STUDY OF POLYPHARMACY AMONG GERIATRIC INPATIENTS IN A TERTIARY CARE HOSPITAL

Dr. Suramya Raju*[1], Dr. Apsara G. Krishnan[2], Dr. Dona Maria Jose[3], Meppil Baby[4] and Dr. Beena P.[5]

[1,2,3]Pharm D., KVM College of Pharmacy, KVM College of Pharmacy, Cherthala, Kerala.

[4]Associate Professor, KVM College of Pharmacy, KVM College of Pharmacy, Cherthala, Kerala.

[5]Principal, KVM College of Pharmacy, KVM College of Pharmacy, Cherthala, Kerala.

*Corresponding Author
Dr. Suramya Raju
Pharm D., KVM College of
Pharmacy, KVM College of
Pharmacy, Cherthala,
Kerala.

ABSTRACT

Polypharmacy refers to the use of multiple medications in patients. Polypharmacy puts individuals at high risk of drug related problems such as Adverse drug reactions, Drug interactions & use of potentially inappropriate medications. This study analyse Polypharmacy among Geriatric inpatients. Inappropriate medication use is common problem in older adults. The aim of the study is to examine the polypharmacy among geriatric patients in a tertiary care hospital. A total of 140 patient case records satisfying the inclusion criteria were analysed over a period of six months to determine the Polypharmacy and Drug related problems among geriatric inpatients also were assessed during the study period. Case records were prospectively reviewed for demographic details, laboratory data, management and outcomes. During the study period 140 prescriptions were screened.

Polypharmacy is a phenomenon less considered, and an emerging public health concern in elderly peoples. In this study drugs prescribed in each prescription was evaluated and it was found that, 52% of the prescriptions had 11-15 drugs and 36% of the prescription contain more than 15 drugs and 32% prescriptions contain 5-10 drug. Statistical correlation between polypharmacy and drug related problems such as Drug interaction, Adverse drug reaction and potentially inappropriate medications were analyzed. There is a significant association was found between polypharmacy and drug interactions. Polypharmacy is a phenomenon less considered, and an emerging public health concern in elderly people and it becoming very

common now a days. Polypharmacy puts individuals at high risk for drug-related problems such as adverse effects and drug interactions.

KEYWORDS: Polypharmacy, ADR, DDI.

INTRODUCTION

Polypharmacy refers to unnecessary or unwanted drug use, usually by using more than five drugs per day or taking more drugs than clinically warranted. Drugs are often needed to treat both acute and chronic conditions, but polypharmacy can be a serious problem when it comes to prescription drugs.[1]
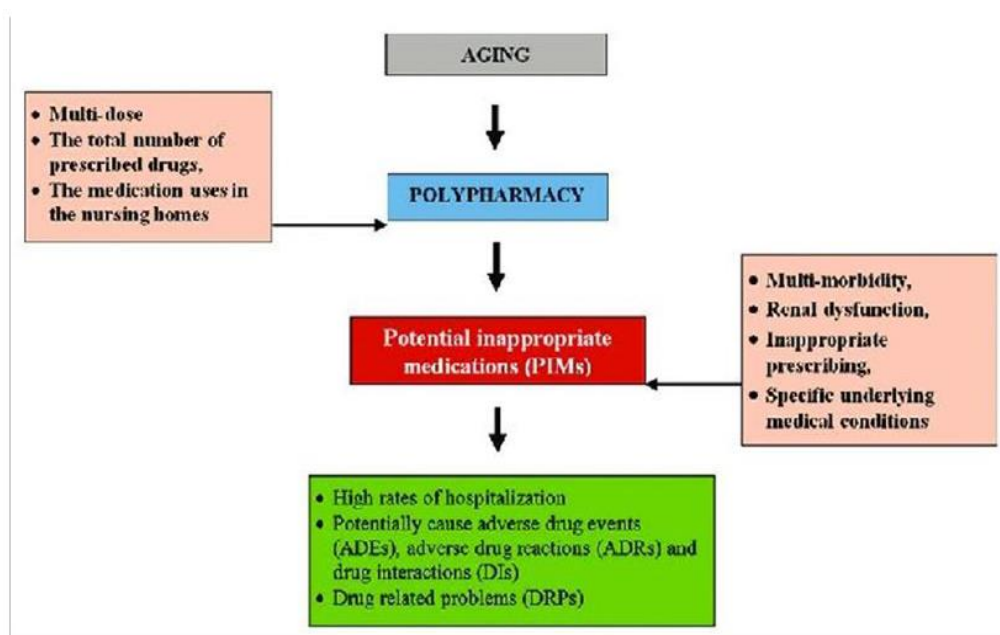

Figure 1: Overview of polypharmacy effect

About 44% of men and 57% of women over age 65 take five or more OTC or prescription medications per week.[2]

Inappropriate polypharmacy occurs due to
- Patient heterogeneity & lack of representation in trials.
- Lack of drug products tailored to patient needs.
- Lack of guidance and education.
- Preferences and perceptions.
- No systematic use of medication review support tools.
- Ineffective shared – decision making process.

Appropriate polypharmacy is available, Where

- All drugs are prescribed to achieve a specific therapeutic goal
- Therapeutic goal is achieved or has Potential to create value for future success
- Medication optimized to reduce the risk of ADR.

Multiple medications can be associated with numerous adverse health outcomes, especially among older adults with multimorbidity, including increased risk of death, falls, drug interactions, noncompliance and hospitalization. This poses a particular challenge for the elderly who have lower metabolic reserves. Poor management of drug- related problems can lead to more drugs increasing the risk without additional benefit.

Depending on the level and type of health insurance, polypharmacy can affect finances, which can be a special burden for older people who often have a fixed income.[3]

Polypharmacy Consequences

1. Adverse drug reactions
2. Drug – drug interactions
3. Non adherence / Decreased Medication compliance
4. Unnecessary drug expenses
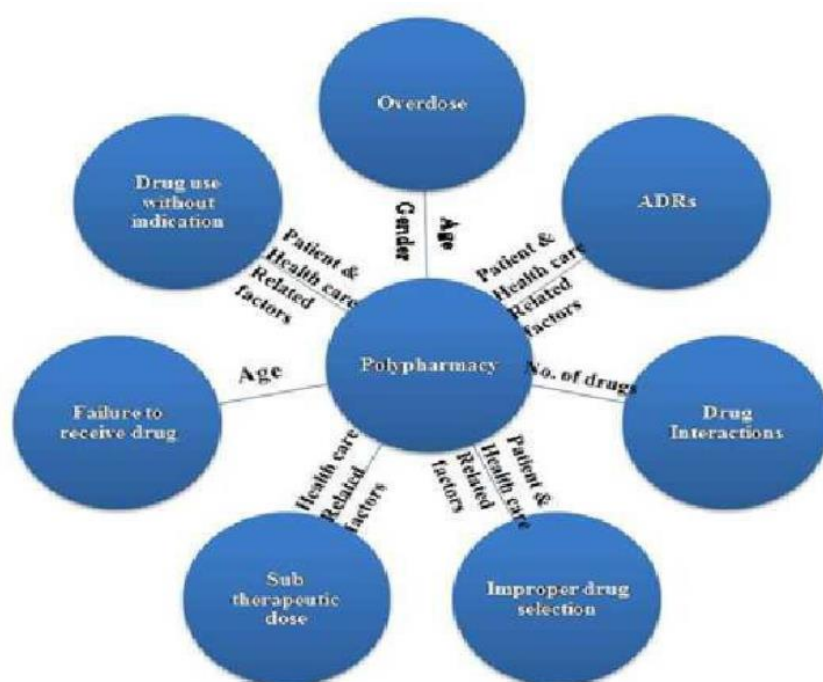5. Poor quality of life, Outcomes

Figure 2: Overview of polypharmacy associated risk factors

Polypharmacy has many negative consequences. Adverse reactions are common in older people and often present differently in younger patients. Adverse drug effects are a response to a drug that is noxious and unintended and occurs at doses normally Used for the prophylaxis, diagnosis or therapy of disease, or for modification of physiological function.[4]

Many factors can predispose patients to developing ADR. Patients with one or more of the following predispositions are at high risk of developing ADRs.[4]

a) **Multiple and Intercurrent Diseases:** Because drugs are used to treat multiple diseases, patients with multiple diseases are more likely to develop ADR.

b) **Polypharmacy**: Patients receiving multiple drug regimens are more likely to develop side effects due to changes in drug action through interaction mechanisms.

c) **Age:** Due to the physiological changes (pharmacokinetics and pharmacodynamics) associated with aging and the frequent use of multiple medications to treat chronic disease in elderly patients are more susceptible to ADRs.

d) **Drug characteristics**: Some drugs are toxic in nature and patients treated with these drugs have an increased risk of adverse reactions. For example, nausea and vomiting are common side effects in patients receiving cytotoxic anti- cancer drugs.

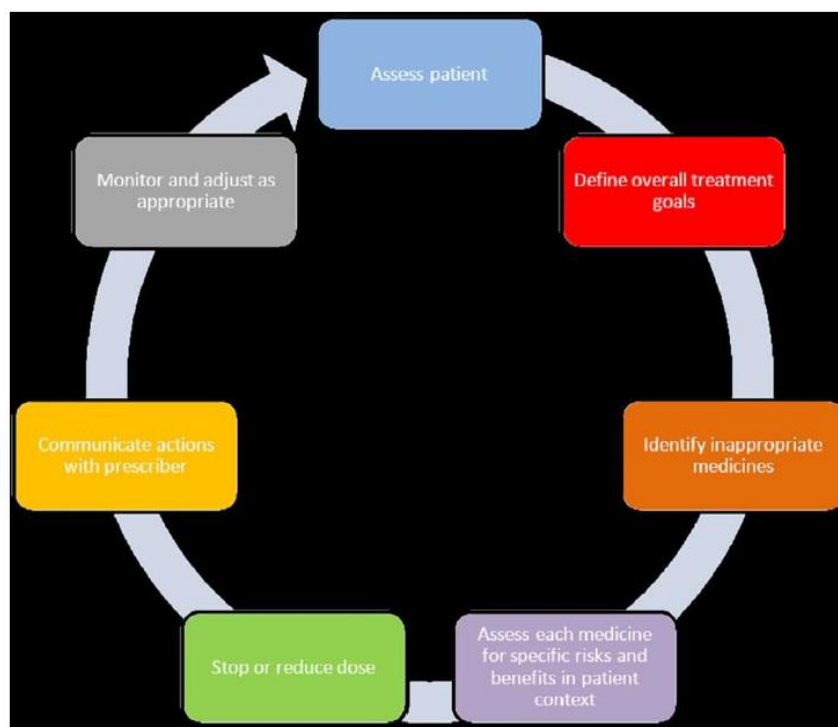e) **Gender**: It has been reported that women are more susceptible to ADR than men for physiological reasons.

Figure 3: A patient centered approach to polypharmacy

Commonly Observed Preventable Drug Related Problems Include

i.   Drug Interactions

ii.   Inadequate Monitoring

iii. Inappropriate Drug Selection

iv.   Lack of Patient Adherence

v.   Overdosage

vi.   Poor Communication

vii. Under Prescribing

viii. Untreated Medical Problem

ix.   Drug – Disease Interaction[5]

MATERIALS AND METHODS

Study Design   :   Prospective Cross sectional Study

Study Setting   :   S H Medical Centre, Kottayam

Study Duration   :   6 Months

Sample Size   :   140 Geriatric Patients

Sampling Technique   :   Convenience sampling technique was used

Sampling Size Determination

140 Cases were collected from general medicine department.

Sample size:- 140

$$n = \left(\frac{z^2\ (p*q)}{me^2} \right)$$

Where, z = 0.95 (95%)

ME = 0.05 (5%)

p = 0.9

q = 0.1

$$n = \frac{1.96^2 * 0.9 * 0.1}{(0.05)^2}$$

= 138.27

= **140**

Criteria for Patient Selection Inclusion Criteria

- Either sex

- Age above 65 years

- Patients with co-morbid conditions

- Prescription should contain atleast one Antibiotic

Exclusion criteria

- Age below 65 years.

- Unconscious patients.

- Out patients

RESULT

Table 1: Classification according to number of drugs in a prescription.

                                                                    (n = 140)

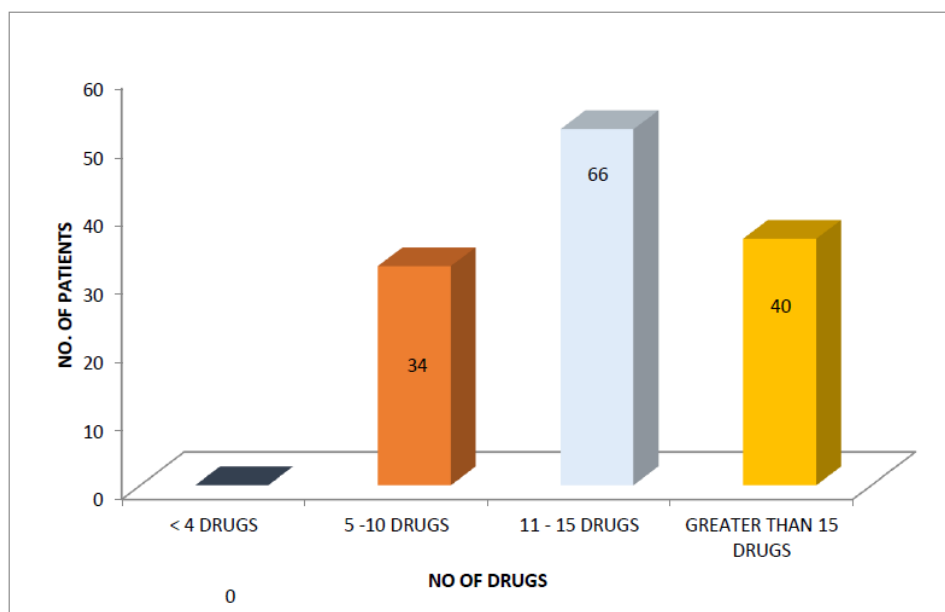| NUMBER OF MEDICATIONS	NUMBER OF PATIENTS (n)
< 4 DRUGS	0
5 – 10 DRUGS	34
11 – 15 DRUGS	66
> 15 DRUGS	40

Number of drugs in a prescription

**Figure 4: Number of drugs in a prescription**

Inference: Almost 47% of the patients were prescribed 11-15 drugs per prescription.

Table 2: Distribution of ADR's observed in the study population.

(n= 140)

SUSPECTED DRUGS	REACTION	FREQUENCY (n)
METOPROLOL	HYPOTENSION	3
NICOTINE	SLEEPING TROUBLE	1
METHYL PREDNISOLONE	HYPERGLYCEMIA	8
CEFTRIAXONE	BLACK DISCOLOURATION OF URINE	2
CIPROFLOXACIN, TRAMADOL, ALUMINIUM HYDROXIDE	CONSTIPATION	10
GLIMEPIRIDE, INSULIN	HYPOGLYCEMIA	12
EDIPINE, ISOSORBIDE MONONITRATE	HEADACHE	7
AMLODIPINE	PEDAL EDEMA	3
ASPIRIN, CLOPIDOGREL	TRO INTESTINAL BLEEDING	9

ADRs observed in the study population
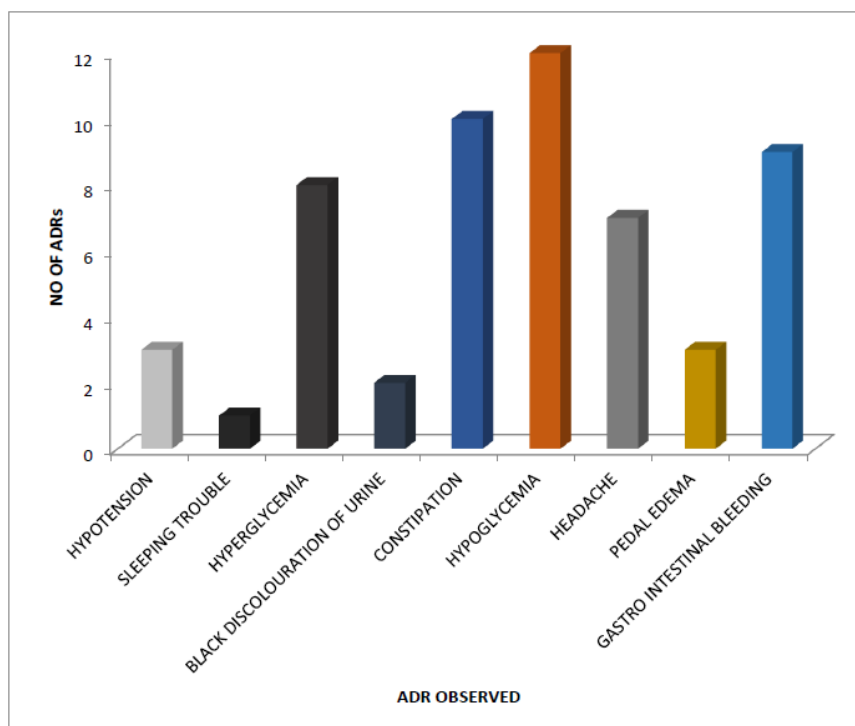
Figure 5: ADRs observed in the study population

Inference: Over the study period, the possibilities of the potential ADRs occurrence resulting from the Polypharmacy were analysed.

Hypoglycemia was found to be the most common ADR among study population which was suspected to be caused due to the administration of Insulin and Glimepiride. It is followed by Constipation which is suspected to be caused due to the administration of Ciprofloxacin,

Tramadol and Aluminium Hydroxide.

Table 3: Drug Interactions observed in the study population.

(n = 140)

No of Drugs Per Prescription	Total Interactions
Less than 5	0
5-10	11
11 -15	36
Greater than 15	31

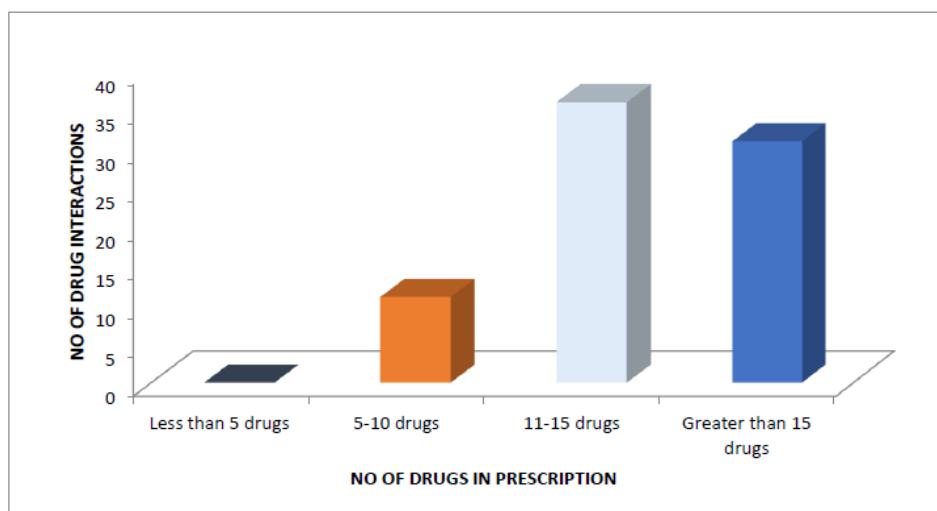Drug Interactions observed in the study population

Figure 6: Drug Interactions observed in the study population

Inference: During the study period 140 prescriptions were screened. There were no drug interactions in prescription containing less than 5 drugs. More drug interactions were found in the prescription containing 10 - 15 drugs, then closely followed drug interactions in prescription containing greater than 15 drugs. Occurrence of potential drug drug interactions increases with increase in number of drugs per prescription.

Table 4: Demographic data analysis of Comorbidities

Age group	Diabetes Mellitus		HypertensioN		COPD		DLP		LRTI		Total		Percentage	
	M	F	M	F	M	F	M	F	M	F	M	F	M	F
65-75	23	25	29	22	8	5	6	12	3	9	69	73	49.29 %	52.14 %
76-85	21	22	12	20	10	8	5	5	7	4	55	59	39.29 %	42.14 %
Greater than 86	3	6	4	7	4	5	2	2	0	5	13	25	9.29 %	17.86 %
Total	47	53	45	49	22	18	13	19	10	18	137	157	49.29	52.14

													%	%
Percentage	33.57 %	37.86 %	32.14 %	35.00%	15.71 %	12.86 %	9.29 %	13.57 %	7.14 %	12.86 %				

Data analysis of comorbidities

The above table shows that the comorbidities were higher in the patients of the age group of 65-75 years. In the age group in between 65-75 years, the comorbidities were found to be greater in females than in males. The incidence of LRTI was merely found in patients greater than 86 years. The table also shows that diabetes mellitus was the most common diagnosis.

LRTI was the least diagnosed comorbidities among both male and female patients. Whereas, Hypertension was found to be the most common comorbidities among male and female patients.
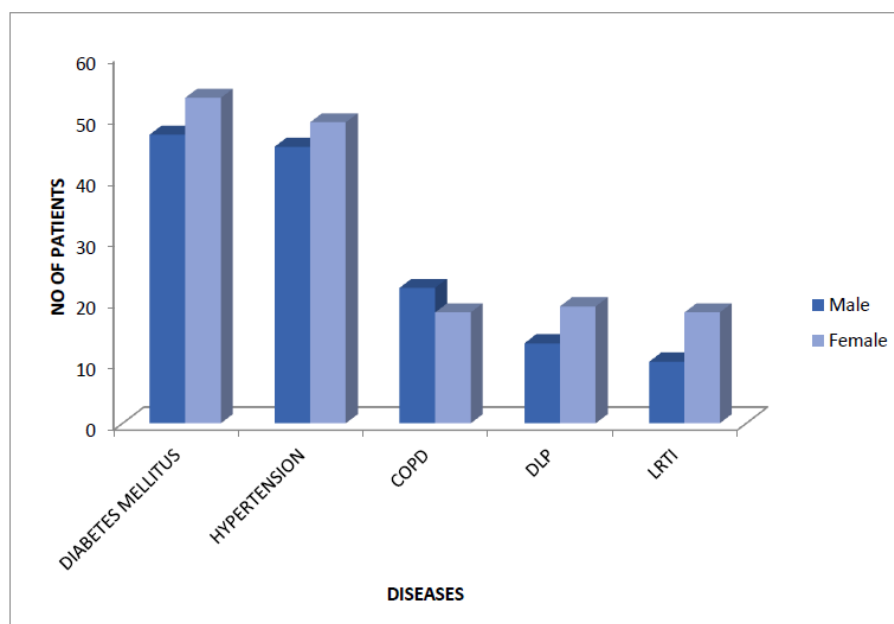

Figure 7: Data analysis of comorbidities

Inference: The above diagram shows the conclusion obtained from the table.

Diabetes Mellitus was the highest diagnosed disease among the population.

LRTI was least diagnosed disease among the population.

Association between Age and Co- morbidities (Chi-Square Test)

Chi-square test age group of patients against comorbidities.

Table 5: Observed Table

| Age group | CO MORBIDITIES | | | | | Total |
	DIABETES MELLITUS	HYPERTENSION	COPD	DLP	LRTI	
65-75	48	51	13	18	12	**142**
76-85	43	32	18	10	11	**114**
Greater than 86	9	11	9	4	5	**38**
Total	**100**	**94**	**40**	**32**	**28**	294

Association between age and comorbidities : observed table

Table 6: Expected Table

| Age group | CO MORBIDITIES | | | | |
	DIABETES MELLITUS	HYPERTENSION	COPD	DLP	LRTI
65-75	48.29931973	45.40136054	19.31972789	15.45578231	13.52380952
76-85	38.7755102	36.44897959	15.51020408	12.40816327	10.85714286
Greater than 86	12.92517007	12.14965986	5.170068027	4.136054422	3.619047619

Association between age and comorbidities : expected table

H_0: The age and comorbidities are not associated.

H_1: The age and comorbidities are associated

Chi-squared value   = 9.892

p − value   = 0.2726

Here 0.2726 > 0.05 So we accept the hypothesis. No association was found between age and comorbidities.

Association between Polypharmacy and ADR

Chi-square test of polypharmacy against ADR's.

Table 7: Observed Table

| ADR | No of Drugs In A Prescription | | | Total |
	5-10	11-15	Greater Than 15	
Constipation	2	4	4	10
Gastrointestinal Bleeding	3	2	4	9
Headache	0	2	5	7
Hypoglycemia	3	5	4	12
Hyperglycemia	1	3	4	8
Hypotension	0	1	2	3
Pedal edema	1	2	0	3
Black Discolouration of Urine	0	1	1	2
Sleeping Trouble	0	0	1	1
Total	10	20	25	55

Association between polypharmacy and ADR : observed table

Table 8: Expected Table

ADR	NO OF DRUGS IN A PRESCRIPTION		
	5-10	**11-15**	**Greater Than 15**
CONSTIPATION	1.8181	3.6363	4.5454
GASTROINTESTINAL BLEEDING	1.6363	3.2727	4.0909
HEADACHE	1.2727	2.5454	3.1818
HYPOGLYCEMIA	2.1818	4.3636	5.4545
HYPERGLYCEMIA	1.4545	2.9090	3.6363
HYPOTENSION	0.5454	1.0909	1.3636
PEDAL EDEMA	0.5454	1.0909	1.3636
BLACK DISCOLOURATION OF URINE	0.3636	0.7272	0.9090
SLEEPING TROUBLE	0.1818	0.3636	0.4545

Association between polypharmacy and ADR : Expected table H_0: The polypharmacy and ADR's are not associated.

H_1: The polypharmacy and ADR's are associated

Chi-squared value   = 10.176

p-value   = 0.85727688

Here $0.8572 > 0.05$. So we accept the hypothesis H_0. That is polypharmacy and ADR's have no association.

Association between Polypharmacy and Drug Interactions

Chi-square test of polypharmacy against drug interactions.

Table 9: Observed Table

DRUG INTERACTIONS	NO. OF DRUGS IN A PRESCRIPTION			Total
	5-10	**11-15**	**Greater Than 15**	
X	4	5	11	**20**
D	4	14	7	**25**
C	2	12	1	**15**
B	1	0	0	**1**
TOTAL	**11**	**31**	**19**	**61**

Association between polypharmacy and drug interactions : observed table

Table 10: Expected Table

DRUG INTERACTIONS	NO. OF DRUGS IN A PRESCRIPTION		
	5-10	11-15	Greater Than 15
X	3.606557377	10.16393443	6.229508197
D	4.508196721	12.70491803	7.786885246
C	2.704918033	7.62295082	4.672131148
B	0.180327869	0.508196721	0.31147541

Association between polypharmacy and drug interactions : expected table

H_0: The polypharmacy and drug interactions are not associated.

H_1: The polypharmacy and drug interactions are associated

Chi-squared value   = 16.71714462

p-value   = 0.010382

Here $0.01 < 0.05$. So we reject the hypothesis H_0. Here a significant association was found between polypharmacy and drug interactions.

Association between Polypharmacy and Beers criteria

Chi-square test of polypharmacy against Beers Criteria.

Observed Table

BEERS GROUP	NO. OF DRUGS IN A PRESCRIPTION			TOTAL
	5-10	11-15	Greater Than 15	
Group-I	6	27	31	64
Group-II	0	9	8	17
Group-III	0	5	5	10
Total	6	41	44	91

Association between polypharmacy and Beers criteria : observed table

Expected Table

BEERS GROUP	NO OF DRUGS IN A PRESCRIPTION		
	5-10	11-15	Greater Than 15
Group-I	4.21978022	28.8351648	30.94505495
Group-II	1.120879121	7.65934066	8.21978022
Group-III	0.659340659	4.50549451	4.835164835

Association between polypharmacy and Beers criteria : expected table H_0: The polypharmacy and Beers Criteria are not associated.

H_1: The polypharmacy and Beers Criteria are associated

Chi-squared value $= 2.948577813$ p-value $= 0.56648$

Here $0.56648 > 0.05$. So we accept the hypothesis H_0. No association was found between polypharmacy and Beers Criteria.

CONCLUSION

Polypharmacy and prescription of PIMs constitute a major problems in elderly patients. Polypharmacy was found in almost all individuals involved in our study. Drug interactions and ADR were the other major drug related problems found in our study.

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