



MEDICATION ERRORS AND ADVERSE DRUG EVENTS AMONG PAEDIATRIC POPULATION IN A SECONDARY CARE PRIVATE HOSPITAL IN KERALA, INDIA

Jesteena J¹, Amratha K Thomas¹, Jeena Jacob¹ and Shaji George*²

¹Pharm. D interns, Nirmala College of Pharmacy, Muvattupuzha, Kerala, India

*²Professor & Head, Department of Pharmacy Practice, Nirmala College of Pharmacy, Muvattupuzha, Kerala, India

ARTICLE INFO

Article History:

Received 15th May, 2020

Received in revised form 7th

June, 2020

Accepted 13th July, 2020

Published online 28th August, 2020

Key words:

Medication errors, prescribing errors, transcribing errors, dispensing errors, administration errors, Clinical Pharmacist.

ABSTRACT

Objective: To study the events of medication errors among paediatric population.

Methods: A prospective observational study was conducted over a period of 10 months in a secondary care private hospital involving 300 pediatric patients based on the eligibility criteria. The cases were collected by chart review method and reviewed from the date of admission till discharge for the assessment of different types of medication errors.

Results: During the study it was observed that the error was observed in 62.6% of cases, and the total errors were 317. Out of 62.6% of errors, 95 prescriptions showcased ≥ 2 errors indicating prescribing error as highest involving 60.57% followed by 31.23% cases of administration error. ADR prevalence were exhibited in 5% of cases and 49.8% of the cases were under the category C type - error, no harm as per NCCMERP index. In the study 44 cases showcased a total of 57 drug interactions.

Conclusion: the incidence of medication errors is very high in paediatric inpatient setting. As majority of the errors were prescription related, indicates importance of clinical pharmacist for prescription monitoring and to assist nurses with dose calculation and proper administration schedule, thereby reducing the incidence of medication errors.

Copyright©2020. Jesteena J, Amratha K Thomas, Jeena Jacob and Shaji George. This is an open access article distributed under the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

INTRODUCTION

A medical error is any circumstances, action, inaction, or decision related to healthcare that contributes to inadequate medication use or patient harm. Medication error is a kind of medical error in which the source of error or harm includes a drug^[1]. Medication error is defined by the National Coordinating Council for Medication Error Reporting and Prevention (NCCMERP) as "any preventable event that may contribute to inappropriate medication use or harm to the patient while the medication is in the control of physician, pharmacist, nurse or patient. Such events are related to compounding, product labelling and packaging, distribution, dispensing, administration, and monitoring^[2]. In this current scenario errors are still frequent, even though some may not produce any harm while others may produce severe injuries and, in some cases, even death^[3]. Medication error can occur at any stage of treatment in an inpatient setting. Pediatric population, the most vulnerable group of patients where the safety and efficacy of drug prescribed are focused with less attention. Also, the problems may be related to rational drug

group. The physiologic differences like body surface area, organ system maturity and weight, which affect the metabolizing and excretion ability in paediatric leads to age related variations in pharmacokinetics and pharmacodynamic parameters. Paediatric population especially neonates have a limited internal reserve compared to adults and hence they are more prone to errors^[4]. Hospitalized children are more susceptible to medication errors^[5]. Several studies also speculate that medication errors are responsible for about 1/3rd of all adverse drug events (ADE) and hence they are preventable. Based on Harvard medical practice, 3.7% of paediatric inpatients are experienced with ADE in New York during 1984. Of these events 69% were considered as preventable^[6]. Hence the purpose of this study is to reduce the incidence of medication errors and adverse drug events among paediatric patients by involving in monitoring and auditing of drugs in a private hospital.

Table 1 Gender Distribution (n = 300)

S. No	Sex	No.	%
1	Male	173	57.7
2	Female	127	42.3

*Corresponding author: Shaji George

Professor & Head, Department of Pharmacy Practice, Nirmala College of Pharmacy, Muvattupuzha, Kerala, India

Table 2 Age distribution (n=300)

S. No	Age category	No.	%
1.	New born (>38 weeks gestational age)	3	1
2.	Neonates(0-30 days)	9	3
3.	Infants(1 months- 2 year)	133	44.3
4.	Young child(2-6 years)	94	31.3
5.	Child(6-12 years)	61	20.3

Table 3 Distribution of medication errors

Prescribing errors (n=192)	No of cases with errors	Total errors	%
Indication without drug	38	41	21.4
Drug use without indication	10	10	5.2
Incorrect drug selection	26	27	14.1
Wrong dosage form	9	10	5.2
Wrong dose	63	69	35.9
Illegible prescription	8	8	4.2
Drug /class duplication	16	16	8.3
Wrong frequency	5	5	2.6
Wrong duration	6	6	3.1
Transcribing errors (n=23)			
Omission error	2	2	8.7
Re writing error	20	21	91.3
Dispensing errors (n=3)			
Mislabeled	2	3	100
Administration errors (n=99)			
Charted incorrectly and given	12	12	12.1
Charted incorrectly but not given	9	9	9.1
Omission	23	28	28.3
Wrong time	1	1	1.0
Wrong frequency	29	32	32.3
Compliance error	14	17	17.2

Table 4 Correlation of variables

S No.	parameter	Correlation coefficient	P value
1	Length of hospital stay & number of errors	0.254	0.000
2	Number of drugs per prescription & number of errors	0.445	0.000

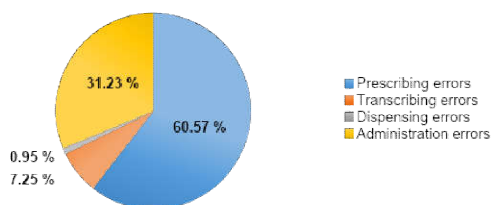


Fig 1 % Distribution of medication errors

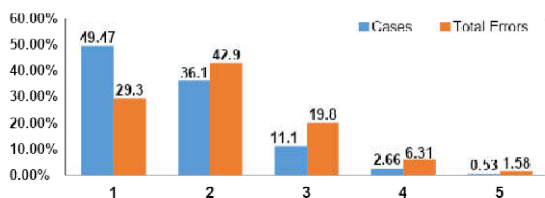


Fig 2 No. of errors per cases

MATERIAL AND METHODS

Ethical considerations

The study was conducted after the approval of ethical clearance obtained from the institutional human ethics committee. Also a prior permission was obtained from the college and hospital to conduct study for a period of 10 months.

Study methods

A prospective observational study was conducted among pediatric inpatients in a secondary care private hospital located in Muvattupuzha, Kerala. Study samples are recruited based upon the eligibility criteria. All patients admitted to the pediatric department having age less than 12 years were enrolled into the study. During the study, inpatients case records were reviewed and the information was documented in the predesigned structured patient profile form. The data collected were analyzed for medication errors, from the date of admission till the date of discharge. Medication error report form and ADR report form were used for the documentation of medication errors as well as ADRs. Type and severity of medication errors were analyzed by using NCCMERP index and drug interactions from Medscape drug interaction checker.

Statistical analysis

Simple percentage analysis were used to categorize the medication errors into different types such as prescribing errors, transcribing errors, dispensing errors and administration errors. Karl Pearson’s correlation was analyzed in IBM SPSS statistics 19 to correlate the variables such as number of drugs per prescription Vs medication error and the length of hospital stay Vs medication error and a positive correlation was observed between the selected variables.

RESULTS

A total of 300 pediatric patients were enrolled into the study. Among them 57.6% were males and 42.3% were females (table 1). The patients were categorised according to their age as newborns, neonates, infants, young child and child. The mean age of the patients was 3.92 ± 0.17 y with maximum patients in the age group of 1 Mon – 2 y belonging to infant category (table 2) and mean weight of the patients was 14.03 ± 0.38kg.

The collected cases were also categorised as per diagnosis and the study reveals that majority of the study subjects were diagnosed with respiratory tract infections (62.3%) followed by gastro intestinal disorders (20.3 %). This led to prescribing large number of antibiotics (82.6%), followed by antipyretics (81.3%) and respiratory drugs (81%). Similar results were observed in the study conducted by Umar L W *et al*^[7].

In the present study it is observed that, culture sensitivity test was done only in 12 % of patients where 88 % of patients were not undergone any culture and sensitivity test. Majority of the antibiotics were prescribed inappropriately. The results were comparable to the study conducted by Borja Croche Santander *et al* were they found that half of the antibiotics prescribed was inappropriate^[8]. Antimicrobial prescriptions based on culture and sensitivity tests were found to be very small percentage similar results were also found in the study by Budhiamajhi *et al*, which shows that majority of the antimicrobials was prescribed empirically without any microbiological

evidence^[9]. Hence it is necessary to follow standard antibiotic prescribing guidelines to reduce antibiotic resistance.

Medication errors

The errors were recorded and distributed under different categories such as prescribing errors, transcribing errors, dispensing errors and administration errors (table 3). Out of which the prescribing error corresponded to 60.57%, followed by administration error with 31.23% of prominence, and trailed by transcribing error at 7.25%, dispensing error at 0.95% (Fig 1). The current study shows a total of 317 medication errors from 300 cases, indicating a higher incidence of 62.6%, which is different from the study conducted by Nrupalpatel *et al.* which shows 36% of errors^[10]. Prescribing errors (60.57%) contributed to the major portion of errors, followed by administration errors (31.23%). The study showed that the infants (1month- 2 years) were more affected by the medication errors, which contributes to 50.47% errors. The results are comparable with the study conducted by Maxwell D.Smith *et al.* which states that the number of medication errors increase with decrease in the child age^[11].

The errors were also classified based on the number of errors in each prescription. More than 2 errors in a single prescription was observed in 70% of prescription, with highest peak in 36.1% of prescription having 42.9% of double errors followed by 29.3% of single errors in 49.47% of cases (Fig 2).

Correlation

The correlation between variables were analysed by Karl Pearson's correlation. Correlation between the number of drugs per prescription with medication error and the length of hospital stay with medication errors were found to be positively correlated, indicating as the number of days of stay in a hospital increases or as the number of errors in a prescription increases the number of errors also escalates concurrently (table 4).

The type and level of severity of medication errors were analysed using NCCMERP index, which indicated that the majority of cases were under category C error, representing no harm. The significant drug - drug interactions among the collected cases were analysed using Medscape drug interaction checker and Paediatric BNF. The analysis showcased that 44 (14.66%) cases had drug- drug interactions and a total of 57 interactions were identified. One major drug-drug interaction was the irregular heart rhythm caused by the parentally administered drugs ofloxacin and ondansetron.

The incidence of ADRs was found to be 5%. Different adverse drug reactions that originated during the study were,

- Ferrous calcium citrate and folic acid induced vomiting
- Chlorpheniramine maleate induced constipation
- Metronidazole induced vomiting
- Amikacin induced rashes
- Amoxicillin and potassium clavulanate induced giddiness
- Promethazine induced drowsiness

- Zinc acetate induced vomiting
- Ferrous calcium citrate and folic acid induced vomiting
- Pheniramine induced drowsiness
- Ibuprofen induced abdominal discomfort
- Lorazepam induced drowsiness
- Chlorpheniramine maleate induced constipation
- Wikoryl induced vomiting
- Ceftriaxone induced rashes

Medication error acceptance

Of the 317 medication errors, 43 (39.81%) medication errors were accepted and corrected, and 76 (88.37%) errors were partially accepted and not corrected and 46 (83.63%) errors were rejected by the physician. Nurses were involved in 105 (33.12%) medication errors, of which 65 (60.18%) errors were accepted and corrected, 10 (11.63%) errors were partially accepted and not corrected, and 9 (16.36%) errors were rejected. Out of the 317 errors 108 errors were accepted and corrected. Nurse's acceptance of the error was found to be higher when compared to that of the physician's (60.18%). Non communicated errors accounted to 68 errors, 57 (83.82%) errors to the physician and 11 (16.17%) errors to nurses, which occurred due to the missed days or time, due to public holidays/ Sundays, or errors happened at night time and the drug was given only for one time

Medication error prevention

According to the pattern of errors observed in the study, recommendations were made to minimise the incidence of future similar types of errors. They should be implemented at various stages of prescribing, transcribing, dispensing and administration by the following methods,

Prescribing

1. Ensure that the patient's body weight is correct while calculating dose for weight-based dosages, confirm that the calculations are correct and does not exceed the recommended dose range. Identify patient's drug allergy and record it in the patient's record.
2. While using decimals, if no numbers before the decimal, use a leading zero before the decimal point.
3. Always write the prescriptions in legible handwriting.
4. Avoid abbreviations of drug names, spell micrograms and nano grams in full.
5. Clearly state adequate dose and frequency of the drugs and prescribe appropriate dosage form based on the patient's condition.
6. Prescription should be written at patient's bedside.
7. While providing medical care consider all the parameters like lab reports, medical condition, past medication history, patient progress and tailor the drug therapy accordingly.
8. According to WHO prescription writing guidelines, medication should be prescribed generically.

Transcribing

1. Ensure that the drug, dose, route, frequency is correct while transcribing the physician order into the nurse's administration sheet.
2. Avoid overwriting the dose.
3. While receiving telephonic medication order from physician, repeat the order to the physician to ensure the medication order is correct.

Dispensing

1. Confirm patient identity before dispensing.
2. Dispensing should be done for a single prescription at a time.
3. Prepare drugs in neat and orderly work place with minimum interruptions.
4. Avoid storing look alike or sound alike medications adjacent to each other.
5. Confusing medication orders should be confirmed with the physician before dispensing.
6. Provide education to the caregivers or patients regarding the medication and its administration.

Administration

1. Double check the medication order before administration and clarify any doubts.
2. Before the administration of each dose the identity of the patient should be confirmed.
3. Administer the drugs at right time, dose and frequency as per the medication order.
4. After administering the medications, carefully chart the date and time of administration with the signature of the nurse.
5. Report and record any allergies or adverse drug reactions experienced by the patient to the physician immediately.
6. Educate the patient and care giver about the proper administration of drugs^[9].

From the study it is evident that the incidence of medication errors is very high in paediatric inpatient setting. Pharmacist is in a position to identify potential sources of error that can happen during any stage of drug therapy. Dosing errors was more frequent which highlights the need of a proper weight based dose calculations. They should be constantly on the "look out" for possible sources of medication errors and should adopt clinical safety oriented practices. As majority of the errors were prescription of which most of them are due to wrong dose a clinical pharmacist enrolled in this field can participate in ward rounds, prescription monitoring, and can assist nurses with dose calculation and proper administration schedule, thereby reducing the incidence of medication errors. A special strategy has to be implemented for the detection and reporting of ADR by all health care professionals. All the health care professionals and patient representatives must be made aware of the ADR to promote safe use of drugs in paediatric patients. Hence the study demands the importance of a clinical pharmacist in paediatric department.

Reference

1. Don A Ballington and Robert J Anderson. Principles of pharmacy practice. 3rd edition. Delhi: CBS publishers.2008; 278-294.
2. G.Parthasarathy, Karin Nyfort-Hansen and Milap C Nahat. A textbook of clinical pharmacy practice: 2ndedition.Chennai: Orient longman private limited.2004; 486-505.
3. Otero P, Leyton A, Mariani G, Ceriani Cernadas JM and Patient Safety Committee. 2008. Medication errors in pediatric inpatients: prevalence and results of a prevention program. Pediatrics; 122(3):737-43.
4. Eva Fernandez, Raul Perez, Alfredo Hernandez, Pilar Tejada *et al.* 2011. factors and mechanisms for pharmacokinetic differences between paediatric population and adult. Pharmaceutics; 3:53-72.
5. Majed I Al- Jeraisy, Menyfah Q Alanazi and Mostafa A Abolfotouh. 2011. Medication prescribing errors in a paediatric inpatients tertiary care setting in Saudi Arabia. BMC research notes; 4:294.
6. Rainukaushal, David W Bates, Christopher landrigia, Kathryn J Mc Kenna, Margaret D.Clapp, Frank Fedrico, Donald A. Goldmann. 2001. Medication error and adverse drug events in paediatric inpatients. American medical association, JAMA; 285 (16): 2114-2115.
7. Umar LW, Isah A, Musa S, Umar B. 2018. Prescribing pattern and antibiotic use for hospitalized children in a Northern Nigerian Teaching Hospital. Ann Afr Med; 17(1):26-32.
8. Santander BC, Alonso EC, Carrión AS, Fuentes LM, Flores ID, Vargas JC, Domínguez BF, Ibañez CT. 2018. Appropriateness of antibiotic prescribing in paediatric patients in a hospital emergency department. Anales de Pediatría (English Edition); 88(5):259-65.
9. Committee on drugs and committee on hospital care American Academy of paediatrics. 2013. Prevention of medication errors in the pediatric inpatient setting. Pediatrics; 112(2): 431-434.
10. Nrupal Patel, Mira Desai, Samdhi Shah, Prakruti Patel and Anuradha Gandhi. 2016. A Study of Medication errors in a tertiary Care Hospital. Perspectives in clinical research; 7:168-173.
11. Maxwell D. Smith, Henry A. Spiller, Marcel J. Casavant, Thiphalak Chounthirath, Todd J. Brophy and Huiyam Xiang. Out-of-Hospital Medication Errors among Young Children in the United States, 2002-2012. Pediatrics.2014; 134(5):867-87

How to cite this article:

Jesteena J, Amratha K Thomas, Jeena Jacob and Shaji George (2020) ' Medication Errors and Adverse Drug Events Among Paediatric Population in A Secondary Care Private Hospital in Kerala, India', *International Journal of Current Advanced Research*, 09(08), pp. 23003-23006. DOI: <http://dx.doi.org/10.24327/ijcar.2020.23006.4548>