A study of drug-drug interactions in prescriptions received at selected community pharmacies in Tamil Nadu

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ABSTRACT

The main objective of the study is to assess the significance and severity of Drug- Drug Interactions (DDI) in prescriptions collected prospectively at selected community pharmacies in Erode and Komarapalayam, Tamil Nadu for a period of six months. All prescriptions with two or more drugs were included in the study and reviewed for drug interactions using Drug interactions software. A total of 2466 prescriptions were reviewed and assessed for the DDIs. A total of 1053 DDIs were observed in 696 (28.22%) prescriptions with frequency rate of 42.7%. Gender difference did not shown any significant influence on precipitation of DDIs. Prescriptions with one or more DDIs used a significantly large number of drugs with an average of 5.42 ± 1.26 (ranged from 2-10 drugs). Prescriptions with 7 or more drugs shown maximum incidence rate of DDIs (96%). Among the total number of prescriptions with DDIs, 64% prescriptions contain more than 4 drugs suggesting a direct relationship between the number of drugs prescribed and the incidence of DDIs (r=0.41). About 44.26% of DDIs found were due to pharmacokinetic, unknown. The main drug classes commonly involved in the precipitation of DDIs were Anti-TB (14.6%), analgesics & antipyretics (17.04%), bronchodilators (15.56%), and diuretics (12.46%). Commonly interacting drug classes involved in DDIs were anti-TB (20.92%), antiplatelets (15.63%), H2 blockers and ulcer healing drugs (16.46%), and bronchodilators (14.64%). The results of the present study show a high frequency rate of the DDIs in prescriptions received at community pharmacies. The occurrence rate is directly proportional to more number of drugs in the prescription.

Keywords: Drug – drug interactions; Prescriptions; Community Pharmacies; Pharmacists.

INTRODUCTION

Many studies have confirmed polypharmacy as one of the major risk factors in precipitation of DDIs (Weideman RA et al., 1998) Patient populations at high risk includes the elderly; critical care patients and patients with co-morbidities etc (Bergendal L et al., 1995). The elderly populations are at increased risk because of decreased functioning of the systems, more number of medications due to co-morbidities, and complicated drug regimens (Stanton LA et al., 1994) Potential drug-drug interactions (DDIs) are considered as one of the most critical aspects of adverse drug reactions (ADRs). Often some life threatening adverse drug reactions precipitate due to potential drug-drug interactions. Severity and Significance are the two important markers in assessing life-threatening potential of the interaction. Community pharmacies are considered as first port of call for patients to fill their prescriptions. The community pharmacist's role becomes very important

in assessing and finding the suitable strategies to minimize and prevent morbidity and mortality due to drug interactions (Lien Ll et al., 1994). The present study is designed to analyze and understand the severity and significance levels of DDIs precipitated in prescriptions received at community pharmacies.

METHODOLOGY

The present study is conducted for six months in two selected community pharmacies in Erode and Komarapalayam Tamil Nadu between Feb – July 2010. High prescription inflow and pharmacist consent are the criteria used in the selection of community pharmacy. A prospective review of prescriptions for potential drug-drug interactions was conducted for a period of six months. Each prescription was reviewed and the patient's demographic data such as age, gender, and number of drugs prescribed were entered into a suitably designed data collection form. All the prescriptions containing two or more drugs were included in the study, and reviewed for drug interactions. DDIs were identified by using Drug Interaction soft ware and standard textbooks.

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Statistical analysis

Microsoft Excel programme was used to calculate correlation (r) between the number of drugs and number of DDIs.

Criteria for frequency

Formula used to calculate frequency

$$\text{Frequency of DDIs} = \frac{\text{The total number of potential drug} - \text{drug interactions}}{\text{Total number of prescriptions}} \times 100$$

RESULTS

A total of 2466 prescriptions were reviewed from two selected community pharmacies during the six months

Interactions with Pharmacokinetic mechanism were 44.26% (n = 466) and Pharmacodynamic were 18.4% (n = 193). The remaining interactions belong to undetermined / unknown mechanisms. Majority (47.7%) of DDIs were found severity. However, 174 (16.52%) DDIs were of major severity.

A maximum of 10 drugs were prescribed in one (0.14%) prescription, while 46 (6.64%), 20 (3.00%), 11(1.56%), and 4 (0.6%) prescriptions had 6, 7, 8, and 9 drugs respectively. Salbutamol and theophylline (14.7%) were the most common drugs involved in precipitation of DDIs followed by isoniazid and rifampicin (13.58%), rifampicin and pyrazinamide (10.54%) and diclofenac and rifampicin (9.11%). All other DDIs were less than

Table 1: Relationship between patient characteristics and DDIs

Characteristics	Number (%)		
	Total (n=2466)	Patients With DDIs (n=696)	Patients Without DDIs (n=1770)
Age (Mean ± SD)	35.20±16.12	42.52 ± 15.7	34.58 ± 14.65
Males	1456	436(62.64)	1034(58.41)
Females	1010	260(37.36)	736(41.59)
No. of drugs			
2-4	1660	285(17.17)	1375(82.83)
5-7	788	355(45.00)	433(55.00)
>7	18	16(88.80)	2(11.2)

Table 2: Drugs most commonly involved in DDIs

Main Drug	Interacting Drug	No. of PDDIs (%) (n=1053)
Salbutamol	Theophylline	155(14.7)
Inh	Rifampicin	143(13.58)
Rifampicin	Pyrazinamide	111(10.54)
Diclofenac	Ranitidine	96(9.11)
Atenolol	Aspirin	84(7.97)
Ibuprofen	Ranitidine	82(7.77)
Pcm	Rifampicin	58(5.50)
Pcm	Inh	50(4.7)
Ramipril	Aspirin	50(4.7)
Metoprolol	Aspirin	31(1.66)
Ceftriaxone	Amikacin	31(1.66)
Digoxin	Furosemide	17(1.62)
Glibenclamide	Aspirin	15(1.47)

study period. The mean age of the patients is 35 ± 16 ranging between 12 years to 70 years. Out of 2466 prescriptions reviewed 696 (28.22%) prescriptions found to have Drug-Drug Interactions (DDIs). Among these prescriptions, 436 (62.64%) prescriptions belong to male patients and 260 (37.86%) belong to female patients. A total of 1053 (42.7%) DDIs were found in 696 prescriptions. The number of drugs present in a prescription ranged from 2 to 10 with a mean of 4.64 (SD ± 1.21). The incidence of DDIs was found to be very high (95.4%) among prescriptions having seven or more drugs. The relationship between patient characteristics and DDIs are given in Table No 1.

7%. The details of the drugs most commonly involved in DDIs are summarized in Table No. 2.

The commonly involved index drug classes in the DDIs were anti-TB (16.6%), analgesics & antipyretics (16.6%), bronchodilators (15.6%), and diuretics (14.06%). Commonly interacting drug classes involved in DDIs were anti-TB (24.36%), antiplatelets (14.47%), H2 blockers and ulcer healing drugs (16.36%), and bronchodilators (13.48%). All the other drug classes were having frequency rate of less than 10%. Table No.3

Table 3: Most commonly involved index and interacting drug classes in DDIs

Main drug	Interacting drug
Anti – TB (16.6%)	Anti – TB (24.36%)
Analgesics & Antipyretics (16.6%)	Antiplatelets (12.11%)
Bronchodilators (15.6%)	H2 blockers & ulcer healing drugs (14.36%)
Anti Hypertensives (14.06%)	Bronchodilators (13.44%)
Antidiabetics (7.66%)	Antibiotics (5.34%)
Diuretics (7.62%)	Anticonvulsants (6.00%)
Anticonvulsants (5.01%) Anti	Hypertensives (4.62%)
Cardiac Glycosides (3.02%)	Analgesics & Antipyretics (4.20%)
Antibiotics (2.4%)	Diuretics (4.00%)

DISCUSSION

Screening of the prescriptions received in community pharmacies for potential drug-drug interactions ensures the safe use of prescribed medicines. Community pharmacists, by virtue of their knowledge are in the right position to review, assess, and provide suitable strategies to the patients to manage the identified DDIs. In a recent published study, the frequency of DDIs reported was ranged from 29.5% to 60%. (Tamal I et al., 1989). In our study, 696 (25.56%) prescriptions had at least one DDI out of 2466 prescriptions received.

Our study shows that elderly individuals received more drugs (4 - 8 drugs) compared to younger individuals. As age advances, the functioning of internal organs in the elderly becomes weak. In this challenged situation, if patients are prescribed with more number of drugs, they are more prone to have adverse effects due to drug interactions. These findings are similar to the study conducted by Leif Bergendal et al., 1995 which states that the elderly patients are at increased risk for DDIs and gender difference does not have impact. The same was also observed in our study.

Prescriptions having 2 - 4 drugs shown 17% incidences in developing DDIs, where as prescriptions having 6 or more drugs shown maximum incidence rate of DDIs (95%). These findings are similar to another study conducted by Weiderman R.A. et al., Among the interactions observed 15.04% DDIs were severe in nature. These interactions require suitable strategies to alter the prescriptions, such as consulting the prescribers for a suitable alternative or, if the interaction can be avoidable by spacing technique, the same may be discussed with patient to minimize the severity Stanton LA et al., 1994

In the present study, the maximum number of DDIs observed was with salbutamol and theophylline (14.7%), followed by isoniazid and rifampicin (13.58%) and rifampicin and pyrazinamide (10.54%). In many developed countries community pharmacists use computers to record the patient prescription profiles and simultaneously review the prescriptions for possible drug – drug interactions. Many drug interactions soft ware's such as Drug Interaction Facts on Disc, Mobile Micromedix, Mosby's Drug Consult Software, the Mobile PDR, Lexi-Interact etc are available for their use.

CONCLUSION

In India, off late many community pharmacists are using computers for business operations. Along with business software, if drug interaction software is also loaded in their system, it becomes easy for them to review and report the life threatening drug – drug interactions to the doctors. It is very essential to have adequate knowledge regarding drug interactions, types of drug interactions, factors influencing the drug interaction incidences, severity levels and strategies to manage the interactions. Studies have corroborated the positive influence of continuing education on pharmacists' awareness and attitude towards identifying the drug – drug interactions, and minimizing iatrogenic hospital admissions.

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