

SHORT COMMUNICATION article

## Antibiotic prescribing in pediatric health care services

Abdulsalam O. Elfowiris\*   and Nissren S.S. Majed

Department of Pharmacology, Faculty of Pharmacy, Omar Al-Mukhtar University, AL-Bayda, Libya

\*Author to whom correspondence should be addressed

**Received:** 12-06-2022, **Revised:** 23-07-2022, **Accepted:** 28-07-2022, **Published:** 30-09-2022

**Copyright**© 2022. This open-access article is distributed under the *Creative Commons Attribution License*, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

### HOW TO CITE THIS

Elfowiris AO, Majed NSS (2022) Antibiotic prescribing in pediatric health care service.  
Mediterr J Pharm Pharm Sci. 2 (3): 12-16. [Article number: 77]. <https://doi.org/10.5281/zenodo.7115130>

**Keywords:** Antibiotic, Libya, pediatric, polypharmacy, prescribing pattern

**Abstract:** Although, antibiotics play a fundamental role in the control of infectious diseases still the injudicious prescription of antibacterial agents and antibiotic resistance are a global problem. This study aims to assess the prescribing pattern of antibiotics and to provide baseline data about behaviors of physicians prescribing antibiotics during pediatric consultations. In this study, a total of 316 pediatric patients of both genders receiving different antimicrobial therapy were evaluated during 2021 in pediatric health care services in Bayda, Libya. Data revealed that the average of drugs prescribed was 4.10 per patient while the average of antimicrobials was 2.30 per prescription. Most of the antibiotics were prescribed for respiratory tract infections (34.0%) and followed by urinary tract infections (29.0%). Cephalosporins and penicillins were the most common antibiotics prescribed in this study. In conclusion, these findings show the presence of polypharmacy and inappropriate prescribing patterns. To improve and minimize the unnecessary prescribing of antimicrobial agents, a continuous training program for physicians, as well as engaged pharmacists in health care services is needed.

### Introduction

Antibiotics are an essential group of medicines used in the treatment of infectious diseases [1]. The unavoidable result of the irrational use of antimicrobials leads to the development in antimicrobial-resistant pathogens which results in a decrease of antimicrobial effectiveness and an increase in demand for searching of new medicines [2]. The resistance of microbes to antimicrobial agents is considered a serious threat to global health. An estimated 700,000 people died due to antimicrobial resistance during 2015, with the majority of these deaths occurring in low- and middle-income countries [3]. The selection of antimicrobial agents requires an appropriate clinical diagnosis and a full understanding of microbiological and pharmacological factors [4]. The loss of antimicrobial effectiveness will have significant consequences on health systems, particularly with vulnerable patients [5]. One of these vulnerable patients is children, who receive a significant amount of the antibiotics prescribed each year [6]. About 50.0% of the antibiotic prescriptions given by practitioners are unnecessary [7]. Antibiotic misuse particularly among children is considered one of the most important healthcare issues, and the prevalence may vary from region to region in the world with different developments in antimicrobial resistance levels [8]. The

rapid development of antimicrobial resistance is primarily caused by the common misuse of antibiotics which accelerates the natural process of genetic selection, leading to an increase in resistance to antibiotic treatments [9]. A huge data that ensure antibiotic misuse is correlated with increasing bacterial resistance. The inappropriate use of antibiotics has been well-documented in developed and developing countries [10]. The common utilization of antibiotics is considered one of the main reasons for antibiotic resistance. Although most of the children infection is caused by viral. However, more than 30.0% of antibiotics were prescribed to children who were suffering from viral infection or non-infectious diseases [11]. Moreover, the irrational prescribing of antibiotics may lead to the development of allergies that affect different systems include respiratory tract that leads to sneezing, congestion, rhinorrhea, wheezing and laryngeal edema. Gastrointestinal symptoms include nausea, vomiting, abdominal pain and diarrhea. Skin symptoms include urticaria, angioedema, flushing or pruritus. Tachycardia and hypotension as cardiovascular symptoms [12]. One of the main reasons for antibiotic resistance is the misuse of antibiotics by self-prescription, incomplete therapies, missing doses and re-use of remnant antibiotics [13]. Therefore, this study aimed to evaluate antibiotic prescribing in children and to provide baseline data about the behaviors of physicians prescribing antibiotics during pediatric consultations in Bayda, Libya.

## Materials and methods

The data of this retrospective study were collected between April and October 2021. The study was carried out in AL-Bayda city, Libya. 316 prescriptions were collected from the department of Pediatrics at health care service, which were prescribed to children from birth day until 12 years old by investigators. All the prescriptions contain at least one antibiotic. The data recorded to assess the prescription pattern included demographic details, clinical diagnosis and antibiotic prescription data, antibiotic class, route of administration and duration of therapy. Ethical approval of the Institutional Ethics Committee of Omar Al-mukhtar University was taken before starting the study and consent was obtained before the participation of subjects in the study.

All data were statistically analyzed and presented as a descriptive (frequency and percentage).

## Results

A total of 316 pediatric patients' prescriptions were engaged, who received different antimicrobial therapy. Of these, 172 were males (54.0%) and 144 were females (46.0%). In **Table 1**, the mean age of both genders was (4.15 years). Since the duration of therapy of the antibiotics has been prescribed, almost half of the patients (50.0%) received antibiotics for 2-6 days, followed by 32.0% for the duration of 7-13 days (32.0%). A total of 1593 drugs were prescribed with an average of 4.1 drugs per patient. The average of antimicrobials prescribed was 2.3 per prescription. Most of the antibiotics were prescribed for respiratory tract infections. Azithromycin (macrolide) which represents 35.0%, n=110, followed by Augmentin (amoxicillin with clavulanic acid), penicillins 29.0%, n=91.

**Table 1:** Demographic characteristics of Libyan pediatric patients

Variable	Data	n (%)
Gender	Male	172 (54.0%)
	Female	144 (46.0%)
Age	1 m-1 yrs	043 (14.0%)
	1-2 yrs	025 (08.0%)
	2-6 yrs	142 (45.0%)
	6-12 yrs	106 (34.0%)

In **Table 2**, azithromycin was the most common class of antibiotic prescription for children (34.8%) followed by Augmentin (28.7%) and then by cephalosporin (23.4%). In **Table 3**, the most common infections in pediatric patients according to diagnosis are presented. Thus, respiratory infections are about one-third of the patients representing the highest rate (34.5%). Tonsillitis and GIT infectious are represent almost the same as respiratory infectious (33.0%, and 29.0%, respectively). However, CNS, surgical and skin infections are the lowest rates in these patients, about 01.0%.

**Table 2:** Distribution of antibiotic class in Libyan pediatrics

Antibiotic class	n (%)
Cephalosporin	74 (23.4%)
Penicillin	30 (9.50%)
Amoxillin	04 (1.30%)
Augmentin	91 (29.0%)
Azithromycin	110 (34.8%)
Erythromycin	04 (01.3%)
Seprin	03 (0.95%)

**Table 3:** Diagnosis pattern in Libyan pediatrics

Diagnosis	n (%)
Respiratory infection	109 (34.49%)
CNS infection	04 (01.26%)
GIT infection	91 (29.0%)
UTI infection	03 (0.94%)
Skin infection	02 (0.63%)
Surgical	04 (1.30%)
Tonsillitis	103 (33.0%)

## Discussion

Pediatric populations are important targets for efforts aimed at reducing unnecessary antibiotic use. The present study has shown the problem of inappropriate prescribing of antibiotics to children in Libya. One of the parameters, we have evaluated is the average number of drugs per prescription which is considered an important indicator of prescription evaluation [14]. The average number of drugs was found to be 4.1 drugs per patient prescription encounter in this study. This shows the presence of polypharmacy. Polypharmacy can be defined as prescribing multiple medications that are clinically indicated or necessary [14]. The ideal WHO standard value for average drugs per encounter is 1.6-1.8. However, it is found that most prescriptions depend only on signs and symptoms and lack any other laboratory findings. These are important tools for diagnostic accuracy to support a prescription of antibiotics and to confirm the diagnosis. The inadequate diagnosis or applying pressure on physicians to prescribe antibiotics for minor symptoms leads to an increased risk of side effects, drug interactions, progress of antimicrobial resistance and increased cost [15].

In the present study, the injectable dosage form prescription was found to be about 35.0% that higher than the WHO recommended range which is 13.4%-24.1%. Unnecessary use of an injectable form may lead to provoke blood related diseases, increase risk of complications and increased expenses [16]. This study has shown a higher rate of antibiotic use in the age group of 2-6 years (45.0%). This may reflect the higher susceptibility of infections of this age group which could be related to nutritional problems and suggests that this age group should be healthcare importance. The respiratory tract infection prevalence rate was the highest one among



illness classifications, this might be attributed to the time of study conducted, since most prescriptions were collected during the springtime. Antibiotic prescribing rates for upper respiratory infections are alarming. Mainly, the symptoms of respiratory illnesses that cause patients to seek medical care include cough, congestion, fever, chills, nasal discharge and sputum production, most of which are self-limiting and viral in origin [6]. Prescribing rates of antibiotics for respiratory infections in children high and largely unnecessary. Reducing unnecessary use is a priority to reduce incorrect antibiotic use in primary health care [17].

Urinary tract infections represented about 30.0%, the second common indication for antibiotic use which is compatible with many studies [18]. While it is important to promptly treat urinary tract infections with antibiotics to prevent complications such as septic shock and renal scarring in children [19]. It is also careful to use antibiotics wisely to decrease adverse effects and antibiotic resistance. Poor hygiene of children could be the cause behind the high prevalence of urinary tract infections [20]. Both cephalosporins and penicillins were the most antibiotics prescribed in this study. The high prescription rate of these antibiotics may be due to their broad spectrum of activity and clinical effectiveness. Another observation is that only 09.0% of physicians used the generic names of drugs. Physicians have adapted to the use of brand names of drugs in prescriptions. However, WHO and local authorities recommend the prescribing of drugs by generic name, generic prescribing is more accurate and fewer errors and supports the transparency between health care providers and patients. Moreover, they are cheaper than the branded drugs. The use of branded names may be due to high promotional actions of pharmaceutical companies and the absent of strict regulation from local authorities. However, this study was undertaken in a single part of east country and short period of time that was not long enough to predict the pattern of antibiotic use over the year.

*Conclusion:* This study has shed light on the prescribing pattern of antibiotics, the results show deviation from WHO criteria, which recommended that the use of antimicrobial agents be closely monitored. There is an urgent need to find institutional policies and guidelines for improving antimicrobial use among hospitals in Libya. Moreover, there is a clear need for continuous education and training programs for physicians and pharmacists about rational prescribing of antimicrobial therapy. Thus, it is recommended that participating clinical pharmacists at all hospital wards improve prescribing patterns.

**Acknowledgments:** The authors would like to thank all the involved participants in the Pediatric Department at Health Care Service and especially Dr. Anessa Elmasri for participating in the collection of prescriptions.

**Data availability statement:** The raw data that support the findings of this article are available from the corresponding author upon reasonable request.

**Author contributions:** EAO & MNSS have conceived, designed, performed the analysis of data and drafted and revised the final version of the manuscript. MNEE has collected the data. Both authors have approved the final version of the manuscript and agreed to be accountable for its contents.

**Conflict of interest:** The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

**Ethical issues:** Including plagiarism, informed consent, data fabrication or falsification and double publication or submission were completely observed by the authors.

**Author declarations:** The authors confirm that all relevant ethical guidelines have been followed and any necessary IRB and/or ethics committee approvals have been obtained.

## References

1. MacPherson EE, Reynolds J, Sanudi E, Nkaombe A, Phiri C, Mankhomwa J, Dixon J, Chandler CIR (2021) Understanding antimicrobial resistance through the lens of antibiotic vulnerabilities in primary health care in rural Malawi. *Global Public Health*. 1-17. doi: 10.1080/17441692.2021.2015615



2. Fleming-Dutra KE, Hersh AL, Shapiro DJ, Bartoces M, Enns EA, File TM, Jr, Zetts RM, Hicks LA (2016) Prevalence of inappropriate antibiotic prescriptions among us ambulatory care visits, 2010-2011. *JAMA*. 315 (17): 1864-1873. doi: 10.1001/jama.2016.4151
3. O'Neill J (2016) Tackling drug-resistant infections globally. Final report and recommendation. Review in antimicrobial resistance. In: Government WTAH. May, 2016.
4. Knudsen PK, Brandtzaeg P, Hoiby EA, Bohlin J, Samuelsen O, Steinbakk M, Abrahamsen TG, muller F, Gammelsrud KW (2017) Impact of extensive antibiotic treatment on faecal carriage of antibiotic-resistant enterobacteria in children in a low resistance prevalence setting. *PLoS One*. 12 (11): e0187618. doi: 10.1371/journal.pone.0187618
5. Jasovsky D, Littmann J, Zorzet A, Cars O (2016) Antimicrobial resistance-a threat to the world's sustainable development. *Upsala Journal of Medical Sciences*. 121 (3): 159-164. doi: 10.1080/03009734.2
6. Nyquist AC, Gonzales R, Steiner JF, Sande MA (1998) Antibiotic prescribing for children with colds, upper respiratory tract infections, and bronchitis. *JAMA*. 279 (11): 875-877. doi: 10.1001/jama.279.11.875
7. Pennie RA (1998) Prospective study of antibiotic prescribing for children. *Canadian Family Physician*. 44: 1850-1856. PMID: PMC2277846.
8. Yannan Xu, Lu J, Sun C, Wang X, Hu YJ, Xudong Zhou X (2020) A cross sectional study of antibiotic misuse among Chinese children in developed and less developed provinces. *The Journal of Infection in Developing Countries*. 14 (2): 129-137. doi: 10.3855/jidc.11938
9. Staff PO (2018) Correction: prescribing patterns and associated factors of antibiotic prescription in primary health care facilities of Kumbo East and Kumbo west health districts, North West Cameroon. *PLoS One*. 13 (4): e0196861. doi: 10.1371/journal.pone.0196861
10. Siddiqui S, Cheema M, Ayub R, Shah N, Hamza A, Hussain S, Khan MH, Raza SM (2014) Knowledge, attitudes and practices of parents regarding antibiotic use in children. *Journal of Ayub Medical College*. 26 (2): 170-173. PMID: 25603670.
11. Garcia-Garcia ML, Calvo Rey C, Del Rosal Rabes T (2016) Paediatric asthma and viral infection. *Archives of Bronconeumology*. 52 (5): 269-273. doi: 10.1016/j.arbres.2015.11.008
12. Elfowiris A, Sharif M, Bianco S (2018) Investigation into causes of allergic diseases using quantitative measurement of allergen-specific Ige in serum in Al-Bayda, Libya. *Al-Mukhtar Journal of Sciences*. 33 (4): 332-339. doi: 10.54172/mjsc.v33i4.305
13. Kardas P, Divine S, Golembesky A, Roberts G (2005) A systematic review and meta-analysis of misuse of antibiotic therapies in the community. *International Journal of Antimicrobial Agents*. 26 (2): 106-113. doi: 10.1016/j.ijantimicag.2005.04.017
14. Chem ED, Anong DN, Akoachere JKT (2018) Prescribing patterns and associated factors of antibiotic prescription in primary health care facilities of Kumbo East and Kumbo West Health Districts, North West Cameroon. *PLoS One*. 13 (3): e0193353. doi: 10.1371/journal.pone.0193353
15. Wong CKM, Kung K, Au-Doung PLW, Ip M, Lee N, Fung A, Wong SYS (2018) Correction: antibiotic resistance rates and physician antibiotic prescription patterns of uncomplicated urinary tract infections in southern Chinese primary care. *PLoS One*. 13 (2): e0192466. doi: 10.1371/journal.pone.0192466
16. Grigoryan L, Burgerhof JG, Degener JE, Deschepper R, Lundborg CS, Monnet DL, Scicluna FA, Birkin J, Haaïjer-Ruskamp FM (2008) Determinants of self-medication with antibiotics in Europe: the impact of beliefs, country wealth and the healthcare system. *Journal of Antimicrobial and Chemotherapy*. 61 (5): 1172-1179. doi: 10.1093/jac/dkn054
17. Elkbuli G, Draïdi RA (2021) Prevalence of self-medication phenomenon with antibiotics among university pharmacy students. *Mediterranean Journal of Pharmacy and Pharmaceutical Sciences*. 1 (4): 44-49. doi: 10.5281/zenodo.5805961
18. Kaufman J, Temple-Smith M, Sancı L (2019) Urinary tract infections in children: an overview of diagnosis and management. *British Medical Journal Paediatric Open*. 3 (1): e000487. doi: 10.1136/bmjpo-2019-000487
19. Johnson JR, Russo TA (2018) Acute pyelonephritis in adults. *The New England Journal of Medicine*. 378 (1): 48-59. doi: 10.1056/nejmcp1702758
20. Karavanaki KA, Soldatou A, Koufadaki AM, Tsentidis C, Haliotis FA, Stefanidis CJ (2017) Delayed treatment of the first febrile urinary tract infection in early childhood increased the risk of renal scarring. *Acta Paediatrica*. 106 (1): 149-154. doi: 10.1111/apa.13636