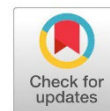


Research Article

6 Open Access



Antibiotic Prescribing Treatment for Acute Gastroenteritis and Respiratory Illnesses among Children in Al-Bayda, Libya: A Cross-sectional Descriptive Study

Yahya S. E. Mansour*, Nusieba A. M. Ibrahim²

*Corresponding author:

yahya.saber@omu.edu.ly Department of Pharmacology and Toxicology, Faculty of Pharmacy, Omar Al-Mukhtar University, Libya.

² Department of Pharmacology and Toxicology, Faculty of Pharmacy, Omar Al-Mukhtar University, Libya.

Received:
17 May 2024

Accepted:
01 October 2024

Publish online:
10 October 2024

Abstract

Acute gastroenteritis and respiratory illnesses pose substantial morbidity and mortality risks among children under the age of 10. This investigation aimed to assess the prescribing patterns of antibiotics in managing respiratory illnesses and acute gastroenteritis in children. Employing a descriptive, cross-sectional design, data were collected over 6 months from the pediatric unit at Al-Jamee Hospital in Albayda, Libya. Children under 10 years old presenting with symptoms indicative of cough, cold, and diarrhea were included. Patient records were scrutinized for data retrieval, and statistical analyses were conducted utilizing frequencies, percentages, and student t-tests, with significance set at $P < 0.05$. The study encompassed 100 patients with a mean age of 7.6 ± 0.8 years. Predominantly, admissions were prompted by fever (30.5%) and cough or cold symptoms (15.7%). Notably, antibiotic prescriptions exhibited higher appropriateness rates in cases of diarrhea (75.5%; $P < 0.05$). Ceftriaxone (59.5%) and ampicillin (32.4%) emerged as the most frequently prescribed antibiotics. Furthermore, the seniority of the prescriber significantly correlated with prescription appropriateness ($P < 0.05$). The investigation revealed a notable propensity for antibiotic utilization during the management of cough, cold, and diarrhea in pediatric patients in Albayda, Libya.

Keywords: Antibiotics; Children; Common Cold; Diarrhea; Medication Consumption; Prescribing Treatment.

INTRODUCTION

The deliberate utilization of antibiotics presents a global concern. Data from the World Health Organization (WHO) indicates that over 50% of medications are prescribed, dispensed, or sold inappropriately, contributing to incorrect administration in half of patients (Carpenter et al., 2008). Non-optimal medication use manifests in various forms, including overuse, underuse, and misuse of both prescribed and over-the-counter drugs (Karras et al., 2003). Factors contributing to irrational medication practices include suboptimal antibiotic prescription quality (Medalla et al., 2021), inappropriate application of antibiotics in non-bacterial conditions, poor patient adherence, and the emergence of antibiotic resistance. Antibiotics are extensively employed in managing prevalent clinical conditions among pediatric patients (Thielman & Guerrant, 2004; Bresee et al., 2012; Medalla et al., 2021). Research approximates an annual prescription rate of 150 million antibiotics



The Author(s) 2024. This article is distributed under the terms of the Creative Commons Attribution 4.0 International License (<http://creativecommons.org/licenses/by/4.0/>), which permits unrestricted use, distribution, and reproduction in any medium, provided you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons license, and indicate if changes were made.

in the United States, with 30 million prescribed for pediatric patients (Hay et al., 2016; Denny & Loda, 2010). Observed antibiotic therapy predominates pediatric prescription practices (Shane et al., 2017; Abujnah et al., 2015). While antibiotics play a critical role in treating acute and chronic infectious diseases, their irrational use poses significant risks, such as super-infections and multi-drug resistance (Medalla et al., 2021; Karras et al., 2003). Notably, methicillin-resistant *Escherichia coli* and *Staphylococcus aureus* have developed resistance to multiple antibiotics (Karras et al., 2003). Antibiotic resistance prolongs patient infectiousness, heightening the risk of disseminating resistant microorganisms. Ensuring appropriate antibiotic prescriptions is imperative to foster judicious antibiotic utilization.

Pneumonia and diarrhea constitute the leading causes of mortality in children under 10 years old, according to WHO data (Bresee et al., 2012). These conditions, along with respiratory illnesses, contribute substantially to morbidity and mortality in developing nations, with one in five child deaths attributed to diarrhea or respiratory diseases. Diarrhea ranks as the third most common cause of childhood mortality worldwide, claiming an estimated 300,000 lives annually (Wu et al., 2018). Despite concerted efforts such as universal programs targeting diarrheal diseases and acute respiratory infections, Libya continues to grapple with unacceptably high burdens of diarrhea, cough, and cold morbidity (Abujnah et al., 2015). National and state-level guidelines are available in Libya for managing cough, cold, and diarrhea in children under 10 years old. The Ministry of Health of Libya has issued comprehensive guidelines addressing these conditions (McCullough et al., 2017). These guidelines align with national policies aimed at mitigating antimicrobial resistance, as established by the directorate general of health services. Recommendations include oral rehydration solution and zinc supplements for acute diarrhea, with antimicrobials such as metronidazole, cefotaxime, and ceftriaxone indicated for chronic diarrhea and dysentery (Wu et al., 2018). Similarly, for the common cold and cough, antibiotics are not advised, while azithromycin and amoxicillin are recommended for pneumonia, and ampicillin, meropenem, and gentamicin, for severe pneumonia (Shane et al., 2017). Previous studies focused on examining antibiotic usage in the Pediatric Department and prescribing behaviors for antibiotics in cases of acute diarrhea among the general population (Wu et al., 2018). This research aimed to evaluate the prescription practices and adequacy of antibiotic administration for the management of cough, cold, and diarrhea among children under the age of 10 years.

MATERIALS AND METHODS

A descriptive, cross-sectional inquiry spanning 6 months from July 2023 to January 2024 was executed. This investigation was conducted within the confines of inpatient pediatric units encompassing a general ward and an Intensive Care Unit (ICU) at Al-Jamee Hospital in Albayda, Libya. All children under 10 years of age admitted to the inpatient department exhibiting symptoms indicative of diarrhea, cough, and cold were enrolled as participants. Prospective candidates are identified through a daily check of patient profiles. A team of registered pharmacists systematically collected data using a prearranged form on a daily basis. The content validity of the data collection instrument was ascertained by a panel comprising four healthcare professionals, including two pharmacists and two physicians, who assessed the relevance and significance of the content. Their feedback was assimilated prior to finalizing the data collection tool. Comprehensive data was acquired through a meticulous review of patient profiles, medication records, and associated documentation. In instances where information interpretation posed challenges, on-duty resident physicians were consulted for clarification. Stringent confidentiality measures were upheld throughout the data collection process. Clinical data e.g., symptoms, primary complaints, pertinent medical history, onset time of diarrhea, cough, and cold, diarrhea frequency, presence of fever, vomiting, and respiratory

difficulties were meticulously documented in the data collection as well as from demographic data, age, gender, weight, date of admission, and discharge. Information pertaining to the prescribed antibiotics, including dosage, and route of administration, was also transcribed from the patient medication chart by the designated data collectors. Subsequently, the gathered data underwent a comprehensive assessment for adherence to established criteria based on the Medication Appropriateness Index (MAI) (Scallan et al., 2011). Various parameters including indication, efficacy, dosage regimen, potential drug interactions and drug-disease interaction, feasibility of instructions, availability of cost-effective alternatives, redundancy with other medications, and treatment duration were meticulously evaluated. The data was coded and entered into SPSS version 20 for statistical analysis, with findings presented through frequencies and percentages. The association between dependent variables, such as prescription appropriateness, and independent variables, namely prescriber designation and disease conditions, was examined utilizing the student t-test, with significance set at $P < 0.05$.

RESULTS

During the study period, a total of 100 patient profiles were examined. The mean age of the patients was 7.6 ± 0.8 years. There was a predominance of male children, comprising 63 individuals (58.4%), compared to 37 female counterparts (42.3%). The primary reasons for admission were fever ($n = 55$, 30.5%), followed by cough and cold ($n = 40$, 15.7%), nausea and vomiting ($n = 35$, 22.2%), and diarrhea ($n = 73$, 60.7%), with abdominal pain being the least reported complaint. Notably, abdominal pain and respiratory tract infections were commonly associated with diarrhea and the common cold, respectively. A significant proportion of children (67.22%) had a history of medication use prior to admission. Pseudoephedrine hydrochloride was frequently used for the common cold, while a combination of diphenoxylate with atropine and ondansetron was a common medication for diarrhea and vomiting. Clinical assessment revealed common cold (67.3%) and diarrhea (75.5%) as the predominant clinical presentations. The analysis also indicated a high rate (93.5%) of antibiotic prescriptions in cases associated with common cold and diarrhea. All data are presented in Tables 1, 2, and 3 respectively.

Table:(1). Demographics of the participant population

Variables	Mean $\pm$ SD, or numbers (%)
Age (years)	7.6 $\pm$ 0.8
Gender, number	
Male	63 (58.4%)
Female	37 (42.3%)
Main complaint, n	
Cough and cold	40 (15.7%)
Fever	55 (30.5%)
Nausea and vomiting	35 (22.2%)
Diarrhea	73 (60.7%)
Abdominal pain	12 (3.6%)
Asthma	25 (10.3%)

SD: Standard deviation

Table:(2). Patient medical history

Variables	Number (%)
Medical history	
Yes	76 (85.32%)
No	24 (14.21%)
Medical history	
Yes	37 (67.22%)
No	63 (34.12%)

Table:(3). Clinical evaluation

Clinical evaluation	Number (%)
Common cold	75 (67.3%)
Diarrhea	82 (75.5%)
Asthma	33 (20.5%)
Pharyngitis	25 (10.3%)

The data indicated that ceftriaxone was prevalent among the commonly prescribed medications, accounting for 70 prescriptions (59.5%). Additionally, ampicillin ranked second with 55 prescriptions (32.4%). Gentamicin was notably the most frequently prescribed antibiotic, accounting for 57 prescriptions (25.7%). In contrast, azithromycin was in 28 prescriptions (18.3%). Comparatively, ciprofloxacin, with or without metronidazole combination, represented the least prescribed medication, in only 11 prescriptions (4.5%). This information is succinctly presented in Table 4.

Table:(4). Type of antibiotics prescribed for respiratory and gastrointestinal symptoms

Antibiotics	Number (%)
Ceftriaxone	70 (59.5%)
Ampicillin	55 (32.4%)
Gentamicin	57 (25.7%)
Azithromycin	28 (18.3%)
Ciprofloxacin	11 (4.5%)

DISCUSSION

To date, this study represents a new effort in assessing the prescription leanings and suitability of antibiotic usage among pediatric patients presenting with cough/cold and diarrhea in Albayda, Libya. Its findings promise a substantial contribution to understanding antibiotic utilization patterns in pediatric populations within the region, offering valuable insights for future research endeavors. The majority of children admitted to the hospital were male (58.4%) compared to female children (42.3%) as shown in Table 1. The outcomes reveal a notable prevalence of antibiotic administration among children under 10 years old suffering from cough/cold and diarrhea, aligning with findings from similar investigations conducted in other developing countries (Denny & Loda, 2010; Edwards et al., 2013). The elevated frequency of antibiotic prescriptions raises concerns regarding potential irrational usage practices, which can exacerbate resistance issues, as evidenced in prior research discussions (Emukule et al., 2014). Discrepancies between observed prescription patterns and WHO guidelines underscore potential deficiencies in healthcare provider awareness and institutional policy implementation (Wu et al., 2018). Notably, the frequent prescription of cephalosporins warrants attention due to its implications for healthcare outcomes and resistance concerns, a tendency observed in analogous studies.

Nonetheless, discrepancies in antibiotic appropriateness were noted, with prescriptions for diarrhea exhibiting better adherence to guidelines compared to those for respiratory distress, contrasting findings from prior research (Buzaid et al., 2011). Possible explanations for these disparities include diagnostic uncertainties and limited familiarity with treatment protocols among healthcare providers (Shane et al., 2017). Addressing these challenges necessitates the development of comprehensive policies, including medication review processes, guideline establishment, and regular educational initiatives for prescribers (Periáñez-Párraga et al., 2012; Troeger et al., 2018). These findings echo similar observations from studies conducted in Libya and Northern Tanzania (Mohammed et al., 2016; Nair et al., 2013), emphasizing the pivotal role of healthcare provider qualifications and ongoing medical education in promoting rational antibiotic prescribing practices (Atia et al., 2020). While this study boasts several strengths, including its comprehensive assessment of antibiotic appropriateness across different pediatric conditions, limitations inherent in its design should be acknowledged (Thielman & Guerrant, 2004). Nonetheless, its pioneering nature in evaluating antibiotic appropriateness in cold, cough, and diarrhea among pediatric populations is a notable strength, offering valuable insights for future research and clinical study.

CONCLUSION

In general, a substantial proportion of antibiotics were administered for cough/cold and/or diarrhea in Albayda, Libya. The adherence of prescribed antibiotics to established guidelines exhibited variability according to the specific clinical contexts. Ceftriaxone emerged as the predominant drug of choice among pediatric patients. The implementation of ongoing educational initiatives such as workshops or symposiums focusing on disease management and antibiotic prescription in pediatric populations may serve to promote the rational use of antibiotics.

ACKNOWLEDGEMENT

We would like to express our deep gratitude to all the esteemed participants for their benevolent support and cooperation in making this study possible. We would also like to acknowledge, with much appreciation, the crucial role of the Department of Pediatrics at Al-Jamee Hospital, which permitted us to use their prescriptions to complete this research study.

ETHICS

Written consent was obtained from the patient's attendants, and authorization to utilize prescriptions for research endeavors was obtained from the Head of the Department of Pediatrics at Al-Jamee Hospital.

Duality of interest: We declare that there are no conflicts of interest regarding the publication of this research study.

Author contributions: This work was carried out in collaboration between all authors. Y. M. designed the study, wrote the protocol, and collected the data. N. I. wrote the manuscript, performed the statistical analyses, and managed the literature reviews. All authors reviewed and approved the final manuscript.

Funding: No funding was received to assist with the preparation of this manuscript.

REFERENCES

- Abujnah, A. A., Zorgani, A., Sabri, M. A., El-Mohammady, H., Khalek, R. A., & Ghenghesh, K. S. (2015). Multidrug resistance and extended-spectrum beta-lactamases genes among *Escherichia coli* from patients with urinary tract infections in Northwestern Libya. *The Libyan Journal of Medicine*, 10, 26412.
- Atia, A. Elyounsi, N., Abired, A., Wanis, A., & Ashour, A. (2020). Antibiotic resistance pattern of bacteria isolated from patients with upper respiratory tract infections; a four-year study in Tripoli city. *Iberoamerican Journal of Medicine*, 03 (August), 155–160. <https://doi.org/10.20944/preprints201808.0435.v1>
- Bresee, J. S., Marcus, R., Venezia, R. A., et al. (2012). The etiology of severe acute gastroenteritis among adults visiting emergency departments in the United States. *The Journal of Infectious Diseases*, 205, 1374–1381.
- Buzaid, N., Elzouki, A. N., Taher, I., & Ghenghesh, K. S. (2011). Methicillin-resistant *Staphylococcus aureus* (MRSA) in a tertiary surgical and trauma hospital in Benghazi, Libya. *The Journal of Infection*, 5(10), 723–726.
- Carpenter, L. R., Pont, S. J., Cooper, W. O., et al. (2008). Stool cultures and antimicrobial prescriptions related to infectious diarrhea. *The Journal of Infectious Diseases*, 197, 1709–1712.
- Denny, F. W., & Loda, F. A. (2010). Acute respiratory infections are the leading cause of death in children in developing countries. *The American Journal of Tropical Medicine and Hygiene*, 35, 1–2.
- Edwards, K. M., Zhu, Y., Griffin, M. R., Weinberg, G. A., Hall, C. B., Szilagyi, P. G., et al. (2013). Burden of human metapneumovirus infection in young children. *The New England Journal of Medicine*, 368, 633–643.
- Emukule, G. O., Khagayi, S., McMorro, M. L., Ochola, R., Otieno, N., Widdowson, M.-A., et al. (2014). The Burden of Influenza and RSV among inpatients and outpatients in Rural Western Kenya, 2009–2012. *PLoS One*, 9, e105543.
- Hay, S. I., Abajobir, A. A., Abate, K. H., Abbafati, C., Abbas, K. M., Abd-Allah, F., et al. (2016). GBD 2016 DALYs and HALE Collaborators. Global, regional, and national disability-adjusted life-years (DALYs) for 333 diseases and injuries and healthy life expectancy (HALE) for 195 countries and territories, 1990-2016: A systematic analysis for the Global Burden of Disease Study 2016. *Lancet*, 390, 1260–1344. [https://doi.org/10.1016/S0140-6736\(17\)32130-X](https://doi.org/10.1016/S0140-6736(17)32130-X)
- Karras, D. J., Ong, S., Moran, G. J., et al. (2003). Antibiotic use for emergency department patients with acute diarrhea: Prescribing practices, patient expectations, and patient satisfaction. *Annals of Emergency Medicine*, 42, 835–842.
- McCullough, A. R., Pollack, A. J., Plejdrup Hansen, M., Glasziou, P. P., Looke, D. F., Britt, H. C., et al. (2017). Antibiotics for acute respiratory infections in general practice: Comparison of prescribing rates with guideline recommendations. [PubMed] [CrossRef] [Google Scholar]. *The Medical Journal of Australia*, 207, 65–69. <https://doi.org/10.5694/mja16.01042>

- Medalla, C., Gu, W., Friedman, C. R., et al. (2021). Increased incidence of antimicrobial resistant nontyphoidal *Salmonella* infections, United States, 2004–2016. *Emerging Infectious Diseases*, 27, 1662–1672.
- Mohammed, M. A., Alnour, T. M. S., Shakurfo, O. M., & Aburass, M. M. (2016). *Prevalence and antimicrobial resistance pattern of bacterial strains isolated from patients with urinary tract infection in Messalata Central Hospital, Libya*, 9(8), 77 776.<https://doi.org/10.1016/j.apjtm.2016.06.01>
- Nair, H., Simões, E. A., Rudan, I., Gessner, B. D., Azziz-Baumgartner, E., Zhang, J. S. F., et al. (2013). Global and regional burden of hospital admissions for severe acute lower respiratory infections in young children in 2010: A systematic analysis. *Lancet*, 381, 1380–1390.
- Periáñez-Párraga, L., Martínez-López, I., Ventayol-Bosch, P., Puigventós-Latorre, F., & Delgado-Sánchez, O. (2012). Drug dosage recommendations in patients with chronic liver disease. *Revista Española de Enfermedades Digestivas*, 104, 165–184.
- Scallan, E., Griffin, P. M., Angulo, F. J., Tauxe, R. V., & Hoekstra, R. M. (2011). Foodborne illness acquired in the United States—Unspecified agents. *Emerging Infectious Diseases*, 17, 16–22.
- Shane, A. L., Mody, R. K., Crump, J. A., et al. (2017). 2017 Infectious Diseases Society of America Clinical practice guidelines for the diagnosis and management of infectious diarrhea. *Clinical Infectious Diseases*, 65, 1963–1973.
- Thielman, N. M., & Guerrant, R. L. (2004). Acute infectious diarrhea. *The New England Journal of Medicine*, 350, 38–47.
- Troeger, C., Blacker, B., Khalil, I. A., Rao, P. C., Cao, J., Zimsen, S. R. M., et al. (2018). Estimates of the global, regional, and national morbidity, mortality, and aetiologies of lower respiratory infections in 195 countries, 1990–2016: A systematic analysis for the global burden of Disease Study 2016. *The Lancet. Infectious Diseases*, 18, 1191–1210.
- Wu, J., Taylor, D., Ovchinikova, L., Heaney, A., Morgan, T., Dartnell, J., et al. (2018). Relationship between antimicrobial-resistance programs and antibiotic dispensing for upper respiratory tract infection: An analysis of Australian data between 2004 and 2015. [PMC free article] [PubMed] [CrossRef] [Google Scholar]. *The Journal of International Medical Research*, 46, 1326–1338. <https://doi.org/10.1177/0300060517740813>