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Potential Drug Interactions in Medical Prescriptions of Hospitalised Pediatric Patients

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ABSTRACT

Paediatric patients require special consideration from health professionals in terms of drug interactions, as they react to drugs differently from adults. To provide better treatment by screening potential drug interactions, to Minimise the unnecessary use of non prescription medications by providing counselling. A prospective observational study was conducted in paediatric patients of a government general hospital. The study included patients between 0 and 12 years old, containing three or more drugs excluding topical drugs in their prescriptions. The analysis of interactions in prescribed drugs was done using Micromedex program. Based on the interactions found an analysis was performed on their relevance to the patients current situation, and after that, the medical teams were informed using the criterion service form of the pharmaceutical unit of the hospital. A total of 150 patients were included and 450 drugs were analyzed in the study. A mean value of 3 drugs per patient was observed during the study. In total, 216 drug interactions were found, which corresponds to 2.08 interactions per prescription. Among them, Ampicillin and Gentamicin was found in 65 prescriptions. Mild drug interactions are more but these are potential interactions. The presence of drug interactions is major risk in hospitalized patients. This study highlights the need for screening prescriptions for potential drug-drug interactions by utilization of computer programs, the pharmacist presence in the multidisciplinary team to minimize the occurrence of possible adverse drug reactions.

Keywords: Potential Drug Interactions, Prospective Observational study, Micromedex

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INTRODUCTION

The possibility of a drug–drug interaction should be assumed anytime a new or unexpected effect occurs that complicates the clinical supervision of a patient in the setting where the patient is receiving more than one drug[1, 2]. Pediatric patients require special consideration from health professionals in terms of drug interactions, as they react to drugs differently from adults. The body parts that are responsible for the excretion and elimination processes are not fully developed until 1 year of age, resulting in extended half-life of metabolized drugs and reduced excretion, which may result in toxicity problems. Serious consequences due to drug–drug interactions continue to pestilence existing pharmacotherapy[3]. A drug–drug interaction may be the pharmacologic or clinical response to the administration of a drug combination, different from that predictable from the known effects of the two agents when given alone. Clinically momentous drug interactions, which facade potential harm to the patients, may result from changes in pharmaceutical, pharmacokinetic, or pharmacodynamics properties[4, 5]. The incidence of drug–drug interactions in pediatric practice is unknown. Further, the possibility of a drug–drug interaction in pediatric practice would appear to be much less common than in adult practice[6]. The reasons for this perceived decreased incidence in pediatrics is also unknown but would appear to reflect the scarcity of pediatric patients who receive multiple concurrent medications, as well as the small number of pediatric patients that receive chronic pharmacotherapy. Patient factors that increase the risk for drug interactions include being critically-ill, polypharmacy, having impaired hepatic or renal function, hypoxemia, or metabolic disturbances. Given the scarcity of data on drug interactions in pediatric patients, children should also be considered at a special risk. The clinical result of a drug-drug interaction may manifest as antagonism ($1 + 1 < 2$), synergism ($1 + 1 > 2$), or idiosyncratic reaction (a response unexpected from the known effects of either agent) [5, 7]. Infants and children are different from adults, also in the way they handle (pharmacokinetics, PK) and subsequently respond (pharmaco dynamics) to drugs. DDIs are often categorized into minor, moderate and severe (or, major). Minor DDIs are considered of slight clinical connotation and typically only call for routine patient monitoring, moderate DDIs have a higher clinical significance and may require dosage changes and closer monitoring, and major DDIs can lead to serious adverse effects and should typically be avoided[8,9]. Developmental PK focuses on developmental aspects of absorption, distribution, metabolism and excretion of drugs, subsequent potentially affecting drug pharmacological response, and safety. Pharmaco genetics and Pharmaco genetics are the studies of genetic

variations in drug response. The study of the drug effects of one gene refers to pharmaco genetics; the study of the effects of all the genes refers to Pharmaco genetics. Genetic polymorphism of the cytochrome P450 (CYP) enzyme is a genetic mutation that results in variations in CYP enzyme activity and thus differences in drug-human interactions[10]. Human variations in drug metabolism with CYP range from extremely poor to rapid metabolism. Drug-drug interactions (DDIs) can lead to serious and potentially lethal adverse events. In recent years, several drugs have been withdrawn from the market due to interaction-related adverse events (AEs). Adverse drug-drug interactions (DDIs) are a serious health threat that can result in significant morbidity and mortality[11]. Current methods for detecting DDIs rely on the accumulation of sufficient clinical evidence in the post-market stage – a lengthy process that often takes years, during which time numerous patients may suffer from the adverse effects of the DDI[12]. An interaction is said to be clinically significant if it requires a dosage adjustment of the perpetrator drugs or therapy monitoring or consists of a drug combination that is contraindicated due to its high potential for clinical adverse effects. Adverse drug interactions masquerade a significant threat to hospitalized patients. Most patients receiving potentially interacting drugs do not experience adverse drug events; however, serious adverse events are known to occur. Evidence from epidemiologic studies suggest that drug interactions contribute to a small, but significant number of adverse events in hospitalized patients. With multiple drugs often prescribed, the potential for adverse drug interactions is an important concern. No associated adverse drug events were identified, but the retrospective design of the study probably limited our ability to detect them. The purpose of the study is to verify the rate and profile of drug interactions in medical prescriptions to hospitalized pediatric patients[13].

MATERIALS AND METHOD

Study design: Prospective observational study

Study objectives:

- To minimize the drug interactions based adverse effects
- To provide better treatment by screening potential drug interactions
- To Minimize the unnecessary use of non prescription medications by providing counselling
- To Educate the patients regarding drugs
- To convey the value of clinical pharmacist in minimizing drug interactions

Study population: study population was 150 patients, in these 70 male patients and 80 female patients

Study duration: 6 months (July 2013 – December 2013)

Inclusion criteria:

- 0 to 12 years male and female patients
- Who were diagnosed with diseases.

Exclusion criteria:

- Patients who were more than 14 years.
- Containing less than 3 drugs per prescriptions.
- ICU Patients.

Methods

This study was approved by the Institutional Ethical Committee. A prospective study was performed from July 2013 to December of 2013 to verify the rate of drug interactions in medical prescriptions to paediatric patients during the hospitalization period at a tertiary care teaching hospital. During the study period selected patients were investigated. Their prescriptions were analyzed and collect the information through a specially designed patient data form. The prescriptions were analyzed for interactions performed through Micromedex. Based on the interactions found in the prescriptions, there were classify based on severity and inform to the medical teams of the hospitals and the alterations may cause the patients clinical responses and to improve the morbidity and mortality of the patient and to reduce the adverse effects.

RESULTS AND DISCUSSION

Drug–drug interactions are often serious hitches of multiple drug therapies and account for 3%–5% in-patient medication errors. During our study period total 220 prescriptions were collected. Out of 220 prescriptions, 150 prescriptions containing drug interactions. Female patients (53%) were more commonly affected towards the disease compared to male patients (47%) which was shown in Figure 1. In those prescriptions female patients are more compared to male. This may be due to variation in immunity power; female patients are more sensitive to diseases. Female children take more time to get adjusted to the corresponding environment, due to those changes symptoms like common cold, fever gets easily attacked. Figure 2 shows that 5 – 10 (75) years age patients are more compared to 1 – 5 (43) years followed by 0 – 1 (20) and 10 – 12 (12) years. Due to hormonal changes some female children of age especially 10-14 years feel stress when compared to male children. 5-10 years aged patients are more followed by 1-5 years compared to

others. Prescriptions of 0-1 year old children contain very less drugs because physicians prescribe some drugs through breast feeding. In severe diseases drugs are more commonly given through IV route or sometimes given as drops. At the age of 1-10 years, during development of body children feel stress and are easily attacked by diseases. Three drugs containing prescriptions are more (108) than four drugs (42) which were found in table 1. In these prescriptions only there is an increase in drug interactions. Drug-drug interactions increase the risk and cost of the patient. Table 2 shows that mild (58%) drug-drug interactions are more compared to moderate and severe interactions i.e., (53.3%) & (6.4%) respectively. By using the soft wares drug interactions are classified based on that mild interactions followed by major are more in prescriptions. Average number of drugs per prescription is 2. 14.4% prescriptions containing mild drug interaction i.e., Ampicillin + Gentamicin followed by Amoxicillin + Doxycyclin (10.6%) moderate interactions and other drug interactions are found in table 3. Ampicillin & Gentamicin containing prescriptions are more with moderate drug interaction. These interactions are observed theoretically. But these are potential drug-drug interactions i.e., these interactions are not observed practically because due to the variation in the time of administration. Drug-drug interactions are a preventable cause of morbidity and mortality. Clinical pharmacist should screen for potential drug interactions with nonthreatening and lenient interview questions. Parents often do not report, or underreport, the use of nonprescription drug substances because they consider them "safe" or "harmless". Clinical pharmacist must also specifically ask about the short list of non-prescription drug products because of their potential for interaction with other drugs. If potential drug-drug interactions are found, the clinical pharmacist should alert the prescriber. They must stress the importance of prescription, non-prescription drug interactions in children by teaching caregivers several key points regarding medication administration. Do not give any non-prescription drug substance to any child younger than age 4 without first consulting with a healthcare provider. Check with the healthcare prescriber first before administering any nonprescription drug substance to a child who is already taking any other medications. Non-prescription paediatric products with dosing instructions that state "for children younger than 2 years old, consult a physician". When prescribed a medication, ask the prescriber and pharmacist about potential interactions with non-prescription drugs. Follow exact dosing and frequency instructions on all medications. Never exceed dosage or frequency for age/weight. Use an exact measuring device. Avoid using a household spoon. This study utilized a computer software i.e., Micromedex to verify the potential of drug interactions in medical prescriptions to paediatric patients and warned the medical teams, by means of

pharmaceutical intervention through a differentiated form of the patients exposed to such interactions. Although the number of clinically relevant drug interactions is considered as low, many hospital admissions are linked with effects caused by the interactions of utilized drugs. The computer software used to verify the possibilities of drug interactions are well described in the fiction as a way to help health professionals prevent severe-level interactions and adverse effects with potential risks.

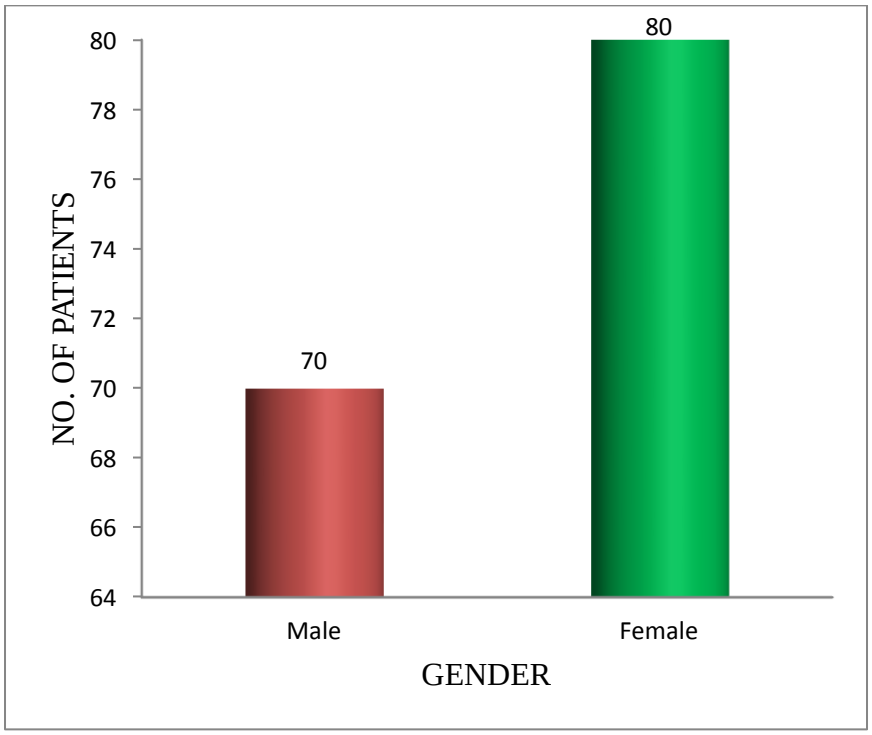

Figure1: Based on Gender wise distribution

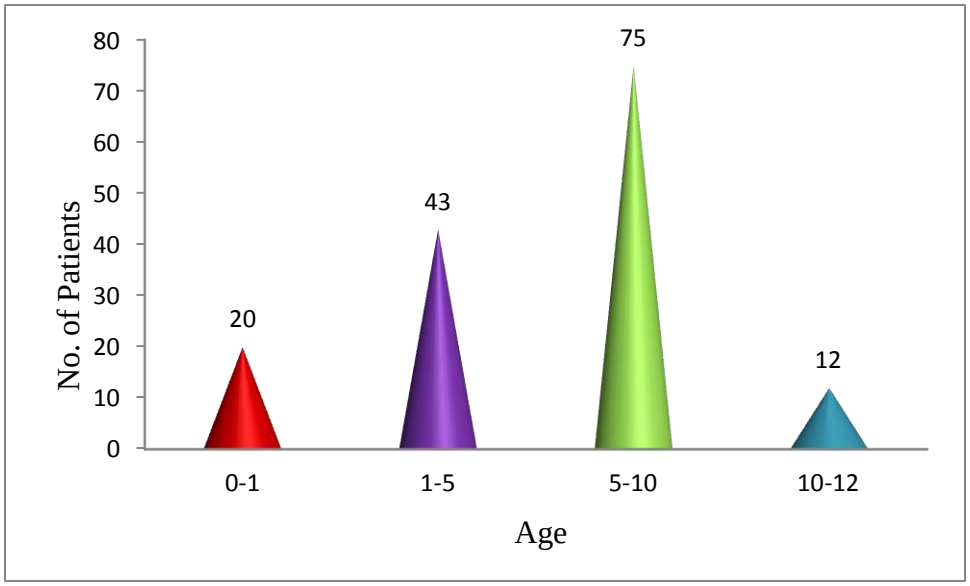

Figure 2: Demographic details of the patient

Table 1: Distribution based on drugs per prescription

s. no	No of drugs in each prescriptio	no of prescriptions	Percentage
1.	4	42	28%
2.	3	108	72%

Table 2: Based on severity of drug interactions

Total interactions	No. of interactions	Percentage
Severe	14	6.4%
Moderate	98	35.3%
Mild	104	58.1%

Table 3: Drug interactions found in medical prescriptions

S. No	Drug interactions	No of drugs	Percentage (%)	Severity level
1.	Ampicillin + Gentamicin	65	14.4	Mild
2.	Amoxicillin + Doxycyclin	48	10.6	Moderate
3.	Amoxicillin + erythromycin	45	10	Moderate
4.	Diclofenac + Furosemide	38	8.4	Minor
5.	Furosemide + Amikacin	25	5.5	Severe
6.	Furosemide + Doxycyclin	25	5.5	Moderate
7.	Tetracycline + furosemide	20	4.4	Minor
8.	Amikacin + pantoprazole	15	3.3	Moderate
9.	Ceftriaxone + diclofenac	15	3.3	Minor
10	Others	154	34.2	
11	Total	450	99.60	

CONCLUSION

The presence of drug interactions is enduring hazard in hospitalized patients. This study highlights the need for viewing prescriptions for potential interactions by exploitation of computer software, and the pharmacist presence is important to minimize the occurrence of possible drug interactions there by reducing adverse drug reactions through intervention. After the intervention nurses and other health care professionals analyzed the prescriptions to minimize the drug interactions.

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