

Available online on 15.04.2025 at <http://jddtonline.info>

# Journal of Drug Delivery and Therapeutics

Open Access to Pharmaceutical and Medical Research

Copyright © 2025 The Author(s): This is an open-access article distributed under the terms of the CC BY-NC 4.0 which permits unrestricted use, distribution, and reproduction in any medium for non-commercial use provided the original author and source are credited



Open Access Full Text Article



Research Article

## Evaluation of Drug Prescription Pattern in Pediatric Out-Patient Department in Science and Technology Hospital Sana'a, Yemen

Butheina Abdul-Wally Alamrani <sup>1</sup>, Ahlam Abdulmalik Abdulwahab Esmail <sup>2</sup>\*

<sup>1</sup> Phd in clinical pharmacology, Assistant lecturer in Department of Pharmacology, Faculty of Medicine and Health Sciences, Science and Technology University, Sana'a, Yemen

<sup>2</sup> Fellowship in pediatrics, Pediatric consultant, Associate Professor Faculty of Medicine and Health Sciences, Science and Technology University, Sana'a, Yemen

### Article Info:



#### Article History:

Received 11 Jan 2025  
Reviewed 26 Feb 2025  
Accepted 24 March 2025  
Published 15 April 2025

#### Cite this article as:

Alamrani BA Esmail AAA, Evaluation of Drug Prescription Pattern in Pediatric Out-Patient Department in Science and Technology Hospital Sana'a, Yemen, Journal of Drug Delivery and Therapeutics. 2025; 15(4):20-25  
DOI:  
<http://dx.doi.org/10.22270/jddt.v15i4.7077>

#### \*Address for Correspondence:

Ahlam Abdulmalik Abdulwahab Esmail, Fellowship in pediatrics, Pediatric consultant, Associate Professor Faculty of Medicine and Health Sciences, Science and Technology University, Sana'a, Yemen

### Abstract

**Background:** This study evaluates the drug prescription patterns in the pediatric outpatient department at Science and Technology Hospital in Sana'a, Yemen, according to WHO indicators for drug prescription.

**Objectives:** To Evaluate the prescribing practices alignment with the World Health Organization (WHO) recommendations in the pediatric outpatient department at Science and Technology Hospital in Sana'a, Yemen

**Method:** A retrospective cross-sectional descriptive study was conducted in December 2022, analyzing prescription data from over 681 pediatric encounters.

**Results:** The average number of drugs prescribed was 3.19 per encounter. Only 11% of the drugs were injections. Antibiotics comprised 16.5% of total prescriptions, but only 4.9% of drugs were prescribed by generic name, and about 72 % of the prescribed drugs were prescribed from the essential drugs list.

**Conclusion:** According to the findings, only the amount of antibiotics prescribed and the average number of injectable drugs meet the WHO indicators. However, the number of drugs prescribed per encounter, prescribing drugs with generic names, and choosing a drug from the essential drug list are less than the WHO indicator rate. The findings underscore the need to improve prescribing practices to enhance patient safety and reduce the risk of adverse drug reactions in the pediatric population, particularly in private healthcare settings.

**Keywords:** Drug Prescription, Pediatrics, Clinical Pharmacology, World Health Organization

## BACKGROUND

Irrational prescription of drugs is a significant global public health issue in the healthcare system. The inappropriate use of medications exceeds 50% of all drug prescriptions.<sup>1</sup> The prescriptions that deviate from guidelines, lead to several adverse effects that affect the outcomes. It increases the risks of adverse drug reactions and drug-drug interactions, demands increased monitoring efforts, and results in unnecessary financial burdens.<sup>2</sup>

The most common irrational practice in drug prescription is; polypharmacy, antimicrobials miss use, inappropriate and unsafe use of injectable drugs and the use of brand-name medicines instead of generic names.<sup>3</sup>

Rational use of drugs is important to all patients; however, the pediatric population is in higher risk to develop drug adverse effect due to their different physiology; pharmacokinetics and pharmacodynamics

compared adults.<sup>3</sup> However, data on drug use in children are often not studied, in regions like the Middle East and North Africa, where children and young people account for approximately half of the population.<sup>3</sup>

The World Health Organization (WHO) has established three main indicators to assess drug prescription which are: prescribing indicators, patient care indicators, and healthcare facility-specific indicators.<sup>4,5</sup> Prescribing indicators, as mentioned in the WHO manual, compose of parameters such as the average number of drugs per encounter, the percentage of drugs prescribed by generic names, the percentage of encounters with prescribed antibiotics, the percentage of encounters with prescribed injections, and the number of drugs prescribed from the essential drug list.<sup>4</sup>

The present study was conducted in order to study the prescribing pattern of drugs in pediatric population in comparison with WHO core indicators.

## METHODS

A retrospective cross-sectional descriptive study was carried out as a single institutional study. The prescription data collected from pediatrics outpatient department of Science and technology hospital, Sanaa, Yemen in December 2022. All patients that encounter the outpatient pediatric department from 1<sup>st</sup> -31<sup>th</sup> of December 2022 were included. Sample size was 681 patients as indicated by WHO guidelines that the sample size should exceed 600 for a single facility study.<sup>6</sup>

The variables that are assessed according to WHO prescription indicators are :<sup>6</sup>

1. The average number of prescriptions per encounter
2. The average number of antibiotics prescribed
3. The average number of intravenous drugs prescribed
4. The average number of drugs prescribed by generic name
5. The average number of drugs prescribed from essential drug list

Moreover, patients' age, gender, and diagnosis also were obtained from the data.

All data were analyzed using the Statistical Package for Social Sciences (SPSS) version 22. The analysis was conducted using mean/average and percentage.

## RESULTS

In the present study, there was 681 encounter and about 679 prescriptions containing a total of 2169 drug prescribed. Almost 49% were male and 51% were females. The age ranges from 7 days to 17 years.

The average drug prescribed per encounter was 3.19. The range of drugs prescribed per encounter range from 1-13, while about 85% of prescriptions had between 1-4 drugs. About 15% had about 5-10 drug per prescription, as shown in Table (1).

Table 1: Average number of drugs per encounter from the studied sample

Number of drugs per prescription	Frequency	Percentage (%)
0	2	0.3
1	128	18.8
2	181	26.6
3	136	20.0
4	103	15.1
5	62	9.1
6	26	3.8
7	17	2.5
8	10	1.5
9	6	0.9
10	6	0.9
12	1	0.1
13	3	0.4

Most common drugs prescribed were antipyretics 18.8% followed by antibiotics, antiallergics and vitamins (16.7%, 11.7%, and 9.3 % respectively) as shown in Table (2). Other drugs prescribed are shown in Table (2)

Table (2): Prescribed drugs Among the Study Sample

Drug	Number of prescriptions	Percentage (%)
Antipyretics	408	18.8
Antibiotic	363	16.7
anti-allergic	254	11.7
Vitamins	201	9.3
Decongestant	146	6.7
Antispasmodic	131	6.0
Fluids	102	4.7
Expectorant	70	3.2
Anti-emetic	67	3.1
Anti-allergic	66	3.0
Hematopoietic	65	3.0
Mucolytic\ decongestant \antipyretics	52	2.4
Minerals	48	2.2
Proton pump inhibitor and H2 blockers	40	1.8
Antifungal	38	1.8
Antiprotozoal	32	1.5
Laxatives	24	1.1
Others	61	2.8
Total	2169	100

About 357 (16.5%) of the drugs prescribed were antibiotics prescribed as shown in Table (3). Cephalosporines and penicillines were the most common antibacterial drugs used. the top 4 antibiotics used were Cefixime, Augmentin, Azithromycin, and Cefuroxime respectively.

About 3% of drugs were antiprotozoal, in which metronidazole was used as the main antiprotozoal drug. Only 0.4 % of prescribed drugs were antifungal mostly used locally. Both antiprotozoal and antifungal drugs are excluded from the antibiotics group according to the WHO parameters.<sup>7</sup>

Table (3): Prescribed Antibiotics Among the Study Sample

Antibiotic group	Antibiotic	Frequency	Percent (%)
Penicillin (N= 92, 4.2%)	Augmentin	78	3.6
	Amoxicillin	12	0.5
	Benzylpenicillin	2	.1
Cephalosporins (N= 162, 6.8 %)	Cefixime	81	3.7
	Cefuroxime	48	2.3
	Cefadroxil	13	.6
	Ceftriaxone	9	.4
	Cefpodoxime	9	.4
	Cefoperazone	1	.0
	Cephalexin	1	.0
Macrolides (N=66 , 3%)	Azithromycin	59	2.7
	Erythromycin	7	0.3
Aminoglycoside (N= 10, 0.4%)	Gentamycin	1	.0
	Tobramycin	9	.4
Fluroquinolones (N= 13, 0.6%)	Ofloxacin	11	.5
	Gemifloxacin	1	.0
	Moxifloxacin	1	.0
Others (N = 14, 0.7%)	Fucidin	8	.4
	Cotrimoxazole	6	.3
Total antimicrobial prescriptions		357	16.5
Total number of prescriptions		2169	100.0

The injectable drugs were only 11% of all the drugs prescribed. Antiemetic drugs were the most common injectable drug (17.6%) as shown in table, followed by

antibiotic antipyretics and proton pump inhibitors and H2 blockers (16.9 %, 14.8 % and 10.3% respectively) as shown in Table (4)

Table 4: Prescribed Injectable Medicine Among the Study Sample

Injection	Frequency	Percent
Anti-emetic	43	17.7
Antibiotic	41	16.9
Antipyretics	36	14.8
Proton pump inhibitor and H2 blockers	25	10.3
Anti-spasmodic	19	7.8
Vitamins	19	7.8
Anti-allergic	18	7.4
Hematopoietic	18	7.4
Distal Water	9	3.7
Anti-inflammatory	7	2.9
Anti-convulsant	3	1.2
Antiprotozoal	2	0.8
Contrast media	2	0.8
Diuretics	1	0.4
Total IV injections	243	11
Total number of prescriptions	2169	100

Table 5: Frequency and percentage of generic /non generic and essential and non-essential drugs Among the Study Sample

	Frequency	Percentage (%)	Total
Generic	106	4.9	2169
Non generic	2062	95.1	
Essential	1554	71.6	2169
Non-essential	615	28.3	

Only 106 (4.9%) drugs were prescribed in generic name, while 2062 (95.1%) were non generic drugs as shown in Table (5). Almost 1554 (71.6%) drug were prescribed in from essential drug list, while 615 (28.3%) were from non-essential list of drug drugs as shown in Table (5).

When comparing the WHO prescription core indicators, it is noticed that the number of antibiotics and injectable drugs are standard according to WHO guidelines. The percentage of prescribed antibiotics didn't exceed 20% of total prescriptions and the average of injections was

only 11% which is corresponded to WHO indicator that stated that the percentage of antibiotics and injection not exceed 30% and 20% respectively. On the other hand, the average number of drugs per prescription in 3.19 and it exceed WHO indicator of less than 2.

About 100% of drugs must be written in genetic names and from essential drug list according to WHO indicator, but Only 4.5 of the drugs are written by the generic names, and 71.6% are included in essential drug list in our facility. As shown in Table (6).

Table 6: Drug Core Prescribing Indicators Identified for the Study Sample

Parameter	Study Sample Value	WHO Standard Value	Standard Achievement
1. Average number of drugs per encounter	3.19	<2.0	No
2. Percentage of encounters with antibiotics	20%	<30%	Yes
3. Percentage of encounters with injection	11%	<20%	Yes
4. Percentage of drugs prescribed by generic name	4.5%	100.0%	No
5. Percentage of drugs from essential drug list	71.6%	100.0%	No

## DISCUSSION

The mean number of drugs per encounter was 3.19 which is higher than WHO core prescription indicators. Which indicates that polypharmacy pattern is present in our facility.

The use of multiple medications increases the risk of drug interactions and side effects in pediatric patients<sup>8</sup> polypharmacy prevalence is 30% globally, and the highest prevalence is in Asia while the lowest in north America.<sup>9</sup> It is more common in old age due to comorbidity.<sup>8</sup> It is more ease to be avoided in young age.

Similar to our study, other studies in the region indicted high average of drug prescription per encounter such as in Afghanistan it was found to be 2.9,<sup>10</sup> in India it was 2.6,<sup>11</sup> in Abu Dhabi it was 4.9,<sup>12</sup> in Nigeria it was 3.4<sup>13</sup> and in Ethiopia it was 2.2,<sup>14</sup> but in our facility, it is still higher than them all. A study done in Jordan had a low average of drugs prescribed per in counter in accordance to the WHO core indicator.<sup>15</sup> Another Study in Sudan had also 2 description drugs per encounter.<sup>16</sup>

In our study the number of antibiotics prescribed were less than 30% which is according to WHO core indicators, which similar to another study done in Jordan.<sup>15</sup> and in Nigeria<sup>13</sup>.

However, in Afghanistan,<sup>10</sup> Ethiopia,<sup>14</sup> Abu Dhabi,<sup>12</sup> Sudan<sup>16</sup>, and India<sup>11,15,17</sup> the antibiotic prescriptions were every high. The over use of antibiotics causes microbial resistance. Our result highlights the physician's knowledge about the mis use of antibiotics.

In our study only 11% of the drugs are given in form of injections which is parallel to the WHO core indicators. This can be attributed to practitioners' increased awareness injection adverse effects. Additionally, it may be that emergency cases are treated in the emergency unit.

Our results were similar to many other studies which had even lower average of injections in Nigeria<sup>13</sup>, Abu Dhabi<sup>12</sup>, Sudan<sup>16</sup>, Jordan<sup>15</sup> Afghanistan<sup>10</sup>, Ethiopia<sup>14</sup> and India<sup>11,15,17</sup>.

Unfortunately, only 4.5% of drugs were written in their generic name it may be because it is a private hospital and

this influence the pharmaceutical companies' relations with the main in the facility. Using generic name in prescribing is an indicator of rational prescribing. It increases access and affordable of drugs, and enhance adherence to the treatment.

A study in Nagpur city in India <sup>17</sup> Nagpur had also very low percentage of generic name (7.4%) similar to our study, however another study in East India with smaller sample size had about 74% of drugs written in generic name.

Other studies in Nigeria,<sup>13</sup> Saudi Arabia,<sup>13</sup> and Afghanistan <sup>10</sup> also had low percentage or generic name prescriptions

An exception is found in Jordan <sup>15</sup> which had 100% of all perceptions were generic. This may be due to governmental regulation and health system guidelines.

But in Jordan they have low average of essential drugs prescriptions which was only 47 % and in our study was 71.5%, which is still lower that the WHO core indicator recommendations. It is because there are no national essential list established in our country. Also, the pediatricians prescribe off label drugs and supplements. More over parents may influence the doctor discission due to low income and far residency.

The percentage of drugs prescribed from essential drug list in Our studies as Nigeria was 89.6% (Okoye, Udemba et al. 2022), and Afghanistan was 67%.<sup>10</sup>

However, a study in India had a 98% of drugs prescribed from essential drug list <sup>18</sup> noting that the sample size in this study was very small and only three physicians involved in the study.

An essential drug list promotes rational drug use and is by cost-effective and is better for prevalent diseases.

## CONCLUSION

This is study revealed that there is some adequate prescribing habits, including an optimal prescription of antibiotics, and injectables which meet WHO standards. But these findings highlight the need to further strategies to decrease the average number of drugs prescribed per encounter. The drug must be from essential drug list and written in their generic name. Limitation of the study is that this was conducted in a private single facility which may not be a good representation of the general population

**Conflicts of interest disclosed:** The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

## Authorship contribution

**Butheina Abdulwalli Alamrani** (correspondent author) is responsible for the Concept and design of study, data analysis, drafting of the article and final approval of the version to be published.

**Ahlam Abdulmalik Abdulwahab Esmail** is responsible for the design of study, data analysis,

drafting of the article and final approval of the version to be published.

**Source of funding:** No funding source

**Ethical board approval:** 1445/008/REC/UST / Science and technology university ethical committee board 14 - Dec -2022

## REFERENCES

1. Tripathy J, Bahuguna P, Prinja S. Drug prescription behavior: A cross-sectional study in public health facilities in two states of North India. *Perspect Clin Res.* 2018;9(2):76-82. [https://doi.org/10.4103/picr.PICR\\_75\\_17](https://doi.org/10.4103/picr.PICR_75_17) PMID:29862200 PMCID:PMC5950614
2. Rasool MF, Rehman AU, Imran I, et al. Risk Factors Associated With Medication Errors Among Patients Suffering From Chronic Disorders. *Front Public Health.* 2020;8:531038. <https://doi.org/10.3389/fpubh.2020.531038> PMID:33330300 PMCID:PMC7710866
3. Bassoum O, Ba MF, Sougou NM, Fall D, Faye A. Evaluation of Prescribing Indicators in a Paediatric Population Seen in an Outpatient Consultation at the Gaspard Kamara Health Centre in 2019 (Senegal). *Pharmacy (Basel).* 2021;9(2). <https://doi.org/10.3390/pharmacy9020113> PMID:34204194 PMCID:PMC8293318
4. Ofori-Asenso R. A closer look at the World Health Organization's prescribing indicators. *J Pharmacol Pharmacother.* 2016;7(1):51-54. <https://doi.org/10.4103/0976-500X.179352> PMID:27127400 PMCID:PMC4831494
5. Shrestha B, Dixit SM. Assessment of drug use pattern using WHO prescribing indicators. *Journal of Nepal Health Research Council.* 2018;16(3):279-284. <https://doi.org/10.3126/jnhrc.v16i3.21424> PMID:30455486
6. Organization WH. How to investigate drug use in health facilities: selected drug use indicators. World Health Organization;1993.
7. Shrestha B, Dixit SM. The Assessment of Drug Use Pattern Using WHO Prescribing Indicators. *J Nepal Health Res Council.* 2018;16(3):279-284. <https://doi.org/10.33314/jnhrc.v16i3.1208> PMID:30455486
8. Kim S, Lee H, Park J, et al. Global and regional prevalence of polypharmacy and related factors, 1997-2022: An umbrella review. *Archives of Gerontology and Geriatrics.* 2024;124:105465. <https://doi.org/10.1016/j.archger.2024.105465> PMID:38733922
9. Baker C, Feinstein JA, Ma X, et al. Variation of the prevalence of pediatric polypharmacy: A scoping review. *Pharmacoepidemiol Drug Saf.* 2019;28(3):275-287. <https://doi.org/10.1002/pds.4719> PMID:30724414 PMCID:PMC6461742
10. Farid Habibyar A, Nazari QA. Evaluation of prescribing patterns using WHO core drug use indicators in a pediatric hospital of Kabul Afghanistan: A prospective cross-sectional study. *Heliyon.* 2023;9(11):e21884. <https://doi.org/10.1016/j.heliyon.2023.e21884> PMID:38027959 PMCID:PMC10661205
11. Mandal P, Asad M, Kayal A, Biswas M. Assessment of use of World Health Organization access, watch, reserve antibiotics and core prescribing indicators in pediatric outpatients in a tertiary care teaching hospital in Eastern India. *Perspect Clin Res.* 2023;14(2):61-67. [https://doi.org/10.4103/picr.picr\\_22\\_22](https://doi.org/10.4103/picr.picr_22_22) PMID:37325582 PMCID:PMC10267998
12. El-Dahiyat F, Salah D, Alomari M, Elrefae A, Jairoun AA. Antibiotic Prescribing Patterns for Outpatient Pediatrics at a Private Hospital in Abu Dhabi: A Clinical Audit Study. *Antibiotics (Basel).* 2022;11(12). <https://doi.org/10.3390/antibiotics11121676> PMID:36551333 PMCID:PMC9774298
13. Okoye BI, Udemba JC, Ndugba CA, Okonkwo JI, Obed EA. Evaluation of rational prescribing in a hospital paediatric outpatient clinic in Nigeria. *BMJ Paediatr Open.* 2022;6(1).

- <https://doi.org/10.1136/bmjpo-2022-001585> PMID:36645753  
PMCID:PMC9562308
14. Summoro T, Gidebo K, Kanche Z, Woticha E. Evaluation of trends of drug-prescribing patterns based on WHO prescribing indicators at outpatient departments of four hospitals in southern Ethiopia. *Drug Des Devel Ther.* 2015;9:4551-4557. <https://doi.org/10.2147/DDDT.S83588> PMID:26309400  
PMCID:PMC4539081
15. Aldabagh A, Abu Farha R, Karout S, Itani R, Abu Hammour K, Alefishat E. Evaluation of Drug Use Pattern in Pediatric Outpatient Clinics in a Tertiary Teaching Hospital Using WHO Drug-Prescribing Indicators. *J Multidiscip Healthc.* 2022;15:1143-1151. <https://doi.org/10.2147/JMDH.S362172>  
PMid:35611000 PMCID:PMC9124472
16. Ahmed AM, Awad AI. Drug use practices at pediatric hospitals of Khartoum State, Sudan. *Ann Pharmacother.* 2010;44(12):1986-1993. <https://doi.org/10.1345/aph.1P423> PMID:21119094
17. Pandey AA, Thakre SB, Bhatkule PR. Prescription analysis of pediatric outpatient practice in nagpur city. *Indian J Community Med.* 2010;35(1):70-73. <https://doi.org/10.4103/0970-0218.62564> PMID:20606924 PMCID:PMC2888372
18. Jose J, Devassykutty D. Paediatric Prescription Analysis in a Primary Health Care Institution. *J Clin Diagn Res.* 2016;10(11):Fc05-fc08. <https://doi.org/10.7860/JCDR/2016/22350.8797>  
PMid:28050392 PMCID:PMC5198345