Assessment of drug utilization in hospitalized children at a tertiary care teaching hospital

Vishwanath M.[1], Narayana Reddy S.[1] and Sahana Devadas[2]

[1]*Department of Pharmacology, , Bangalore Medical College and Research Institute, KR Road, Fort, Bangalore, Karnataka, India*
[2]*Department of Paediatrics, Bangalore Medical College and Research Institute, KR Road, Fort, Bangalore, Karnataka, India*

_____

ABSTRACT

The present study was done to analyze drug utilization among Paediatric inpatients and to assess WHO prescribing indicators. A prospective, observational study was conducted in Department of Paediatrics at Vanivilas Hospital, Bangalore, over a period of 1 year (June 2012 to May 2013). Data was collected from case records of inpatients and analyzed using descriptive statistics. A total of 150 inpatients aged 1-5 years were analyzed, which included 80 males and 70 females. Duration of hospitalization was 4-5 days. Respiratory diseases were accounted for 33.33%, followed by gastrointestinal disorders (19.33%). Among them majority of cases were pneumonia (56%) and acute gastroenteritis (82.75%). A total of 854 drugs were prescribed. Most commonly prescribed drug classes were antimicrobial agents (28.10%), drugs acting on respiratory system (12.18%) and NSAIDs (7.50%). Penicillins (28.75%) were most commonly prescribed AMAs, followed by aminoglycosides (23.33%) & cephalosporins (17.5%). Salbutamol aerosol (48.08%) was most commonly used bronchodilator followed by inhaled salbutamol + ipratropium (21.15%). Paracetamol (90.63%) was most extensively prescribed NSAID followed by ibuprofen + PCT (9.37%). 49.06% of drugs were injectables (IV/IM), 44.73% oral and 6.21% inhalational. Average number of drugs prescribed per encounter was 5.69 (±1.4). 62.30% of drugs were prescribed by their generic name. 86.42% were from EML. Polypharmacy and prescription by brand name were common. Use of 'generic name' in prescriptions needs to be promoted. Encouraging data on choice of drugs from EML can go a long way in creating awareness and application of essential drug (medicines) concept(s).

Key words: Drug utilization, Paediatrics, Rational drug use, prescribing indicators

_____

INTRODUCTION

Infants and children constitute a large proportion of the population in developing countries. They are especially vulnerable to contract illnesses and to the harmful effect of drugs due to differences in pharmacodynamics and pharmacokinetics [1]. Children constitute 40% of India's population. They suffer from frequent but usually non-serious illnesses. Most of these are self limiting and often treated not only inappropriately but also resorting to polypharmacy [2]. Acute respiratory infection, acute diarrhoea and viral fever are the common childhood illnesses accounting for the major proportion of paediatric visits [3]. Current child health scenario indicates that pneumonia and diarrhoea continue to result in high mortality among children less than 5 years of age [4]. Epidemiological evaluation of medicine use in elderly is now a highly visible topic, but drug prescribing studies in paediatric patients have been limited. The need for the safe and effective drugs for use in sick neonates, infants, children and adolescents requires the establishment of thoughtful drug therapy strategies [5].

Drug utilization research was defined by WHO in 1977 as 'the marketing, distribution, prescription, and use of drugs in a society, with special emphasis on the resulting medical, social and economic consequences' [6]. Periodic evaluation of drug utilization studies needs to be done to enable prescription of suitable medications, to improve the therapeutic benefits and reduce the adverse effects. Prescribing pattern studies are powerful exploratory tools to ascertain the role of drugs in the society. They seek to monitor, evaluate and if necessary suggest modifications in prescribing practices [7]. In a tertiary care centre, prescribing is expected to be judicious, appropriate, safe, effective and economical. The ultimate goal is to achieve rational and effective medical care, particularly in the economically developing countries. There is paucity of such studies at national and international level [8].

Considering these facts, this study was planned. The objectives of the study were to analyze drug utilization among Paediatric inpatients and to assess WHO prescribing indicators. Findings of this study are expected to provide relevant and useful feedback to paediatricians and general practitioners. The results of study will enable us to compare the data with other studies done at different levels and throw light on emerging trends. This may also aid the process of planning, supply and distribution of drugs in the hospital.

EXPERIMENTAL SECTION

This prospective, observational study was conducted in the Department of Paediatrics at Vanivilas Hospital, Bangalore, over a period of 1 year (June 2012 to May 2013). Case records of inpatients aged 1-5 years admitted to the paediatric ward were used as source of data. After taking an informed consent from the patient's attendant, data was collected in a study proforma from these case records. Study proforma contained demographic data, disease data and drug data of the patients. Data was analyzed by descriptive statistics namely total numbers, mean, standard deviation and percentage wherever applicable and WHO prescribing indicators assessed.

To assess the scope for improvement in rational drug use, World Health Organization (WHO) in 1993 has formulated a set of "Core drug use indicators" namely prescribing indicators, patient care indicators and facility indicators. Among them, for this study only "prescribing indicators" were taken which measure the performance of prescribers. The prescribing indicators are average number of drugs per encounter, percentage of drugs prescribed by generic name, percentage of encounters with an antibiotic prescribed, percentage of encounters with an injection prescribed and percentage of drugs prescribed from essential drug list or formulary.

RESULTS

A Total 150 inpatients aged 1-5 years admitted in the Paediatric ward were randomly selected for study. 80 (53.33%) patients were males while 70 (46.67%) females. Age distribution shows, most of the patients were between 1-2 years old with the percentage of 34.67, followed by 4-5 years (31.33%) and 2-3 years (25.33%) (Table 1).

Table 1: Demographic characteristics of patients

Gender	No. of patients (%)
Male	80 (53.33)
Female	70 (46.67)
Total	150
Age group (years)	**No. of patients (%)**
1-2	52 (34.67)
2-3	38 (25.33)
3-4	13 (8.67)
4-5	47 (31.33)
Total	150

Duration of hospitalization was 4-5 days. Respiratory system disease (33.33%) was most commonly seen, followed by GIT (19.33%) & CNS (16.67%) disorders. Among them Pneumonia, Acute GE and Seizure disorder were most commonly seen.

A total of 854 drugs were prescribed. Most commonly prescribed drug classes were antimicrobial agents (28.10%), drugs acting on respiratory system (12.18%) and NSAIDs (7.50%) (Table 2).

_____

Table 2: Commonly prescribed drug classes

Drug class	No. of drugs	Percentage (%)
Antimicrobial agents	240	28.10
Drugs acting on RS	104	12.18
NSAIDs	64	7.50
Drugs acting on GIT	54	6.32
Drugs acting on CVS + Renal system	48	5.63
Drugs acting on CNS	44	5.15
Other drugs	300	35.12
Total	854	100

Penicillins (28.75%) were the most commonly prescribed AMAs, followed by aminoglycosides (23.33%) & cephalosporins (17.5%). Salbutamol aerosol (48.08%) was the most commonly used bronchodilator followed by inhaled salbutamol + ipratropium (21.15%) (Table 3).

Table 3: Individual drug classes

| Antimicrobials	No. of drugs	Percentage (%)
Penicillins	69	28.75
Aminoglycosides	56	23.33
Cephalosporins	42	17.5
Macrolides	17	7.08
Anthelmintics	13	5.42
Tetracyclines	12	5
Glycopeptides	7	2.92
Antimalarials	7	2.92
Fluoroquinolones	6	2.5
Nitroimidazoles	6	2.5
Anti-TB drugs	5	2.08
Total	240	100
Drugs acting on RS	**No. of drugs**	**Percentage (%)**
Salbutamol	50	48.08
Salbutamol + ipratropium	22	21.15
Cough syrup	14	13.46
Ipratropium	6	5.77
Ambroxol	6	5.77
Budesonide	4	3.85
Terbutaline	2	1.92
Total	104	100

Paracetamol (90.63%) was most extensively prescribed NSAID followed by the combination of ibuprofen + PCT (9.37%) (Table 4).

Table 4: NSAIDS

Drugs	No. of drugs	Percentage (%)
Paracetamol	58	90.63
Ibuprofen + PCT	6	9.37
Total	64	100

Among GIT drugs, ranitidine (51.86%) was most commonly used followed by pantoprazole & ondansetron with 18.52% & 14.81% respectively (Figure 1).

Figure 1: Drugs acting on GIT
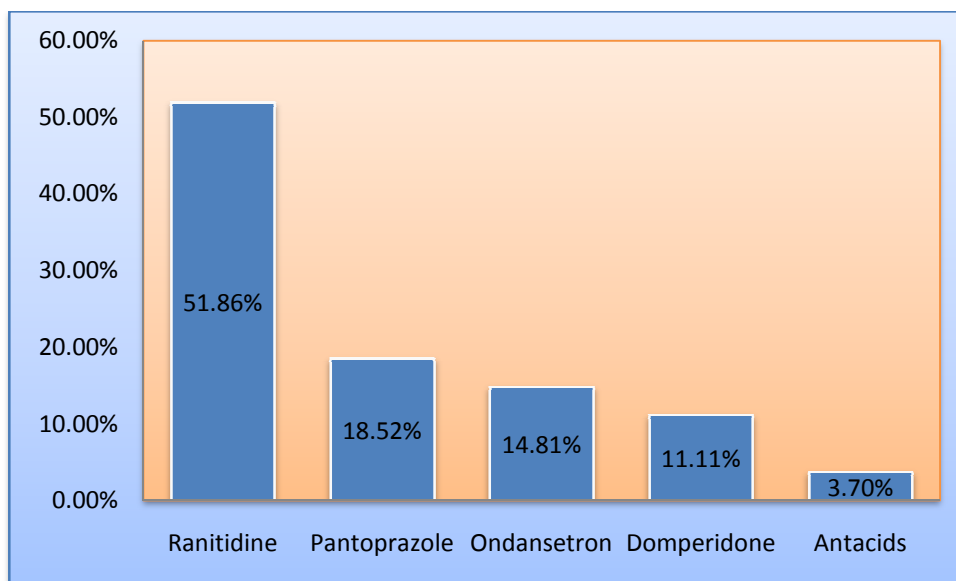
Among CNS drugs, phenytoin (31.82%) was most commonly prescribed followed by phenobarbitone and lorazepam, both with a percentage of 18.18 (Table 5).

Table 5: Drugs acting on CNS

Drugs	No. of drugs	Percentage (%)
Phenytoin	14	31.82
Phenobarbitone	8	18.18
Lorazepam	8	18.18
Clobazam	6	13.64
Sod.Valproate	4	9.10
Carbamazepine	2	4.54
Levetiracetam	2	4.54
Total	44	100

Out of 300 other group of drugs, 90 IV fluids & 50 vitamins (B-Complex) were prescribed, followed by 40 ORS, 30 calcium preparations, 28 zinc, 10 prednisolone and 8 mannitol (Figure 2).

Figure 2: Other drugs

_____
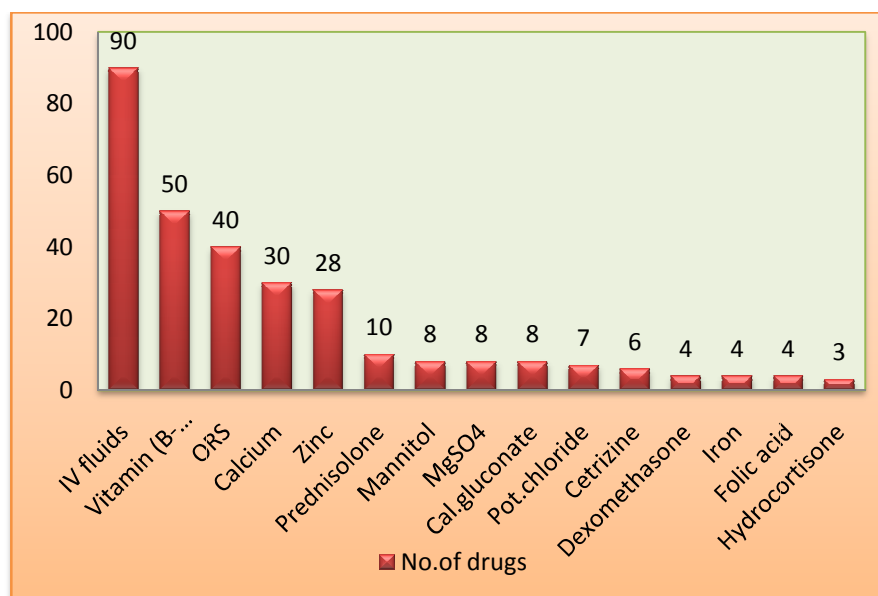
Analysis of routes of drug administration revealed, 49.06% of drugs were injectables (IV/IM), 44.73% oral and 6.21% inhalational (Table 6).

Table 6: Routes of drug administration

Route	No. of drugs	Percentage (%)
IV	410	48.00
ORAL	382	44.73
INHALATIONAL	53	6.21
IM	9	1.06
TOTAL	854	100

Assessment of *WHO prescribing indicators*: Average number of drugs per encounter = 5.69 ($\pm$1.4). Percentage of drugs prescribed by generic name = 62.30% (Figure 3). Percentage of encounters with an antibiotic prescribed = 28.10%. Percentage of encounters with an injection prescribed = 49.06%. Percentage of drugs prescribed from essential drugs list (essential medicines list, EML) = 86.42% (Figure 4).
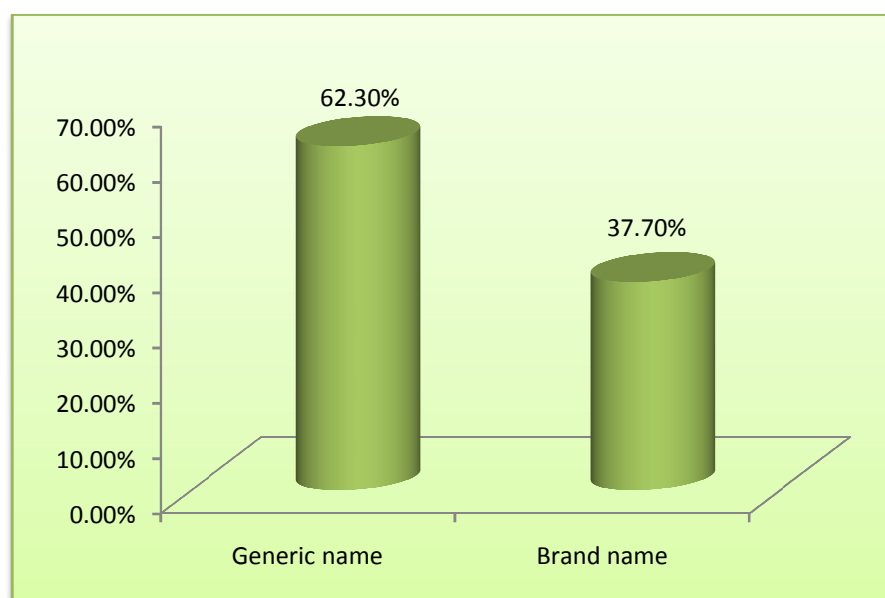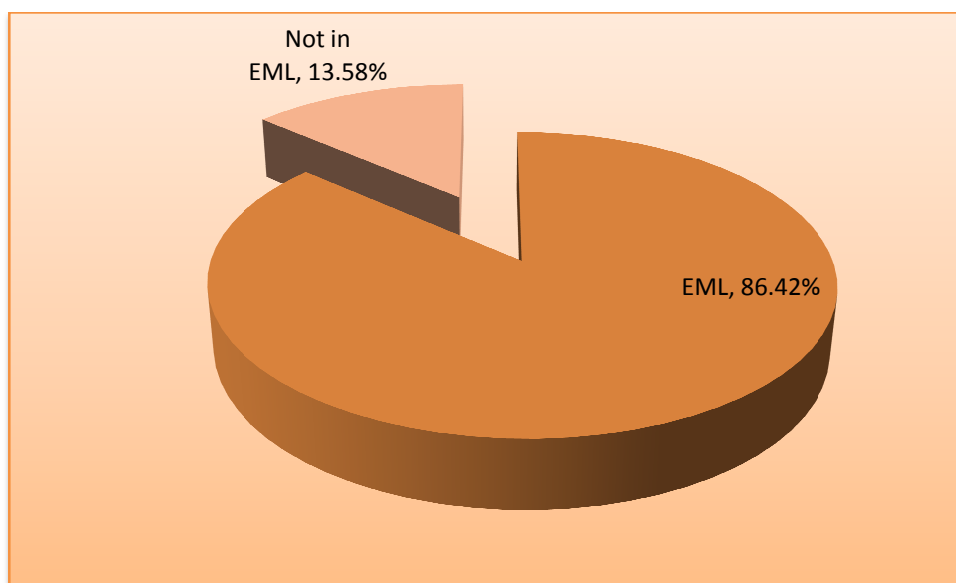
Figure 3: Drugs prescribed by generic name

Figure 4: Drugs prescribed from essential medicines list, EML

596

_____

DISCUSSION

In the present study, out of 150 patients, 53.33% of the study subjects were males and 46.67% females. The male preponderance closely matches with the findings of the study previously done by MA Ansari et al [9] which was 55.3%.

Among disease data, respiratory disease was the most commonly seen (33.33%), majority in the form Pneumonia, which is little high when compared to study done by T Pramil et al [10] (31%) and less compared to the study done by A Agalu et al [11] (36.53%). The burden in India is relatively great and expected to increase further which could be due to multiple factors like high levels of pollution, use of indoor fuels, inadequate ventilation, overcrowding and infections. Next common is the diseases of gastrointestinal tract (19.33%), majority in the form acute GE was the common presentation, which is higher than study done by PR Shankar et al [1] (16.6%). Literature reveals that rotavirus infection is the common cause for acute GE in children.

 Diseases in children lead to longer stay at the hospital and higher use of resources. This finding has important and practical implications not only for clinical management, but also for initiating preventive strategies and health policy implementation.

Antimicrobial agents (28.10%) were the major drugs class prescribed. Among them Penicillins (28.75%) were most commonly used, followed by Aminoglycosides (23.33%), Cephalosporins (17.5%). PR Shankar et al [1] recorded 23% use of AMAs in children whereas H Ashraf et al [12] revealed it as 43.19%. The similar pattern of AMA prescription was seen in another study conducted by KG Dinesh et al [7] Chennai, that shows penicillins (39%) were the most commonly prescribed AMAs. But a study done by N Palikhe et al [13] at Kathmandu Valley hospital shows Cephalosporins (34%) were the most frequently prescribed antibiotics.

Limited use of AMAs in children will reduce development of antibiotic resistance, adverse drug reactions, polypharmacy and cost of the therapy. Present study suggests that strategies and strict antibiotic policies to control irrational use of antibiotics should be implemented and the guidelines used for treatment of paediatric patients should be upgraded periodically.

12.18% drugs prescribed were those acting on respiratory system, which is closer to the study done by P Ajapuje et al [14] (12.60%). Respiratory diseases were the major illness for which children were hospitalized.

Among NSAIDs, paracetamol (90.63%) was most commonly prescribed followed by the combination of ibuprofen + PCT (9.37%) which is similar to study conducted by MS Akhtar et al [15] in New Delhi. 6.32% of drugs prescribed belonged to gastrointestinal therapy, which were mainly used to control reflux and vomiting associated with gastroenteritis.

Among the other group of drugs, IV fluids (30%) were most commonly prescribed, followed by vitamins (16.67%), ORS (13.34%), calcium (10%), zinc (9.33%), prednisolone (3.33%) and mannitol (2.67%) etc. Unnecessary use of injectables and intravenous fluids increases the length of hospital stay and also the cost of the therapy. Emphasis should be placed on early switching from parenteral to enteral route of drug administration [16].

Intravenous (48%) was the major route of drug administration, followed by oral route (44.73%). Similar study conducted by PR Shankar et al [1] shows lower percentages for intravenous (38.2%) route. Parenteral route of drug administration increases the length of the hospital stay which in turn exposes the children to nosocomial and multi drug resistant infections. The parenteral route may be necessary in paediatric patients but is more expensive in terms of nursing resources. Disposable syringes are used to administer drugs, thus reducing the risk of infection but adding to the cost of treatment.

Average number of drugs per prescription was 5.69, which was relatively high compared to a study done by PR Shankar et al [1] (4.5). Polypharmacy is highly prevalent in children, exposing them not only to the adverse effects, but also to the drug interactions, increased cost of therapy and non-compliance. Prescription by generic name was 62.30%, which is high compared to a study done by PR Shankar et al [1] (58.1%). Percentage of encounters with an antibiotic prescribed was 28.10%, which is comparable to study by RK Goel et al [17] that shows 25.7%. Percentage of encounters with an injection prescribed was 49.06%, which shows similarity to findings of PR Shankar et al [1] (48.9%). Prescription from essential drug list was 86.42%, which is also high compared to study done by YM Nazima et al [2] (77.61%).

Provision of drugs in their generic name, prescribing from essential drug list and rational drug prescribing are recognized measures that can considerably reduce the cost of the drugs to the patients.

CONCLUSION

The present study revealed that polypharmacy and prescription by brand name were common. Use of 'generic name' in the prescriptions needs to be promoted. The encouraging data on the choice of drugs from EML can go a long way in creating awareness and application of essential drug (medicines) concept(s).

Better prescribing practices as suggested above would lead to improvement in quality of health care provided to children. Educational interventions towards improving prescribing practices are required.

REFERENCES

[1] PR Shankar; DK Upadhyay; P Subish; AK Dubey; P Mishra. *Singapore Med J*, **2006**, 47(4), 261 - 265.
[2] YM Nazima; D Sagun; G Barn. *Bangladesh J Pharmacol*, **2009**, 4, 39-42.
[3] K Shamshy; B Mufida; P Perumal. *International Journal of PharmTeach Research*, 3(3), **2011**, 1530-1536.
[4] OP Ghai; KP Vinod; B Aravind. Essential Pediatrics, 7th Edition, CBS Publishers & Distributors, New Delhi, **2009**; 735-736.
[5] Kliegman; Behrman; Jenson; Stanton. Nelson Text book of Pediatrics, 18th Edition, Elsevier Health Sciences, Philadelphia, **2007**; 331-332.
[6] World Health Organisation. Introduction to Drug Utilization Research, Oslo, **2003**; 1-48.
[7] KG Dinesh; L Padmasani; J Vasantha; RB Veera; P Sudhkar; MR Uma. *Indian Journal of Pharmacy Practice*, 4(2), **2011**, 85-89.
[8] JS Bapna; DG Shewade; SC Pradhan. *Br J Clin Pharmacol*., 37(4), **1994**, 399-400**.**
[9] MA Ansari; Z Khan; N Khalique; AR Siddiqui. *Indian J. Prev. Soc. Med.,* 39(3), **2008**, 94-97.
[10] T Pramil; A Rajiv; G Gaurav. *Indian Journal of Pharmacy Practice*, 5(1), **2012**, 40-44.
[11] A Agalu; H Mekonnen. *Int. Res. J. Pharm. Pharmacol.*, 2(6), **2012**, 132-138.
[12] H Ashraf; S Handa; NA Khan. *International Journal of Pharmaceutical Sciences Review and Research*, 3(2), **2010**, 1-5.
[13] N Palikhe. *Journal of Nepal Health Research Council*, 2(2), **2004**, 31-36.
[14] P Ajapuje; P Dhengre; VC Giri; GM Khakse. *International Journal of Recent Trends in Science and Technology*, 5(2), **2012**, 104-106.
[15] MS Akhtar; D Vohora; KK Pillai; K Dubey; MS Roy; AK Najmi. *Asian J Pharm Clin Res*, 5(1), **2012**, 146-149.
[16] S Gyawali; PR Shankar; A Saha; L Mohan. *McGill Journal of Medicine*, 12(1), **2009**, 13-20.
[17] RK Goel; S Khanna; A Verma; P Shankar; VS Chopra; RK Dixit. *International Journal of Pharma Sciences and Research*, 4(4), **2013**, 78-80.