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Research Article

PREVALENCE OF POLYPHARMACY AND DRUG TO DRUG INTERACTIONS IN A TERTIARY CARE TEACHING HOSPITAL

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ABSTRACT
Drugs are the most common medical interventions for betterment of the patients but they are fatal too. Inappropriate prescription and using of multiple medications can lead to morbidity and mortality. Polypharmacy is an important factor for occurrence of drug related problems like adverse drug reactions and drug-drug interactions, especially in elderly and ICU treated patients. Concomitant use of multiple medications associated with increased risk of hospitalization, increase in economic burden to patient and can potentially leadsto therapeutic failure. The study was aimed to assess the prevalence of polypharmacy and drug-drug interactions. The study was carried out in a 500 bedded tertiary care teaching hospital for a period of four months. About 940 prescriptions were screened for the study, in this male were 50.95 % (n = 479) and female 49.04 % (n = 461). About 51.06 % (n = 480) patients had major poly pharmacy followed by 22.97 % (n = 216) patients with minor polypharmacy and 25.95 % (n = 244) patients with non-poly pharmacy. In present study, majority of thepatients had respiratory followed by cardiovascular diseases. There were 512 (54.46 %) prescriptions which had drug-drug interactions and 420 (45.53 %) prescriptions had no drug-drug interaction. Out of 512 prescriptions there were 734 drug-drug interactions among them 16.75 % (n = 123) were major, 41.82 % (n = 307) were moderate and 41.41 % (n = 304) were minor drug-drug interactions. Poly pharmacy has a very high prevalence among hospitalized patients especially in ICU, resulting in more drug interactions. Physicians should prescribe a rationale combination and pharmacist should provide the pharmaceutical health care to improve the quality of patients.
Keywords: Prevalence, Poly pharmacy, Drug-drug interactions

INTRODUCTION

The word 'poly' is a Greek word and means many or much[1]. Appropriate drug utilization is beneficial in global reduction of morbidity and mortality with its consequent medical, social and economic benefits[2]. Drugs are the most common medical interventions for betterment of patients but it had recognized long ago that they are fatal too. The saying rightly goes about the drugs that ''Drugs are Double Edged Weapons''[2,3]. Inappropriate prescription of drugs is the major problem of health care system especially in developing countries where health budgets are small and 30 - 40 % of the total health budget spent on drugs[1]. Poly pharmacy is defined as concurrent use of multiple medications >2 by a patient. Poly pharmacy is a common occurrence in adult patients and mainly in elderly due to a variety of reasons like increasing comorbid diseases, availability of non-prescription drugs, prescription of high cost medications, hoarding of old medications, inadequate patient knowledge about medications and medical conditions, taking at least one drug for every diagnosis and tendency towards self-treatment/self-medication[4]. The use of multiple medications increases the possibility of drug interactions and adverse reactions to drugs, poorer compliance, increased risk of hospitalization and medical errors caused by drugs[5-7]. Drug interaction represents a major problem in day-to-day practice[8]. Drug interaction is defined as modification of the effect of a drug when it is administered with another drug and this effect may increase or decrease the action of either substance or drug[9]. Whenever more than 2 drugs are taken concurrently, there is a chance that there will be an interaction between the drugs and which may harm the patient leading to therapeutic failure[10]. The likelihood of the drug interactions increases as the number of drugs which are taken by a patient increases. Incidence of DIs is estimated to vary from 6 % - 30 % in hospital admission and they continue to pose a significant risk to the patient's health outcomes and a considerable economic burden on the health care system[11]. It is reported in several studies that elder patients (61-80 years) had more prevalence of polypharmacy and drug-drug interactions compared to the other age groups. The study aimed to assess polypharmacy and drug interactions in the in-patients of a medicine department in a tertiary care teaching hospital

MATERIALS AND METHODS

This is a prospective observational hospital based study carried out in the department of Medicine of in a 500 bedded tertiary care teaching hospital from Februaryto May 2014. This study was including hospital in-patients treated in Medicine department for various diseases.

Inclusion Criteria

Age group between 21-80 years of both genders and patients who admitted to Medicine (MICU-Medical Intensive Care Unit, MMW-Male Medical ward, FMW-Female Medical Ward and CW-Corporate Ward) department

Exclusion Criteria

Patients who are treated in the outpatient departments, those who stayed < 24 hours in the hospital and who were shifted to medicine department from other departments were excluded. The data was collected from the patient's case records, which included the medication history, for number of drugs prescribed and for the possible drug interactions. In this study about 940 in-patients in the department of medicine were enrolled. Details of demographics, clinical manifestations, patient history and treatment regimen were

collected. The treatment regimen was analyzed for DDIs by using the Stockley's; online data base-Micro medex 2.0; [M] Medscape drug interaction checker and Drugs.com. A severity rating scale with categories of Major interaction if the risk of the adverse outcome appeared the potential drug interactions and can cause permanent damage or life risk, Moderate interaction if the administration of the drug was avoided unless it was determined that the benefit of the administration outweighed the risk and Minor interaction if the administration of the drug small or no clinical effect, with no treatment required.

RESULTS

During the study period, total of 1984 patients got admitted in department of medicine, 1044 patients did not meet the criteria as 653 patients stayed for less than 24 hours and 134 were excluded because they were either critically ill or mechanically ventilated, 119 were admitted for poisoning and another 138 patients were excluded as were transferred in from other departments. In present study, 940 prescriptions were enrolled and in this 479 (50.95 %) patients were male and 461 (49.04 %) patients were female. There were around 5602 drugs prescribed and average drugs per prescription was 5.95. Among 940 patients, it was observed that 51.06 % (n = 480) patients with major poly pharmacy and 22.97 % (n = 216) patients with minor polypharmacy and 25.95 % (n = 244) of patients with non-polypharmacy. Coming to the department wise analysis, out of 480 patients 52.91 % (n = 254) of patients were received major polypharmacy in MICU followed by 22.05 % (n = 108) in FMW, 16.25 % (n = 78) in MMW and 8.33 % (n = 40) in CW, further 43.05 % (n = 93) of patients with minor polypharmacy were MICU followed by, 25.46 % (n = 55) in CW, 17.13 % (n = 37) in FMW and 14.35 % (n = 31) in MMW respectively. The categorization of polypharmacy based on department and hospital stay has presented in (Table 1).

Therapeutic Category v/s Poly pharmacy

Patients admitted to the medicine department with different diseases which include respiratory 164 (17.44 %), cardiovascular 127 (13.51 %), gastrointestinal 105 (11.17 %), endocrine 102 (10.85 %), hematological 99 (10.53 %), hepatic 78 (8.29 %), infectious 72 (7.66 %) and miscellaneous diseases 193 (20.53 %). Except theophylline all other commonly prescribed 10 drugs in our study are listed inthe national list of essential medicines of India 2011. Therapeutic category of poly pharmacy and most commonly prescribed drugs to patients are shown in (Table 2/Table 3) respectively. Total of 940 prescriptions were analyzed, in this 512 (54.46 %) prescriptions were found to have the DDIs and 428 (45.53 %) prescriptions did not have DDIs. The relationship between the prescriptions and DDI based on poly pharmacy showed in (Figure 1).

Poly pharmacy v/s DDI Category

On comparing the DDI based on the gender, it was found that females had 53.27 % (n = 391) and males had 46.73 % (n = 343) respectively. The patients in the age group of 21-40 years (n = 317) constituted the highest number of patients i.e., 33.72 % of the total patients followed by 33.40 % in the age group of 41-60 years and 32.87 % in age group between 61-80 years. Among the 734 drug-drug interactions observed in 940 patients, 525 (55.85 %) DDI were observed in patients with major poly pharmacy (n = 480) and 204 (21.70 %) DDI observed in patients with minor poly pharmacy (n = 216) and 5 (0.53) DDI were seen in non-poly pharmacy (n = 34) patients respectively. The DDI was categorized into 3 types based on significance of the reaction which includes major, moderate and minor. The prevalence of drug-drug interaction were seen more in the elderly [n = 271 (36.92 %) out of 734] followed by 21-40 years of age group [234 (31.88 %) out of 2734] and 41-60 years of age group [229 (31.19 %) out of 734]. Correlation between the Poly pharmacy and DDI as showed in (Table 4).

Frequency of the DDI

The top 5 commonly observed major, moderate and minor drug-drug interactions and their frequencies are shown in (Table 5).

Table 1: Categorization of Poly pharmacy Based on Department and Hospital Staying

		Polypharmacy			Frequency	Percentage (%)
		Major (≥ 6 drugs)	Minor (3-5 drugs)	None (≤ 2 drugs)		
Department	MICU	**254**	93	21	368	39.14
	FMW	108	37	110	255	27.12
	MMW	78	31	76	185	19.68
	CW	40	55	37	132	14.04
Total		480	216	244	940	100
Hospital stay	≤ 5days	213	87	235	535	56.91
	≥ 6days	**267**	129	09	405	43.08

Table 2: Prevalence of poly pharmacy vs. Therapeutic category

Therapeutic Category	Major	Percentage (%)	Minor	Percentage (%)	None	Percentage (%)
Respiratory	99	20.62	37	17.13	28	11.47
Cardiovascular	69	14.37	35	16.20	23	9.42
Gastrointestinal	54	11.25	33	15.27	18	7.37
Endocrine	51	6.07	25	11.57	26	10.65
Hematological	54	11.25	23	10.64	22	9.01
Hepatic	45	9.37	18	8.33	15	6.14
Infectious	36	7.5	14	6.48	22	9.01
Others	72	15.0	31	14.35	90	36.88
Total	480	100	216	100	244	100

Table 3: Most Commonly Prescribed Drugs

Name of the drug (n = 3602)	Frequency	Percentage (%)
Ceftriaxone	657	11.72
Pantoprazole	558	9.96
Paracetamol	336	5.99
Salbutamol	270	4.82
Metronidazole	237	4.23
Ondansetron	221	3.94
Metformin	195	3.48
Furosemide	180	3.21
Theophylline	177	3.16
Folic acid	126	2.24

Table 4: Poly pharmacy V/S DDI Based on Age Group

Age group	Polypharmacy	Frequency	DDI	DDI Category		
				Major	Moderate	Minor
21-40 years	Major	145	163	30	**73**	60
	Minor	80	69	09	29	31
	Non	92	02	00	00	02
41-60 years	Major	160	154	28	61	65
	Minor	73	74	14	34	26
	Non	81	01	00	00	01
61-80 years	Major	**175**	**208**	**34**	**86**	**88**
	Minor	63	61	08	24	29
	Non	71	02	00	00	02
Total		940	734	123	**307**	304

Table 5: Distribution of DDIS Based on the Frequency

DDI Category	Interaction	Frequency	Percentage (%)
Major	Ofloxacin + Ondansetron	39	**31.70**
	Metformin + Ofloxacin	19	15.44
	Rifampicin + Dexamethasone	11	8.94
	Diclofenac + Methotrexate	10	8.13
	Carbamazepine + Theophylline	8	6.5
	Others	36	29.26
Total		123	100
Moderate	Azithromycin + Ondansetron	43	**14.0**
	Metronidazole + Theophylline	37	12.05
	Hydrocortisone + Theophylline	26	8.46
	Levofloxacin + Diclofenac	25	8.14
	Phenytoin + Dexamethasone	21	6.84
	Others	155	50.48
Total		307	100
Minor	Metronidazole + Diclofenac	51	**16.77**
	Ceftriaxone + Furosemide	47	15.46
	Metronidazole + Rabeprazole	39	12.82
	Phynytoin + doxycycline	26	8.55
	Furosemide + Folic acid	19	6.25
	Others	122	40.13
Total		304	100

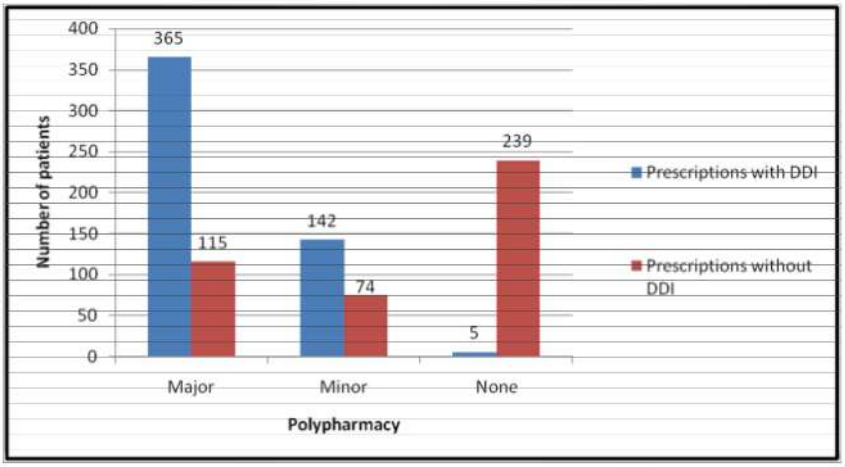

Figure 1: Division of poly pharmacy v/s DDI prescriptions

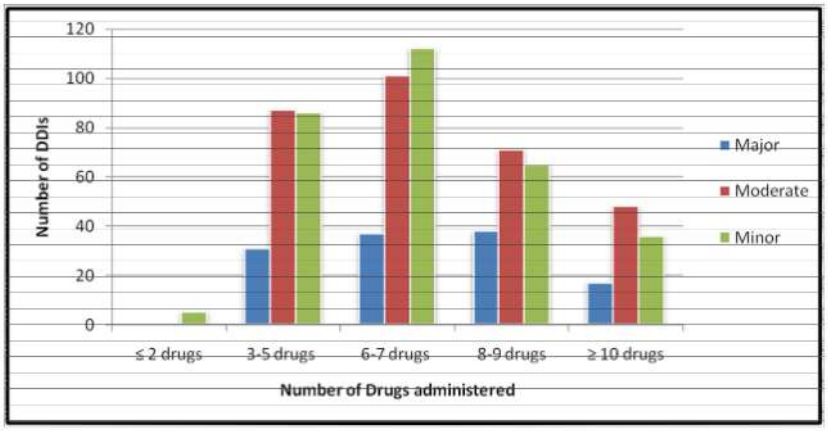

Figure 2: Number of drugs administered and % of DDIs in patients

DISCUSSION

With advancement in medical care and increases access to health facilities, more and more people are living in to their late 80's leading to exponential increase in incidence and prevalence of chronic, degenerative diseases with consequent increase in multiple drug use which predisposes for drug interactions and adverse drug reactions. Many studies have been done to assess the prevalence of the polypharmacy in developed and developing countries which reflects the data about association of polypharmacy with Age, gender, and therapeutic and comorbid conditions. In present scenario the drug related problems are commonly seen with patients receiving multiple medications. The study done by Hostadius *et al*[12] in Sweden in 2008 revealed thatthe average prescribed number of drugs per individual was 3.4, but the number of drugs increased to 5.0 in the population under age group 70 to 79 years and 6.6 in aged above 90 year. However in our study the average numbers of drugs per individual patient were 5.95 and patients between 61-80 years had received an average 6.26 drugs per prescription.The study done by Mahesh Kumar *et al*[1] showed that, out of 502 prescriptions 61 (11.73 %) had minor poly pharmacy and 457 (88.26 %) had major poly pharmacy, where on our study, out of 940 prescriptions 480 (51.06 %) major poly pharmacy, 216 (22.77 %) minor poly pharmacy were noted and 244 (25.95 %) prescriptions had no poly pharmacy. One study by Jyrkka *et al*[13] in 1998 found that 54 % of elderly patients used more than 5 drugs and 19 % used > 10 drugs. In 2003 these numbers were 67 % and 28 %. In the present study 37.29 % elder patients received ≥ 6 drugs and these results suggest that physicians at our hospital were relatively more cautious while prescribing multiple drugs. The relationship between poly pharmacy and hospitalization seems quite clear when considering that poly pharmacy increases non-adherence as well as drug-drug interactions[14]. Drug-drug interactions increases with the number of medications taken and resulting in reduced efficacy of medication may be overlooked more often than those resulting in synergistic effect, because other reasons may be used to explain the lack of efficacy[15]. About 54.46 % prescriptions had drug-drug interactions in our study; this result was similar to that of Shahabudin *et al*[11] as 66 % and with males (61 %) preponderance of drug-drug interactions. In our study females had 53.27 % and males had 46.73 % drug interaction. It indicates that female gender was more prone for drug interactions because of co-prescription of multiple medications for various physical conditions and presence of chronic health conditions. When coming to the Frequency of interactions the top 5 common drug interactions were quite different with the study by Shahabudin *et al*[11], the major interactions found in his study are with Ciprofloxacin + Insulin and Digoxin + Spiranolactone but in our study we found that the major interactions were between Ofloxacin + Ondansetron and Metformin + Ofloxacin but it was noticed in both studies that, the major interactions were associated with fluroquinolones. In our hospital settings the fluroquinolones were most commonly used antibiotics after the β-Lactams.

CONCLUSION

Polypharmacy has a very high prevalence among hospitalized patients in our country and represents an urgent public health issue that should be addressed. This study shows that major poly pharmacy and major and moderate drug-drug interactions are more prevalent in females and in the age group of 61-80 years. Health care professionals should be aware of the risks and should cut down unnecessary medications to prevent the poly pharmacy from occurring. Physician should prescribe the evidence based medicine (EBM) with rational combinations and pharmacist should provide pharmaceutical care, which can and prevent the drug related problems like drug interactions and improves the patient quality of life.

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