Pharmaceutical Research and Applications
Volume 8, Issue 3 May-June 2023, pp: 3471-3490 www.ijprajournal.com ISSN: 2249-7781

medications prescribed and taken. These adverse drug effects often require physician contacts and, in some cases, emergency room visits or hospitalizations. Moreover, if an adverse effect emerges, it can be very difficult to figure out which of the many drugs is the cause. Another possible problem is what is referred to as medication or drug interactions, meaning that the effects of one medication, favorable or unfavorable, may change if given together with another medication. Thus, taking five or more medications leaves many opportunities for such interactions. The knowledge of medication interactions gained during the drug development phase is often limited due to incomplete testing.

Polypharmacy also places a burden on patients to remember when and how to take all prescribed medications. Multiple medications increase the risks of inappropriate medication use, non-adherence, adverse effects and medical cost. Another unwanted effect could be that physicians may hesitate to prescribe a new essential medication to a patient already on five or more medications. Thus, paradoxically, polypharmacy can lead to under treatment. Another consequence of overutilization is the soaring cost of health care in the U.S. Pharmaceutical spending per capita in the U.S. in 2005 was twice that of other developed countries. Higher expenditures can be justified if the health outcomes for U.S. patients measured as life expectancy, disease- specific mortality and other measures were more favorable -- but they are not.

We strongly recommend a medication review for patients prescribed a large number of medications. For all the above cases, Analysis an Audit on Polypharmacy in an Outpatient Pharmacy at Tertiary Care Hospital is so important and Need for study.

OBJECTIVE

Primary objective:

• To do an audit on polypharmacy in an outpatient pharmacy.
• To identify high risk medication prescribed in an outpatient pharmacy.
• To identify type of formulation prescribed in an outpatient pharmacy.

Secondary objectives:

• To identify class/type of drug prescribed.
• To identify polypharmacy and Justify the poly pharmacy in an outpatient pharmacy.
• To identify number of drugs prescribed.
• To check for different formulation prescribed.

II. METHODOLOGY

Study site:

This study was conducted at department of Bangalore Baptist Hospital (BBH) Hebbal. The hospital has various departments like Medicine, Surgery, Paediatrics, Gynaecology and Obstetrics, Orthopaedics, Ear Nose Throat (ENT), Nephrology, Psychiatry and Dermatology

Study design:

The study was conducted in the Out-patient pharmacy department of Bangalore Baptist Hospital (BBH) Hebbal.

Source of data and Materials:

- Inpatient case sheets
- Prescription counter
- Inpatient medication charts
- Nurse notes
- Physician notes
- Laboratory investigation charts
- Patients Interview

Inclusion Criteria:

All inpatients admitted to Bangalore Baptist Hospital.

Exclusion Criteria:

- Patients admitted to others wards rather than medicine ward.

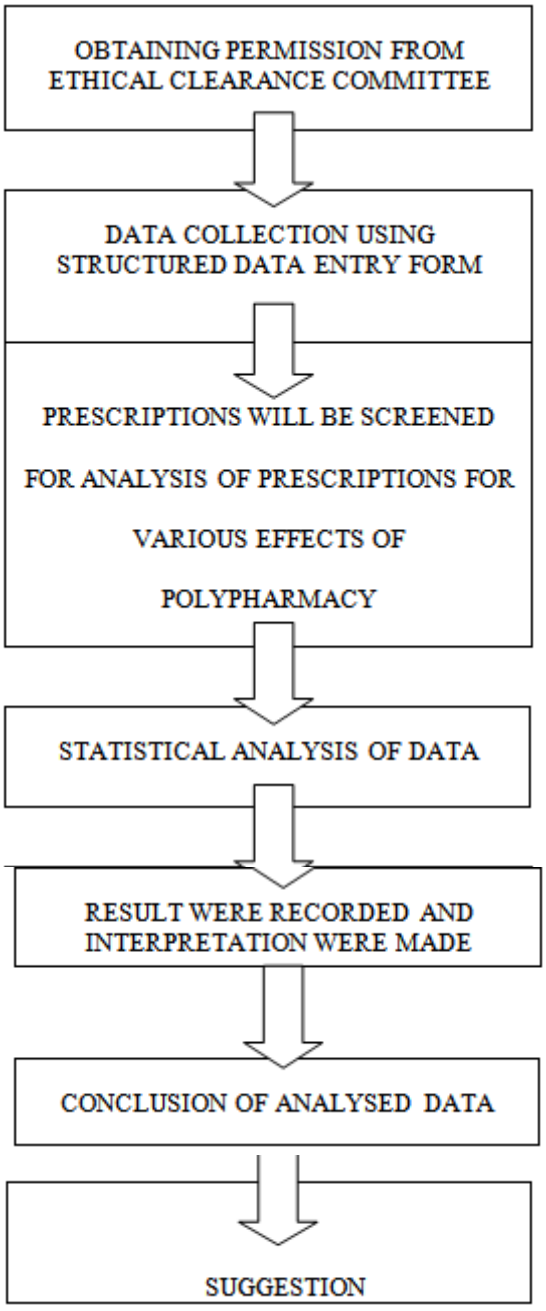
Method of collection of data:

In this method, the inpatient case sheets and prescriptions were screened for Analysis of prescriptions for various effects of polypharmacy on daily basis. All the prescribed medications along with other medications and relevant information was noted in a customized data collection form to find out the polypharmacy and other. The study patients were followed daily until their discharge. The Micromedex, Medscape, articles and relevant references books were used as tools to review the collected data. The prescribed medication was checked for their existence in the hospital and also the relevant dosing calculation and polypharmacy. Check for any error in prescription such as doses, frequency and route of administration and analysis of prescription for any polypharmacy etc.

Study procedure:

International Journal of Pharmaceutical Research and Applications
Volume 8, Issue 3 May-June 2023, pp: 3471-3490 www.ijprajournal.com ISSN: 2249-7781

All the outpatients/inpatients prescriptions presented at outpatient pharmacy collected on daily basis and for polypharmacy, the prescriptions reviewed and it is noted in a predefined data collection form. The prescription components, drug utilization behaviour and prescribing compliance to hospital formulary were noted and subjected for Analysis of prescriptions for various effects of polypharmacy.



International Journal of Pharmaceutical Research and Applications
Volume 8, Issue 3 May-June 2023, pp: 3471-3490 www.ijprajournal.com ISSN: 2249-7781

Does the study require any investigation or interventions to be conducted on the patients?
Yes

Has ethical clearance been obtained from your institution in case of above?
The ethical committee clearance was obtained from the Institutional Ethical committee of Bangalore Baptist Hospital (BBH) before initiating the study.

Study period:
The study was conducted for a period of 6 months

Study site:
Study was conducted in inpatient at all wards at in Bangalore Baptist Hospital (BBH)

III. OBSERVATION

Patient Demographics

Table 1 Study patient's demographic details

Parameter	Gender				Total	
	Male		Female			
	N	%	N	%	N	%
Patient age (Years)						
BELOW 10	7	2.45	4	1.43	11	3.88
10--20	10	3.47	7	2.04	17	5.51
20-30	21	6.94	21	6.53	42	13.47
30-40	22	7.35	22	7.14	44	14.49
41-50	24	8.16	23	7.35	47	15.51
51-60	26	8.57	24	8.16	50	16.73
61-70	28	9.18	21	8.57	49	17.76
71>	21	6.94	19	5.71	40	12.65
Special population						

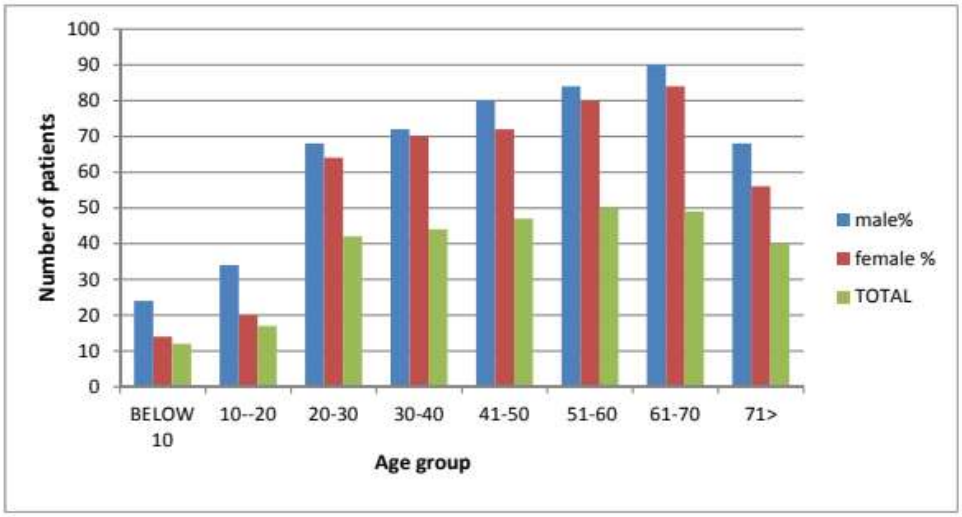


Figure 2Bar graph showing age group of study patients

International Journal of Pharmaceutical Research and Applications
Volume 8, Issue 3 May-June 2023, pp: 3471-3490 www.ijprajournal.com ISSN: 2249-7781

In our study population out of 300 patients' prescriptions contains polypharmacy, which that 159 were male and 141 were female and in paediatric population 53% were male and 47% were female. In Special population highest number i.e. 8.57% male and 8.16% females are in the age group 51-60 years. 9.18% males and 8.57% females were in the age group of 61-70. The demographic details of study population are listed in Table 1. Age group in Figure 2.

Table 2 Number of drug usage by study patients

Number of Drug Dispensed	Male		Female		Total	
	N	%	N	%	N	%
1,2,3	7	2.25	4	1.43	11	3.67
4,5,6	46	15.51	35	11.63	81	27.14
7,8,9	106	35.31	101	33.88	207	69.18

N=300

A total of 300 drugs were prescribed, and thus the average number of drugs per patient was 7. Among studied patients 3.67% were using 1-3 medication followed by 27.14% of patients using 4-6 medications. According the table 2,3 Extensive (70%) poly pharmacy was observed in study population. The number of drug dispensed is given in Table 2 and represented by pie chart in Figure 3.

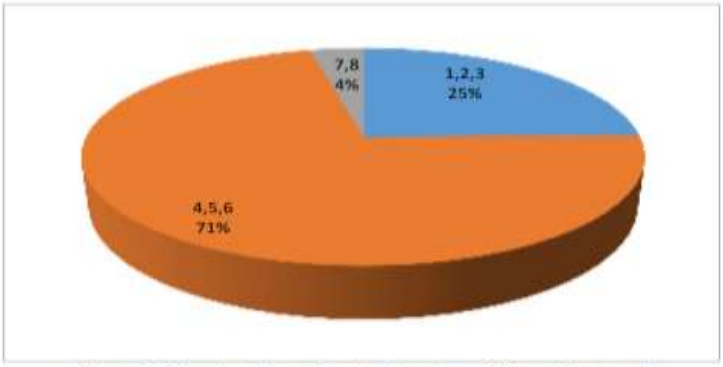


Figure 3 Pie chart showing the Number of Drug Dispensed

International Journal of Pharmaceutical Research and Applications
Volume 8, Issue 3 May-June 2023, pp: 3471-3490 www.ijprajournal.com ISSN: 2249-7781

Table 3 Definitions of polypharmacy

Specific definitions of polypharmacy	Number of articles	medication use	Number of articles
(Polypharmacy is…)			
Medication does not match the diagnosis*	4 [58,26,20,7]	Drug/drug interactions	32, 11, 58
Many medications	3 [11,18,58]	Excessive duration	32, 11, 58
Duplication of medication*	37,20,26	Inappropriate drugs (ie, lack of proven benefit, drug indication, etc.)	22, 11
Drug/drug interactions*	220,26	Drugs that cause adverse effects	210, 58
Inappropriate dosing frequency (excessive, too low, too long)*	27,26	Drug/disease interactions	22, 58
Medication prescribed to treat the side effect of another medication (except for cases where there is no other option)*	27,26	Availability of an equally effective, lower-cost alternative	22, 58
Two or more drugs of the same chemical class	16	Excessive dosages	22, 11
Two or more meds to treat the same condition	18	Inappropriate dosing frequency	22, 11
Two or more agents with the same or similar pharmacologic actions to treat different conditions	16	Complicated drug regimen affecting compliance	22, 11
Minor polypharmacy 2–4 meds. Major	120	Prescription of multiple meds by different specialists	12
polypharmacy Š5 meds.		for treating concurrent conditions	
3,5, or 6 different medications	127	Medication does not match the diagnosis	158
Two or more medications	135	Medication prescribed to treat the side effect of another medication (except for cases where there is no other option)	158
Greater than 5 medications	17	Polypills	158
Excessive use of medication	126	More than one pharmacy used	158
Unnecessary use of medication	126	Multiple prescribers of medication	158
Medications prescribed greater than twice per day	17	High risk medications	158
Complicated drug regimen effecting compliance*	18	Number of medications	158
Contraindicated in the elderly	18	Diet	158
Taking an OTC medication, an herbal product or another person's medication	18	Frequency of medication therapy monitoring	158
Availability of an equally effective, lower-cost alternative*	17	Male Gender	158

International Journal of Pharmaceutical Research and Applications
Volume 8, Issue 3 May-June 2023, pp: 3471-3490 www.ijprajournal.com ISSN: 2249-7781

The term 'polypharmacy' is frequently used in the medical literature; however, the definitions of polypharmacy often varied from scholar to scholar. No consensus definition for polypharmacy was readily identified. The various definitions of polypharmacy identified in 11 publications reviewed are summarized in Table 3. The most commonly cited definition, which appeared in four articles, "was medication did not match diagnosis". The term 'inappropriate' was part of definitions used in six articles. Several other different definitions, used by at least three scholars, involved one of the following concepts: many medications, duplication of medications, drug/drug interactions, and excessive duration. Some definitions for polypharmacy place a value on the number of concurrent medications; the most commonly referenced number was six medications or more. This finding is interesting especially because elderly residents of extended care facilities typically receive more than seven medications per day.

Because no consensus definition for polypharmacy emerged during our literature review, we applied two of the most commonly cited ones to our dataset, specifically "use of a potentially inappropriate drug" or "use of six or more concomitant drugs". The analyses of the data collected from patients demonstrate that a significant percentage of this population are, in fact, prescribed six or more concomitant drugs and/or use a potentially inappropriate medication. Of the patients evaluated, 69.18% are prescribed 6 or more concurrent drugs, 15.7%, or 199 patients, are prescribed one or more potentially inappropriate drugs, and 9.3% meet both definitions of polypharmacy used in this study (ie, "six or more concurrent medications" and "at least one potentially inappropriate drug"). The potentially inappropriate medications prescribed include medications known to produce significant central nervous system depressant or anti-cholinergic effects. For example, 32% of the patients who were prescribed a potentially inappropriate drug received at least one benzodiazepine-containing product (see Table 3).

Table 4 Study Patients Based on Number of medications Prescribed

DRUG NAME	NO OF DRUG	% OF DRUG
RAMIPRIL	7	0.5
SPIRONOLACTONE	8	0.5
ACENOCOUMAROL	8	0.5
NEBIVOLOL	9	0.5
CILNIDIPINE	9	0.5
HYDROCORTISONE	10	0.5
VENLAFAXIN	10	0.5
BUSCOPAN	12	0.75
CHYMOSAL FORTE	12	0.75
CARVEDILOL	13	0.75
INSULIN	13	0.75
MIXTARD	14	0.87
ARISTOZUME	14	0.87
CETRIZINE	15	0.87
ONDANSTERON	15	0.87
CREMAFFIN	16	1
DUOLIN	16	1
LULIFIN CREAM	17	1

International Journal of Pharmaceutical Research and Applications
Volume 8, Issue 3 May-June 2023, pp: 3471-3490 www.ijprajournal.com ISSN: 2249-7781

AMOXICICLINE	18	1.12
ALLEGRA	18	1.12
DAILYCAL	20	1.25
PYRIDOXIN	20	1.25
CEFUROXIM	22	1.37
CILICUR	24	1.5
EMSET	24	1.5
METRONIDAZOLE	24	1.5
CLOPIDOGREL	25	1.62
COMBIFLAM	28	1.75
FOLLIC ACID	28	1.75
RABERA DSR	30	1.87
GLYCIPHAGE	32	2
METFORMIN	34	2.12
DICLOFENAC	36	2.5
ATORVAS	36	2.5
SHELCAL	36	2.5
AZITHROMYCIN	42	2.62
ECOSPRIN	44	2.75
IRON	44	2.75
AUGMENTIN	46	2.87
CALCIUM	52	3.25
VERTIN	56	3.5
ACTON OR	60	3.75
THYRONORM	61	3.75
DOLO	68	4.25
LEVOCETRIZIN	70	4.37
ZINCOVIT	72	4.5
RABERA DSR	80	5
PARACETAMOL	95	5.87
PANTOPRAZOLE	254	15.87

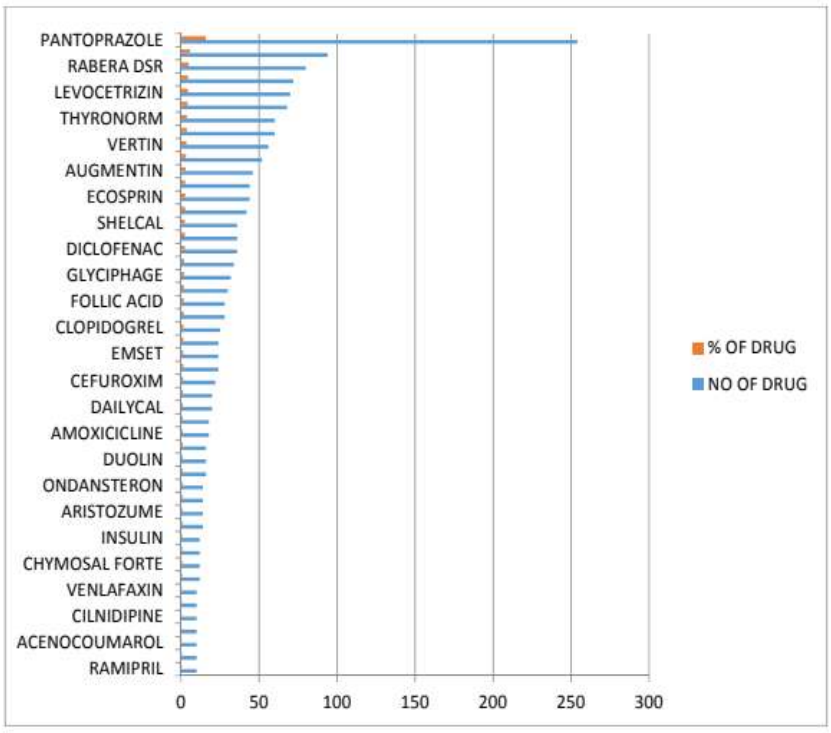


Figure 4 bar chart of study Patients Based on Number of medications Prescribed

International Journal of Pharmaceutical Research and Applications
Volume 8, Issue 3 May-June 2023, pp: 3471-3490 www.ijprajournal.com ISSN: 2249-7781

In our study various classes of drug like PANTOPRAZOLE, ASPRIN, PARACETAMOL, ZINCOVIT, LEVOCETRIZIN etc. Were prescribed. Out of which 53% males, 47 % females were prescribed with PANTOPRAZOLE which were highest among monotherapy. Table 4, fig 4.

Potential Drug-Drug Interaction

Concerns about polypharmacy include increased adverse drug reactions, drug interactions, Pharmacists Intervention, prescribing cascade and higher costs. Polypharmacy is often associated with decreased quality of life, including decreased mobility and cognition .

Table 5 Summary of potential drug-drug interaction

Parameters		Total	
		N	%
Severity	Major	101	40.59
	Moderate	145	58.11
	Minor	6	1.28
Pharmacodynamic Interaction		147	57.26
Pharmacokinetic Interaction		91	36.75
Unknown Mechanism		18	5.98
Management	Monitoring	185	73.93
	Dose adjustment	38	13.67

Out of 300 prescriptions analyzed, 142 prescriptions comprised of potential drug interactions and it was found that 235 drug interactions were present. The incidence of potential drug interaction was 63.64%. Among 235 drug interaction 90 types of interaction combinations were identified. The studied prescription comprised 58.11% moderate interaction, 40.59% major drug interactions and 1.28 minor drug interactions. Among them 57.26% were pharmacodynamic drug interactions followed by 36.75% of pharmacokinetic interaction and 5.98% of unknown mechanism interactions. The summary of potential drug-drug interactions is listed in Table 5.

Table 6 Frequency of drug interaction in study population

Frequency of pDDI	Male		Female		Total	
	N	%	N	%	N	%
1	52	37.14	23	16.42	75	53.57
2	25	17.85	18	12.14	43	30
3	14	10	5	3.57	19	13.57
4	2	1.42	0	0	2	1.42
5	2	1.42	0	0	2	1.42

N=142

In most patients of the cases one potential drug interaction were identified with median of 1.67 potential drug-drug interactions. Among them 30% of prescription had two potential drug-drug interactions. The frequency of pDDIs is shown in Table 6 and represented by Figure 5.

International Journal of Pharmaceutical Research and Applications
Volume 8, Issue 3 May-June 2023, pp: 3471-3490 www.ijprajournal.com ISSN: 2249-7781

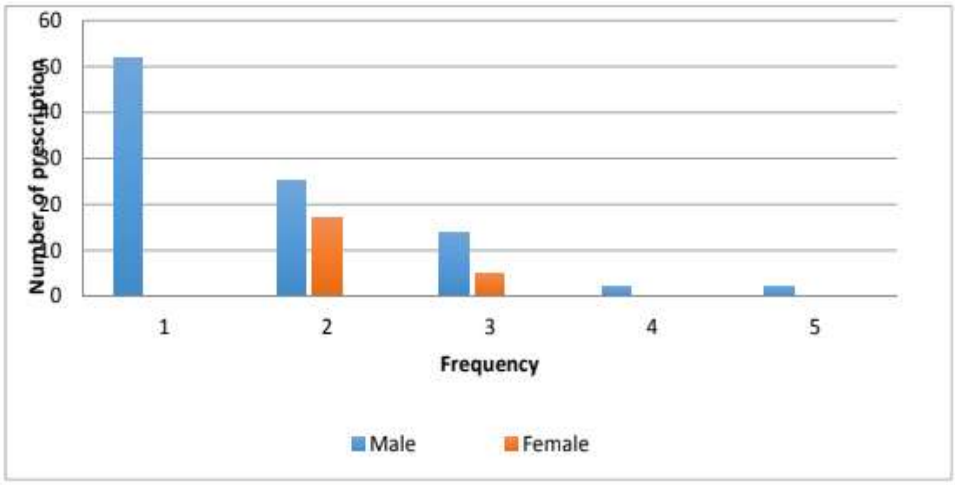


Figure 5 Frequency of potential drug interaction

Pharmacists Intervention

Out of the 235 interventions proposed, the most frequent suggestion was on monitoring for adverse effect (44.01%) followed by dose adjustment (15.81%). 25.64% of interventions were accepted and therapy was changed. Various interventions provided by the pharmacist and their result are presented in Table 7 and 8. It is also represented in Figure 6.

Table 7 Types of pharmacist intervention to prevent pDDI

Types of intervention	Total	
	N	%
Substitution	24	10.25
Stop/avoid/dose adjustment	37	15.81
Monitoring	103	44.01
No change	70	29.91

Table 8 Result of pharmacist intervention

Recommendation	Result	
	N	%
Suggestion accepted and therapy changed	60	25.64
Suggestion accepted and therapy not changed	74	31.62
Neither suggestion accepted nor therapy changed	100	42.73

International Journal of Pharmaceutical Research and Applications
Volume 8, Issue 3 May-June 2023, pp: 3471-3490 www.ijprajournal.com ISSN: 2249-7781

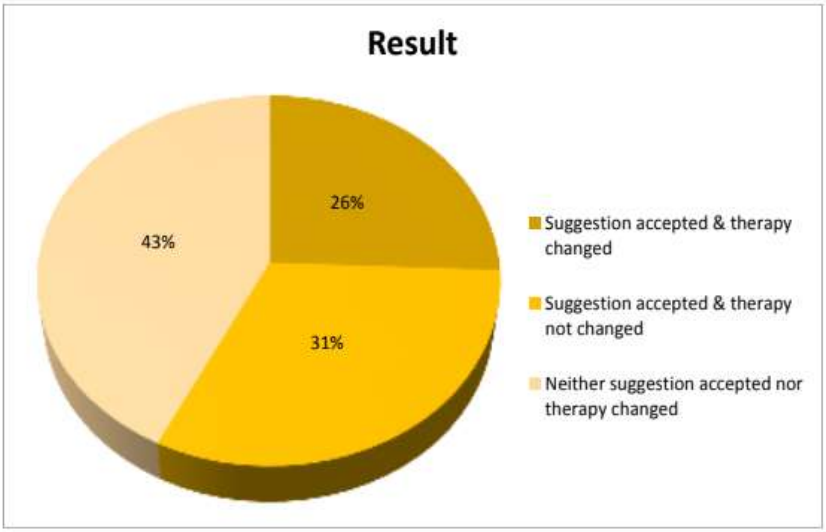


Figure 6 Result of pharmacist intervention

Adverse drug-drug Interaction

During the study period, a total of 28 adverse drug reactions were recorded among 234 pDDIs identified. The incidence rate of adverse drug interactions was found to be 20%. The study revealed that male patients 21(75%) predominated over females 7(25%) in ADR occurrence. The comparison between observed drug interaction and potential drug interaction is represented by Figure 7.

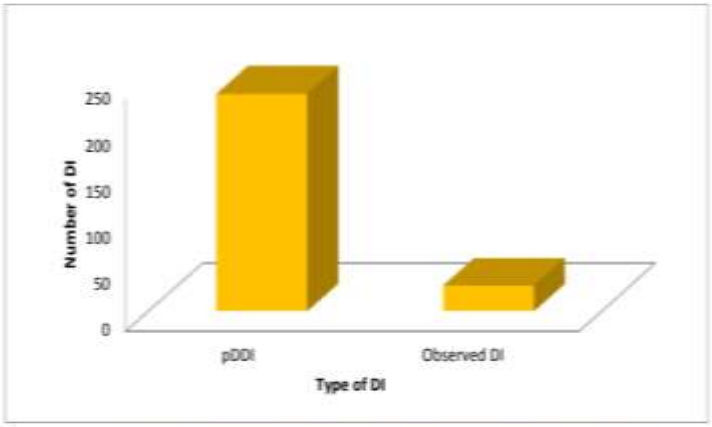


Figure 7 Comparison between observed drug interaction and pDDIs

IV. DISCUSSION

Mostly the causes of polypharmacy are the patients having more medications and the patient not reliable on single doctor because of that not a single doctor knows about all medications of particular patients. Study's found that among older adults polypharmacy is a common problem who older than age 65 is taking More than 5 medications per week 44% of men and 57% of women More than 9 medications per week 12% of both men and women The drug include in this are mostly OTC product such as acetaminophen, ibuprofen, aspirin, vitamin and mineral supplements and herbal products. The class of

International Journal of Pharmaceutical Research and Applications
Volume 8, Issue 3 May-June 2023, pp: 3471-3490 www.ijprajournal.com ISSN: 2249-7781

drugs mostly involve are cardiovascular agent, antibiotics, diuretics, anticoagulants, steroids, opioid's, anticholinergic, NSAID's, etc.

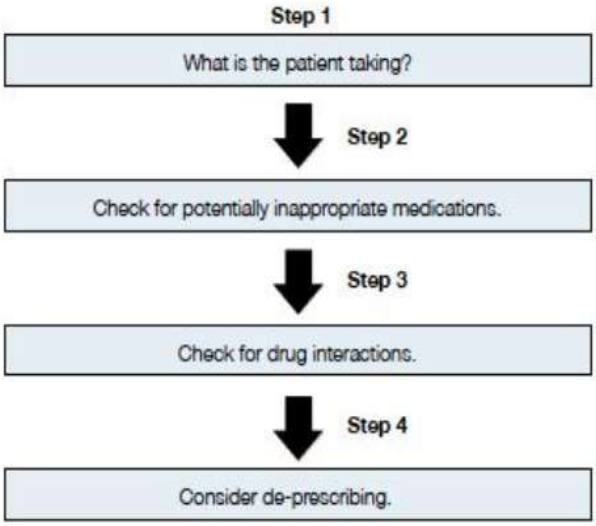


Figure 7 polypharmacy of pathway

In our study population out of 300 patients' prescriptions contains polypharmacy, which that 159were male and 141 were female and in paediatric population 53% were male and 47% were female. In Special population highest number i.e. 8.57% male and 8.16% females are in the age group 51-60 years. 9.18% males and 8.57% females were in the age group of 61-70. The demographic details of study population are listed in Table 1. Age group in Figure 1.according my demographic detail polypharmacy accrued in elderly patient. And we can say that almost polypharmacy patients were old people.

A total of 300 drugs were prescribed, and thus the average number of drugs per patient was 7. Among studied patients 3.67% were using 1-3 medication followed by 27.14% of patients using 4-6 medications. According the table 2,3 Extensive (70%) poly pharmacy was observed in study population. The number of drug dispensed is given in Table 2 and represented by pie chart in Figure 2

In our study various classes of drug like PANTOPRAZOLE, ASPRIN, PARACETAMOL, ZINCOVIT, LEVOCETRIZIN, ATORVASTATIN etc. were prescribed. Out of which 53% males, 47 % females were prescribed with PANTOPRAZOLE which were highest among monotherapy. Table 4, fig 3

Various class of drugs are prescribed in our study population based on the patient condition and comorbidities .out of which 87 males, 47 females are prescribed with atorvastatin drugs which were highest followed. Totally 20.74% atorvastatin were prescribed. 16.41% of patient used PANTOPRAZOLE, 10.22 H.ACTAPID, 6.81% ZICOVIT, 6.5% CEFTRAXONE, 5.27 PARACETAMOL and etc.

Concerns about polypharmacy include increased adverse drug reactions, drug interactions, Pharmacists Intervention, prescribing cascade and higher costs. Polypharmacy is often associated with decreased quality of life, including decreased mobility and cognition.

Out of 300 prescriptions analyzed, 142 prescriptions comprised of potential drug interactions and it was found that 235 drug interactions were present. The incidence of potential drug interaction was 63.64%. Other studied showed the incidence rate of 30.67% from South Indian Hospital[60], 91.6% from Pakistan[42] and 14.66% from Manipal University .[61] Among 235 drug interaction 90 types of interaction combinations were identified. However, another study of South Indian teaching hospital identified 388 pDDIs in 249 patients involving 51 different drugs with a total of 74 different drug combinations. Cardiac patients have previously

International Journal of Pharmaceutical Research and Applications
Volume 8, Issue 3 May-June 2023, pp: 3471-3490 www.ijprajournal.com ISSN: 2249-7781

been found to have a higher chance of having drug interactions compared to other group of patients.

In most patients of the cases one potential drug interaction were identified with median of 1.67 potential drug-drug interactions.

Of the 234 interventions proposed, the most frequent suggestion was on monitoring for adverse effect (44.01%) followed by dose adjustment (15.81%). 25.64% of interventions were accepted and therapy was changed. A study conducted in Coimbatore reported 251 intervention which is higher than this study. Of the 251 intervention, most common were related to drug interaction followed by doing changes. This higher result might be due to more of sample size than this current study[62].

The pharmacist role regarding clinical outcomes of various adverse events is very important as pDDIs are a significant factor for hospitalization of patients. A clinical pharmacist can help in the improvement of pharmacotherapy. A clinical pharmacist can find factors that may result in irrational prescriptions. Such factors are called ‘‘drug related problems’’ and may alter the desired effects of drugs. The role of pharmacist in the developed world is well recognized but this profession is not well established in the developing countries including India. The lack of proper role of pharmacist in less developed countries is leading patients with higher ratio of drug related problems. This can be reduced by clinical pharmacist’s active participation in direct patient care.

The incidence rate of adverse drug interactions was found to be 20%. This rate is similar to the study conducted in Iran[15]. Another study reported 17.53% of observed drug interaction which is lower than this study[60]. The most common drug interaction pair resulting in adverse drug reaction was aspirin/clopidogrel (5). Bleeding was the most important interaction in 8 cases followed by hypoglycaemia (4) and QT-interval prolongation (4). The most common objective drug is aspirin and precipitant drug is clopidogrel. Similarly, Bleeding was most common clinical effect of observed drug interaction in South Indian study[60].

V. CONCLUSION

In our study population out of 300 patients prescriptions contains polypharmacy, which that 159 were male and 141 were female and in paediatric population 53% were male and 47% were female. All this information can be Concluded that:

1) As the population ages, polypharmacy increases. The elderly often require multiple medications to treat multiple health-related conditions. The demographic details of study population shown that 70 % of polypharmacy occurred in elderly people, because they use 6 or more medicine.

2) Out of the patients evaluated, 69.18% are prescribed 6 or more concurrent drugs, 15.7%, or 199 patients, are prescribed one or more potentially inappropriate drugs, and 9.3% meet both definitions of polypharmacy used in this study.

3) A recent hospitalization also puts you at risk of polypharmacy. Medicines are started and stopped quite frequently during your hospital stay. 4) Multiple doctors are prescribing medications for the same patient. Once a patient starts a medication, it is never discontinued.

5) Doctor changes from one med to another within the same therapeutic class; but the patient doesn’t stop taking the first med. For example: You are taking Protonix 40mg and Dr. gives you a prescription for Prevacid 30mg. Both of these drugs are in the same therapeutic class “Proton Pump Inhibitors” and work the same way. No one should be on both these meds. Prescription drugs switching to over-the-counter (OTC) status is another problem area in this therapeutic class. A patient may take Prilosec (OTC) and get a script for Protonix, Prevacid,, etc. This is why it is so important that you take all the meds you take on a regular basis with you when you go to the doctor.

6) Doctors also may have a patient on a brand name drug and write the next prescription for a generic drug. Example: A patient is taking Coumadin 5mg daily; the Doctor gives patient a prescription for Jantoven 5mg, another trade name for Coumadin. The patient continues to take both not realizing they are the same medication. This could have devastating consequences. 7) In an effort to cut costs, patients fill prescriptions at several pharmacies. Once you choose the most cost-effective pharmacy, stick to one pharmacy. One pharmacy would have a complete list of all your meds to better inform you of duplications, interactions, etc.

8) Lack of patient education is the most common reason. Doctors don’t inform patients or patients do not ask questions.

9) This study shows that DDIs are frequent among hospitalized cardiac patients. About 234 drug interactions were reported during study period with median number of 1.67 pDDIs in the cardiac patients. It was found that incidence of pDDIs was

associated with old age, polypharmacy and increased lengths of hospital stay. Polypharmacy was high in the present study which can be minimized by the appropriate use of the medication. This study emphasizes the need to consider pDDIs during therapeutic planning, protect patients from consequence of drug interactions. In addition, providing DDI related information to the prescribers and drug interaction alert software to the dispensing pharmacist can play a vital role in minimizing the incidence rate of DDI.

10) The majority of interactions were pharmacodynamic in nature, having moderate severity. Anti-platelets and anti-coagulants were commonly implicated in many PDDIs in this study and therefore require intensive monitoring during therapy. The most common management plan found in present study for most of the drug interaction was monitoring and dose adjustment. The study reported that about 26% of intervention proposed were accepted by physician.

11) The incidence rate of adverse drug interactions was found to be 20%. The results provided an insight to the healthcare providers on the importance of monitoring and reporting of adverse drug interactions. The active involvement of a well-trained clinical pharmacist for detecting the adverse drug interactions and delivering the awareness classes for the healthcare professionals regarding the need of reporting the incident could improve the scenario in under-reported hospitals.

REFERENCES

[1]. Abidi,.a ,Surabhi Gupta, Saurabh Kansal, Ramgopal . Prescription auditing and drug utilization pattern in a tertiary care teaching hospital of western UP. International Journal of Basic & Clinical Pharmacology, [S.l.], v. 1, n. 3, p. 184-190, feb. 2017. ISSN 2279-0780.

[2]. Allardx J, et al. 2001. Efficacy of a clinical medication review on the number of potentially inappropriate prescriptions prescribed for community- dwelling elderly people. Can Med Assoc J, 164:1291–6.

[3]. American Geriatrics Society 2012 Beers Criteria Update Expert Panel. American Geriatrics Society updated Beers Criteria for potentially inappropriate medication use in older adults. J Am Geriatr Soc 2012; 60:616– 31.

[4]. Bergman-Evans B. 2006 Evidence-based guideline: Improving medication management for older adult clients. J Gerontol Nurs, 32:6–14. **5)** Boyd, CM; Darer, J; Boult, C; Fried, LP; Boult, L; Wu, AW (2005). "Clinical practice guidelines and quality of care for older patients with multiple comorbid diseases: implications for pay for performance". JAMA. 294 (6): 716–24. PMID 16091574. doi:10.1001/jama.294.6.716.

[5]. Brager R, Sloand E. 2005. The spectrum of polypharmacy. Nurs Pract, 30:44– 50.

[6]. Bressler R, Bahl JJ. 2003. Principles of drug therapy for the elderly patient. Mayo Clin Proc, 78:1564–77.

[7]. Bushardt RL, Jones KW. 2005. Nine key questions to address polypharmacy in the elderly. JAAAPA, 18:32–7.

[8]. Cadogan, Cathal A.; Ryan, Cristín; Hughes, Carmel M. (2016). "Appropriate Polypharmacy and Medicine Safety: When Many is not Too Many". Drug Safety. 39 (2): 109–16. PMC 4735229. PMID 26692396. doi:10.1007/s40264-015-0378-5.

[9]. Callahan, J.; Sashin, J. I. (1987). "Models of affect-response and anorexia nervosa". Ann. N.Y. Acad. Sci. 504: 241–259. doi:10.1111/j.1749-6632.1987.tb48736.x.

[10]. Chobanian AV, Bakris GL, Black HR, et al; and the National High Blood Pressure Education Program Coordinating Committee. 2003. The Sev- enth Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure: The JNC 7 Report. JAMA, 289:doi:10.1001/jama.289.19.2560.

[11]. Cline, C.M.J.; Björck-Linné, A.K.; Israelsson, B.Y.A.; Willenheimer, R.B.; Erhardt, L.R. (1999-06-01). "Non-compliance and knowledge of prescribed medication in elderly patients with heart failure". European Journal of Heart Failure. 1 (2): 145–149. ISSN 1879-0844. PMID 10937924. doi:10.1016/S1388-9842(99)00014-8.

[12]. da Cruz, Ligiane Paula; Miranda, Patrícia Monforte Miranda; Vedana, Kelly Graziani; Miasso, Adriana Inocenti (2011). "Medication therapy: Adherence, knowledge and difficulties of elderly

people from bipolar disorder" (PDF). Revista Latino-Americana De Enfermagem (RLAE). 19 (4): 944–952. PMID 21876947. doi:10.1590/S0104-11692011000400013.

[13]. Espino DV, Bazaldua OV, Palmer RF, et al. Suboptimal medication use and mortality in an older adult community-based cohort: results from the Hispanic EPESE Study. J Gerontol A Biol Sci Med Sci2006; 61:170–5.

[14]. Fialová D, Topinkova E, Gambassi G, et al. Potentially inappropriate medication use among elderly home care patients in Europe. JAMA 2005;293:1348–58.

[15]. Fick DM, Cooper JW, Wade WE, et al. Updating the Beers criteria for potentially inappropriate medication use in older adults: results of a US consensus panel of experts. Arch Intern Med 2003;163:2716–24.

[16]. Franchi C, Tettamanti M, Pasina L, et al. Changes in drug prescribing to Italian community-dwelling elderly people: the EPIFARM-Elderly Project 2000–2010. Eur J Clin Pharmacol 2014;70:437–43.

[17]. Frank C. 2002. Conscientious family physicians and polypharmacy. Can Fam Phys, 48:1418–20

[18]. Gellad, Walid F.; Grenard, Jerry L.; Marcum, Zachary A. (2011). "A systematic review of barriers to medication adherence in the elderly: Looking beyond cost and regimen complexity". American Journal of Geriatric Pharmacotherapy. 9 (1): 11–23. PMC 3084587. PMID 21459305. doi:10.1016/j.amjopharm.2011.02.004. **20)** Haider, SI; Ansari, Z; Vaughan, L; Matters, H; Emerson, E. (2014). "Prevalence and factors associated with polypharmacy in Victorian adults with intellectual disability". Research in Developmental Disabilities. 35 (11): 3070– 3080. doi:10.1016/j.ridd.2014.07.060.

[19]. Haider, SI; Johnell, K; Thorslund, M; Fastbom, J (2007). "Analysis of the association between polypharmacy and socioeconomic position among elderly aged >/=77 years in Sweden". Clin Ther. 30 (2): 419–27. PMID 18343279. doi:10.1016/j.clinthera.2008.02.010.

[20]. Haider, SI; Johnell, K; Thorslund, M; Fastbom, J (2007). "Trends in polypharmacy and potential drug-drug interactions across educational groups in elderly patients in Sweden for the period 1992 - 2002". International Journal of Clinical Pharmacology and Therapeutics. 45 (12): 643–653. PMID 18184532. doi:10.5414/cpp45643.

[21]. Haider, SI; Johnell, K; Weitoft, GR; Thorslund, M; Fastbom, J (2009). "The influence of educational level on polypharmacy and inappropriate drug use: a register-based study of more than 600,000 older people.". Journal of the American Geriatrics Society. 57 (1): 62–69. PMID 19054196. doi:10.1111/j.1532-5415.2008.02040.x.

[22]. Hilmer, Sarah N.; Gnjidic, Danijela; Le Couteur, David G. (December 2012). "Thinking through the medication list: appropriate prescribing and deprescribing in robust and frail older patients.". Australian Family Physician. 41 (12): 924–928. PMID 23210113.

[23]. Hiroto Ito, Asuka Koyama, Teruhiko Higuchi. (Sep 2005)Polypharmacy and excessive dosing: psychiatrists' perceptions of antipsychotic drug prescription .The British Journal of Psychiatry , 187 (3) 243- 247; DOI: 10.1192/bjp.187.3.243

[24]. Jones BA. 1997. Decreasing polypharmacy in clients most at risk. AACN Clinical Issues, 8:627–34.

[25]. Jorgensen T, Johansson S, Kennerfalk A, et al. 2001. Prescription drug use, diagnoses and healthcare utilization among the elderly. Ann Pharma- cother, 35:1004–9.

[26]. Jyrkkä J, Enlund H, Korhonen MJ, et al. Patterns of drug use and factors associated with polypharmacy and excessive polypharmacy in elderly persons results of the Kuopio 75+ study: a cross-sectional analysis. Drugs Aging 2009;26:493–503.

[27]. Kramer TAM. Polypharmacy. MedGenMed 2(3), 2000 [formerly published in Medscape Psychiatry & Mental Health eJournal 5(3), 2000]. Available at: http://www.medscape.com/viewarticle/430552

[28]. Maher et. al. (2014). "Clinical Consequences of Polypharmacy in Elderly". Expert Opinion on Drug Safety. 13 (1): 57–65. PMC 3864987 . PMID 24073682. doi:10.1517/14740338.2013.827660

[29]. Mandell, A.J.; Selz, K.A. (1992). "Dynamical systems in psychiatry: Now what?". Biological Psychiatry. 32: 299–301. doi:10.1016/0006- 3223(92)90034-w.

[30]. Mukoro, George & Weriwoyingipre Silver, Yeibake & P.J., Alagoa. (2014). Audit of prescription Notes from a Tertiary health centre. IOSR Journal of Dental and Medical Sciences. 13. 2279-861. 10.9790/0853-13127982.

[31]. Munger MA (Nov 2010). "Polypharmacy and combination therapy in the management of hypertens". Drugs Aging. 27: 871–83. PMID 20964461. doi:10.2165/11538650-000000000-00000.

[32]. Ndungu, Tk & Maru, Sm & Kuria, Kam & Karimi, Pn & Bururia, Jm. (2008). Prescription Audit carried out at the Pharmacy Practice Centre of the University of Nairobi between June and November 2004. East and Central African Journal of Pharmaceutical Sciences. 10. . 10.4314/ecajps.v10i2.9762.

[33]. Nusbaum NJ. 2005. Improving elder care by integrating geriatric expertise into medicare. Drugs Aging, 22:371–4.

[34]. Page, AT; Clifford R., M; Potter, K; Schwartz, D; Etherton- Beer, CD (14 April 2016). "The feasibility and the effect of deprescribing in older adults on mortality and health: A systematic review". British Journal of Clinical Pharmacology. 82: 583–623. PMID 27077231. doi:10.1111/bcp.12975.

[35]. Polypharmacy in Elderly Patients.Vumc.nl. Retrieved 16 January 2015. **38)** Polypharmacy. TheFreeDictionary.com. Retrieved 16 January 2015.

[36]. Potter, Kathleen; Flicker, Leon; Page, Amy; Etherton-Beer, Christopher (4

[37]. March 2016). "Deprescribing in frail older people: a randomised controlled trial.". PLOS ONE. 11 (3): e0149984. PMC 4778763 . PMID 26942907. doi:10.1371/journal.pone.0149984.

[38]. Pozzi C, Lapi F, Mazzaglia G, et al. Is suboptimal prescribing a risk factor for poor health outcomes in community-dwelling elders? The ICARe Dicomano study. Pharmacoepidemiol Drug Saf 2010;19:954–60.

[39]. Preskorn SH, Silkey B, Shah R, et al. 2005. Complexity of Medication Use in the Veterans Affairs Healthcare System: Part I: Outpatient Use in Rela- tion to Age and Number of Prescribers. J Psychiatr Pract, 11:5–14.

[40]. Qato, DM; Wilder, J; Schumm, LP; Gillet, V; Alexander, GC (2016). "Changes in Prescription and Over-the-Counter Medication and Dietary Supplement Use Among Older Adults in the United States, 2005 vs 2011". JAMA. 176 (4): 473–482. PMID 26998708. doi:10.1001/jamainternmed.2015.8581.

[41]. Reamer L Bushardt, Emily B Massey, Temple W Simpson, Jane C Ariail, Kit N Simpson. Polypharmacy: Misleading, but manageable. Clin Interv Aging. 2008 Jun; 3(2): 383–389. Published online 2008 Jun.

[42]. Richard W. Grant, Nicole G. Devita, Daniel E. Singer, James B. Meigs. Polypharmacy and Medication Adherence in Patients With Type 2 Diabetes .Diabetes Care May 2003, 26 (5) 1408-1412; DOI: 10.2337/diacare.26.5.1408

[43]. Richardson K, Ananou A, Lafortune L, et al. Variation over time in the association between polypharmacy and mortality in the older population. Drugs Aging 2011;28:547–60.

[44]. Robert L Maher, Joseph Hanlon & Emily R Hajjar. Clinical consequences of polypharmacy in elderly. Expert Opinion on Drug Safety Vol. 13 , Iss. 1,2014 **47)** Roschelle Heuberger. Polypharmacy and Food–Drug Interactions Among Older Persons: A Review. Journal of Nutrition in Gerontology and Geriatrics Vol. 31 , Iss. 4,2012

[45]. Schuler, J., Dückelmann, C., Beindl, W. et al. Wien Klin Wochenschr (2008). Polypharmacy and inappropriate prescribing in elderly internal medicine patients in Austria. 120: 733. https://doi.org/10.1007/s00508-008- 1089-z

[46]. Sergi, G; De Rui, M; Sarti, S; Manzato, E (2011). "Polypharmacy in the elderly: Can comprehensive geriatric assessment reduce inappropriate medication use?". Drugs Aging. 28 (7): 509–518. doi:10.2165/11592010- 000000000-00000.

[47]. Sönnichsen, Andreas; Trampisch, Ulrike S.; Rieckert, Anja; Piccoliori, Giuliano; Vögele, Anna; Flamm, Maria; Johansson, Tim; Esmail, Aneez; Reeves, David; Löffler, Christin; Höck, Jennifer; Klaassen-Mielke, Renate; Trampisch, Hans Joachim; Kunnamo, Ilkka (2016). "Polypharmacy in Chronic Diseases – Reduction of Inappropriate Medication and Adverse Drug Events in Older Populations by Electronic Decision Support (PRIMA-eDS): Study Protocol for a Randomized Controlled Trial". Trials. 17 (57). PMID 26822311. doi:10.1186/s13063-016-1177-8. Retrieved July 15, 2016.

[48]. Stawicki, S. P.; Gerlach, A. T. (2009). "Polypharmacy and medication errors: Stop, listen, look, and analyze...". OPUS 12 Scientist. 3 (1): 6–10.

[49]. Steinman, M. A., Seth Landefeld, C., Rosenthal, G. E., Berthenthal, D., Sen, S. and Kaboli, P. J. (2006), Polypharmacy and Prescribing Quality in Older People. Journal of the American Geriatrics Society, 54: 1516–1523. doi:10.1111/j.1532-5415.2006.00889.x

[50]. Sumukadas D, McMurdo ME, Mangoni AA, et al. Temporal trends in anticholinergic medication prescription in older people: repeated cross sectional analysis of population prescribing data. Age Ageing2014;43:515–21.

[51]. Veehof, L., Stewart, R., Meyboom-de Jong, B. et al. Adverse drug reactions and polypharmacy in the elderly in general practice. E J Clin Pharmacol (1999) 55: 533. https://doi.org/10.1007/s002280050669

[52]. Wan-Hsuan Lu, Yu-Wen Wen, Liang-Kung Chen, Fei-Yuan Hsiao. Effect of polypharmacy, potentially inappropriate medications and anticholinergic burden on clinical outcomes: a retrospective cohort study. CMAJ. 2015 Mar 3; 187(4): E130–E137. doi: 10.1503/cmaj.141219

[53]. When Is Polypharmacy an Advantage? . Ajp.psychiatryonline.org. Retrieved 16 January 2015.

[54]. Yasein, Nada A.; Barghouti, Farihan F.; Irshaid, Yacoub M.; Suleiman, Ahmad A. (March 2013). "Discrepancies between elderly patient's self reported and prescribed medications: a social investigation". Scandinavian Journal of Caring Sciences. 27 (1): 131–138. PMID 22616831. doi:10.1111/j.1471-6712.2012.01012.x.

[55]. Zarowitz, Barbara J. (2006). Medication overuse and misuse. Geriatr Nurs, 27:204–5.

[56]. Zhan C, Sangl J, Bierman AS, et al. Potentially inappropriate medication use in the community-dwelling elderly: findings from the 1996 Medical Expenditure Panel Survey. JAMA 2001;286:2823–9.

[57]. Patel VK, Acharya LD, Rajakannan T, Surulivelrajan M, Guddattu V, Padmakumar R. Potential drug interactions in patients admitted to cardiology wards of a south Indian teaching hospital. Australas Med J. 2011; 4(1):9-14.

[58]. Mateti UV, Rajakannan T, Nekkanti H, Rajesh V, Mallaysamy SR, Ramachandran P. Drug-drug interactions in hospitalized cardiac patients. J Young Pharmacists. 2011; 3:329-33.

[59]. Abraham RR, Devi AM. Drug related problems and reactive pharmacist's interventions for inpatients receiving cardiovascular drugs. Am J Pharm Tech Res. 2012; 2(3):1154-66.

[60]. Divya Vedhartham, Narender Boggula, Vasudha Bakshi*. (2018). ANALYSIS OF PRESCRIPTIONS FOR VARIOUS EFFECTS OF POLY PHARMACY IN TERITARY HOSPITAL CARE. INDO AMERICAN JOURNAL OF PHARMACEUTICAL SCIENCES, 05(06), 5969–5983.

[61]. Halli-Tierney, A. D., Scarbrough, C., & Carroll, D. (2019). Polypharmacy: evaluating risks and deprescribing. American family physician, 100(1), 32-38.

[62]. Denneboom, W., Dautzenberg, M. G., Grol, R., & De Smet, P. A. (2006). Analysis of polypharmacy in older

patients in primary care using a multidisciplinary expert panel. The British journal of general practice : the journal of the Royal College of General Practitioners, 56(528), 504–510.

[63]. Khandeparkar, A., & Rataboli, P. V. (2017). A study of harmful drug-drug interactions due to polypharmacy in hospitalized patients in Goa Medical College. Perspectives in clinical research, 8(4), 180–186. https://doi.org/10.4103/picr.PICR_132_16