Assessment of Prescribing Pattern in Paediatrics Department in a Tertiary Care Hospital Using WHO Indicators.

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Abstract

Prescribing patterns studies are powerful explorative tools to determine the role of drugs in the society. Assessing the prescription pattern in an important component in evaluating health professional's skill in determining a drug that provides maximum benefits to patients. The present study was undertaken with the objectives to assess the prescribing pattern in the paediatrics department of a tertiary care hospital using WHO Indicators. It was a prospective observational study conducted for a period of 6 months after obtaining the permission from institutional ethical committee. The data was collected and analysed according to the inclusion and exclusion criteria. Based on the methodology, a total of 301 patients (n=301) were included and evaluated in our study. Out of 301 patients (52%) were females and (48%) were males. Gender distribution of data shows high prevalence rate in females. The most highly susceptibility to infections age was Toddlers (1-5 yrs.) (45%) are at a younger age. The maximum number of patients were hospitalized for 4-5 days (40%). In this study out of 301 cases, Respiratory infections (26%) were the most commonly affected diseases. Among the total number of cases Antibiotics were prescribed as a maximum drug in the prescription. There were totally 1341 drugs prescribed in total 301 prescriptions and out of those 1341 drugs the maximum number of drugs fall under the category of Anti-infectives (27%) followed by NSAIDS. In the category of antibiotics Cephalosporin group (32%) of antibiotics are the most commonly prescribed followed by penicillins. In case of route of administration, drugs given through the IV route Injections (46%) were more frequent followed by syrups and tablets. The WHO prescribing indicators which were assessed for drug prescriptions using IBM SPSS Statistics version: 28.0.1.1. The result was obtained through One sample t-test for analysing 95% Confidence Intervals. It was depicted that all the prescribing indicators are non-compliant with the WHO Standards. The results of our study conclude that prescribing practices was not satisfactory and irrational use of drugs was observed. While antibiotics are irrationally prescribed which causes polypharmacy which could lead to adverse drug reactions and drug-drug interactions. From our study we can conclude that periodic evaluation of prescribing pattern in paediatric is needed to enable prescription of suitable medication to improve therapeutic benefits.

***KEYWORDS**: Prevalence, prescribing pattern, WHO indicators, Essential medicine List*

Introduction:

Studies of prescribing patterns are helpful in finding out the role of medications in community [1]. Assessing the prescription pattern is an important component in evaluating health professional's skill in determining a drug that provides maximum benefit to the patients [2].

Paediatrics is a specialty of medicine that deals with the growth, diseases, and problems of children under the age of twelve [1]. Infants and children together constitute a larger proportion of population in various countries [3]. Paediatrics differs from adult in many aspects of which body size and maturational changes plays an important role. Children constitute 40% of India's population. Although, this subgroup is susceptible to a wide range of diseases and illnesses [2]. Height, emotional wellbeing, and pharmacodynamic responsiveness are all variables which change with time in children. In terms of pharmacological reaction of drugs, children, particularly new borns differ from adults. In the new born era, extra caution is required to ensure that the prescription medicine is appropriate and that the correct amount is administered. Furthermore, because children's renal, immunological, and hepatic systems are underdeveloped, pharmacokinetic and pharmacodynamic abnormalities exist, predisposing them to adverse medication responses and drug damage [3].

Premature newborns are at the enhanced danger of unforeseen toxic effects or a poor response to therapy from incorrect pharmaceutical dosage plans due to impaired pharmacokinetics or dosage limitations in this population [4]. When compared to adolescents and the older adults, they suffer from more serious problems more often. The majority of these ailments are self-limiting. According to sources, these ailments are treated ineffectively, resulting in polypharmacy [5].

A paediatric patient's medication therapy is focused on a tentative and confirmational diagnosis, as well as the best course of treatment, which includes a pharmaceutical treatment regimen. Because of the differences in the profiles of pharmacokinetics and pharmacodynamics of the drugs, drug therapy is considered to be a key element in the health care management of paediatrics because this population, i.e., children and infants, are more susceptible to illness and to the deleterious effects of the drugs when prescribed and administered. To provide good health services and to improve the quality-of-life prescribing pattern plays a chief role in the management of serious health disorders [1].

Despite significant advancements in the field of paediatric pharmacotherapy, many questions remain unresolved. Many significant medications pharmacokinetics have been clarified, but their pharmacodynamics have yet to be completely investigated. Similarly, most medications haven't been investigated for the impact of illness states and patient factors including genetic status. Similarly, many drugs lack knowledge on comparative safety and effectiveness in paediatrics, research into the influence of pharmacological therapy on medical and financial consequences, as well as standard of living, is needed [6].

According to various studies, children remain unique in many ways. Due to changes in pharmacokinetics, pharmacodynamics, and/or other variables. Children and young adults require varying amounts of dosage/ kilogramme of body weight. Children have the largest dose requirement per kilogramme per day, while premature infants have the lowest, with adults in the middle. Children younger than seven years of age may require extemporaneously created

dosage forms because of the difficulties in administering tablets and capsules and the fact that doses are modified based on body weight (like syrups, emulsions etc.)[4].

Because of the scarcity of pharmacokinetic research, establishing the best doses for youngsters seems to be complicated. Adult doses cannot always be projected straight to children's doses. The weight or age of a child is used to determine several paediatric dosages. Depending on an individual and the clinical response, paediatric dosages may need to be altered. It is critical to double-check dose calculations. So, in most cases the predicted paediatric dose should not exceed the adult dose [7].

Pharmacological dosing, could be determined by using body surface area (BSA). This is attributed to the reason as BSA may have a stronger link to organ function and, as a result, drug dosage requirements.

In practise, the **Mosteller formula** is most usually utilised.

BSA (m2) $=\sqrt{Bodyweight\ in\ kg \times height\ in\ cm/3600}$ [4]

Therefore, assessing the prescription pattern is considered to be an important component in evaluating the health professional skill in determining a drug which provides maximum benefit to the patients [3]. Alterations in the prescribing of drugs may result in adverse medication responses or drug- drug interactions or polypharmacy & drug resistance. Hence, analysis of the drug prescribing pattern is indeed a crucial part of the healthcare assessment that aims to monitor & assess prescription patterns and modifying the prescribing practices accordingly in order to make it a rational medical care [2].

In the year of 1985, World Health Organization (WHO) has defined that “Usage of medications rationally necessitates patient receives medicines according as per the medical needs, in dosage which satisfy one’s personal criteria for a sufficient duration of period at an affordable price to patient populations and the community".

For promoting the rational drug usage, monitoring and evaluation of drug utilization, the WHO prescribing indicators and Index of Rational Drug Prescribing are recognized as the basic minimum standard. By using the formulae mentioned below the prescribing pattern is assessed. They are as follows:

1) Average number of drugs/prescription= $\frac{\text{Total no. of drugs prescribed}}{\text{Total no. of encounters sampled}}$

• Aids in determining the degree of polypharmacy

2) % of drug prescribed by generic name= $\frac{\text{Total no. of drugs prescribed by generic name}}{\text{Total no. of drugs prescribed}} \times 100$

•helps to measure cost-effectiveness in order to procure and use drugs.

3) % of prescriptions with an injection prescribed = $\frac{\text{No. of patient encounters with an injection prescribed}}{\text{Total no. of encounters sampled}} \times 100$

• Aids in determining the overall prevalence of excessive and expensive intravenous medication regimen.

4) % of prescription with an antibiotic prescribed = $\frac{\text{No. of prescriptions with an antibiotic}}{\text{Total no. of encounters sampled}} \times 100$

• Aids in determining the extent of antibiotic abuse.

5) % of drugs prescribed from essential drug list (EML) = No. of drugs prescribed from EDL / Total no. of drugs prescribed x 100

• Aids in determining hoTw closely practises adhere to the EML's national drug policy.

The prescribing indicators listed in previous section are very helpful in the identification of difficulties in regular dispensing. These indicators can be used expeditiously and rapidly in various studies in order to assess the problems associated with drug use when prescribed and administered and focus to correct these problems [8].

Every year, millions of children under the age of five die from diseases that are generally treatable with currently available treatments [9]. One of most immediate healthcare necessities of the community are fulfilled by essential medications. These medications are selected depending on the diseased condition prevalence, efficiency, tolerability, and cost benefit. Essential drugs must continuously be obtainable, with in right dosage forms, in consistently high quality, and at a budget which communities could manage in within scope of operational healthcare systems. The 8th Edition of the WHO Model List of Essential Medicines for Children seems to be the most comprehensive list of essential medicines (2021) [10]**.**

Objectives:

- To analyse the prescribing pattern in paediatric department of a tertiary care hospital using WHO indicators.
- To assess the rational prescribing pattern of drugs according to WHO-EML for children (8^{th} list 2021).

Methodology:

It was a hospital based prospective and observational study conducted for 6 months duration, ethical clearance was granted by the institute. Patients were selected based upon the inclusion and exclusion criteria. In-patients of paediatric department with age group of <12 years cases with complete information till discharge were included in the study. Unconscious patients, outpatient department and patient's those undergone surgery were excluded from the study.

Based on inclusion and exclusion criteria a sample size of 301 paediatric patients were included and evaluated in the study. Data was collected by case sheets, following data were collected from the data sheet the patient's demography, past medical and medication histories, diagnosis, complete prescription, using a pre-designed pro forma. The collected data was assessed for prescribing patterns using WHO Indicators. Statistical analysis was carried by one sample t-test for analysing 95% confidence intervals using IBM SPSS Statistics version: 28.0.1.1 software.

Results and Discussion:

A total of 325 cases were observed during the study period out of which 24 cases were left because patient either absconded or left the hospital without information. Finally, 301 cases were identified, included and analysed for final outcome.

Following parameters were considered for analysis of collected cases.

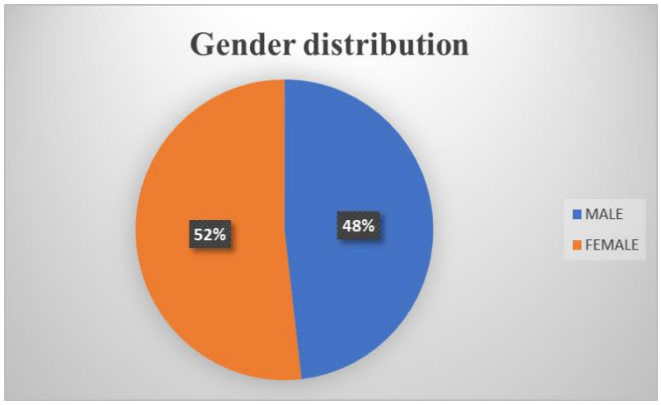

Figure 1. Gender wise distribution

The above figure indicates that among the 301 pediatric patients out of which 156 (52%) were female and 145 (48%) were male. Therefore, it represents preponderance of females in our study.

Table 1. Age Group Distribution

Sl No.	Group	Age	Number of cases	Percentage%
1.	Neonates	Up to 3 months	28	9
2.	Infants	3-12 months	23	8
3.	Toddler	1-5 years	135	45
4.	Child	6-12 years	115	38
	Total		**301**	**100%**

The above table indicates that out of 301 paediatric patients, the maximum number of patients fall within the age group of 1-5 years (45%) followed by 6-12 years (38%), up to 3 months (9%) and 3-12 months (8%).

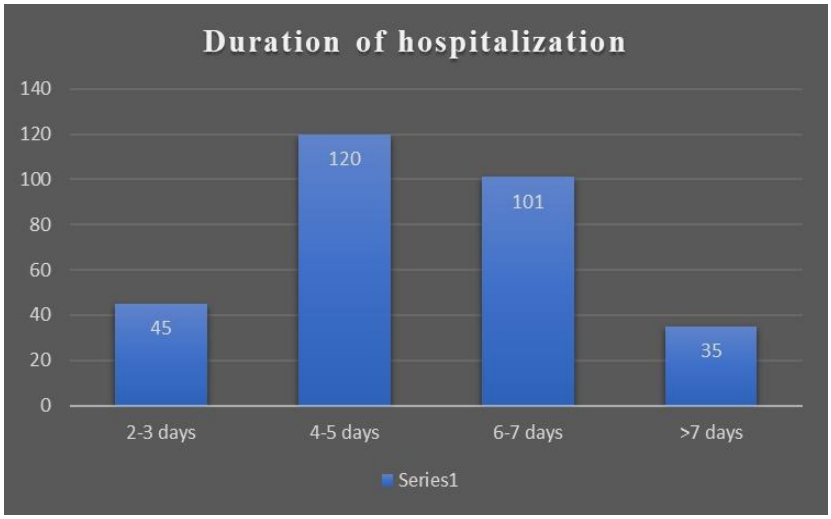

Figure 2. Distribution of patients according to duration of hospitalization.

The above figure indicates that out of 301 pediatric in-patients most of the patients had duration of hospitalization of 4-5 days (40%) followed by 6-7 days (33%), 2-3 days (15%) and >7 days (12%).

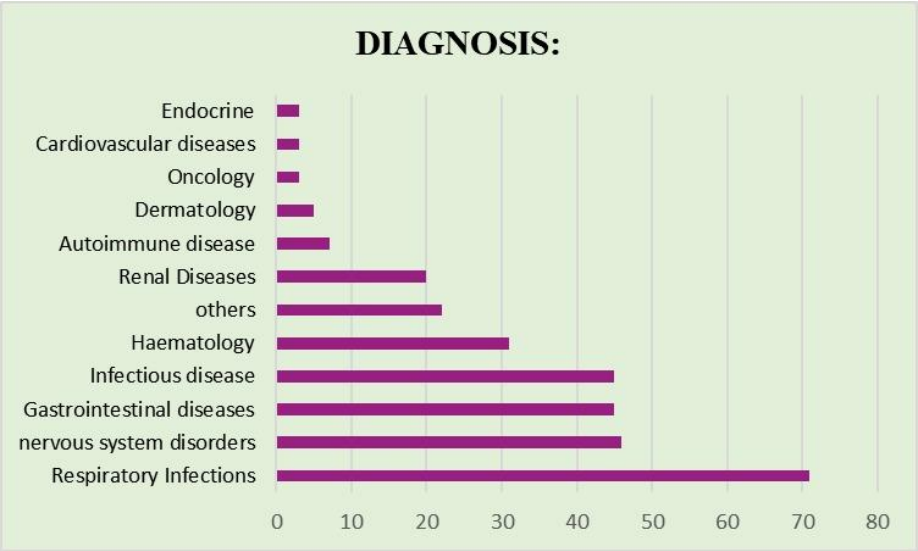

Figure 3. Distribution of pediatric in-patients according to diagnosis.

The above figure indicates the classification of cases according to the patient's confirmational diagnosis. It represents that out of 301 cases analyzed, Respiratory infections were found to be the maximum (24%) followed by Nervous System disorders (15%) and cardiovascular diseases, endocrine diseases and oncology diseases were found to be the least (1%).

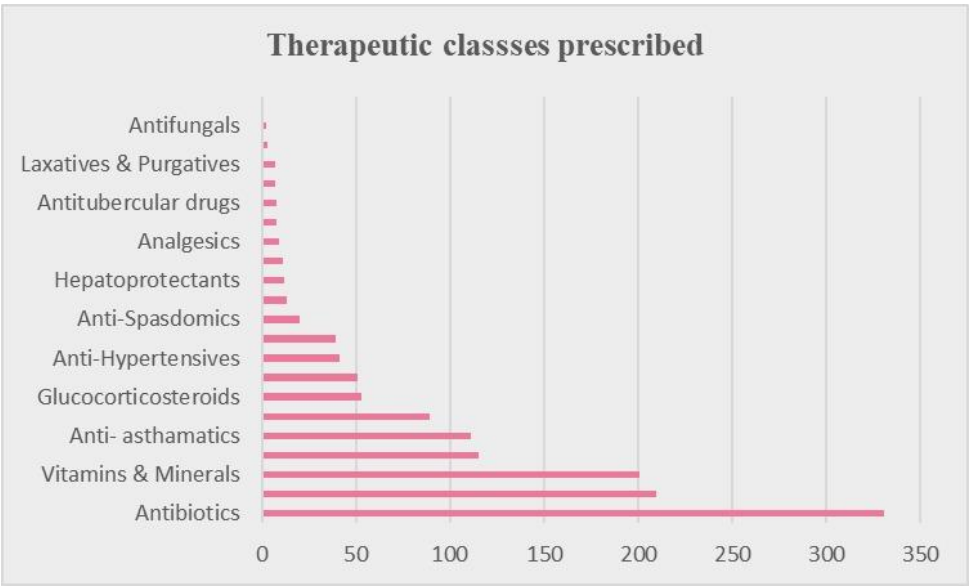

Figure 4. Distribution of cases according to therapeutic drugs class.

The above figure indicates that out of 1341 drugs most of the drugs prescribed to the pediatric in-patients are Anti-infectives followed by NSAIDs, Vitamins and Minerals, Proton pump inhibitors and Bronchodilators.

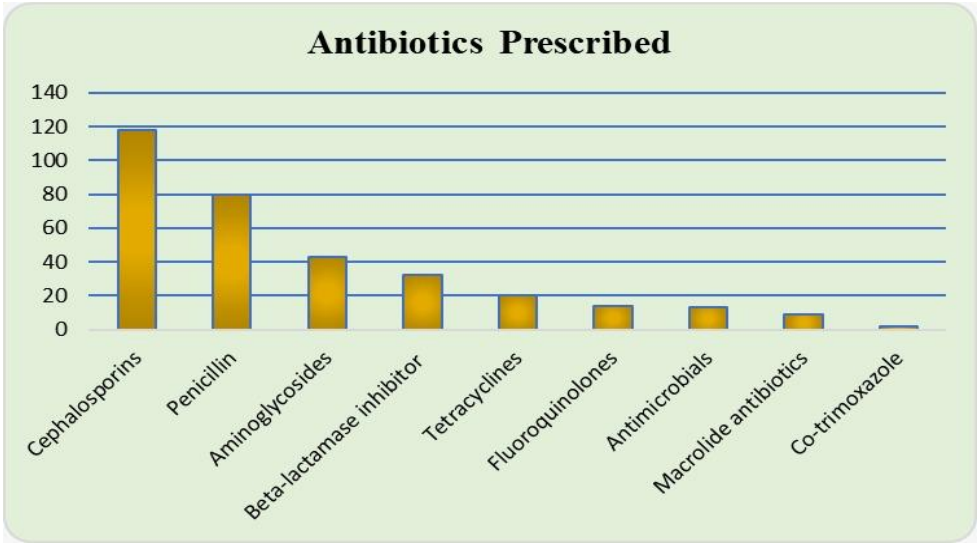

Figure 5. Distribution of different classes of antibiotics prescribed.

The above figure represents that among 363 antibiotics mostly prescribed class of antibiotic is Cephalosporin's (32%) followed by Penicillins, Aminoglycosides, Beta Lactamase Inhibitors and Tetracycline's.

WHO Prescribing Indicators

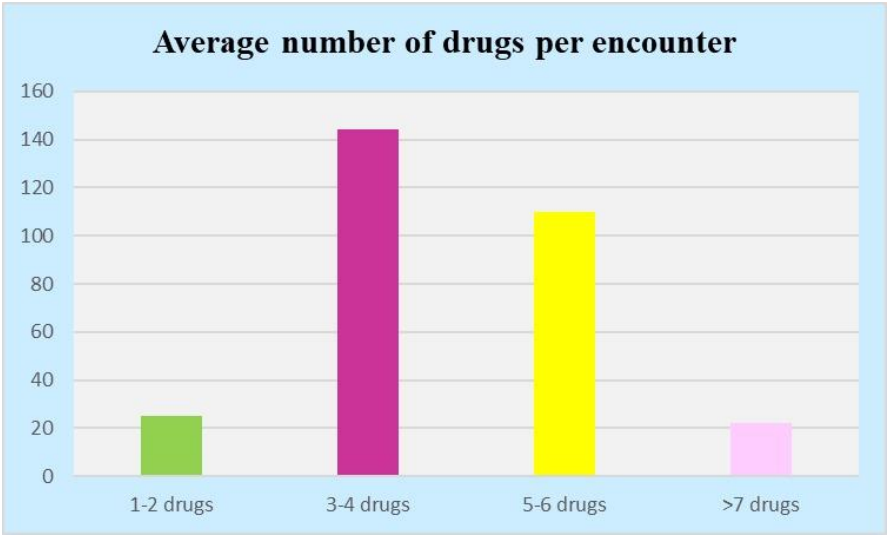

Figure 6. Classification of cases according to the average number of drugs per encounter.

The above table indicates that out of 301 prescriptions analyzed and studied, 3-4 drugs (48%) were prescribed in most of the prescriptions followed by 5-6 drugs (37%), 1-2 drugs (8%) and least number of prescriptions contained >7 drugs (7%).

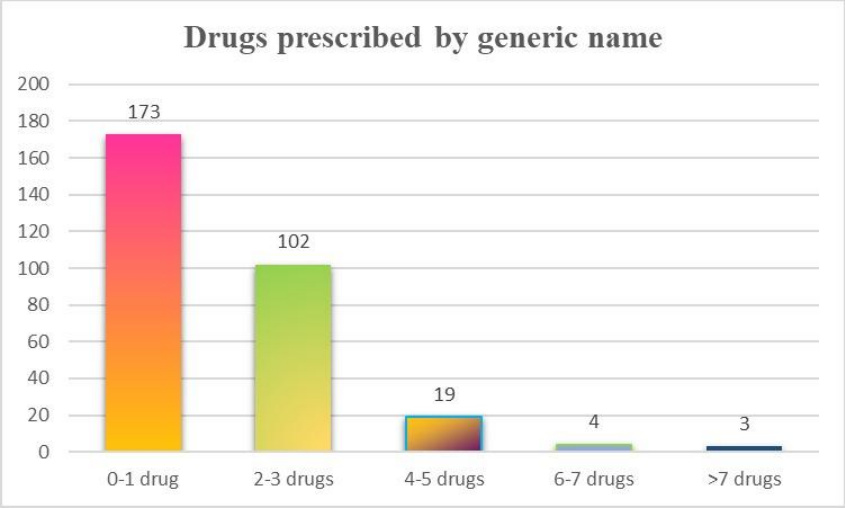

Figure 7. Distribution of cases according to the drugs prescribed by Generic Name.

The above figure indicates among the 301 prescriptions analyzed and studied in pediatric in-patients, 0-1 drugs (58%) were prescribed by generic name in most of the prescriptions followed by 2-3 drugs (34%), 4-5 drugs (6%) and the least number of prescriptions which had 6-7 drugs and >7 drugs prescribed by generic name (1%).

Table 2. Classification of cases according to the number of antibiotics prescribed.

S. No.	No. of cases with antibiotics prescribed	Number	Percentage%
1.	No antibiotics prescribed	81	27
2.	1	151	50
3.	2	59	20
4.	3	10	3
	Total	**301**	**100%**

The above table indicates that out of 301 prescriptions which were analyzed in the study, most of the prescriptions had at least 1 antibiotic prescribed (50%) followed by 0 antibiotic prescribed (27%), 2 antibiotics prescribed (20%) and the least number of prescriptions had 3 antibiotics prescribed (3%).

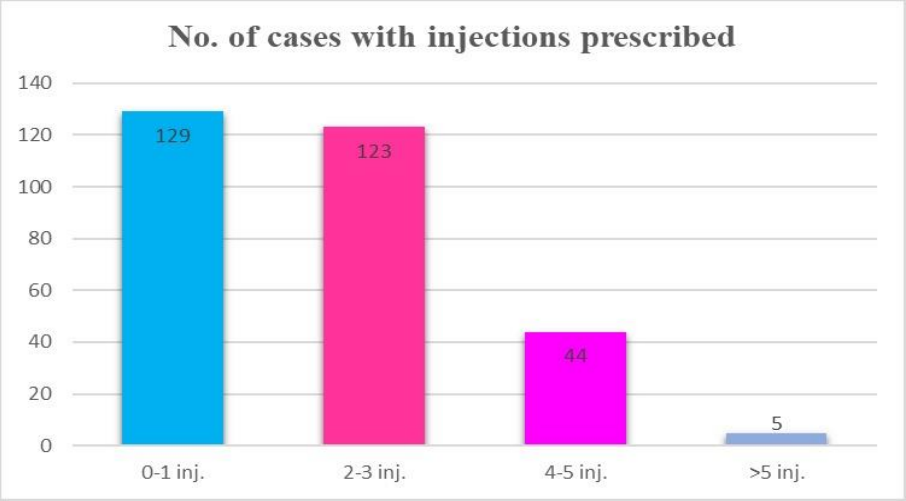

Figure 8. Distribution of cases according to the number of injections prescribed.

The above figure indicates that out of 301 prescriptions analyzed there were a greater number of prescriptions which had 0-1 injections prescribed (43%) followed by 2-3 injections prescribed (41%), 4-5 injections prescribed (14%) and only few prescriptions had >5 injections prescribed (2%).

Table 3. Number of drugs prescribed from the Essential Drug List.

Sl. No.	Essential Drug list	Number	Percentage%
1.	No. of drugs prescribed from EDL	1260	94
2.	No. of drugs not prescribed from EDL	81	6
	Total	**1341**	**100%**

The above table indicates that there were maximum number of drugs prescribed from the Essential Drug List (EDL) (94%) which is almost compliant with the WHO Standard criteria.

Table 4. The WHO prescribing indicators assessed for drug prescriptions (n=301)

Sl.No.	WHO Indicator	Values	95% CI	WHO Standards
1.	Average number of drugs per prescription	4.45	4.27-4.62	2
2.	Percentage of drugs prescribed by generic name	34.22	32.56-36.78	100%
3.	Percentage of encounters with antibiotics	73.08	71.89-75.69	<30%
4.	Percentage of encounters with injections	78.07	76.05-79.86	<10%
5.	Percentage of drugs from EDL	93.9	92.1-94.7	100%

The above table represents the WHO prescribing indicators which were assessed for drug prescriptions. Statistical analysis was performed using IBM SPSS Statistics version: 28.0.1.1 during the study period. The result was obtained through One sample t-test for analysing 95% Confidence Intervals. From the above table it can be depicted that all the prescribing indicators were non-compliant with the WHO Standards.

From the above table it can be concluded that the average number of drugs per encounter (4.45), percentage of drugs prescribed by generic name (34.22%), percentage of encounters with antibiotics (73.08%), percentage of encounters with injections (78.07%) were non-compliant with the WHO Standard criteria. The percentage of drugs prescribed from EDL was found to be almost compliant to the WHO standard criteria.

Discussion:

A prospective observational study was conducted to assess the prescribing pattern in paediatrics patients using WHO indicators. The aim of the study was to analyse the rational prescribing patterns according to WHO-EML for paediatrics. The main goal of the study was whether the study is beneficial to the society by improving prescribing patterns.

An overall of 301 paediatric patients were identified, included &analysed in the study from In-patients units of Department of Paediatrics, Gandhi Hospital, Secunderabad.

Our study concludes that the percentage of female (52%) were more than that of male (48%) which is contrary to the report of the study given by **Chandika. G (2019)** [8]**.**

In the current study of prescribing patterns, the paediatric patients of various age groups distribution shows that Toddlers (1-5 years) (45%) was found to be more which is similar to the study reported by **Venkateshwara Murthy. N (2017).** It reflects that the Toddlers were more prone to have higher susceptibility of infections [11].

In our present study, patients were categorized according to the duration of days hospitalized in which maximum number of patients were hospitalized for 4-5 days (40%) followed by 6-7 days (33%), 2-3 days (15%) and >7 days (12%) which is similar to the study reported by **Biradar S.M (2019)** [12]**.**

Among the data of various diseases analysed in this study, out of 301 cases it is found that Respiratory infections were the most commonly encountered (26%) followed by nervous system disorders (15%), gastrointestinal diseases (14%) and infectious diseases (12%) which is similar to the study reported by **Venkata Naveen Kumar P (2020)** [13]**.**

A study conducted by **Muhammed Faisal. E (2017)** reported that Antibiotics were prescribed the maximum followed by NSAIDs. However, our present study also reports the same. Overall, 1341 drugs were given to 301 paediatric In-patients, out of which the maximum of antibiotics (27%) were more followed by anti-inflammatory (15%) [14].

In our study, overall, 363 antibiotics were prescribed to the `paediatric patients. Out of that, Cephalosporins were the most commonly prescribed antibiotics which is similar to the study reported by **B. Vinoly Jeevan (2017)** [15]**.**

When compared to all the other dosage forms, drugs given through the I.V. route (Injections) (46%) were more frequently administered by Syrups (22%) and Tablets (20%) which is comparatively familiar to the report given the study by **Vishwanath M (2014)** [16]**.**

Our study found that, an average number of 4.45 drugs per patient prescription which is relevant to the study done by **Palikhe N (2004).** This average number of drugs per prescription is more when compared to the WHO standards i.e., 1.6-1.8. Higher value indicates Polypharmacy which can lead to risk of adverse drug reaction, Drug interactions, Drug errors and non-adherence [17].

There is a typical practice in our nation, that majority of the drugs administered using brand names, which increases the cost of therapy. So, prescribing generic drugs may decrease the cost of therapy. In our present study the % of generic drugs prescribed was found to be 34.22% which was lower than the WHO Standard (100%) but higher than the study reported by **Lourdu Jafrin Antony (2021).** This could be related to concerns about generic product quality, pharmaceutical company marketing influence [18].

According to **Deshmukh SN (2016)** research study, roughly 28% of prescriptions contain at least two antibiotics, 96 percent of which are administered by parenteral route, and 79 percent of prescriptions are written in generic names. Antibiotics should be used <30% according to WHO standards for prescription guidelines. Antibiotic use is quite high in underdeveloped countries like India (98.1%) due to a lack of facilities and monetary resources for laboratory tests, which could be reasons for an increase in antibiotic use. In our present study it is found that the percentage of antibiotics seen per prescription is greater, that is 73.08% than the WHO prescription indicator which is 20–26.8 %. The bulk of antibiotic prescriptions are for acute respiratory infections and acute gastrointestinal dysentery disease, which could explain the rise in antibiotic prescriptions [19]. The irrational use of antibiotics is observed in our study.

Injectables have a number of drawbacks, such as risk of infection during administration, risk of tissue toxicity due to local irritation and the difficulty in correcting errors. According to the WHO, the percentage of injectable per prescription should be 13.4%–24.1%. However, in our study the % of injectable per prescription was found to be 78.07% which shows higher than the WHO Standards. Increased parental use was also documented in a study by **Sai Sravani D (2017)** [20]**.** This increased parenteral use may be due to the increased rate diseases condition in children under the age of 3 years, also may be due to the type of disease condition.

In a developing country, the variety of health issues are treated by essential drugs which provides a cost-effective treatment. They should be chosen based on illness prevalence, price, quality assurance, and availability in the right dosage forms. The % of drugs prescribed from the WHO's essential drugs list was 93.9% found in our study which is lower than the WHO Standard optimum of 100%. This is relevant to the study done by **Sharma and Shweta (2015).** [21].

Conclusion:

This study examines medication prescribing patterns in a tertiary care teaching hospital's paediatrics unit. It had aided in the identification of rational drug prescribing practises utilising W.H.O indicators.

This study revealed that all prescribing indicators in Tertiary care hospital deviated from WHO standards expect for the % of medications administered from Essential Drug List. Results from this study indicate prescribing practices was not satisfactory and irrational usage of drugs was observed especially with respective to polypharmacy, antibiotics and prescribing drugs with

injectables. Although antibiotics are dispensed inappropriately, polypharmacy can lead to adverse medication responses and medications interactions. From our study we can conclude that periodic evaluation of prescribing pattern in paediatric is needed to enable prescription of suitable medication to improve therapeutic benefits.

Funding:

Nil.

Conflict of Interest:

None.

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