



A PROSPECTIVE OBSERVATIONAL STUDY ON WEIGHT BASED DOSING IN PAEDIATRIC PATIENTS IN A QUATERNARY CARE HOSPITAL

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ABSTRACT

Background: Special care should be given to high risk patients like children and elderly according to JCI standard COP.3. According to JCI Standard MMU.5.1, medication prescriptions or orders are reviewed for appropriateness. Weight based dosing is a critical elements of an appropriateness review.

Introduction: Pediatric patients are at a higher risk of experiencing medication errors than adults because of the need for a dose calculation. According to JCI Standard MMU.5.1, medication prescriptions or orders are reviewed for appropriateness and weight based dosing is a critical element of an appropriateness review.

Methodology: A prospective observational study on 53 pediatric patients was carried out in pediatric ward and ICU at Fortis Memorial Research Institute, Gurgaon from March 1 up to April 15, 2017.

Result: Out of 365 drugs prescribed, 119 were antimicrobials and 246 were other drugs. In 119 antimicrobial prescriptions, 96 were based on patient body weight and 23 were not weight based. In that 15 prescriptions were on overdose and 8 on under-dose. Overdose prescription mostly seen in Clindamycin and under-dose in Amikacin. In neurology department all the prescriptions are based on weight.

Conclusion: Lack of standard dosing guidelines can cause medication errors in pediatric patients. Proper weight estimation and documentation should be mandatory.

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INTRODUCTION

Pediatric population by itself is a spectrum of different physiologies with significant changes in pharmacodynamics and pharmacokinetics. Body weight is considered as the gold-standard for drug prescribing, and is recommended by the World Health Organization. WHO states that “The ideal children’s medicine is one that suits the age, physiological condition, and body weight of the child taking them and is available in a flexible solid.” Promotion of appropriate, rational and safe drugs in children is the need of the hour globally. Irrational use of drugs has led to adverse drug reactions and drug resistance to the usual pathogens and infections by unusual organisms. There is a spurt in drug resistance due to the overzealous prescription of antimicrobials not indicated, such as, using inadequate dosage or duration of drug regime leading to partially treated infections, using the incorrect antimicrobial due to ignorance of causative organism, and finally using indigenous, irrational combinations⁽¹⁾.

Medication errors that can cause harm were three times more likely in children than in the adult population⁽²⁾. Sub-therapeutic dosing or underdosing of antimicrobials has been described as a frequent problem in the pediatric population as many physicians do not consider weight when they calculate the dose or they simply calculate the pediatric dose as one half of the adult dosing. Optimizing antibiotic dosing is essential to avoid treatment failure and minimize the emergence of resistant organisms. *Joint Commission International (JCI) Accreditation Standards for Hospitals* (5th edition) explained that the hospital policy should specify the weight-based dosing strategy in the particular circumstance (pediatric patients, elderly patients)⁽³⁾.

Inappropriate weight estimates and omission of weight documentation could potentially contribute to medication dosing errors. Prescribing medication without considering the weight of the patient may result in drug overdose or under dose. Noncompliance, untreated condition, improper documentation of body weight in case file and inadequate weight based dosing by physician may lead to under-dosing. This may contribute polypharmacy, tolerance, poor patient outcome, antibiotic resistance, increased length of hospital

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stay and cost of treatment. Overdose can cause adverse drug reactions and increased cost of treatment^{(4),(5),(6)}.

Aim and Objective

- To assess the compliance of prescribed dose with standard dose of antimicrobials.
- To monitor the weight based dosing in paediatrics.
- To evaluate whether the prescribed dose is overdose or under-dose.

MATERIALS AND METHOD

A prospective observational study on weight based dosing in pediatric patients was carried out in pediatric ward and ICU at Fortis Memorial Research Institute, Gurgaon from March 1 up to April 15, 2017. All pediatric patients receiving antimicrobials of age less than 15 years were included in the study. 53 patient case files were analyzed and patient demographic details (age, sex, height, weight, BMI), diagnosis, antimicrobial details like name, prescribed dose, frequency and route of administration were recorded in data collection form. Compare the prescribed dose with its standard dose and assess whether it is prescribed based on body weight. If not, analyze whether it is overdose or under-dose.

RESULTS

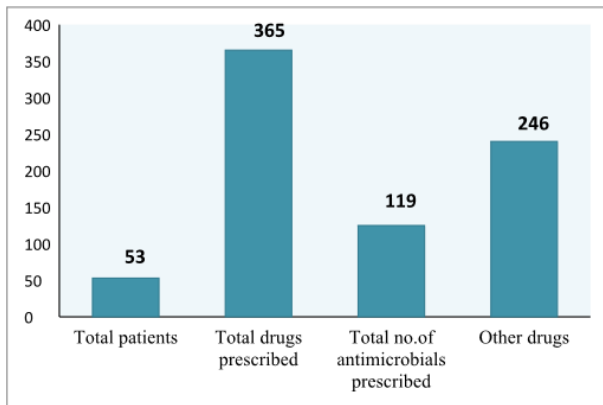


Fig.1 Drugs Prescribed

Altogether 53 pediatric patients were enrolled in the study. Out of 365 drugs prescribed, 119 were antimicrobials and 246 were other drugs (Fig.1). The average number of drugs per prescription is 7.

Table I Evaluation of antimicrobial prescription

Total number of antimicrobials prescribed	Prescribed based on body weight	Not prescribed based on weight	Overdose	Under-dose
119	96	23	15	8

Out of 119 antimicrobial prescriptions, 96 were based on patient body weight and 23 were not weight based. In that 15 prescriptions were on overdose and 8 on under-dose (Tab I).

Out of 23 antimicrobial prescription that prescribed not based on weight, 15 prescriptions were in overdose. In that 20% Clindamycin (3), 13% Azithromycin (2), Meropenem(2), Cefoperazone/sulbactam(2) and Ceftriaxone(2), 7% Metronidazole(1), Piperacillin/tazobactam(1), Amoxicillin/clavulanic acid(1) and Nitrofurantoin(1) were present (Fig.2).

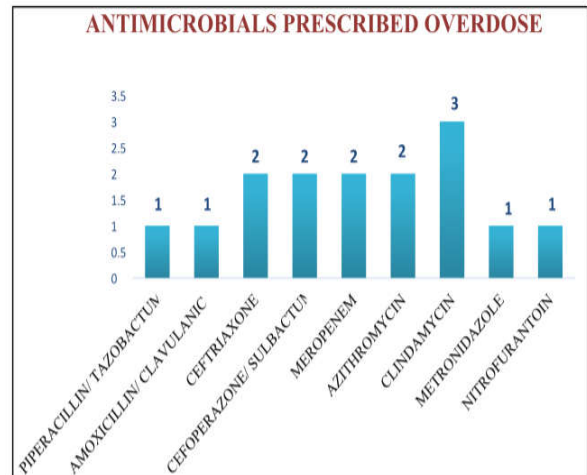


Fig. 2 Antimicrobials prescribed overdose.

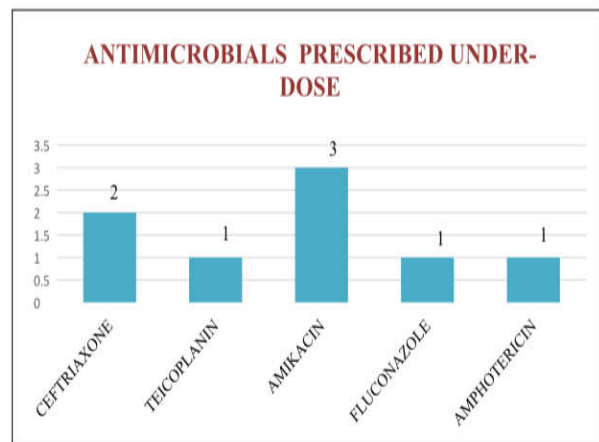


Fig. 3 Antimicrobials prescribed underdose.

Out of 23 antimicrobial prescription that prescribed not based on weight, 8 prescriptions are in under-dose. In that 37% Amikacin(3), 25% Ceftriaxone(2), 13% Amphotericin(1), 13% Fluconazole(1) and 12% Teicoplanin(1) were present (Fig.3).

Table II Antimicrobials in different departments.

Department	Number of Antimicrobials prescribed	Prescribed based on body weight	Prescribed not based on body weight
Pediatrics	96	79	17
Neurology	9	9	0
Oncology	9	6	3
Dental	2	1	1
Gastroenterology	3	1	2

Out of 119 antimicrobial prescription, 96 were from pediatric department. In that 79 were prescribed based on weight and 17 were not. All the prescriptions are weight based in Neurology department (Table II)

DISCUSSION

The weight based dosing can be done by using total body weight and standard recommended dose. 53 patients were enrolled in the study. Out of 365 prescriptions, 119 were antimicrobial prescriptions. 96 were prescribed based on body weight and 23 were not weight based. In that 15 are in overdose and 8 are in under-dose. The average number of

drugs per prescription is 7. Overdosing of antimicrobials may cause ADR to occur and thereby increased cost of treatment. In our study we found that 3 clindamycin prescriptions were on overdose. Along that Azithromycin (2), Meropenem (2), Cefoperazone/sulbactam(2) and Ceftriaxone(2), Metronidazole (1), Piperacillin/tazobactam(1), Amoxicillin/clavulanic acid(1) and Nitrofurantoin(1) were also found. In case of under-dose prescription, Amikacin was found to be more in number. Under-dosing may leads to polypharmacy, tolerance, poor patient outcome, antibiotic resistance, increased length of hospital stay and cost of treatment. In neurology department all the prescriptions are based on weight.

CONCLUSION

From this study we can conclude that under-dosing and overdosing are the main problems facing in antimicrobial prescriptions. Proper weight estimation and documentation of all paediatric patients should be mandatory. Encourage to mention the weight of patient in the medication chart and this will help the physician to prescribe based on weight. Different tools are now using for dosing and there is a lack of standard dosing guideline was found. A standard dosing guideline for pediatric patients which include the doses recommended for different weight groups and condition of patient is recommended. Provide education for doctors regarding importance of following standard dosing guidelines and appropriate weight based dosing.

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