

**Original Article**

**DRUG UTILIZATION PATTERN IN PAEDIATRIC PATIENTS IN A SECONDARY CARE HOSPITAL**

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**ABSTRACT**

**Objective:** The study was carried out to generate research on drug utilization pattern in paediatric patients in government headquarters hospital, Tiruppur, Tamilnadu, India using world health organization (WHO) and international network for rational use of drugs (INRUD) core indicator.

**Methods:** The core prescribing indicators of the world health organization was used to assess the appropriate use of drugs. Index of rational drug prescribing (IRDP) developed by Zhang and Zhi was also used to find out the performance of a health care system in terms of drug utilization.

**Results:** Out of 859 drugs in 200 cases the highest prescribed drug class is antibiotics 304(35.39%) and the majority of drugs were administered in injectable form 412(47.94%). It was analysed that a majority of prescriptions 117(58.5%) were discharged in between 4-7 d. 161(80.5%) patients were dismissed after completion of treatment. On analysing world health organization (WHO) prescribing core indicators, the average number of drugs per prescription was 4.29 which is higher than double the average number (i.e., 2). This indicates poly-pharmacy practice. 97.78% of drugs were prescribed were the generic name and percentage of encounters with antibiotic prescribed was 90.5% which is thrice greater than world health organization (WHO) standard <30%. Prescribing of injections is not within the world health organization (WHO) recommended range <20% and it was far higher showing 97.5% which is essential for paediatric inpatients. The prescribing practice in paediatric ward is in complete adherence to national essential drug list (EDL) or formulary. The mean value of the index of rational drug prescribing (IRDP) obtained was 3.09 which is very similar to that of optimal value world health organization (WHO).

**Conclusion:** Prescription by generic name, prescribing drugs from essential drug list (EDL) and free government supply are encouraging findings in this hospital. The result shows poly-pharmacy and overuse of antibiotics are the areas to be concerned. The better clinical outcome shows rational prescribing is practised well.

**Keywords:** Core indicators, an International network for rational use of drugs (INRUD), Index of Rational Drug Prescribing (IRDP), Poly-pharmacy, Essential drug list (EDL), Antibiotics

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**INTRODUCTION**

World Health Organization (WHO) defined drug utilization research as 'studies on the marketing, distribution, prescription and the use of drugs in a society, with special emphasis on the resulting medical, social and economic consequences [1, 2]. Drug utilization studies are important in order to evaluate the appropriate and judicious use of drug therapy [3]. Appropriate drug utilization studies are properly utilized to evaluate the efficacy, safety, convenience and economic aspects at all levels in the chain of drug use.

Various drug utilization reviews have been conducted all over the world but only limited studies are conducted addressing the drug use pattern in paediatric population especially in India [4]. 20 to 25% of total world population comprise paediatric, which are more prone to acute and chronic infectious disease. The incomplete development of paediatric physiological conditions and their rapid growth and development need some accurate diagnosis and evidence-based medical treatment [5].

Infants and children are the most vulnerable population groups. They are particularly sensitive to contract illness and harmful effects of drugs because of their difference in pharmacokinetics and pharmacodynamics to that of adults [6]. Also, drug use in paediatric is not extensively researched and the dosage form of licensed drugs is limited [7].

Monitoring the safety of medical use in children is of paramount importance because only a limited data can be generated through clinical trials of drug development [8]. Infants and children constitute a large population in a developing country like India. Promotion of appropriate and safe drugs for children is hour globally essential [9].

Doses for children often derived from adult dosages after adjusting the body weight. But even within the paediatric population especially preterm neonate doses varies from the calculated weight-adjusted doses [10]. There are likewise various drug-related problems in children such as heterogeneous nature of paediatric population, off-label and unlicensed drug use, lack of familiarity between adult and paediatric guidelines, inability to swallow solid dosage form etc [11]. Prescription auditing, a type of vigilance activity, which is beneficial in clinical practice for reducing the burden of disease and to ensure irrational prescribing is hence indispensable [9].

**MATERIALS AND METHODS**

**Study site**

The study was conducted in the department of child health on Government district headquarters Hospital, Tiruppur, a 500 bedded hospital.

**Study design**

This is a prospective observational study and was carried out in the department of child health unit of Government Headquarters Hospital, Tiruppur.

**Study period**

The study was undertaken during a period of 6 mo from March 2018 to August 2018.

**Study population**

The study population includes the patients of Govt. Headquarters Hospital, Tiruppur. A total of 200 numbers of admitted cases were chosen from paediatric ward.

**Ethical approval**

Research protocol, data collection form and informed consent form (Tamil/English) was approved by the Institutional Human Ethics Committee (IHEC) of the Government Headquarters Hospital, Tiruppur, Tamilnadu (IHEC NO: IHEC/GH-Tiruppur/ECP/PD-002). The approval was obtained before the study was commenced.

**Patient selection**

Patient's selection was based on the inclusion criteria. The inclusion criteria included newborn of 1 mo to 12 y, considered both male and female patients who stayed in the hospital for more than 24 h. Exclusion criteria included all adult patients, outpatients, intensive care unit emergency patients, immunocompromised patients and the patients not willing to participate in the study.

**Prescribing core indicators**

The prescribing core indicators of WHO was an average number of medicines per encounter, percentage of medicines prescribed by generic name, percentage of encounters with an antibiotic prescribed, percentage of encounters with an injection prescribed and percentage of medicines prescribed from the essential drug list formulary.

**Index of rational drug prescribing (IRDP)** was also performed.

**Statistical analysis**

Data were entered and analysed using Microsoft Excel (windows 8; version 2007). Graphical representation is used for visual interpretation of the analysed data.

**RESULTS**

Out of 200 prescriptions analyzed, a total of 859 drugs were prescribed.

**Table 1: Age-wise classification**

Age group	Frequency	Percentage (%)
1-23 Mo	58	29
2-11 Y	134	67
12 Y	8	4

**Table 2: Gender wise distribution**

Age	% of male	% of female
1-23 Mo	29	29
2-11 Y	65	69
12 Y	6	2

**Table 3: Distribution of diseases in paediatric patients**

Distribution of diseases	No. of diseases	Percentage (%)
Seizure disorder	27	13.5
GI disorder	35	17.5
Fever	54	27
Respiratory disease	46	23
UTI	4	2
Anaemia/Malnutrition	4	2
Poison cases	14	7
Genetic disorders	2	1
Autoimmune disease	1	0.5
Others	13	6.5

**Table 4: Medicines prescribed to paediatric patients**

Medicines category	No. of drugs	Percentage (%)
Anti-asthmatics	57	6.64
Anti allergics	43	5.0
NSAIDS	159	18.5
Anti-emetics	41	4.77
Corticosteroids	5	0.58
Anti-epileptics	42	4.88
Antiulcer agents	82	9.54
Antispasmodics	4	0.47
Vaccines	3	0.34
Anti-amoebic agents	14	1.63
Vitamin supplements	10	1.16
Antibiotics	304	35.39
Others	95	11.1

**Table 5: Antibiotics prescribed to paediatrics**

Antibiotic classification	No. of antibiotics	Percentage (%)
Aminoglycosides	83	27
Cephalosporins	167	55
Penicillin	22	7
Penicillin combinations	11	3
Macrolides	15	5
Tetracyclines	2	1
Sulphonamide combinations	2	1
Carbapenem	2	1

**Table 6: Route of administration**

ROA	Sub-class	Frequency	Percentage (%)
Injectables	Intravenous	409	47.6
	Intramuscular	2	0.23
	Subcutaneous	1	0.11
Oral	-	384	44.7
Inhale	-	62	7.21
Topical	-	1	0.11

**Table 7: Drug-drug interaction per encounter**

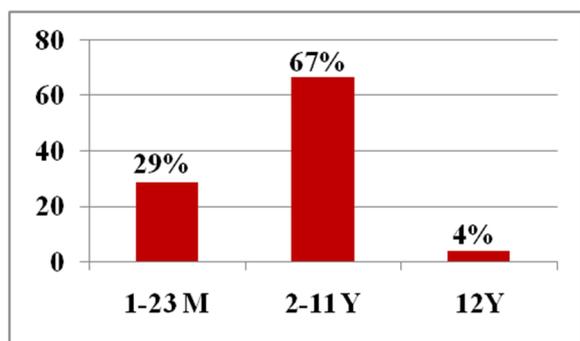
Drug interaction	No. of prescriptions	Percentage (%)
Cases with DI	126	63
Cases without DI	74	37

**Table 8: Duration of hospital stay**

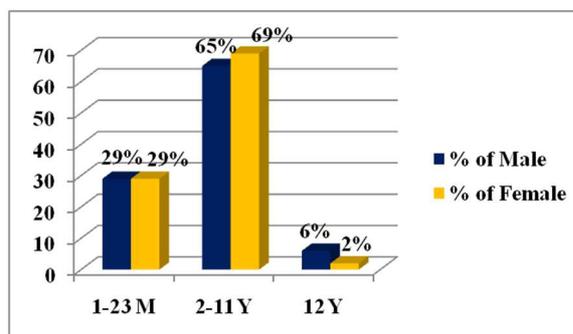
Duration	No. of prescriptions	Percentage (%)
1-3 d	58	29
4-7 d	117	58.5
8-11 d	22	11
12 or above	3	1.5

**Table 9: Patient outcomes**

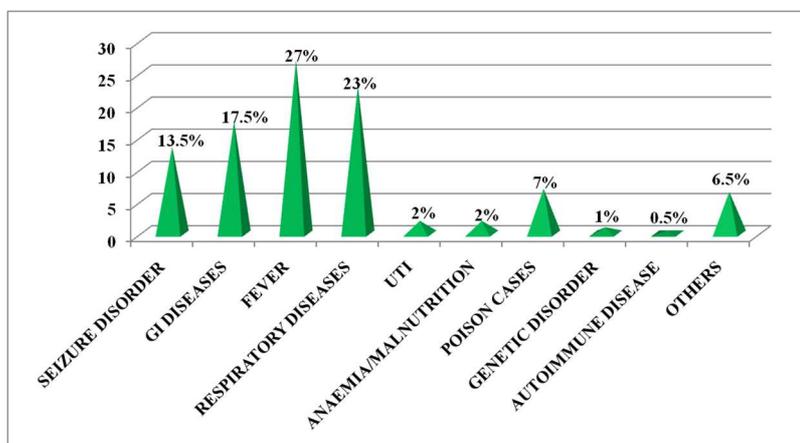
Patient outcomes	No. of patients	Percentage (%)
Discharged	161	80.5
Referred	8	4
Discharged at request	21	10.5
Absconded/leave against medical advice (LAMA)	10	0.5



**Fig. 1: Age wise classification**



**Fig. 2: Gender wise distribution**



**Fig. 3: Distribution of diseases**

Table 10: Assessment of prescribing indicators

Prescribing indicators assessed	Average/percentage	WHO standard
Average number of drugs per encounter	4.29	≤2
Percentage of drugs prescribed by generic name	97.78%	100%
Percentage of encounters with antibiotics	90.5%	<30%
Percentage of encounters with injections	97.5%	<20%
Percentage of drugs from essential drug list	100%	100%

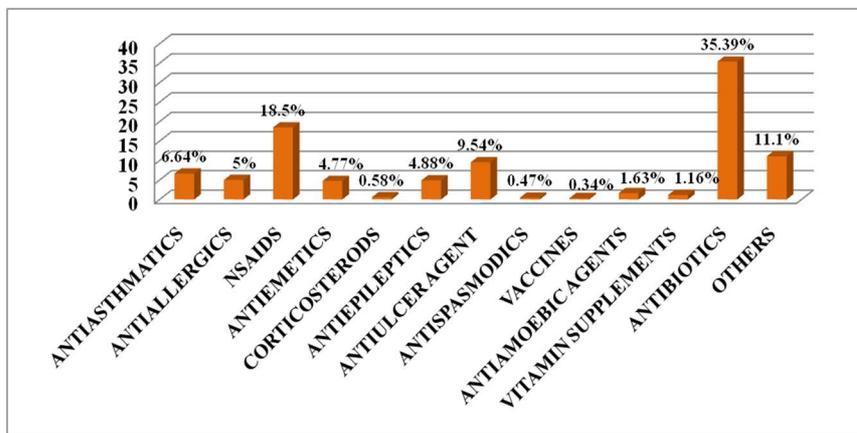


Fig. 4: Medicines prescribed to paediatrics

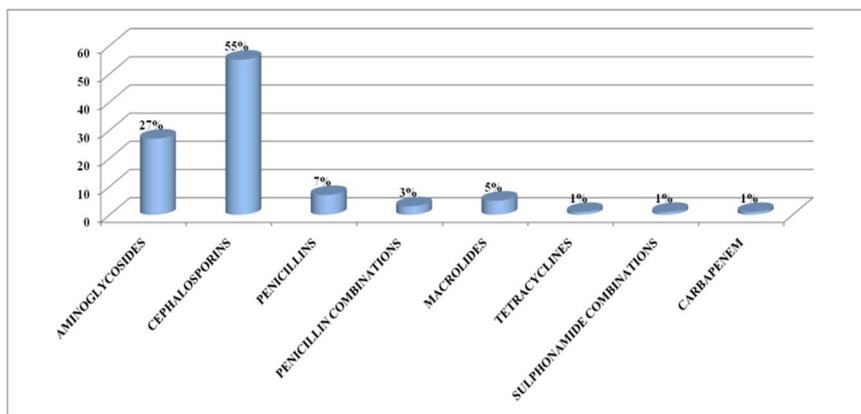


Fig. 5: Antibiotics prescribed

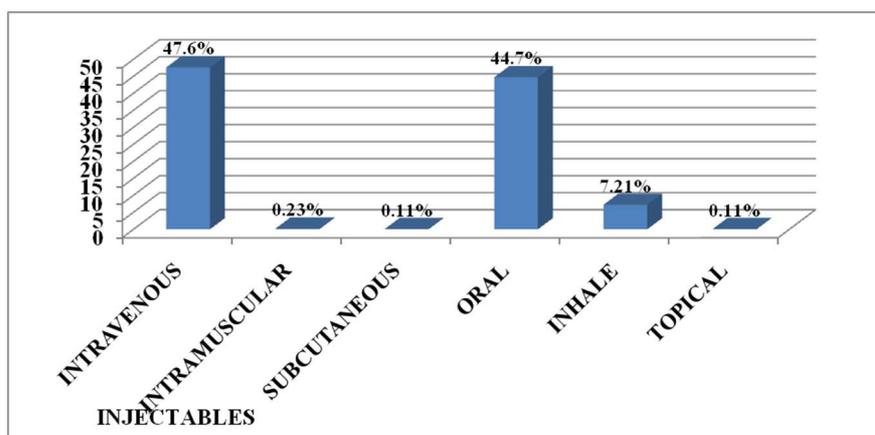


Fig. 6: Route of administration

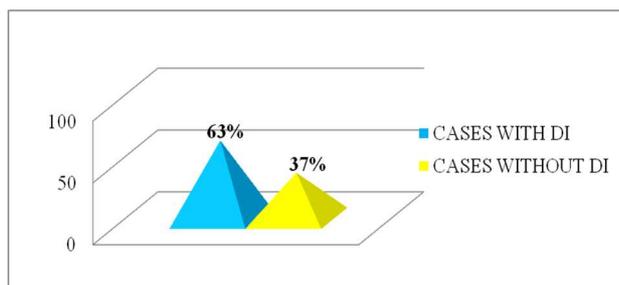


Fig. 7: Drug-drug interaction

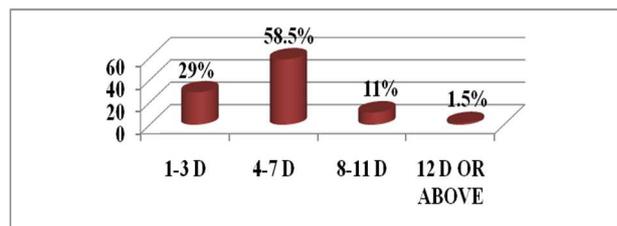


Fig. 8: Duration of hospital stay

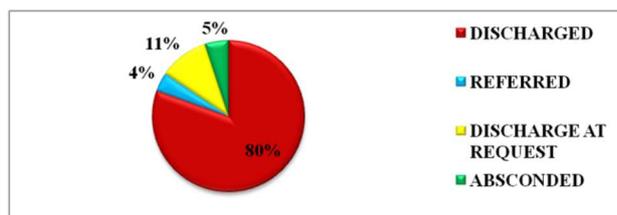


Fig. 9: Patient outcomes

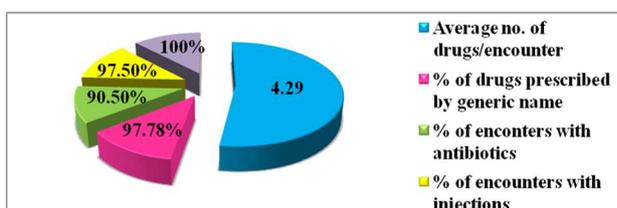


Fig. 10: WHO prescribing indicators

## DISCUSSION

The paediatrics were considered to be infants and toddlers (1 mo-23 mo), children (2-11 y) and adolescents (12 y) according to age group and also by considering inclusion criteria of this study. Adolescent patients are 8 (4%), found to be significantly less when compared to infants and toddlers 58 (29%) and children 134 (67%).

The number of male patients (65%) and female patients (69%) was found to be significantly high in the age group 2-11 y (children) when compared to the number of male patients (6%) and female patients (2%) in the age group of 12 y (adolescents). An equal number of male and female patients (29%) was observed in the age group 1 mo — 23 mo (infants and toddlers).

The majority of paediatric patients were taken to the hospital due to fever and it was 54 (27%). Second comes respiratory disease 46 (23%). Gastrointestinal disorder was found to be 35 (17.5%) and then comes seizure disorder 27 (13.5%). Paediatric patients admitted with poisoning cases were 14 (7%) and with genetic disorder is 1 (0.5%). Paediatrics admitted due to urinary tract infection and anaemia/malnutrition were found to be equal 4 (2%).

Only 1 (0.5%) is admitted due to autoimmune disease and 13 (6.5%) belong to other diseases. An earlier study reported that respiratory system disease (25.6%), was most commonly seen, followed by fever (19.2%), GIT (18.4%) and hepatitis (8.8%) disorders [6].

The highest prescribed drug class is antibiotics 304 (35.39%). Second commonly prescribed drugs belong to nonsteroidal anti-inflammatory drugs (NSAIDs) 159 (18.5%). 57 (6.64%) number of drugs prescribed are anti-asthmatics, 43 (5%) are anti-allergic, 41 (4.77%) are antiemetic, 5 (0.58%) are corticosteroids, 42 (4.88%) number of drugs belong to anti-epileptic, 82 (9.54%) are anti-ulcer agents, 14 (1.63%) are anti-amoebic agents, 10 (1.16%) are vitamin supplements and 4 (0.47%) are antispasmodic. The least prescribed drugs are vaccines 3 (0.34%). The rest of drugs 95 (11.1%) are categorized as others. A previous study reported that analgesic drugs were the most frequently prescribed therapeutic class of drugs (26.9%) [12].

Among antibiotics, cephalosporin 167(55%) are the most prescribed and then comes aminoglycosides 83 (27%). 22 (7%) number of drugs is penicillin, 15 (5%) are macrolides and 11 (3%) are penicillin combinations. Equal number of drugs 2 (1%) are prescribed as tetracyclines, carbapenem and sulphonamide combinations. In a study, it was found that the most frequently prescribed group of antibacterial were cephalosporin (62%) followed by penicillin [13].

The majority of drugs were administered in injectable form 412 (47.94%), in which the intravenous route is most commonly administered 409 (47.6%). Only 2 (0.23%) of drugs are administered via intramuscular route and 1 (0.11%) is given via subcutaneous route. Oral route is contributing around 384 (44.7%). Inhalation route contributes around 62 (7.21%) and topical was only 1 (0.11%). In another study it was found that 85.6% of medications are oral medications, 4.4% of cases consist of inhalational drugs, 8.6% of cases are topical drugs and 1.3% are suppositories or pessaries [14].

27 (13.5%) number of prescriptions was found to be there with drug duplication and the remaining 173 (86.5%) were identified as cases without drug duplication as per drugs.com website. 126 (63%) prescriptions are cases with drug interaction and 73 (37%) number of prescriptions are found to be without drug interactions. 141 (72.31) number of moderate drug interactions and 54(27.69%) number of minor drug interactions were found by analysing the prescription. Major drug interactions are not reported in case drug-food interaction 184 (92%) prescriptions have no drug-food interactions and only 16 (8%) number of prescriptions have reported drug-food interactions. Utilizing drugs.com website it was determined that 155 (77.5%) numbers are cases without contraindications and 45 (22.5%) are cases with contraindications.

While considering the comorbidity 69 (34.5%) prescriptions out of 200 are having 1 comorbidity, 9(4.5%) are prescriptions with 2 co morbidity and only 2 (1%) are prescriptions with  $\geq 3$  comorbidity. Majority of the prescriptions 117 (58.5%) show a duration of hospital stay for 4-7 d, 58 (29%) number of patients stayed in the hospital for 1-3 d, 22 (11%) number of patients were stayed for a period of 8-11 d and 3 (1.5%) patients were stayed for 12 or more days. 161 (80.5%) number of patients were discharged after completion of treatment and 8 (4%) were referred for better treatment. 21 (10.5%) were discharged at the request and 10 (5%) were absconded during the study.

An average number of drugs per prescription were 4.29 which is greater than double the average number (i.e., 2) recommended by the world health organisation (WHO). The increased value indicates the poly-pharmacy practice in this hospital. However, this cannot be considered irrational poly-pharmacy practice as there is need of empirical therapy till definitive diagnosis becomes clear and secondly for management of acute-life threatening conditions. Most of the patients require two or more drugs and here 52 (26%) patients have received 5 drugs during the hospital stay, which is the highest.

The percentage of drugs prescribed by generic (international non-proprietary) name is 97.78 in this study but according to WHO

standards the optimal value is 100%. By using the generic name in the prescriptions, the chance of duplication of drug products can be avoided. Example: the prescribing of albuterol and duolin (levalbuterol/ipratropium) at a time.

Percentage of encounters with an antibiotic prescribed was 90.5% which is thrice greater than WHO standard <30%. This indicates an increased use of antibiotics in paediatric population. However, the increased use of antibiotics in paediatrics is caused by severe infections, prophylactic treatment for infections and for doubtful secondary bacterial infections in viral diseases. The lack of proper or definitive diagnosis is also a reason for increased antibiotic use.

Prescribing of injections is not within the WHO recommended range <20% and it was far higher showing 97.5%. However, this increased prescribing of injection is not irrational as the recommended range is for outpatients. Due to the severity of illness, unavailability of oral and other dosage forms for a particular drug and to increase medication adherence injection formulation may be prescribed more. Nevertheless, the overuse of injections may lead to economic cost and health hazards. In a previous study it was found that average number of drugs per prescription as 4 and percentage of drugs prescribed by generic name as 45%. The percentage of antibiotics prescribed was 33% and percentage of encounters with an injection in that study was 30.6% [6].

In this study, it was found that the prescribing practice in paediatric ward is in complete adherence to national essential drug list/formulary.

The mean value of Index of Rational Drug Prescribing (IRDP) was 3.09 which are very close to WHO optimal value of 5. The optimal index for all indicators was fixed at 1. Values closer to 1 indicates the rational drug use.

#### CONCLUSION

This study demonstrates that prescription by generic name and prescribing drugs from EDL and free government supply of health care is encouraging findings. Poly-pharmacy and overuse of antibiotics are the areas to worry. Prescribing antibiotics to paediatric patients based on empirical therapy without culture sensitive test may lead to antibiotic resistance and health issues in the future.

It is rational to choose the intravenous route in the paediatric patient with age less than 14, who are admitted and who are in need of emergency care. Hence, prescribing of injections is not within the WHO recommend range <20%.

Sticking to state standard treatment guidelines in the light of WHO/INRUD for paediatrics and awareness among paediatricians will promote more rational prescribing.

#### LIMITATION OF THE STUDY

The study was conducted in a hospital in a rural area and only 200 paediatrics have participated in the study. As a result, we could not have a large sample size which could increase our work significance.

#### AUTHORS CONTRIBUTIONS

R. Senthilselvi and V. Ganesan designed and conceived the study. Priya Visuvasam and R. Senthilselvi analyzed, interpreted the data and drafted and revised the article while Linta Sathyan and M. Boopana participated in data collection and article revision.

#### CONFLICTS OF INTERESTS

All authors have none to declare

#### REFERENCES

1. World Health Organization. Introduction to drug utilization research. Geneva: WHO; 2003.
2. World Health Organization. The rational use of drugs. Report of Conference of Experts: WHO; 1985.
3. Meena A, Kumar V, Agarwal A. Evaluation of drug utilization pattern in indoor patients of medicine department at tertiary care teaching hospital in Southern Rajasthan. *Int J Pharm Sci Res* 2016;7:3835-40.
4. Kumar MA, Ram KT, Ramasamy C. Cross-sectional prospective study on drug utilization in an outpatient paediatric department of tertiary care teaching hospital. *Global J Pharmacol* 2013;7:99-102.
5. Ramanath KV, Balaji BV. Study of outpatient prescription pattern of antibiotics in paediatric populations of two hospitals. *Arch Pharm Pract* 2013;4:21-7.
6. Sireesha G, Thomas JC, Patil PB, Dodayya H. A prospective study on medication prescribing pattern for paediatrics in a tertiary care teaching hospital. *World J Pharm Pharm Sci* 2016;5:654-66.
7. Ashraf H, Handa S, Khan NA. Prescribing pattern of drugs in outpatient department of a childcare centre in Moradabad city. *Int J Pharm Sci Rev Res* 2010;3:1-5.
8. The importance of pharmacovigilance; safety monitoring of medicinal products. Geneva, World Health Organization; 2002.
9. Abidi A, Gupta S, Kansal S. Prescription auditing and drug utilization pattern in tertiary care teaching hospital in western UP. *Int J Basic Clin Pharmacol* 2012;1:184-90.
10. Kearns GL, Abdel-Rahman SM, Alander SW, Blowey DL, Leeder JS, Kauffman RE. Developmental pharmacology—drug disposition, action, and therapy in infants and children. *N Engl J Med* 2003;349:1157–67.
11. World Health Organization. Promoting Safety of Medicines for Children. Geneva WHO; 2007.
12. Santos LD, Heineck I. Drug utilization study in paediatric prescription of a university hospital in southern Brazil: off-label, unlicensed and high-alert medications. *Farm Hosp* 2012;36:180-6.
13. Gupta A, Maheshwari P, Dokania KK, Tambe JJ. Drug utilization pattern in sick paediatric patients: analysis for rationality and other aspects. *Int J Basic Clin Pharmacol* 2017;6:2815-21.
14. Murthy NV, Faisal EM, Kumar RS. Assessment of drug prescription pattern in paediatric patients. *J Pharm Sci Res* 2017;9:81-4.