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Assessment of Drug Related Problems and Pharmacist Interventions in Pediatric Drug Therapy in a Tertiary Care Teaching Hospital.

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ABSTRACT

Children are most susceptible to diseases and drug related problem as due to immature physiological functions. Though most of them are self-limiting, drug therapy is being regarded major component of pediatric management in healthcare settings. The aim of the study was to identify the type of drug related problems and assess the impact of pharmacist interventions in hospitalized pediatric patients. A Prospective interventional study was carried out in paediatric wards of a tertiary care teaching hospital over a period of 8 months from July 2015 to February 2016. The drug therapy details of the patients were collected from inpatient paediatric case records. Clinical pharmacist reviewed the drug therapy, identified the drug related problems during ward rounds and discussed with the physicians and suitable suggestions was provided which had been documented. A total of 46 drug therapy problems were identified from 39 patient case records. The number of drug related problems was predominant in males than females. Drug related problems were commonly seen in patient's ≤ 1 years of age. The most common drug related problems was found to be drug- drug selection (71 %) followed by adverse drug reaction (8.1%). The most frequent suggestions by the clinical pharmacist were on substitution of drug (42.8%). The acceptance rate of suggestions and the changes in drug therapy was found to be (30.2%). The level of significance of drug related problems was found to be moderate significance in grade. The identification of drug related problems and their prevention through pharmacist interventions in pediatrics drug therapy may help to avoid the unwanted harmful effects of drugs that will helps in improving therapeutic outcome and quality of care.

Keywords: Drug related problem, Pediatric patients, and clinical pharmacists.

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INTRODUCTION

"Pediatrics is the branch of medicine dealing with medical care of infants, children and adolescents and the age limit usually ranges from birth up to 18 years". Children are particularly susceptible to drug related problem(DRP) as they vary in weight, body surface area and organ maturity which can affect their ability to metabolize and excrete medications effectively[1].**Drug related problem** can be defined as any event or circumstances involving drug treatment that interferes or can potentially interfere with the patient achieving an optimum outcome of medical care. Pharmacist intervention is defined as an action by a clinical pharmacist which results in a change in the patients' therapeutic management. In a review of international studies the male patients (53%) were more susceptible to drug related problems and inappropriate administration and untreated indication were more common DRPs. The pharmacist intervention more were done in optimizing the mode of administration (22%) and dose adjustment (20%) conducted by Labarathe S P et.al. in Four French speaking countries.[2] In the study conducted by Hussain et.al. on drug related problems in pediatric teaching hospital the most common error was incorrect dose.[3]Clinical pharmacist has a greater role in pediatrics especially in drug management. Drug therapy is the major problem facing in the management of disease in paediatric patients. It happens because of less number of drugs available in pediatric dose. It makes challenges for pediatrician during the prescribing of medicines as per the disease of patients especially for antibiotics. Because of pediatric patients were more susceptible to infectious disease. The pharmacist interventions during the prescription writing will reduce the drug related problems in pediatrics. Thus this study was aim to identify the frequency and type of drug related problems and to assess and quantify the impact of pharmacist interventions in pediatric patients.

MATERIALS AND METHOD

The study was conducted in pediatric department of private multi-specialty teaching hospital. All the hospitalized pediatric patients of either gender were included in this study. Pediatric patients visiting the outpatient pediatric department and patients admitted in the intensive care unit were excluded from this study. All the enrolled pediatric patients were monitored from the day of admission until discharge for any drug related problem. Drug related problem has categorized and described by the helper and strand that includes untreated indication, improper drug selection, adverse drug reaction, drug interaction, sub therapeutic dosage, overdose, failure to receive drug, drug use without indication. The assessment of therapy especially dose calculation was done by using Clarks formula, Fried's formula and Young's formula . Drug interactions were determined

by micromedex and medscape and improper drug selection was analyzed by using various guidelines (eg. WHO guideline). The identified drug related problems were discussed and the intervention was conveyed to the respective pediatrician along with the best possible approach to rectify drug related problems during the next ward round visits. Details of the drug therapy before and after the pharmacist interventions were documented in the suitably designed documentation form and later reviewed for the level of clinical significance, whether the drug related problem was major or moderate or minor. The acceptance of level of pediatrician for the particular intervention was also recorded as either accepted or not accepted according to the action of the treating pediatrician.

Statistical Analysis

The statistical software SPSS version 16.0 was used to analyze all the data collected and extracted in this study. Descriptive statistics such as mean, standard deviation and frequencies were calculated to establish the prevalence of interventions' by pharmacists responding to drug related problems in the outcomes of clinical pharmacist interventions.

RESULTS AND DISCUSSION

Demography

In our study 200 in-patients were selected and 39(19.5%) had drug related problems. The male patients (74.3%) were more susceptible to drug related problems than the female patients (25.6%). Age groups affected by drug related problem in the study population were ≤1 year (25.6%) and 9-12 (20.5%), followed by 1-4 years(17.9%). 5-8 years(17.9%) and 13-16 years(17.9%).The mean and standard deviation of age was 6.60±5.47. The mean and standard deviation of duration of hospital stay was 7.38±5.45 days.

Prevalence of disease in pediatric patients

The study population who were affected with the most common disease was found to be lower respiratory tract infection (21.7%) followed by febrile seizures (8.5%), and then seizures(6.3%),urinary tract infection, meningitis, Acyanotic heart disease, malaria(4.2%), Henoch-Schonleinpurpura, gastroenteritis, hepatitis, Wheeze associated with lower respiratory tract infections ,infective endocarditis, Rheumatic heart disease ,Inflammatory bowel disease etc.

Table 1. Prescribing pattern of drugs in the study population.

Therapeutic class	Frequency (N=230)	Percentage (%)
Antibiotics	73	31.7
Bronchodilators'	21	9.13
Antacids	20	8.6
Antipyretics	18	7.8

Antiepileptic	16	6.9
Vitamins	14	6.9
Antiemetic	10	4.3
Diuretics	9	3.9
Steroids	9	3.9
Antihypertensive	7	3.04
Antimalarial	6	2.6
Anesthetics	4	1.7
Anti-tussive	4	1.7
Antiulcer	3	1.2
Anticoagulants	2	0.86
Cardiac glycoside	2	0.86
Anti-inflammatory	2	0.86
Sedatives	2	0.86
Anti-muscarinic	2	0.86
Anti -anxiety	2	0.86
Anti -parkinsonism	2	0.86
Immunosuppressant	1	0.43
Laxatives	1	0.43

The prescribing pattern of drugs in the present study population was identified. By this analysis we found that antibiotic (31.7%) was the most prescribed drugs and then bronchodilators'(9.13%),antipyretics(7.8%),vitamins(6.9%),antiemetic(4.3%),diretics(3.9%),steroids(3.9%),antihyperetensive(3%),antimalarial(2.6),anesthetics(1.7%,antitussive(1.7%),antiulcer(1.2%),anticoagulants(0.8%),cardiacglycoside(0.8%),antinflammatory(0.8%),sedatives(0.8%),antimuscarinic(0.8%),antianxiety(0.8%),antiparkinsonism(0.8%immunosuppressants(0.4%),laxatives(0.4%).

Table 2. The number of drugs prescribed per patients

Number of drugs prescribed	Frequency(N=39)	Percentage (%)
1-3	4	10.25
4-6	19	48.71
7-9	12	30.7
≥10	4	10.25

The number of drugs prescribed per patients during the hospital stay was analyzed. The patients taken 4-6 drugs were more common when correlate with others. Others means patients taken drugs 7-9 (30.7%), and 1-3(10.2%) and ≥10(10.2%). The mean and standard deviation of number of drugs given was 6.08±2.26.

Table 3.Drug Related Problems identified in pediatric patients

Drug Related Problem	Frequency(N=49)	Percentage (%)
Adverse drug reaction	4	8.1
Over dose	4	8.1

Failure to receive drug	1	2
Untreated indication	2	4
Subtherapeutic dosage	0	0
Drug use without indication	3	6.1
Improper drug selection	0	0
Drug interaction	35	71

There were 49 drug related problems identified during study period. Among this most common were drug interactions' (71%), adverse drug reaction (8.1%) , over dose (8.1%) and then drug use without indication(6.1%), untreated indication(4%) and failure to receive drug (2%).

Drugs most commonly involved in causing DRPs

The drugs which commonly involving in causing drug related problems were identified. The antibiotics(22.6%)and anti-epileptics(11.9%)were the most prevalentandthenantiemetics(10.7%),antacids(7.1%),steroids(5.9%),antihypertensiv's(5.9%),bronchodialators(4.7%),diuretics(4.7%),anticoagulants(4.9%),antipyretics(35%),vitamins(3.5%)antimuscarinicagents(3.5%),antimalarials(2.3%),antianxiety(2.3),immunosuppressants(1.1%),NSAIDs(1.1%),anesthetics(1.1%),cardiacglycosides(1.1%).

Table 4:Drugs most commonly involved in causing DRPs

DRPs Induced Drugs	Frequency	%
Antibiotics	19	22.6
Anti-epileptics	10	11.9
Anti emetics	9	10.7
Antacid	6	7.1
Steroids	5	5.9
Anti-hypertensive's	5	5.9
Bronchodilators'	5	5.9
Diuretics	4	4.7
Anticoagulants'	4	4.7
Antipyretics	3	3.5
Anti -muscarinic Agent	3	3.5
Vitamins'	3	3.5
Anti malarial	2	2.3
Anti-anxiety	2	2.3
Immunosuppressant's	1	1.1
NSAIDs	1	1.1
Anesthetics	1	1.1
Cardio glycosides	1	1.1

Table 5. Severity of drug interaction

Severity of drug interaction	Frequency	%
Major	2	5.7
Moderate	15	42.8
Minor	18	51.4

Severity of drug related problems were determined. The drug interaction under minor (51.4%) category was highest when compared to moderate (42.8%) and major (5.7%).The major drug interaction were found to be 1) aspirin-enoxaparin will increase risk of bleeding,2) Furosemide – amikacin will increase risk of nephrotoxicity.The moderate drug interaction identified were 1) Meslamine-azathioprime , meslamine increase toxicity of azathioprime increases risk of blood disorders, 2)amikacin-digoxin amikacin will increase the level or effect of digoxin by altering intestinal flora,etc. Minor drug interaction founded were 1) phenytoin-ondansetron, phenytoin will decrease the level or effect of ondansetron by affecting hepatic/intestinal enzyme cyp3A4 metabolism.2)ampicillin-spiranolactone, ampicillin increases effects of spiranolactone by unspecified interaction mechanism, hyperkalemia.

Adverse drug reaction Identified during the study

There are four adverse drug reactions identified during study. The most common was allergic reactions implicated by ciprofloxacin, Heparin, Midazolam. And the gastroenteritis induced by aspirin.

The intervention performed during the study

The Pharmacist interventions' carried out during the study was analyzed. The intervention most done was substitution of drug (42.8 %), others (22.4 %), cessation of drug (22.4%), change in drug dose (10.2 %), and addition of drug (4 %)

Table 6. Type of interventions performed

Pharmacist Interventions	Frequency(N=49)	Percentage (%)
Substitution of drug	21	42.8
Cessation of drug	10	20.4
Change in drug dose	5	10.2
Addition of drug	2	4
Others(laboratory monitoring, unwanted drug prescription)	11	22.4

Table 7. Level of significance of drug related problems

Level significance of DRPs	Frequency (N=49)	Percentage (%)
Minor	23	46.9
Moderate	26	53.06
Major	0	0

When evaluating the severity of drug related problem I find out that most frequent was moderate 26 (53.06%) and then minor 23 (47.8) and no patient found with major DRP

Table 8: Results of pharmacist Intervention

Results of pharmacist intervention	Frequency (N=49)	Percentage (%)
Suggestion accepted & drug therapy changed	15	30.2
Suggestion accepted but drug therapy not changed	30	61.2
Neither suggestion accepted nor drug therapy changed.	4	8.1

Results of pharmacist interventions were evaluated. The results were suggestion accepted and drug therapy changed (30.2%), suggestion accepted but drug therapy not changed (61.2%) and neither suggestion accepted nor drug therapy changed (8.1%).

DISCUSSION

The study of potential drug related problems in pediatric patients is very essential in the prevention of the complications arising from drug therapy. The unawareness of the health care professionals always leads to the over usage of medications in this class of population, resulting in poly-pharmacy thereby leading to adverse events. The drug related problems were most commonly found in pediatrics were dosing error, adverse drug reactions etc. The results of our study was analyzed and compared with various studies and described below.

In our study 200 patients were selected and among these 39 patients had drug related problems from these patients 49 drug related problems were founded. From this drug related problems the most common in our study was found to be drug interaction when correlate with the other drug related problems like over dose and adverse drug reaction, untreated indication etc.

Considering the demographic details of pediatric patients in our study, it was found that pediatrics aged ≤1 (25.6%) year were more prone to drug related problems. Our study results was similar to the results of study conducted by Majed AL Jeroisy on medication errors in pediatrics' because in their study it shows that the children aged ≤1 year (44.5%) were more susceptible to drug related problems. Pediatric patients less than one year old were more subjected to drug related problems due to prematurity in their organ growth and function.[4]

The Pediatric patients more affected with drug related problems were male (74.3%) as compared to female (25.6%). Our study result was similar to the study of Prot-Labarthe et.al. Their result also shows that male (53%) had more drug related problems.[2]

We determined the duration of stay of patients in hospital. The average duration of stay was 7.38± 5.45 days. Our study result was contrast to study conducted by Wittawassamrankal R et.al. Their study result showed that 5.37±4.06 days were most of the patients stayed in hospital. In our study

duration of stay was high when compared with this study because most of them have LRTI and more patients taking amoxicillin antibiotics, in a day it was administrated for 7 days.[5]

The number of drugs taken during the hospital stay was analyzed. The patients took 4-6 (48.6%) drug which was highest when compared to others. This study was difficult to compare with other studies due to less availability of data's.

The most important findings of drug related problems in the present study were drug interaction (71%), adverse drug reaction (8.1%) and over dose (8.1%), were identified in patients of pediatric department. These Results were contrast to the prospective study conducted by Hussain S A et.al. in which incorrect dose was the most common drug related problem identified in their study, another study by Rashed A N et.al. Found out that the dosing problems and adverse drug reaction was the most common DRPs.[3,6]

In this study drugs that caused majority of drug related problems were determined as antibiotics and antiepileptic drugs. This result is similar to the study on medication errors in pediatric patients conducted by Majed Al Jeroisyet.al,Llamazares C M et.al and Folli H L et.al. Their study outlined that antibiotic drugs caused the higher drug related problem. The reason for the majority of drug related problems in antibiotic and antiepileptic drugs in this study is due to the lower respiratory tract infection and febrile seizure in the pediatric patients subjected to this study.[6,8,7.]

According to this study the severity of drug related problems were identified as moderate and minor (52.17% and 47.8%). This outcome was similar to the Llamazares C M F et.al. Their study results showed severity of drug related problems were as moderate and minor (51.9% and 12.9%). The reason for the results of the study is due to moderate and minor drug interaction in drug related problems analyzed.[8]

Based on the analysis in the interventions performed during the study it was found that the substitution of drug were more prevalent. This result was heterogeneous to study done by Strunk P et.al. and Martinez L E et.al. There study reported those interventions' more in dose, frequency and safety issues. The reason for the different in the study was due to more drug interactions in the drug related problems which decrease the therapeutic efficacy of drugs in order to overcome this substitution of drug was the solution.[9,10]

The acceptance of the result of the pharmacist intervention was analyzed after the study. Of the acceptance criteria, the suggestions were accepted but therapy not changed was the highest criteria obtained in the interventions' made in the drug related problem. The explanation given for the suggestion was that the benefactor outcome was more of concern to the pediatricians than the

drug related problems assessed with these drugs. This result was difficult to compare with other studies due to the lack of availability of data.

The most common diseases in drug related problem induced patients were evaluated. The lower respiratory tract infections (21.27%) and febrile seizure (8.5 %) were the most common diseases. This study was contrast to Alakhali K M et.al. In their study fever (12.5%) and pneumonia (9.7%) were the highest disease affected in pediatrics' patients.[11]

CONCLUSION

The study highlights the benefits of clinical pharmacist in multidisciplinary health care team in early identification, prompt intervention and further prevention of drug related problems, which will help to optimize patient drug therapy. The determination of pharmacist intervention in pediatrics may help to avoid the unwanted harmful effects of drugs and improve the patients' therapeutic outcome and quality of care.

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