International Journal of Pharmacy & Therapeutics

Research article

A CLINICAL STUDY ON POLYPHARMACY AND POTENTIAL DRUG – DRUG INTERACTIONS IN SCCL MAIN HOSPITAL, KOTHAGUDEM

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ABSTRACT

To evaluate and assess the drug- drug interactions. Methods: A prospective observational study was conducted in department of General medicine, Singareni Collieries Company Limited (SCCL) Main hospital, Kothagudem. A total of 225 subjects were included in the study aged between 18 to 85 yrs Results: Two hundred and ninety two drugs out of 2010 (14.52%) drugs with prescription were observed to have drug-drug interactions. Out of 225 prescriptions, drug-drug interactions were reported in 134 prescriptions which accounts to 59.5% of the population with 292 drug-drug interactions. Out of 134 prescriptions (59.5%), drug-drug interactions were reported in highest number in males (n=73) accounting to 54.4% compared to females (n=61) accounting to 45.52% prescriptions. Out of 134 prescriptions with 292 drug-drug interactions major drug drug interactions were found to be 139 which represents 47.602%, moderate drug drug interactions were found to be 140 which represents 47.945%, minor drug drug interactions were found to be 13 which represents 4.45%.Conclusion: From present study we can conclude that polypharmacy leads to more potential drug-drug interactions. To improve drug safety in this high-risk population, appropriate prescribing and close monitoring of the patients taking drugs with potential drug drug interactions are keys to optimal therapeutic result.

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INTRODUCTION

POLY is derived from the Greek word which means more than one or more than two and pharmacy refers to the Greek word for drug Pharmacon. Polypharmacy refers to the use of one or more medications than are medically necessaryor use ofmultiple medications by patient (Robert L. ,Joseph TH, 2015). Polypharmacy definition excludes topical and herbal medications as they are not included in the traditional methods of assessing prescription quality. Vitamins and minerals taken as much needed by individuals are also excluded in because of inconsistent inclusion of this medication in polypharmacy (Abdulraheem, 2013).

Problems of polypharmacy

Polypharmacy leads to following problems:
1. Drug drug interactions,
2. Decreased medication compliance,

3. Adverse drug reactions, mostly due to over the counter drugs,
4. Poor quality of life,
Unnecessary drug expense (Abdulraheem, 2013).

A medication might not work as well when used with the other medications that interfere with its effect. This is known as drug drug interaction.

The problems of polypharmacy in the older adults are exacerbated by:
• Comorbidities
• Use of more than one prescribing physician and also use of more than one pharmacy
• Utilization of OTC medications, such a dietary supplements and home remedies that are not reported to physician
• Age related, physiological changes
• Difficulty in reading and understanding medication instructions
• Improper dosing
• Over and under prescribing(KarthikJanardanSalwe, DharaniKalyansundaram 2016)

METHODS
Data source
Study site
This study was conducted in Singareni Collieries Company Limited, Main Hospital ,KothagudemBhadradi District, Telangana, India.

Study design
This study is a prospective observational study.

Study period
This study was conducted for a period of six months from December 2017 to May 2018.

Source of data
The data was collected prospectively from SCCL, Main Hospital, Kothagudem.

Ethical approval
Approval was obtained to conduct the hospital based from Institution Ethics Committee before commencement of the study (CRP/MED/I/002/ dates). Subject confidentiality was maintained during and after data collection.

Data collection
All the patients admitted in the department of general medicine of all the male and female wards of SCCL, Main Hospital, Kothagudem during the study period were considered for the study.

This department had maximum rates of inpatient admissions in the hospital; hence, due to logistical constraints, inpatient records of this departments were considered. Intravenous fluids were considered as drugs in the prescription account.

Study criteria
Inclusion Criteria:
Prescriptions were considered under polypharmacy if:
• 5 or more drugs were prescribed at a same time in one single prescription during hospital stay
• The said prescription was continued for minimum period of 3 days
• Subjects with Chronic diseases
• Inpatients
Exclusion Criteria:
• Incomplete patient case sheet are excluded
• Emergency and Intensive care unit patients
• Multidrug therapies involving antimalignancy chemotherapy were excluded from the study
• Death of patients before being discharged
• Below 18 yrs
• Outpatients
• Prescriptions with less than 5 drugs
• Pregnancy

Data analysis
Demographic information (age and sex) was obtained from the clinical records.
Factors studied were:
• Patient characteristics (gender, age)
• Prescription characteristics (number of drugs per prescription)

Drug interactions were identified using a computerized DDI database system (Lexicomp version:,Lexicomp, Inc., Hudson, OH,USA & Micromedex). This computer program describes all potential interactions and also states whether information is available on specific drugs within a class of drugs.

Classification of drug-drug interactions
Based on the profile of the medications prescribed, the drug-drug interactions were identified and classified according to Lexi-Comp database. As per the Lexi-Comp computer database, all the three categories of drug-drug interactions were considered as harmful.
According to severity and rating, drug-drug interactions were classified as:
• X: Avoid combination together
• D: Consider therapy modification
• C: Monitor given therapy

Statistical analysis
Quantitative data analysis was done by SPSS for windows version 17.0 (SPSS Inc., Chicago, IL). Mean with 95% confidence interval (CI) was used to

summarize age. Frequencies expressed as percentage were used to summarize sex, age. Descriptive analysis performed to assess frequency of categorical variables such as number of drugs prescribed, total number of drug-drug interactions per prescription and severity of drug-drug interactions. Chi-Square test was used to find out the association between elderly, number of drugs, and drug-drug interactions. Pearson correlation between numbers of drugs with drug-drug interactions present and its severity. P < 0.05 was considered statistically significant.

RESULTS

Table 1. Gender wise distribution of patients admitted under department of General Medicine

S.No.	Gender	Total No. of Subjects	Percentage (%)
1	Males	117	52
2	Females	108	48

Table 2. Age wise distribution of male subjects and female subjects in the study population

Age	Total no. of subjects (Males)	Percentage (%)	Total no of subjects (Females)	Percentage(%)
0-20	1	0.85	0	0
21-30	6	5.12	1	0.92
31-40	3	2.56	2	1.85
41-50	20	17.09	32	29.62
51-60	58	49.57	29	26.85
61-70	19	16.24	18	16.66
71-80	5	4.27	20	18.51
81-90	5	4.27	6	5.55
14.62 ± 33.56	-	13.5 ± 26.439		

Table 3. Total number of drugs prescribed

S.No.	Drugs	Frequency	Percentage
1.	5-9	140	62%
2.	10-14	81	36%
3.	≥15	4	1.77%
	Mean ± SD	75 ± 55.68	-

Table 4. Total number of drugs prescribed and total drug-drug interactions

No. of drugs prescribed	2010	100%
Drug – drug interactions	292	14.52%

Table 5. Severity of drug-drug interactions

Drug-drug interactions	Number	Percentage (%)
Total drug- drug interactions	292	100
Major	139	47.602
Moderate	140	47.945
Minor	13	4.45
Mean ± SD	97.33 ± 59.63	-

Table 6. Major drug-drug interactions

Major drug-drug interaction	Frequency	Percentage(%)	Mechanism
Ofloxacin+Ondansetron	19	13.66	Pharmacodynamic
Metronidazole+Ondansetron	13	9.352	Pharmacodynamic
Ofloxacin+Metronidazole	13	9.352	Pharmacodynamic
Clopidogrel+Amlodipine	11	7.91	Pharmacokinetics
Clopidogrel+Aspirin	9	6.47	Pharmacokinetics

Clopidogrel+Omeprazole	7	5.03	Pharmacokinetics
Ondansetron+Ultram	4	2.87	Pharmacokinetics
Ranitidine+Ultram	4	2.87	Pharmacokinetics
Domperidone+oflox	4	2.87	Pharmacodynamics
Domperidone+Ondansetron	4	2.87	Pharmacodynamics

Table 7. Moderate drug-drug interactions

Moderate drug-drug interactions	Frequency	Percentage(%)	Mechanism
Clopidogrel+Atorvastatin	40	28.57	Pharmacokinetic
Ofloxacin+Aluminum hydroxide	15	10.71	Pharmacokinetic
Metoprolol+Metformin	12	8.57	Pharmacodynamic
Alprazolam+Theophylline	7	5	Pharmacokinetic
Glimepiride+Metoprolol	4	2.85	Pharmacodynamic
Aspirin+Aluminium hydroxide	3	2.14	Pharmacokinetic
Ramipril+Metformin	3	2.14	Pharmacodynamic
Ofloxacin+Metformin	3	2.14	Pharmacodynamic
Metoprolol+Diclofenac	3	2.14	Pharmacodynamic
Hydrocortison+Furosemide	3	2.14	Pharmacodynamic

Table 8. Minor drug- drug interactions

Minor drug-drug interactions	Frequency	Percentage (%)	Mechanism
Ofloxacin+Theophylline	5	38.46	Pharmacokinetic
Furosemide+Theophylline	4	30.76	Pharmacokinetic
Glimepiride+Ranitidine	2	15.38	Pharmacodynamic
Aspirin+Rantidine	1	7.69	Pharmacokinetic
Badofen+Amitrone	1	7.69	Pharmacokinetic
Mean ± SD	2.6 ± 1.62	-	

Table 9. Comparison of drug -drug interactions with number of drugs used

Total number of drugs per prescription	Total number of drug-drug interactions per prescription			
	1-2	3-4	5-7	Total
5-7 drugs	19(67.85%)	9(32.14%)	0(0)	28
8-10 drugs	39(69.42%)	16(28.07%)	2(3.50%)	57
More than 10 drugs	31(63.26%)	10(20.40%)	8(16.32%)	49
Total	89(66.41%)	35(26.11%)	10(7.46%)	134
Mean ± SD	44.5 ± 26.65	17.5 ± 10.45	10 ± 4.69	-

Table 10. Number of drug-drug interactions per prescription with polypharmacy

S.No.	Drug-drug interactions	Number of prescriptions	Percentage(%)
1.	0	91	40.44
2.	1	54	24
3.	2	35	15.55
4.	3	24	10.66
5.	4	11	4.88
6.	5	7	3.11
7.	6	3	1.33
	Mean ± SD	32.14 ± 29.14	-

Fig 1. Gender wise distribution of patients admitted under department of General Medicine

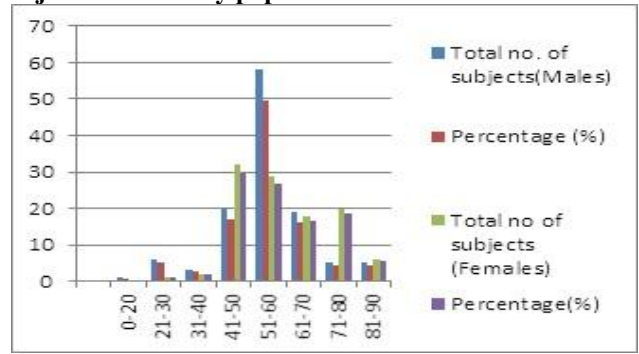**Fig 2. Age wise distribution of male subjects and female subjects in the study population**

Fig 3. Total number of drugs prescribed.
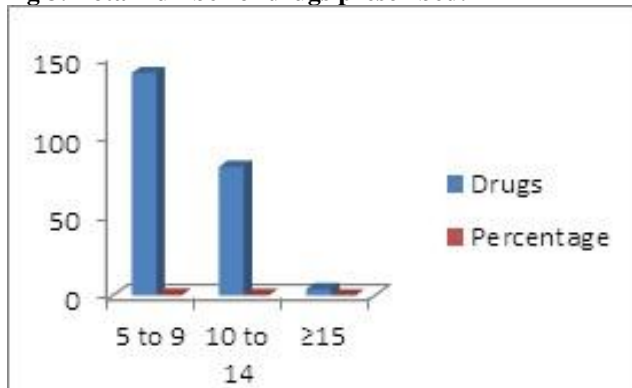

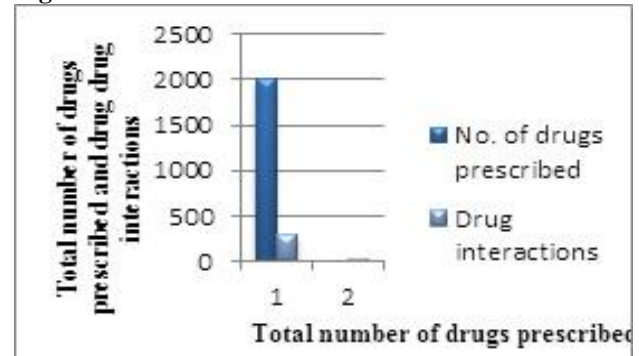**Fig 4. Total number of drugs prescribed and total drug-drug interactions assessed.**

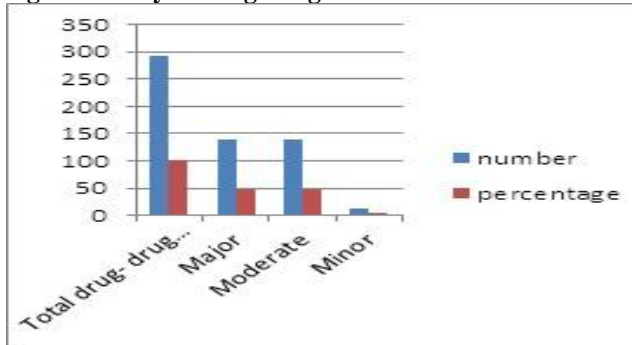**Fig 5. Severity of drug-drug interactions.**
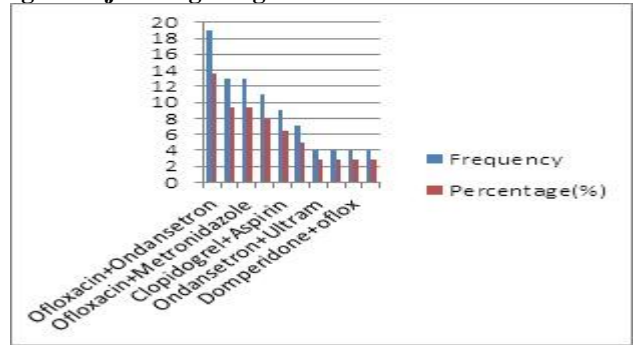

Fig 6. Major drug-drug interactions.
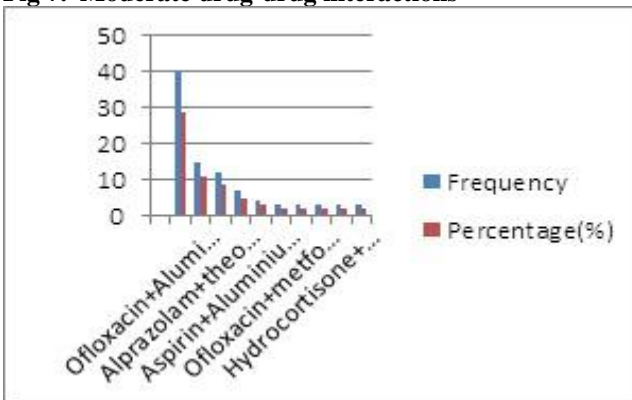

Fig 7. Moderate drug-drug interactions

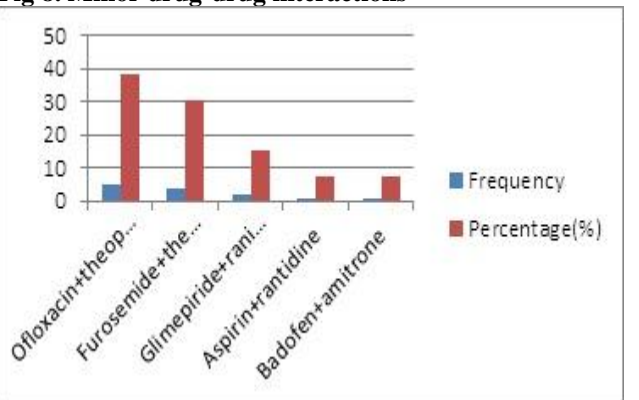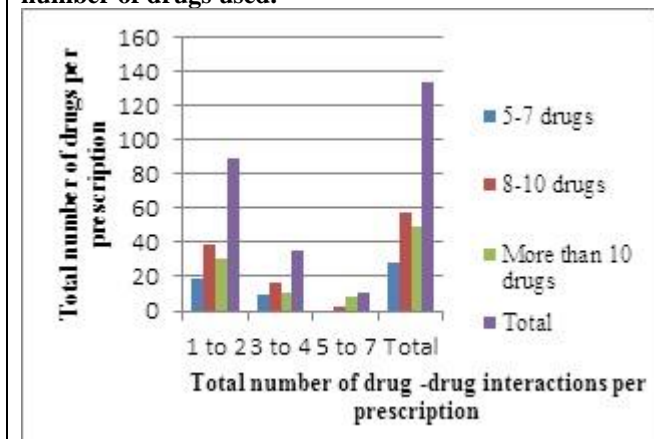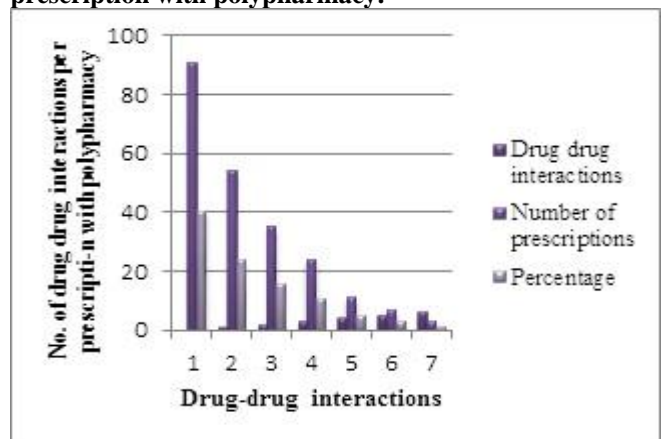
Fig 8. Minor drug-drug interactions

Fig 9. Comparison of drug- drug interactions with number of drugs used.	Fig 10. Number of drug-drug interactions per prescription with polypharmacy.

DISCUSSION

Study was done in Singareni Colleries Company Limited, Main Hospital which includes assessment of drug drug interactions through online checks. A total of 225 cases were collected prospectively. Table 1 and Figure 1shows that out of 225 subjects 117 are males with 52% and 108 are females with 48% of total study population.

Our study results are also similar to study done by (Karthik J et al., 2016) in which risk of polypharmacy in study population 100 is 62% in males and 38% in females.

Table 2 and Figure 2 shows that age group between 51 – 60 years which represents 49.57 % are more prone to polypharmacy and the mean and SD of males was 14.62 ± 33.56 and age group between 41-50 years which represents about 29.62% are more prone to polypharmacy and mean and SD of females was 13.5 ± 26.439 among females.

Table 3 and Figure 3shows that the total number of drugs prescribed, out of 225 prescriptions 140 prescriptions are prescribed with 5-9 drugs which represents 62%, followed by 81 prescriptions with 10-14 drugs which represents 36% followed by 4 prescriptions with more than 15 drugs which represents 1.77%, and mean and SD was 75 ± 55.68 and same study was seen with 20 prescriptions with less than 4 drugs which represents 20%, followed by 53 prescriptions with 5-9 drugs which represents 53%, 25 prescriptions with 10-14 drugs which represents 25%, and 2 prescriptions with more than 15 drugs which represents 2% and mean and SD was 7.61± 3.38 (Yogesh B, 2016).

Table 4 and Figure 4 shows that 292 drug-drug interactions are found out of 2010 drugs , similar results are seen with 401 drug-drug interactions out of 761 drugs prescribed (Karthik JS *et al.*, 2016).

Table 5 and Figure 5shows that out 292 drug-drug interactions major drug–drug interactions are found to be 139 which represents about 47.602%, moderate drug-drug interactions are found to be 47.945% and minor drug-drug interactions are found to be 4.45%.

Table 6 and Figure 6 shows major drug-drug interactions, higher drug-drug interactions are between oflox and zofer followed by metrogyl and zofer, the mean and SD was found to be 3.30 ± 3.9

Table 7 and Figure 7 shows moderate drug-drug interactions, higher drug-drug interactions are found between clopilelt and atoravas, oflox and digene.

Table 8 and Figure 8shows minor drug-drug interactions, higher drug-drug interactions are found between oflox and theophylline and mean and SD was found to be 2.6 ± 1.62.

Table 9 and Figure 9shows that out of 134 prescriptions with drug-drug interactions had 57 prescriptions with 7-10 drugs followed by 49 prescriptions with more than 10 drugs followed by 28 prescriptions with 5-7 drugs. Out of 134 prescriptions with drug-drug interactions had 89 prescriptions with 1-2 drug-drug interactions with 5-7 drugs in the prescription followed by 35 prescriptions with 3-4 drug-drug interactions with 7-10 drugs in the prescription followed by 10 prescriptions with 5-7 drug-drug interactions with more than 10 drugs in the prescription .

Table 10 and Figure 10 shows that 91 prescriptions are with 0 drug-drug interactions followed by 54 prescriptions with 1 drug-drug interaction, followed by 35 prescriptions with 2 drug-drug interactions, 24 prescriptions with 3 drug-drug interactions, 11 prescriptions with 4 drug-drug interactions, 7 prescriptions with 5 drug-drug interactions and 3 prescriptions with 6 drug-drug interactions.

CONCLUSION

- Although Polypharmacy is seen mostly in elderly population, as the age advances the patient gets exposed to more number of drugs. It can be said that polypharmacy is reported in 56% of the population in patients under 18 -85 years age group.
- Males were more subjected to drug-drug interactions compared to females.
- Out of 225 prescriptions, drug-drug interactions were reported in 134 prescriptions which accounts to 59.5% of the population with 292 drug-drug interactions.
- Out of 134 prescriptions (59.5%), drug-drug interactions were reported in highest number in males (n=73) accounting to 54.4% compared to females (n=61) accounting to 45.52% prescriptions.
- Out of 134 prescriptions with 292 drug drug interactions major drug-drug interactions was found to be 139 which represents 47.602%, moderate drug-drug interactions was found to be 140 which represents 47.945%, minor drug-drug interactions was found to be 13 which represents 4.45%.
- From the present study we can conclude that polypharmacy leads to more potential drug-drug interactions. To improve drug safety in this high-risk population, appropriate prescribing is very important.

Limitations
- ❖This study was based on the prescribing patterns of drugs more than 5 drawn from case sheets.
- ❖The study didn't take into consideration of drugs which are less than five from the case sheets.
- ❖Study period was short.
- ❖ Study population was very small and doesn't cover the pediatrics and geriatrics.
- ❖ Hospital based study which was done only at a single centre.
- ❖ No relevant patient counseling was advised to the patients and no additional advice given about their drug-drug interactions.
- ❖ There is lesser scope for intervention as this is purely a observational study.

ACKNOWLEDGEMENT
Nil

CONFLICT OF INTEREST
No interest

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