Original Article

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Drug utilization pattern in South Indian pediatric population: A prospective study

Abstract

Background: Studies on the process of drug utilization focus on factors related to prescribing, dispensing, administering and taking of medication and its associated events. **Aims:** The aim of this study is to assess the prescribing patterns of medicines, apply the World Health Organization (WHO) core indicators and to assess the appropriateness of prescribed medicines in a pediatric unit. **Materials and Methods:** A prospective observational drug utilization study was carried out in a pediatric unit of a super specialty hospital in South India for a period of 9 months. Patients who attended the pediatric unit with the age newborn to 18 years were included in the study and patients who were not willing to participate in the study were excluded and the data collected from the pediatric unit were analyzed. **Results:** Out of 209 patients, the average number of drugs per patient was 4.56. The percentage of drugs prescribed with the generic name was found to be 19.16%. Among 209 prescriptions 49.78% of the drugs were essential drugs. Among the antibiotics 33.33% prescribed, cephalosporin group were the most commonly prescribed followed by amino glycoside and penicillin. Nearly, 21.80% of the medicines were given as intravenous and the prescriptions without drugs were 1.43%. Only 75.6% of patients have knowledge about their dosage schedule and almost all the prescriptions were appropriate. **Conclusion:** The assessment of WHO core indicators helped to improvise the prescribing pattern, identify significant problems involved in the knowledge gap of patients or caretakers understanding of instructions provided by consultants and even to minimize the cost burden on patient.

Key words: Drug utilization, indicators, pediatrics, prescribing

INTRODUCTION

Pediatrics is the branch of science that deals with the medical care of infants, children and adolescents. Studies on the process of drug utilization focus on factors related to prescribing, dispensing, administering and taking of medication and its associated events. Drug utilization

play a significant role in helping the health-care system to understand, interpret and improve the prescribing administration and use of medications.[1] The irrational use of drugs is known to an increase in the cost of treatment, incidence of adverse drug reactions. Markets for children's medicines tend to be small and the range of doses used may be wide for any drug formulation because many drugs prescribed widely for infants and children are not available in suitable dosage forms, leading to a lack of attention to pediatric medicines. Most of the drugs prescribed for children have not been tested in the pediatric population due to the difficulties in carrying out clinical studies in children and ethical issues due to children not being able to make their own decisions to participate in a clinical trial. Therefore, many medications have not been approved by the Food and Drug Administration for children.[2]

There is enough evidence to demonstrate that the prescribing of the drugs has shifted from generics to branded and prescribing out of National List of Essential Medicines (NLEM). The rational prescribing can be assessed with the help of conducting prescription audit and the results of such studies help in developing the quality of rational drug use in a health facility.[3] World Health Organization (WHO) has formulated a set of core drug use indicators, which measure the performance of prescribers, patients experience at health facilities and whether the health personnel can function effectively. The assessment of WHO core indicators help to improvise the prescribing pattern, identify significant problems involved in the knowledge gap of patients or caretakers understanding of instructions provided by consultants and even to minimize the cost burden on patient. The assessment of drug use indicators according to WHO guidelines on how to investigate drug use in health facilities are prescribing indicators, patient care indicators, facility indicators and complementary indicators.[4]

The objectives of this study are to assess the prescribing patterns of medicines, apply the WHO core indicators and to assess the appropriateness of prescribed medicines in a pediatric unit.

MATERIALS AND METHODS

The drug utilization pattern was carried out in the pediatric in-patient Department in Super Specialty Hospital at Warangal, Andhra Pradesh, South India. A prospective observational study was carried out; medication utilization form was designed, over a period of 9 months from January to September 2012. Patients of either sex from new born to 18 years of age attending the pediatric unit were included in the study and patients who were not willing to participate in the study, patients who visit the out-patient unit were excluded. All studies were approved by the Human Ethical Committee of St. Peter's Institute of Pharmaceutical Sciences, Kakatiya University. Research participants gave written informed consent after thorough explanation of the study. Data record included patients demographics, diagnosis, dosage, dosage form and route of administration of drugs prescribed. The data were analyzed for the WHO recommended core indicators and other prescribing patterns. The prescribing and utilization pattern of the medicines was carried out with reference to NLEM. During the discharge understanding of their drug use by patients/caretakers was assessed. The detailed summary of the materials and methods were summarized in the flow chart Figure 1.

PROCEDURE FOR CORE INDICATORS CALCULATION

Prescribing indicators
- Average number of drugs per encounter was calculated by dividing the total number of different drug products prescribed by the number of encounters surveyed
- Percentage of drugs prescribed by generic name was determined by dividing the number of drugs prescribed by generic name by the total number of drugs prescribed, multiplied by 100
- Percentage of encounters with an antibiotic prescribed
- Percentage of encounters with an injection prescribed was calculated by dividing the number of patient encounters during which an antibiotic or an injection was prescribed by the total number of encounters surveyed, multiplied by 100
- Percentage of drugs prescribed from essential drug list (EDL) was determined by dividing the number of products prescribed from EDL of the hospital by the total number of drugs prescribed, multiplied by 100.[5]

Patient care indicators
- Average consultation time was determined by dividing the total time for a series of consultations, by the actual number of consultations
- Average dispensing time was calculated by dividing the total time for dispensing drugs to a series of patients, by the number of encounters
- Percentage of drugs actually dispensed was worked out by dividing the number of drugs actually dispensed at the health facility by the total number of drugs prescribed, multiplied by 100.[5]

Facility indicators
- Availability of copy of EDL: By stating yes (or) no.
- Availability of key drugs was calculated by dividing the number of specified products actually in stock by the total number of drugs on the check list of essential drugs multiplied by 100.[5]
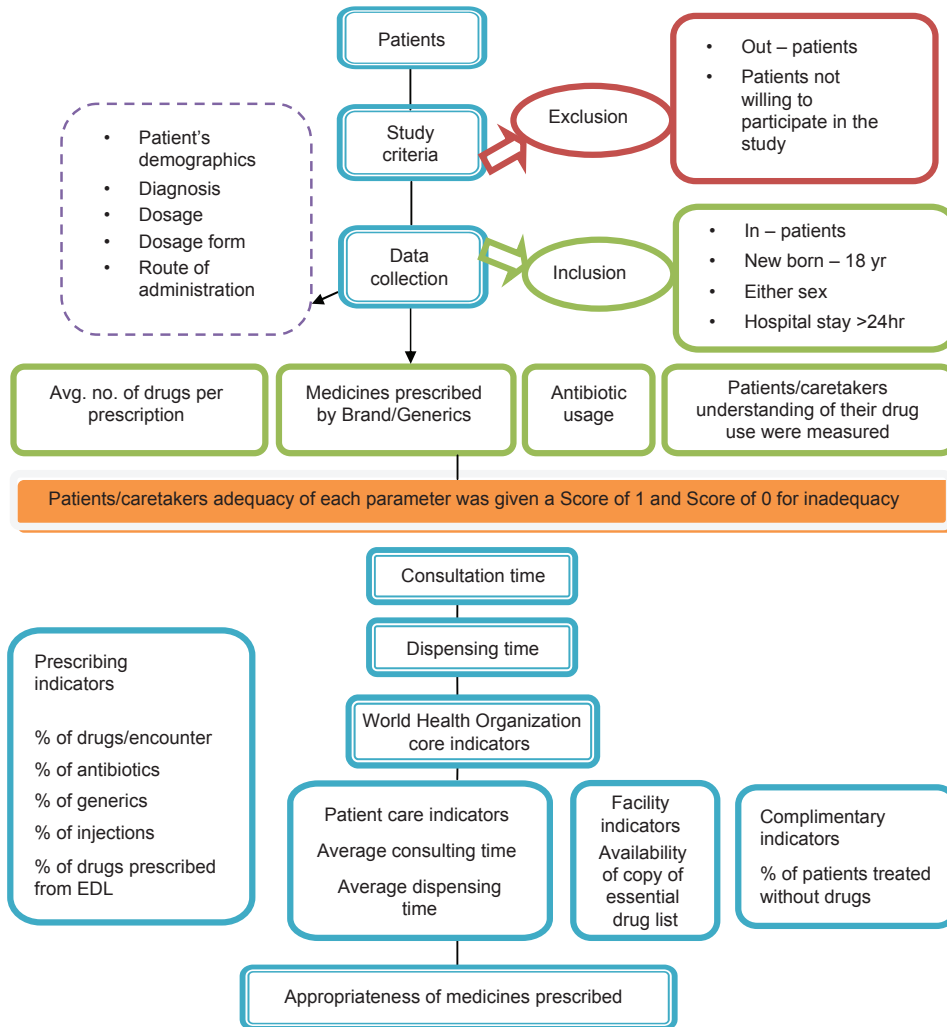
Figure 1: Methods flow chart

Complementary indicators

- Percentage of patients treated without drugs was calculated by dividing the number of consultations in which no drug is prescribed by the number of consultations surveyed.[5]

RESULTS

A total of 209 patients were analyzed during the 9 months study period (January-September 2012), in the pediatric unit. Out of 209 patients, 137 (65.55%) were males and 72 (34.44%) were females. The average length of stay for 107 (51.19%) was 2-4 days and the average number of drugs prescribed were in the range of 4-7 for 126 (60.28%). Patient and drug details were summarized in the Table 1. A total of 955 medicines were prescribed for 207 patients. Out of 955 medications, antibiotics 318 (33.29%) were the highly prescribed followed by non-steroidal anti-inflammatory medicines 148 (15.49%) and antiulcer class of medicines 77 (8.06%). Among six classes of

antibiotics prescribed, cephalosporins 151 (50.62%) are most commonly prescribed followed by amino glycosides 101 (32.07%), together other classes were summarized in the Table 2. The key drug use indicators were summarized in the Table 3.

Of all the drug use parameters evaluated at the time of discharge, disease parameter was understood by almost all patients followed by indication and frequency parameter as summarized in the Table 4. Patients/caretakers adequacy of each parameter was given a Score of 1 and Score of 0 for inadequacy. Based on these seven parameters, each patient was given a Score of minimum 0 to a maximum of 7. After assigning a score to each parameter, the sum of scores obtained by patient, 87 (41.63%) of 209 patients understood their drug use parameters moderately, followed by well-understood 71 (33.97%) and poorly understood 51 (24.40%).

Based on five parameters (dose, dosage form, frequency, route of administration, duration of treatment), a medicine

Table 1: Patient and drug details

Parameters	Number and percentage
Age	
0-28 days	35 (16.74)
Up to 1 year	30 (14.35)
1-3 years	28 (13.39)
4-5 years	21 (10.04)
6-10 years	33 (15.78)
11-14 years	26 (12.44)
14-18 years	36 (17.22)
Gender	
Male	137 (65.55)
Female	72 (34.44)
Length of hospital stay	
2-4	107 (51.19)
5-7	64 (30.62)
8-11	28 (1.39)
12-15	8 (3.84)
16-19	2 (0.96)
No. of medicines per prescription	
0-3	66 (31.57)
4-7	126 (60.28)
>7	17 (8.13)
Formulations	
Intravenous	606 (63.45)
Oral drops	22 (2.30)
Syrup	124 (12.98)
Nasal drops	2 (0.21)
Tablet	157 (16.44)
Capsule	4 (0.42)
Others	40 (4.19)

or medicine combination could have a Score of minimum 0 to a maximum of 10 in the appropriateness scale. After assigning a score to each medicine of a prescription with either 0 (inappropriate) or 2 (most appropriate), an average score of appropriateness for medicines in a prescription was obtained by dividing the total score of all medicines by the number of medicines in that particular prescription. In the present study, most of the prescriptions were most appropriate 109 (52.65%) followed by appropriate 97 (47.34%).

DISCUSSION

The results of the present study were based on the data obtained from 209 patients. Out of 209 patients most of the patients were male 65.55% followed by female patients 34.44%. Our results were similar to the studies conducted by Dinesh *et al.,* and Karande *et al.*[6,7]

Our study results states that most of the patients were prescribed with 15.49% syrup/oral drops/nasal drops and 16.85% as tablets/capsules and all other dosage forms were comprised of 4.18% whereas, in Dinesh *et al.,* study, 60.4% of medicines were prescribed as syrup/oral drops/nasal drops, 32% was prescribed as tablets/capsules and others were 7.6%. In Dimri *et al.,* study 72% of medicines

were prescribed as syrup followed by tablet (16.1%) and all others dosage forms comprised only 5.8%.[6,8]

Most of the studies conducted on assessing WHO core indicators in the pediatric population were limited only to prescribing indicators. This study was successful in analyzing all the WHO indicators. In the present study, on an average 4.56 medicines were prescribed per patient, which is much higher when compared with 2.9 and 2.07 in similar studies from Karande *et al.,* conducted in Mumbai and Dinesh *et al.,* study conducted in Chennai. In the present study, four or more drugs were prescribed in 60.28% of prescriptions, which increase the risk of drug interactions, dispensing errors and the parent not knowing the dosage schedules.[6,7,9]

Prescribing generic name is known to reduce the cost of drug treatment and rationalizing drug therapy. This varies from 13.3% to 93% across the globe. The results of work conducted in India report this as 3.8% Pramil *et al.*, which does not comply with the figure of 19.16% found in this study. Nazima *et al.,* in the tertiary care teaching hospitals found that the medicines prescribed by generic names as 30.7%. One of the reasons for poor prescribing by generic name is the non-availability of the pediatric formulations in the hospital pharmacy.[10,11]

Prescribing of antibiotics does not fell within the WHO recommended range of 20-26, but it was higher 33.29% than the range recommended while prescribing of injections was within than the recommended range 21.80% of WHO 13.4-24.0%. A lower rate of injections was prescribed in other Indian studies.[12,13]

About half of the drugs (49.78%) prescribed were from EDL, which was a higher percentage than studies of Dimri *et al.,* Pramil *et al.,* and lower in percentage than Karande *et al.,* The average consultation time and average dispensing time was found to be 6-8 and 9-12 min respectively. Percentage of drugs actually prescribed was 84.74% higher value than Karande *et al.,* study 76.9% and percentage of patients with correct knowledge of dosage were 75.6%, a lower value than Karande *et al.,* study 80.8%.[7,8,10] During the assessment of facility indicators, it was found that there was no availability of EDL and key drugs were available at a percentage of 79.65 and it was 85% in the study conducted by Karande *et al.*

Only limited studies were published in respect to complementary indicators and the present study was successful in this aspect. Percentage of patients treated without drugs was found to be 1.43%. Although the instructions given by the consultant were brief, rate of patient understanding varied widely. In this study, 33.97% of

Table 2: Medicines prescribed to the pediatric population

Medicines prescribed	Number and percentage	Medicines prescribed	Number and percentage
Antiasthmatics		Antiamoebic agents	19 (1.98)
Levosalbutamol	14 (40)	Metronidazole	14 (73.68)
Budesonide	9 (25.71)	Albendazole	5 (26.31)
Theophylline	7 (20)	Multivitamin	78 (8.16)
Etofylline	5 (14.28)	Calcium supplements	26 (2.72)
Antiallergics	29 (3.03)	Antidiarrheal agents	26 (2.72)
Pheniramine maleate	9 (31.03)	Sedatives	17 (1.78)
Chlorpheniramine maleate	6 (20.68)	Others	27 (2.83)
Dextromethorphan	14 (48.27)	Antibiotics	318 (33.29)
NSAIMs	148 (15.49)	Aminoglycosides	32.70
Paracetamol	87 (59.18)	Amikacin	100 (99)
Ibuprofen	6 (4.05)	Tobramycin	1 (0.99)
Diclofenac	25 (16.89)	Cephalosporins	50.62
Ketorolac	4 (2.70)	Cefuroxime	1 (0.66)
Mefenamic acid	5 (3.37)	Cefoperazone+sulbactam sulbactam	5 (3.31)
Tramadol	17 (11.48)	Cefotaxime	61 (40.39)
Nimesulide	4 (2.70)	Cefpodoxime	4 (2.64)
Digestive aids	27 (2.825)	Ceftazidime	7 (4.63)
Trypsin	7 (25.92)	Ceftriaxone+sulbactam	4 (2.64)
Chymotrypsin	13 (48.15)	Cefepime	1 (0.66)
Diastase	7 (25.92)	Ceftriaxone	68 (45.03)
Antiemetics	44 (4.60)	Macrolides	2.51
Domperidone	38 (86.36)	Azithromycin	4 (100)
Ondansetron	6 (13.63)	Aminoglycosides	32.70
Corticosteroids	33 (3.45)	Amoxicillin	2 (11.76)
Betamethasone	17 (51.51)	Ampicillin	14 (82.35)
Prednisolone	16 (48.48)	Cloxacillin	1 (5.88)
Antiepileptics	35 (3.66)	Pencillin combinations	5.03
Phenytoin	23 (65.71)	Amoxicillin+clavunate	3 (18.75)
Fosphenytoin	5 (14.28)	Piperacillin+tazobactum	13 (81.25)
Valproic acid	7 (20)	Quinolones	3.45
Antiulcer agents	77 (98.06)	Ofloxacin	11 (100)
Pantoprazole	56 (72.72)	Others	17 (5.34)
Ranitidine	21 (27.27)		
Vaccines	16 (1.67)		
Tetanus toxoid	13 (81.25)		
Rabies	3 (18.75)		

NSAIMs=Non-steroidal anti-inflammatory medicines

Table 3: List of WHO core indicators in pediatric population

Indicators	Data
Prescribing indicators	
Average number of drugs	4.564
Percentage of drugs prescribed by generic name	19.16
Percentage of antibiotic prescribed	33.33
Percentage of injections prescribed	21.80
Percentage of drugs prescribed from essential drug list	49.78
Patient care indicators	
Average consultation time	6-8 min
Average dispensing time	9-12 min
Percentage of drugs actually dispensed	84.74
Facility indicators	
Availability of essential drug list	No
Availability of key drugs	79.65%
Complementary indicators	
Percentage of patients treated without drugs	1.43

WHO=World health organization

Table 4: Drug use parameters in pediatric population

Parameters	Adequacy (%)	Inadequacy (%)
Disease	207 (99.04)	2 (0.96)
Indication of the drug	166 (79.42)	43 (20.58)
Dose	177 (84.68)	32 (15.32)
Frequency	157 (75.12)	52 (24.88)
To be taken before/after food	96 (45.93)	113 (54.07)
Duration	121 (57.89)	88 (42.11)
Awareness of side-effects	9 (4.31)	200 (95.69)

23.9% were found to have well-understood and 18.1% were found to have poorly understood. The dispensers after having explained once should request the parents to repeat the drug dosages. This would help identify parents who require to be explained again. Most of the previous Indian studies are focused mainly on prescribing indicators.

In the present study, on the basis of appropriateness scale all the prescriptions were appropriate or most appropriate

patients/caretakers well-understood the instructions given by physicians and in the similar study conducted by Dinesh *et al*.,

whereas in Nazima *et al.*, more than 80% prescriptions could be rated either as appropriate or most appropriate. Only about 1/6 of all prescriptions were found to be inappropriate. Dinesh *et al.*, showed that 94.8% were found to have appropriate dose whereas, only 5.2% of prescriptions were found with in-appropriate doses. All attempts to enhance the quality of prescribing should be encouraged as also education of patients/caretakers remains crucial.

CONCLUSION

The assessment of WHO core indicators helped to improvise the prescribing pattern, identify significant problems involved in the knowledge gap of patients or caretakers understanding of instructions provided by consultants and even to minimize the cost burden on patient. The percentage of drugs prescribed from the EDL should be increased, use of injections was high and the percentage of prescribing by generic name was low and efforts to encourage prescribing by generic name should be initiated. The mean number of drugs was high. An increasing in the percentage of patients knowing correct dosage schedule will improve the present health-care of patients attending pediatric unit of a super specialty hospital. Continuous medical education with a focus on rational drug use and evidence based medicine should form part of the program of the hospital. They should be involved in the collection and presentation of prescribing data as part of clinical audit and also the education of patients/caretakers.

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