Review Article

Drug Therapy Problems in Pediatrics

Gudisa Bereda*

Department of Pharmacy, Negelle Health Science College, Ethiopia

*Corresponding author

Gudisa Bereda, Department of Pharmacy, Negelle Health Science College, Guji, Ethiopia, Tel: 251919622717/251913118492; Email: gudisabareda95@ gmail.com

Abstract

Pediatrics are defined as those age groups less than or equal to 18 years including premature. Medication use in children may be accompanied by problems not seen in adults or cause adverse drug reactions that are more common than in adults. The rate of absorption was correlated with age, being much slower in neonates than in older infants and children. In Pediatrics there is not much information, but it has been estimated that from 20 to 50% of children suffer some drug therapy problems during the hospital stay, children, and particularly small children, take considerable amounts of drugs and several studies indicate that drug related problems in children are of great clinical relevance and that many of them are preventable. Depending on the definition of Pharmaceutical Care Network Europe, a drug-related problem can be defined as an undesirable event including drug therapy that actually or potentially interferes with desired health outcomes and needs professional judgment to resolve through careful assessment of patients, medicines, and disease information to determine the appropriateness of each medication regimen. Needs additional drug could occur when a patient needs more medication to treat their condition or Preventive therapy is needed to reduce the risk of developing a new condition or a medical condition requires combination therapy to achieve synergism or additive effect. Unnecessary drug therapy can be characterized as no valid medication indication for the drug at this time or this could occur when the patient has been placed on too many medications for their condition and the drug is simply not needed.

INTRODUCTION

The term pediatrics can be derived from the Greek word 'pediopais, which means a child or donating relationship to a child (pedio), 'iatrike' meaning surgery or medicine and 'ics', suffix of a subject of science. Pediatrics are defined as those age groups less than or equal to 18 years including premature [1,2]. Infancy and childhood are rapid growth and development. The many organs, body systems and enzymes that handle medicines developed at different rates; hence, drug dosage, formulation, response to drugs and adverse reactions different throughout childhood [3]. Clinician's needs to ensure not only that toxicity is kept to a minimum but also that children are not denied the use of appropriate medicines [4]. Medication use in children may be accompanied by problems not seen in adults or cause adverse drug reactions that are more common than in adults [5]. The rate of absorption was correlated with age, being much slower in neonates than in older infants and children [6]. Changes in the absorption rate would appear to be of minor importance when compared to the age related differences of drug distribution and excretion of medications [7]. The percentage of total body weight, the total body water and extracellular fluid volume decrease with age [8-11]. In Pediatrics there is not much information, but it has been estimated that from 20 to 50% of children suffer some drug therapy problems during the hospital stay, children, and particularly small children, take considerable amounts of drugs and several studies indicate that drug related problems in children are of great clinical relevance and that many of them are

preventable [12]. The differences in medicines pharmacokinetics & pharmacodynamics demonstrated in children influence the choice of the drug, dose, dosage form & dosing interval [13]. The pediatric medication use process is complex & error prone because of the multiple steps needed in calculating, verifying, preparing, administering doses. These factors make the pediatrics to be at high risk for drug related problem. Therefore, all pediatric prescriptions & medication orders must be checked for its appropriateness of the dose, route, & frequency with a pediatrics dosing reference [14]. Pediatric inpatients may have three times more medication errors than adult in patients, and these errors are frequently harmful. Neonates also reveal prolonged gastric emptying. Thus during the neonatal period, acid-labile medicines like benzyl penicillin and ampicillin are well-absorbed, while the absorption of drugs like phenytoin, Phenobarbital and Rifampicin is low. Moreover re flux of gastric contents retrograde into the esophagus is very common during the first year of life [15]. Depending on the definition of Pharmaceutical Care Network Europe, a drug-related problem can be defined as an undesirable event including drug therapy that actually or potentially interferes with desired health outcomes and needs professional judgment to resolve through careful assessment of patients, medicines, and disease information to determine the appropriateness of each medication regimen [16,17]. An actual drug therapy problem can be characterized as an event that the patient is currently experiencing even if they are well controlled, whereas a potential drug therapy problem is an event that the patient is not recently experiencing, but is at risk of developing

due to either drug therapy prescribed or concomitant disease states [17]. Drug-related problems are classified into seven categories, which are unnecessary drug therapy, needs additional drug, ineffective drug, dose too low, dose too high, adverse drug reaction, and noncompliance [18]. Drug therapy problems are correlated with prolonged length of stay and elevated economic burden and result in an almost 2-fold enhanced risk of death. Drug therapy problems are the dominant reasons for admission [1]. Pediatric are especial populations, so they require special attention in their drug therapy; but they have been faced with a number of drug-related problems because data concerning significance of drug therapy problem in pediatric patients is limited in the world [20]. According to a prospective observational study done in pediatric patients admitted to pediatric ward of southwestern Ethiopian hospital shown that over the study period, a total of 189 pediatric populations were included. Among these, 115 (60.8%) were males, and the mean age of the patients was 1.4339 ± 0.864 years. The medication related problems was found among 121(64.01%) of pediatric patients. Among seven types of drug therapy problems unnecessary drug therapy, need additional drug therapy, ineffective drug therapy and dose too high were the most predominantly occurred DRP that accounted 74 (27.72%), 67 (25.09%), 43 (16.10%), 36 (13.48%), respectively. The mean number of hospital stay was 4.29 days with minimum and maximum stay of 2 and 9 days and antibiotics 364 (51.3%), were the most common class of drugs that was associated with drug related problems. Being a neonate, hospital stay greater than or equal to seven days, and the presence of co-morbidity were the predictors of the medication related problems [1]. Factors that contributes for occurrence of drug therapy problems in pediatric patients involve such as poly-pharmacy, certain infectious & parasitic diseases, type of admission, length of hospital stay,& number of disease condition, & also includes, missing information, poor patients knowledge of the drug use, administration of drug with a narrow therapeutic range, poly-morbidity, hepatic [21]. The frequently used term explanation and definition of seven types of drug therapy problems are discussed in turn below. Hospital stay can be described as the time gap will be spent by the patient in the hospital from his/her admission till his/her discharge (discharge date will be determined by looking his/ her discharge date from his/her medical chart) [22]. Medication error is characterized as any preventable event that may cause or lead to inappropriate medication use or patient harm while the medication is in the control of the health care professional, patient or consumer [23]. Pharmaceutical care can be defined as the process through which a pharmacist cooperates with a patient and other professionals in designing, implementing and monitoring a therapeutic plan that will produce specific therapeutic outcomes for the patient [24]. Poly Pharmacy can be explained as the daily consumption of 5 or more medications [25]. Needs additional drug could occur when a patient needs more medication to treat their condition or Preventive therapy is needed to reduce the risk of developing a new condition or a medical condition requires combination therapy to achieve synergism or additive effect [26]. Unnecessary drug therapy can be characterized as no valid medication indication for the drug at this time or this could occur when the patient has been placed on too many medications for their condition and the drug is simply not needed [27]. Ineffective drug therapy is defined as the drug is not the most effective one for the medical problem or when a patient is given medication that does not treat the patient's condition or the condition is refractory to the drug product being used or the dosage form is inappropriate [28]. Dosage too high can be described as the dose is too high for the patient or the dosing frequency is too short or the duration of therapy is too long or a drug interaction causes a toxic reaction to the drug product or the dose was administered too rapidly & this could occur when a patient is given medication that is too strong & is causing detrimental effects or is simply not necessary [29]. Noncompliance could occur when a patient chooses not to or forgets to take a medication or the patient does not understand the instructions or the patient prefers not to take the medication or drug product is too expensive or the patient cannot swallow or self-administer the medication properly [30]. Adverse drug reaction can be explained as the drug product causes an undesirable reaction that is not dose-related or this could when a patient has an allergic response to a medication or safer drug is needed because of patient risk factor or a drug interaction causes an undesirable reaction [31]. Dosage too low can be characterized as the dose is too low to produce the desired outcome or the dosage interval is too infrequent or this could occur when a patient is given medication that is not strong enough to get beneficial or therapeutic effects & a drug interaction reduces the amount of active drug available or the duration of therapy is too short [32].

CONCLUSION

The term pediatrics can be derived from the Greek word 'pediopais, which means a child or donating relationship to a child (pedio), 'iatrike' meaning surgery or medicine and 'ics', suffix of a subject of science. The pediatric medication use process is complex & error prone because of the multiple steps needed in calculating, verifying, preparing, administering doses. These factors make the pediatrics to be at high risk for drug related problem. Drug-related problems are classified into seven categories, which are unnecessary drug therapy, needs additional drug, ineffective drug, dose too low, dose too high, adverse drug reaction, and noncompliance. Drug therapy problems are correlated with prolonged length of stay and elevated economic burden and result in an almost 2-fold enhanced risk of death. Drug therapy problems are the dominant reasons for admission. Noncompliance could occur when a patient chooses not to or forgets to take a medication or the patient does not understand the instructions or the patient prefers not to take the medication or drug product is too expensive or the patient cannot swallow or self-administer the medication properly. Adverse drug reaction can be explained as the drug product causes an undesirable reaction that is not dose-related or this could when a patient has an allergic response to a medication or safer drug is needed because of patient risk factor or a drug interaction causes an undesirable reaction.

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DATA SOURCES

Sources searched include Google Scholar, Research Gate, PubMed, NCBI, NDSS, PMID, PMCID, and Cochrane database. Search terms included: drug therapy problems in pediatrics

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