

Assessment of Dosing Errors in pediatric Patients Prescriptions in Basra City

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Abstract

Pediatrics needs special care in drug prescription as any even a small error could lead to a significant harmful effect on their health. This work aimed to evaluate the doses and duration of medications prescribed for children in the hospital's outpatient clinic and a private clinic and checking them, according to children's weight and age, using BNF for children (2018). Results revealed a higher rate of dosing error in the hospital's outpatient clinic (64%) compared with the private clinic (34%) [p-value 0.002]. Most of the errors were seen in antibiotics (49%), bronchodilator (52%), antipyretic and analgesics (30%), antihistamines (15%), nasal decongestant (13%), and antiemetic (9%). Pediatric dosing errors were common in both hospital outpatients and private clinics. The health institutions should give more efforts for training health care providers and monitoring the pediatric prescriptions to minimize the dosing errors.

Keywords: Pediatric, Dosing errors, Hospital outpatient, private clinic

INTRODUCTION

Infancy and childhood are periods of rapid growth and development. The various organs, body systems, and enzymes that handle drugs develop at different rates; hence, drug dosage, formulation, response to drugs, and adverse reactions vary throughout childhood [1,2]. Unlike adults, the pharmacokinetics in pediatrics is remarkably affected by the growth and development of children [3]. Physiological development during childhood can produce significant effects on drug absorption, distribution, metabolism, and excretion [4,5].

The pediatric dose should be determined according to the body weight and/or body surface area, however, child age should also be taken into account for the maturation in pediatrics [6,7]. Therefore, the administration of medication doses using the child age only or by halving the adult dose would result in a medication error. Medication errors can occur in administering medicine (wrong dose, wrong route, wrong frequency, and wrong duration) [8]. Prescribing errors are particularly important in pediatrics where dose calculations are complicated and small errors can cause significant harm [9]. Children are particularly at risk for such errors because of the need to calculate doses individually due to small body size, need for weight-based dosing and availability of different formulations with variable concentration of drugs [10]. In addition to this, obtaining statistics on rates of error is challenging as staff may be unwilling to report errors or may not include errors that were corrected before any harm occurred. Prescribing errors can be reduced by improving training, using

computerized systems, and involving pharmacists in checking drug charts [11]. This work aimed to evaluate the doses of different medications prescribed to pediatric patients by different health care prescribers and checking them according to children's weight and age, using BNF for children (2018) [12].

MATERIAL AND METHOD

Study design

The study was carried out in 110 pediatric patients allocated from the hospital outpatients and private clinics. The data was collected from February 2019 to April 2019 and from patients' prescriptions and interviews with children's parents.

Subjects

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All patients were pediatric, with the age range from one month to sixteen years. The enrolled patients had been diagnosed with different illnesses and they were treated in the hospital's out care clinic and private clinic. The patients with a chronic disease like type 1 diabetes, congenital disease, or those using chronic medications were excluded from the study.

Materials

Pediatric prescriptions were checked about the doses (according to the age and body weight) using BNF for children (2018) [13]. Demographic information and objective data including data collected from patients' prescriptions were entered into Microsoft Excel (2012) and analyzed using the MedCalc statistic program.

RESULTS

Demographic data

Table 1: Demographic Data of the patients included in the study.

Parameters	Description	Percentage (%)
Age	Infant (1 month – 2 years)	42%
	Young Child (2-6 years)	27%
	Child (6-12 year)	21%
	Adolescence (12-18) year	9%
Gender	Male	57%
	Female	43%
Weight	Less than 10 kg	38%
	10 kg – 20 kg	32%
	20 kg – 30 kg	11%
	30 kg – 40 kg	12%
	More than 40 kg	7%
Other diseases	Drug Allergy	0%
	Chronic Allergy	1%
	G6PD	2%
	Sickle cell anemia or thalassemia	0%
Parent Education	Educated	60%
	Non-educated	40%
Physician	GP	18%
	Pediatric specialist	82%
Type of clinical care	Private clinic	45%
	Hospital outpatient	55%

Table 2: Percentages of medical conditions included in this study

Medical condition	Overall
Tonsillitis	18.6%
Bronchiolitis	16.6%
Cough	10.7%
Chest Infection	7.8%

UTI	7.8%
Common Cold	6.8%
Diarrhea	6.8%
Constipation	4.9%
Recurrent Vomiting	3.9%
Jaundice	2.9%
Pinworm	2.9%
Abdominal Pain	2.9%
Poor Appetite	2.9%
Conjunctivitis	2.9%
Anal fissure	0.9%

Table 3: Percentages of the categories of prescribed medications

Prescribed medications	Overall Percentage (%)
Antibiotics	25%
Antipyretic and analgesics	17.5%
Antihistamine	15.5%
Bronchodilators	6.7%
Nasal Decongestant	4.6%
Antiemetic	6.5%
Corticosteroids	4.4%
Tonics and vitamins	4.7%
Laxatives	0.8%
LK-antagonist*	0.6%
Topical nasal drops	2.3%
Topical eye drops	1.4%

*LK-antagonist: leukotriene antagonist

Table 4: Medication Error Profile According to Medication Class

Prescribed medication	% of Error
Antibiotics	49%
Antipyretic and analgesics	30%
Antihistamine	15%
Bronchodilators	52%
Nasal decongestant	13%
Antiemetics	9%

Table 5: Medication Error Profile According to the type of health care system

	Hospital out patients [no (%)]	Private clinic [no (%)]	P-value*
% of Error	36 (64%)	16 (34%)	0.002

* p value <0.05 considered significant

DISCUSSION

Pediatrics needs special care in drug administration. More attention should be paid in drug prescription because even

small errors in the dose and/or duration of medication use may lead to significant harmful effects. Therefore, medication errors in pediatrics are not uncommon. In this study, the prescriptions of pediatrics in different health care systems were checked and the doses of medications were recalculated according to child body weight and age rather than age only depending on standard reference (BNF for children 2018).

Demographic data (Table 1) illustrates the age, sex and weight of patients included in the study, in addition to the educational level of parents and type of clinical care they received. The medical conditions were shown in Table 2 and one can conclude that respiratory tract-related illnesses were the most common cases seen during the present study. This may be explained by the time of data collection, as from February to April is the season of the appearance of these disorders. Other medical conditions like gastrointestinal disorders and urinary tract infections also were frequently seen in this study.

Table 3 shows the percentages of prescribed medications and clearly shows the highest rate of antibiotic prescription (about 25% of prescribed medications). This can be explained by the high rate of infections seen in this study. Most Antibiotics were prescribed empirically without a culture and sensitivity test. This may lead to ineffective treatment and/or lead to the growth of resistant bacterial strains. According to the American Academy of Pediatrics "Don't initiate empiric antibiotic therapy in the patient with suspected invasive bacterial infection without first confirming that blood, urine or other appropriate cultures have been obtained, excluding exceptional cases" [14]. Among other widely prescribed medications were the antipyretics and bronchodilators. This could be explained by the season of data collection (winter), when the respiratory disorders are common.

Medication errors are not uncommon in children. The complex dosing method in children makes many prescribers to administer the medications according to age only rather than weight or body surface area. Obtaining weight among the pediatric group, in particular, is of great importance as inaccurate weight estimation may contribute to prescription errors such as over/under recommended dosages. In this research, child weight was the dependent parameter in checking the doses using the reference BNF for children [12]. Table 4 shows the medication error for each class of medication. A large percentage of errors were in antibiotic doses and/or duration of use. The findings of this study suggest that prescribers miscalculated the proper antibiotic dosages with a tendency to commit over or under the recommended dosage errors. This may be due to the high rate of empiric use of different types of antibiotics with different efficacies. The availability of different concentrations of antibiotic products for children, usually as a liquid suspension, needs more accurate dose calculations and could lead to dosing errors. This result

agrees with many literatures that revealed the prevalence of medication errors in this class of medication [15, 16]. Other medication errors were seen in Bronchodilator, salbutamol, antipyretic, and paracetamol. The rate of medication error was also seen in decongestants and antihistamines, but at a lower rate. The error in salbutamol was usually seen when physicians give a standard dose (usually five milliliters) or one teaspoon of the product to most of the patients rather than exact milliliters of the syrup. The inaccurate dose of this B2 agonist makes the child susceptible to adverse effects like tremor and palpitation.

The dosing error in antipyretics, antihistamine, or decongestant may not be associated with direct harmful effects; however, the dosing error noticed in this study may accompany under therapeutic effect or expose the patient to unnecessary extra doses. Table 5 reclassifies the dosing error in children according to the type of clinical care either governmental hospital outpatient or private clinic. The findings of this study show that most of the errors occur in hospital outpatient. This may be due to the larger number of patients attending these clinics due to low-cost services, therefore, lower time available for each patient. In addition, the limited type and concentrations of medication available in the hospital may be misleading. The results of this study agree with other studied that revealed the presence of dosing errors in pediatric patients [13]. These errors can be reduced by using clinical strategies to avoid mistakes like training doctors and pharmacists to ensure that they have a full oversight in administering, dispensing, standardizing, and identifying medications effectively.

CONCLUSION

Pediatric dosing error is common in both governmental and private clinics. Pediatric dosing error may be in dose calculation, duration of medication use or improper and inaccurate administration device. Health care institutions in Iraq should give more efforts for rational use of medication in pediatrics and educate the society to enhance health literacy.

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Conflict of interest

The authors declare no conflict of interest.

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