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# Assessment of Paediatric Antibiotic Prescriptions Practice Among Hospitalized Children Using WHO AWaRe Guidelines in Sulaimani City, Iraq

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## ABSTRACT

***Background:*** *Inappropriate antibiotic use among hospitalised children is a growing concern, particularly in low- and middle-income countries.* ***Objective:*** *The study aims to evaluate the rationality of antibiotic prescription practices among hospitalized children in a major referral hospital in Sulaimani, Iraq, using the World Health Organisation AWaRe classification as a benchmark.* ***Methods****: A cross-sectional study with a convenience sampling method was conducted on 600 patients from January to April 2025 at Dr Jamal Ahmad Rashid Paediatric Teaching Hospital. Data were collected from inpatients on wards, in the Intensive Care Unit, and in the Neonatal Intensive Care Unit using the interview method, medical record reviews, and a structured questionnaire aligned with WHO standards. Statistical analyses were performed using SPSS version 25.* ***Results****: Out of 600 patients, 435 (72.5%) received antibiotics. The most prescribed antibiotics were Ceftriaxone (31.4%) and Cefotaxime (16.7%). According to WHO, AWaRe classification, 65.8% of prescriptions were from the Watch group, 33.7% from Access, and 0.4% from the Reserve group. Only 8.9% underwent culture and sensitivity testing. Modifications to the antibiotic regimen were implemented in 70% of positive culture cases. Patients prescribed antibiotics had a higher discharge cure/stable rate (86.1%) but also accounted for all reported mortalities (3.9%).* ***Conclusion:*** *Antibiotic prescribing practices at the hospital show substantial reliance on Watch group antibiotics and limited microbiological guidance, highlighting potential misuse. Strengthen antimicrobial stewardship programs, increase microbiological testing, promote prescriber education, and encourage adherence to WHO guidelines to ensure rational antibiotic use and curb resistance.*

**Keywords: Antibiotic, Paediatric, WHO AWaRe Classification, Antimicrobial Stewardship.**

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## INTRODUCTION

A molecule or material formed by microorganisms that, at very low concentrations, has the capability to stop or kill other microbes is known as an antibiotic. Antibiotics are employed to address bacterial infections in people and animals. [(1)]. They can be classified in numerous ways, based on source (natural/artificial), mechanism of action, nature of action (bacteriostatic/bactericidal), and range of activity (narrow spectrum/broad spectrum) [(2)] The art of antibiotics was shaped in the twentieth century (1940) [(3)].Children in general in the world simply receive antibiotics more often than adults, and studies show that up to 50% of the treatments in paediatric affected roles are unnecessary or inappropriate [(4, 5)]. Antimicrobial consumption among kids of low- and middle-income countries (LMICs) remains disproportionately high at known rates of 68–88% [(6)], compared with 32.5% in high-income settings like London [(7)]. Furthermore, regional variability continues; Turkey stated 70.8% of antibiotic use in paediatric inpatients [(8)], while Iranian information reported 75% in kids' wards and 67.9% in newborns' wards [(9)]. Shocking is the frequency in Iraqi hospitals, with 94.3% of the kids' cases getting antibiotics in Al-Najaf [(10)], and 66.7% in the Baghdad hospitals, with a high of 97.2% in newborn ICUs [(11)], Kids are in a dangerous period of physiological and neural development; during this stage, exposure to antibiotics can cause important lasting health penalties. Whereas antibiotic resistance is the greatest broadly known consequence, there are additional opposing results such as asthma, food allergies, obesity, and attention deficit hyperactivity disorder (ADHD) [(12)]. A substantial amount of antibiotics ordered for kids are broad-spectrum agents that mark infectious and commensal microorganisms. Individuals' gut microbiota has an important part in metabolism, the maturation of the immune system, and behaviour [(13)].

In 2017, the World Health Organization (WHO) listed the essential medicines and cultivated the AWaRe classification of antibiotics—Access, Watch, and Reserve—to guarantee accessibility and clinical results concurrently dropping down the antimicrobial resistance and preventing the use of the Reserve (last resort) group till the end of other safe and effective choices. Access groups are essential with low-resistance-profile antibiotics used as primary- or the second line antibiotics, which should be broadly accessible and kept as the first line. Antibiotics in the Watch group exhibit greater toxicity and resistance than those in the Access group, and these antimicrobial agents are under the targets with more emphasis in stewardship programs. The Reserve Group is the last option employed for specific indications when all alternative therapies have proven ineffective, resistive or unsuitable [(14)].

Antibiotics are used to treat serious infections or decrease their problems, and antibiotics have played a crucial role in dropping worldwide deaths from infectious illnesses, mainly in low- and middle-income countries (LMICs). Throughout the period from 2000 to 2015, consumption of antibiotics rose by 114% in LMICs, in harmony with a significant decline in deaths from lower respiratory tract infection (LRTI), with a 32% reduction in Streptococcus pneumoniae pneumonia and an 86% decline in Haemophilus influenzae type B pneumonia deaths. First-line antibiotics continue to be clinically effective against such pathogens, testifying to their survival potential in resource-poor locations. Mass distribution of azithromycin in sub-Saharan Africa reduced baby deaths by 13.5%, testifying to its vital role in susceptible societies. This is, however, countered by the danger of developing antibiotic resistance, driven by high usage and the ethical dilemma of fulfilling short-term survival supplies at the charge of long-term value. Even though antibiotics most certainly underpin universal health advancements, their unstable resistance dynamics and the harsh imperative for durable stewardship plans underline the need to temper access in contradiction of restraint as a means of maintaining upcoming treatment capabilities [(15)].

New studies reveal that antimicrobial resistance is one of the main significant harms to public health since it is particularly involved in illness and death in affected groups due to the increasing resistance and random deactivation of risky and harmless microbiota. Antibiotic resistance in pathogenic bacteria can be defined microbiologically or clinically. Microbial resistance is the incidence of a hereditary mechanism of resistance (acquired or mutated), classifying the pathogen as resistant or vulnerable predicated on the claim of a set termination in a phenotypic lab test. Clinical resistance denotes a degree of antibacterial efficacy associated with an elevated possibility of therapeutic Unsuccessful outcome. The test indicator for determining therapeutic resistance can diversify with aspects of the clinical setting, including the infection site or the quantity of medication [(16)]. The study aims to measure the suitability of antibiotic prescribing practices for paediatric inpatients at Dr. Jamal Ahmad Rashid Paediatric Teaching Hospital in accordance with the WHO AWaRe classification system and to recognize patterns of misuse and potential areas for antimicrobial stewardship improvement.

## METHODS

A cross-sectional study was conducted at Dr. Jamal Ahmad Rashid's Paediatric Teaching Hospital in Sulaimani, Kurdistan Region, Iraq, to determine the rationality of antibiotic prescribing practices. Data collection started from January to April 2025 and to ensure consistency, data collection was carried out daily between 8:30 AM and 1:00 PM. The study targeted only children who were admitted to the Wards, Intensive Care Unit (ICU), and Neonatal Intensive Care Unit (NICU). Exclusion criteria included patients who were discharged or transferred before the completion of data collection, as well as patients whose companions did not agree to participate in the study.

### Administrative Arrangement and Ethical Considerations

This study was approved by the Research Council at the Scientific Committee of the College of Medicine and the Ethical Committee of the Medical Colleges of Sulaimani University. Additionally, approval letters were obtained from the Department of Health (DOH) and Dr. Jamal Paediatric Teaching Hospital for the data collection. Since the study involved children, oral consent was obtained from the patients' companions (e.g., parents or guardians) for all study participants. The consent process included A delineation of the study's objectives, methodologies, possible hazards, and advantages. Participants were assured of the confidentiality of their data, that the collected data would only be used for academic purposes, and that they had the right to withdraw from the study at any time without any consequences.

### The Data Collection Questionnaire

To meet the study's purposes, a semi-structured questionnaire form was developed. Data were obtained in accordance with World Health Organisation (WHO) guidelines for rational antibiotic use. The questionnaire comprised demographic background questions, clinical indications and infection types, antibiotic prescribing patterns (type, dose, etc.), adherence to standard treatment protocols (WHO guidelines), information on culture and sensitivity tests (if available), and a final section including questions on treatment response and patient outcomes. To validate the content, clarity, and relevance of the questionnaire, the questionnaire form was reviewed by experts in the field, including seven medical professionals with backgrounds in paediatrics, pharmacology, and community health. Furthermore, before launching the main study, a pilot phase involving 20 patients was conducted to assess the clarity and consistency of the questions. This preliminary test led to minor modifications that improved the effectiveness of the data collection process in real-time settings.

### Data Collection Technique

The total study sample was 600 cases, chosen based on the consecutive sampling method, which is the strongest method of sampling since all population has been selected during the study period who meets the inclusion criteria. The data collection technique was the interview method, conducted with the children or, if they were unable to respond, with their companions. Information was collected through multiple stages, from admission to discharge, to ensure comprehensive coverage. The first step included follow-up and daily observation of each patient throughout their hospitalisation to record changes in treatment and response. A review of hospital documents, including prescriptions, physician notes, and lab reports, was performed for clinical accuracy. Interviews with the patients or their caregivers were also conducted to double-check sociodemographic data and background information.

### Statistical Analysis

The collected data were analysed using SPSS version 25 to generate descriptive statistics, including mean, standard deviation, frequency, and percentage for both qualitative and quantitative data. To identify differences between two categorical variables, the chi-square test was used. If expected values included less than 10, Fisher's exact test was used instead of the chi-square test. A p-value of 0.05 or less was deemed statistically significant.

## RESULTS

The age of the children who participated in the study ranged from one day to 17 years, with a mean (3.06) and a standard deviation (SD) (3.97), and most patients were infants under the age of one year, 278 (46.3%). Furthermore, children aged 1–4.9 years represented 192 (32%), those aged 5–9.9 years 70 (11.7%), and the lowest age group was children aged 10 years or older, 60 (10%). Regarding gender distribution, the males, 333 (55.6%), were more compared to females, 266 (44.4%), and for the cause of admission, respiratory conditions were at the top, 340 (56.7%), followed by gastrointestinal issues at 149 (24.8%). Other diagnoses included nervous system conditions, 34 (5.7%); urinary tract infections, 5 (0.8%); skin/soft tissue infections, 1 (0.2%); and other causes, 71 (11.8%), respectively. Most of the patients who were selected for the current study were in general ward 409 (68.3%), while others were in the ICU 98 (16.4%) and NICU 92 (15.4%). (Tab 1)

**Table (1): Demographic characteristics and hospital admission causes of the study participants.**

| Variables and groups | Value | Frequency | % |
|---|---|---|---|
| **Age groups** | <1<br>1-4.9<br>5-9.9<br>≥10 | 278<br>192<br>70<br>60 | 46.3<br>32<br>11.7<br>10 |
| **Gender** | Male<br>Female | 333<br>266 | 55.6<br>44.4 |
| **Admission Diagnosis** | Respiratory<br>Gastrointestinal<br>Urinary tract<br>Skin/soft tissue<br>Nervous system<br>Other | 340<br>149<br>5<br>1<br>34<br>71 | 56.7<br>24.8<br>0.8<br>0.2<br>5.7<br>11.8 |
| **Department** | Ward<br>ICU<br>NICU | 409<br>98<br>92 | 68.3<br>16.4<br>15.4 |

Figure one shows that the majority of the patients who were admitted to the hospital were prescribed antibiotics, 435 (72.5%), while only a minority, 65 (27.5%), did not receive antibiotics.

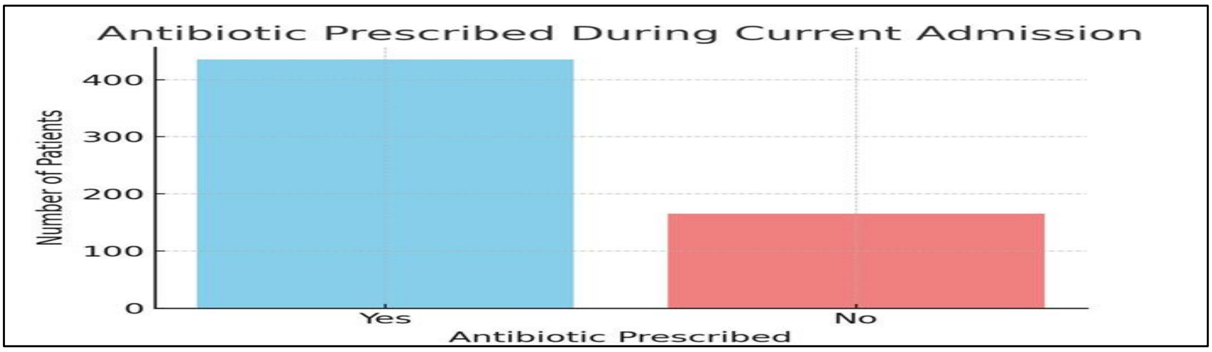


**Figure (1): Frequency of antibiotic prescription among admitted patients.**

Table 2 presents the rate of different antibiotics prescribed, categorised according to the WHO Aware classification. Ceftriaxone was the most often given antibiotic at 218 (31.4%), followed by Cefotaxime at 116 (16.7%) and Ampicillin at 84 (12.1%). Under the WHO classification, the

Access group accounted for 241 (33.7%) prescriptions, the Watch group for 471 (65.8%), and the Reserve group for 3 (0.5%), with no antibiotics classified as Not Recommended. Notably, all prescriptions for ampicillin, amoxicillin, and gentamicin fell under the Access group, whereas ceftriaxone and cefotaxime were exclusively in the Watch category. Finally, a total of 694 antibiotic prescriptions were recorded across all types.

**Table (2): Prescription rates of various antibiotic types in relation to WHO guideline classifications.**

| Antibiotic type | N | % | Antibiotic category (WHO Aware Classification) | | |
|---|---|---|---|---|---|
| | | | Access | Watch | Reserve |
| **Amoxicillin** | 11 | 1.59 | 11 | 0 | 0 |
| **Ampicillin** | 84 | 12.10 | 84 | 0 | 0 |
| **Amoxiclav** | 41 | 5.91 | 41 | 0 | 0 |
| **Ceftriaxone** | 218 | 31.41 | 0 | 219 | 0 |
| **Metronidazole** | 28 | 4.03 | 28 | 0 | 0 |
| **Vancomycin** | 41 | 5.91 | 0 | 42 | 0 |
| **Gentamicin** | 48 | 6.92 | 48 | 0 | 0 |
| **Meropenem** | 19 | 2.74 | 0 | 19 | 0 |
| **Amikacin** | 25 | 3.60 | 25 | 0 | 0 |
| **Cefotaxime** | 116 | 16.71 | 0 | 116 | 0 |
| **Azithromycin** | 49 | 7.06 | 1 | 47 | 1 |
| **Others** | 14 | 2.02 | 3 | 28 | 2 |
| **Total** | 694 | | 241 (33.7) | 471 (65.8) | 3 (0.5) |

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Culture/sensitivity tests were performed among only 38 (8.9%) of the cases, with 13 (34.2%) returning positive results and 25 (65.8%) negatives. Based on culture results, antibiotic choices were adjusted in 7 (70%) of positive cases. Also, antibiotic therapy was reviewed within 48–72 hours for 78 (18.1%) patients, and most patients were discharged either cured or in stable condition, 519 (87.1%), while others were either not improved, 29 (4.9%), transferred, 31 (5.2%), or passed away, 17 (2.9%), respectively. (Tab 3)

**Table (3): Microbiological culture/sensitivity tests and changes according to it.**

| Variables and groups | | Frequency | % |
|---|---|---|---|
| **Microbiological culture/sensitivity test performed?** | Yes | 38 | 8.9 |
| | No | 391 | 91.1 |
| **Culture result (Growth Microorganism)** | Positive | 13 | 34.2 |
| | Negative | 25 | 65.8 |
| **Antibiotic choice adjusted based on culture?** | Yes | 7 | 70 |
| | No | 3 | 30 |
| **Antibiotic therapy reviewed at 48-72 hours?** | Yes | 78 | 18.1 |
| | No | 354 | 81.9 |
| **Discharge Status** | Cured/Stabled | 519 | 87.1 |
| | Not Improved | 29 | 4.9 |
| | Transferred | 31 | 5.2 |
| | Passed Away | 17 | 2.9 |

Table 4 compares various clinical and procedural factors between prescribed and non-prescribed antibiotic groups. Before hospital admission, antibiotic use was reported among 152 (34.9%) of those currently prescribed antibiotics, while none of the non-prescribed group had this history, with highly significant differences between prior admission and current admission antibiotic prescription (P-value 0.0001). Culture/sensitivity tests were conducted among 38 (8.9%) of the current admission prescribed group and none in the non-prescribed group, with a non-significant difference (P-value 0.755). Antibiotic review at 48–72 hours occurred in the minority of 77 (17.9%) of the cases compared with those not reviewed, 354 (82.1%) cases of the currently prescribed group, and only once (100%) in the currently non-prescribed group, with a significant difference (p-value 0.033). The P-value (0.004) demonstrates a highly significant difference between the antibiotic-prescribed groups with the patient's outcome. The majority of the patients, 373 (86.1%), in the prescribed group were cured or stabilised versus 146 (89.6%) in the non-prescribed group, while mortality was observed in 17 (3.9%) of those who received antibiotics, with no deaths reported in the non-prescribed group.

**Table (4): Comparison of some variables with prescribed and non-prescribed patients.**

| Variables and groups | | Antibiotic prescribed | | | | P-value |
|---|---|---|---|---|---|---|
| | | Yes | | No | | |
| | | Frequency | % | Frequency | % | |
| **Antibiotics prescribed before hospital admission?** | Yes<br>No | 152<br>283 | 34.9<br>65.1 | 0<br>165 | 0<br>100 | 0.0001 |
| **Microbiological culture/sensitivity test performed?** | Yes<br>No | 38<br>390 | 8.9<br>91.1 | 0<br>1 | 0<br>100 | 0.755 |
| **Antibiotic therapy reviewed at 48-72 hours?** | Yes<br>No | 77<br>354 | 17.9<br>82.1 | 1<br>0 | 100<br>0 | 0.033 |
| **Discharge Status** | Cured/Stabled<br>Not Improved<br>Transferred<br>Passed Away | 373<br>17<br>26<br>17 | 86.1<br>3.9<br>6<br>3.9 | 146<br>12<br>5<br>0 | 89.6<br>7.4<br>3.1<br>0 | 0.004 |

## DISCUSSION

A cross-sectional study with a consecutive sampling technique was conducted on 600 patients in a paediatric hospital to determine the rationality of antibiotic use among children and evaluate the antibiotic prescription practice according to the WHO AwaRe guideline. The WHO AWaRe classifies antibiotics into Access, Watch, and Reserve and offers clear, evidence-based recommendations on selecting types of antibiotics, such as appropriate dosing, administration routes, and durations for over thirty prevalent infections in both children and adults across different medical facilities.

The majority of cases 470 (78.3%), in the current study who were admitted to the hospital during the study period were children under five years. This is in line with a study by Sharma and Paudel [17], who also reported that children under five years made the most frequent admissions to paediatric hospitals. The large number highlights the susceptibility of this early childhood age period to severe diseases that require hospitalisation, likely due to their immature immune systems and heightened risk of exposure. For the cause of admission, Respiratory Tract Infections (RTIs) were the predominant cause of admission with 340 (56.7%) of patients, and the second was gastrointestinal complaints, which accounted for 24.8% of admissions. Also, these causes stated that most of the children in the study were from the general ward units. This predominance of RTIs follows the findings of the Samoo study [18], which stated that respiratory diseases are common causes of morbidity and mortality among young children in the world. The high incidence of RTIs noted here underscores their ongoing important role in child health in our environment, justifying sustained public health emphasis on prevention and control. Though RTIs were found to be most common in our study, Durrani [19], described gastroenterological illnesses as the most frequent admission cause in their environment. The differences between these studies might be due to the time of year when the data were collected. For example, in the current study, data were gathered during the winter months, when flu-like illnesses are usually at their highest. This seasonal timing could explain why these infections were more common compared to other conditions, such as gastrointestinal diseases, which tend to be less frequent in colder seasons.

Antibiotics were administered to most of the admitted patients 435(72.5%). The prevalence of antibiotic prescribing is consistent with the Långström study [20], who listed antibacterials as among the most commonly prescribed sets of medicines for children. Excessive antibiotic prescribing needs well-informed reflection under antimicrobial stewardship (AMS) programs to ensure proper prescribing and limit the danger of the generation of Antimicrobial Resistance (AMR), The main challenges include making rational antibiotic choices and addressing potential abuse [21].

About types of antibiotics prescribed, Ceftriaxone was the most frequently prescribed, administered to 218 (31.4%) of cases, compared with other antibiotics. Cefotaxime was second 116 (16.71%), and ampicillin was third 84 (12.1%). This trend, headed by third-generation cephalosporins (ceftriaxone and cefotaxime), is mildly different from that observed by Alharbi [22], study where Penicillin emerged as the most prescribed antibiotic among children, followed by Cephalosporins. The superiority of cephalosporins in our setting, over penicillin in Alharbi's findings, can be attributed to factors such as local antibiotic formulary guidelines, trends of prevalent resistance, severity and spectrum of infections encountered (particularly RTIs), or drug availability in the formulary. Significant disparities in antibiotic use were found based on factors like age, health status, insurance status, parental income and education, race-ethnicity, and geographic location [23][24].

Comparing the prescribed antibiotics to the AWaRe WHO guidelines, Watch-group antibiotics dominated prescribing patterns with 65.8%, far exceeding WHO recommendations, whereas Access-group drugs were prescribed for just 33.7% of prescriptions. Consistent with the Shikha study [25], who reported similar AWaRe guideline breaches (notably high Azithromycin/Ceftriaxone prescription). These results confirm an area of predisposition towards broader-spectrum Watch-group antibiotics, where this group of antibiotics such as Ceftriaxone/Cefotaxime increase the risk of AMR [26], Absence of local guidance among low-middle countries on antibiotic treatment [27], is likely creating this imbalance by permitting empiric Watch-group use of antibiotics when Access-group choices (e.g., Amoxicillin, Gentamicin) may be sufficient. To overcome this problem, the studies recommend that hospitals must have specific guidelines that prefer Access-group antibiotics and initiate an antibiotic stewardship program against Watch-group antibiotic overuse. Also, educating the paediatric physicians about the AWaRe WHO guidelines to effectively monitor antibiotic use to ensure its application in avoiding AMR [28, 29].

The compared results between the antibiotic-prescribed and non-prescribed groups with other variables of the current study showed that antibiotic overuse began with pre-admission. Among children to whom antibiotics were prescribed, 152 (34.9%) of them received antibiotics before hospital admissions in contrast to the non-prescribed group with highly significant differences between the two groups (P-value 0.0001). same results been noticed from Wonodi's study [30]. Also, this is supported by research findings that 22.2% of children were given antibiotics before hospital admission—predominantly for cough and fever—while 54%

of children admitted as inpatients had received antibiotics before hospital admission [31]. This disparity suggests varying criteria for prescribing within primary and hospital care.

Culture/sensitivity testing was performed on just 38 (8.9%) of the antibiotic-prescribed patients and none of the non-prescribed patients with no significant difference between groups statistically (P-Value 0.755). The prevalence of culture guided therapy is in line with the Bajpai report that few cases of antimicrobial therapy is guided by culture results [32].

Antibiotic review compliance for the prescribed group within 48–72 hours was similarly poor in the current study in 77 (17.9%) of cases compared to the Hobday study [33], where post-intervention reviews were 68–100% among all cases and Manuel's study [34], where 46% of cases had their alterations initiated therapy reviewed with a significant difference between antibiotic-prescribed and non-prescribed groups (P-value 0.033). These low rates of compliance against other studies suggest institutional barriers to the implementation of stewardship protocols, either through resource limitation or workflow disruption. There was a significantly large difference in patient outcomes between the non-prescribed and prescribed antibiotic groups (P-value 0.004). Since the rate at which patients were cured or stabilised was 373 (86.1%) in the prescribed group, the same rate was slightly higher in the non-prescribed group 146 (89.6%). Mortality was 17 (3.9%) among those who were treated with antibiotics, as compared to zero deaths in the non-prescribed group. This aligns partially with findings that associate antibiotic prescription volume with patient satisfaction [35]. However, there is no evidence to suggest a direct association between prescribing antibiotics with increased satisfaction, recovery, or follow-up adherence [36].

The main limit of this study is the study period, which is three months and may limit it is findings to be applied to broader populations outside the specific sample and setting even with a fair sample size which is 600 cases, for the community's needs regarding antibiotic prescribing longer studies needed. Despite this limitation, the study highlights a significant concern over the heavy burden of hospital-acquired respiratory and gastrointestinal infections in children under five years in our healthcare setting. Additionally, the results of the study notably showed a high rate of antibiotic prescriptions in the Watch group according to the WHO AWaRe classification which is classified as moderately to high potential of antibiotic resistance, particularly third-generation cephalosporins, underscoring the urgent need for strong antimicrobial stewardship to protect children and combat the growing trends of antibiotic resistance in paediatric care.

## CONCLUSION

This study revealed the high prevalence of antibiotic prescriptions among paediatric inpatients, with a marked preference for broad-spectrum antibiotics classified under the WHO Watch category. The limited use of microbiological testing and inadequate therapy reviews suggest a need for more rigorous, evidence-based prescribing practices. These findings reflect potential overuse and misuse, raising concerns about the acceleration of antimicrobial resistance in paediatric care.

The study recommends implementing institutional Antibiotic Stewardship Programs to monitor and guide prescription practices. Increase Microbiological Testing Capacity to inform targeted antibiotic therapies. Train Healthcare Providers on the WHO AWaRe classification to improve compliance. Develop Local Clinical Guidelines for paediatric infections based on WHO standards and finally, Promote Regular Review of Antibiotic Therapy within 48–72 hours of initiation.

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**Ethical approval**

The present study Which is conducted by authors (Haidar Hamakhan M. Amin), was approved by the local Department of College of Medicine -Ethics committee.

**Statement of permission and conflict of interests**

The authors declare that the study has no conflict of interest, and the authors received permission from the Research Council at the Scientific Committee of the College of Medicine and the Ethical Committee of the Medical Colleges of Sulaimani University. Additionally, approval letters were obtained from the Department of Health (DOH) and Dr. Jamal Paediatric Teaching Hospital for the data collection.

## REFERENCES

1. Haddad MF, Abdullah BA, AlObeidi H, Saadi AM, Haddad MFJIJoM, Research ABH. Antibiotic classification, mechanisms, and indications: A review. 2024;5(3):39-46.
2. Dharmapalan DJIJoPP. OVERVIEW OF ANTIBIOTICS. 2022;24(1):5.
3. Kisil OV, Efimenko TA, Efremenkova OVJA. Looking back to Amycolatopsis: history of the antibiotic discovery and future prospects. 2021;10(10):1254.
4. Rudnick W, Conly J, Thirion DJ, Choi K, Pelude L, Cayen J, et al. Antimicrobial use among paediatric inpatients at hospital sites within the Canadian Nosocomial Infection Surveillance Program, 2017/2018. 2023;12(1):35.
5. McMullan B, Bryant PA, Duffy E, Bielicki J, De Cock P, Zembles T, et al. Multinational consensus antimicrobial stewardship recommendations for children managed in hospital settings. 2023;23(6):e199-e207.
6. Hossain MS, Islam MF, Arka PB, Rohman M, Ahmed TS, Ahammed T, et al. Antibiotic prescription from qualified sources for children with fever/cough: cross-sectional study from 59 low-and middle-income countries. 2023;61.
7. Olmeda K, Trautner BW, Laytner L, Salinas J, Marton S, Grigoryan LJA. Prevalence and predictors of using antibiotics without a prescription in a Pediatric Population in the United States. 2023;12(3):491.
8. Ergül AB, Gökçek İ, Çelik T, Torun YAJTAoPTPA. Assessment of inappropriate antibiotic use in pediatric patients: point-prevalence study. 2018;53(1):17.
9. Sepehri G, Amiri M, Hosseininasab AJZJoRiMS. Antibiotic Prescription Patterns for Hospitalized Children Under 12 Years in a Tertiary Referral Teaching Hospital, Kerman, Iran. 2021;23(1).
10. Abdulbary M, Ibrahim SL, Haydar M, Hadi Z, Ali N, Muslim EAJIJfRiAS, et al. Study the antibiotic misuse by people in Al-Najaf city. 2020;7(6):195-9.
11. Mustafa BR, Kurdi AJPJoB, Sciences A. Evaluation of the antimicrobial prescribing pattern and the stewardship programs among COVID-19 hospitals in the capital city of Kurdistan-Northern Iraq: A multicenter point prevalence study. 2023;5(1):65-71.

12. Blaser MJJS. Antibiotic use and its consequences for the normal microbiome. 2016;352(6285):544-5.
13. Gensollen T, Iyer SS, Kasper DL, Blumberg RSJS. How colonization by microbiota in early life shapes the immune system. 2016;352(6285):539-44.
14. Abu-Ajaleh S, Darwish Elhajji F, Al-Bsoul S, Abu Farha R, Al-Hammouri F, Amer A, et al. An evaluation of the impact of increasing the awareness of the WHO access, watch, and reserve (AWaRe) antibiotics classification on knowledge, attitudes, and hospital antibiotic prescribing practices. 2023;12(6):951.
15. Abat C, Gautret P, Raoult D. Benefits of antibiotics burden in low-income countries. Proc Natl Acad Sci U S A. 2018;115(35):E8109-E10.
16. MacGowan A, Macnaughton EJM. Antibiotic resistance. 2017;45(10):622-8.
17. Sharma S, Paudel KM. Review of Paediatrics Inpatient at a Zonal Hospital. Journal of Nepal Paediatric Society. 2013;32(3):239-44.
18. Samoo U, Ehsan S, Agha F. Frequency and pattern of respiratory diseases in children. International Journal of Contemporary Pediatrics. 2017;4(5).
19. Durrani SF, Khalid N, Musharraf FF, Ahmad S. Trends and outcomes of admissions in the Paediatrics ward at a tertiary care hospital of urban Karachi. J Pak Med Assoc. 2022;72(5):954-7.
20. Långström D, Iso-Mustajärvi I, Sandler N, Prami T. Children's Medication In The Nordic Countries – Survey on National Administrative Register Data. Value in Health. 2015;18(7):A745-A6.
21. Hu S, Liu X, Peng YJJoi. Assessment of antibiotic prescription in hospitalised patients at a Chinese university hospital. 2003;46(3):161-3.
22. Alharbi N, Alharbi S, Almotairi R, Alamri R, Sayyer A, Mastoorah AJIJoP, et al. The most common antibiotic prescribed among the paediatric population. 2022;2(11):479-83.
23. Sarpong EM, Miller GEJHsr. Narrow- and broad-spectrum antibiotic use among US children. 2015;50(3):830-46.
24. Gadzhanova S, Roughead EJAfp. Prescribed antibiotic use in Australian children aged 0-12 years. 2016;45(3):134-8.
25. Jaiswal S, Srivastava S, Mishra A, Sheohare R. 6130 Assessment of antibiotic prescribing pattern as per WHO AWaRe assessment tool of antimicrobial stewardship program in a tertiary care hospital central India. BMJ Publishing Group Ltd; 2024.
26. Zanichelli V, Sharland M, Cappello B, Moja L, Getahun H, Pessoa-Silva C, et al. The WHO AWaRe (Access, Watch, Reserve) antibiotic book and prevention of antimicrobial resistance. 2023;101(4):290.
27. Mugada V, Mahato V, Andhavaram D, Vajhala SMJTjops. Evaluation of prescribing patterns of antibiotics using selected indicators for antimicrobial use in hospitals and the access, watch, reserve (AWaRe) classification by the World Health Organization. 2021;18(3):282.
28. Budd E, Cramp E, Sharland M, Hand K, Howard P, Wilson P, et al. Adaptation of the WHO Essential Medicines List for national antibiotic stewardship policy in England: being AWaRe. 2019;74(11):3384-9.
29. Mudenda S, Daka V, Matafwali SKJAs, epidemiology h. World Health Organization AWaRe framework for antibiotic stewardship: where are we now and where do we need to go? An expert viewpoint. 2023;3(1):e84.
30. Wonodi W, West BAJIJoTD, Health. Pre-hospital Antibiotic Use in the Rivers State University Teaching Hospital Paediatric Outpatient Clinic. 2024;45(9):45-53.
31. Arulmoli SA, Sivachandiran S, Perera BJSLJoCH. Prescribing patterns of antibiotics for children before admission to a paediatric ward in Jaffna Teaching Hospital. 2009;38(4).
32. Bajpai V, Gupta D, Bindra A, Malhotra R, Mathur PJJoPS, Control I. Culture of

cultures: antimicrobial prescription practices in hospitalised patients at level 1 trauma centre. 2018;6(1):23-6.
33. Hobday D, Choudhury A, Asour A, Khan S, Abburu S, Sood J, et al. Delivering the 48-hour antimicrobial review on inpatient drug charts. 2018;79(3):163-7.
34. Manuel O, Burnand B, Bady P, Kammerlander R, Vansantvoet M, Francioli P, et al. Impact of standardised review of intravenous antibiotic therapy 72 hours after prescription in two internal medicine wards. 2010;74(4):326-31.
35. Ashworth M, White P, Jongsma H, Schofield P, Armstrong DJBJoGP. Antibiotic prescribing and patient satisfaction in primary care in England: cross-sectional analysis of national patient survey data and prescribing data. 2015.
36. Hamm RM, Hicks RJ, Bemben DAJTJotOSMA. Antibiotics and respiratory infections: do antibiotic prescriptions improve outcomes? 1996;89(8):267-74.