

Evaluation of Pharmacists' Awareness Regarding the Appropriate Use of Antibiotics for Managing Upper Respiratory Tract Infections in Children Under Five Years in Dhamar City

Waleed Al-Alwi¹, Hisham Al-Alwi², Faisal Mohammed Abduh Al-Nihmi³

¹Department of Pharmacy, Institute of Continuous Education, Albaydha University- Yemen

²Department of Pharmacy, Institute High Institute Of Health Sciences, Dhamar - Yemen

³Department of Biology, Institute Education & Sciences, Albaydha University - Yemen

Abstract

Background: Antibiotics are widely used in pediatric inpatient and outpatient settings, with many prescriptions deemed unnecessary. Antibiotic stewardship aims to use antibiotics only when necessary, targeting the appropriate spectrum, dose, route, and duration to optimize outcomes while minimizing adverse effects. **Objective:** To assess pharmacists' awareness of antibiotic use for treating upper respiratory infections in children under five in Dhamar City. **Methods:** A descriptive quantitative study was carried out using a structured questionnaire administered by the researchers, 116 questionnaires were found acceptable for analysis. The population of the study was all the pharmacists working at the pharmacies in Dhamar City. A total of 160 questionnaires were sent to pharmacists in Dhamar, with 135 returned. After discarding 19 unsuitable responses. Data collection and analysis were conducted using SPSS during the 2023–2024 academic year. **Findings:** The findings reveal that Cefoxitin is the most commonly prescribed antibiotic for upper respiratory illnesses, as reported by 84 participants (72.4%). This second-generation cephalosporin is effective against various gram-positive and gram-negative bacteria. Conversely, Azithromycin was flagged as the antibiotic with the most safety concerns, with 49 respondents (42.2%) expressing doubts regarding its safety. In terms of respiratory illnesses, the common cold was identified as the most frequently occurring condition by 94 respondents (81.0%), while diphtheria was noted as the least prevalent. For upper respiratory infections like tonsillitis, Lincomycin was perceived as the safest treatment option by 85 individuals (73.3%); however, only 52 respondents (44.8%) deemed Doxycycline safe for use in young children..

Keywords: Upper Respiratory Infection, Antibiotic, Children, Under Five Years.

المخلص

تقييم وعي الصيادلة حول استخدام المضادات الحيوية لعلاج التهابات الجهاز التنفسي العلوي عند الأطفال تحت سن الخامسة في مدينة ذمار

الخلفية النظرية: تُستخدم المضادات الحيوية على نطاق واسع في عيادات الأطفال الداخلية والخارجية، رغم أن العديد من الوصفات الطبية غير ضرورية. تهدف إدارة المضادات الحيوية إلى استخدام المضادات الحيوية فقط عند الضرورة، واستهداف الطيف والجرعة والطريق والمدة المناسبة لتحسين النتائج مع تقليل الآثار الضارة. هدفت الدراسة إلى تقييم وعي الصيادلة باستخدام المضادات الحيوية لعلاج التهابات الجهاز التنفسي العلوي عند الأطفال دون سن الخامسة في مدينة ذمار بطرق العمل: أجريت دراسة كمية وصفية باستخدام استبيان أعده الباحثان، ووجد أن 116 استبياناً مقبولة للتحليل. تكون مجتمع الدراسة من جميع الصيادلة العاملين في الصيدليات في مدينة ذمار. تم إرسال ما مجموعه 160 استبياناً إلى الصيادلة في ذمار، وتم إرجاع 135 منها وتم استبعاد 19 استجابة غير مناسبة. تم إجراء جمع البيانات وتحليلها باستخدام برنامج SPSS خلال العام الدراسي 2023-2024. النتائج: تكشف النتائج أن سيفوكسيتين هو المضاد الحيوي الأكثر شيوعاً لعلاج أمراض الجهاز التنفسي العلوي، كما أفاد 84 مشاركاً (72.4%). هذا المضاد الحيوي فعال ضد العديد من البكتيريا إيجابية الجرام وسلبية الجرام. وعلى العكس من ذلك، تم تصنيف أزيثروميسين على أنه المضاد الحيوي الأكثر إثارة للقلق فيما يتعلق بالسلامة، حيث أعرب 49 مشاركاً (42.2%) عن شكوكهم بشأن سلامته. فيما يتعلق بأمراض الجهاز

التنفسي، تم تحديد نزلات البرد الشائعة على أنها الحالة الأكثر حدوثاً من قبل 94 مشاركاً (81.0%)، في حين لوحظت الدفتيريا على أنها الأقل انتشاراً. بالنسبة لالتهابات الجهاز التنفسي العلوي مثل التهاب اللوزتين، اعتبر 85 فرداً (73.3%) أن لينكومايسين هو خيار العلاج الأكثر أماناً؛ كما اعتبر 52 مشاركاً فقط (44.8%) أن الدوكسيسيكليين آمن للاستخدام في الأطفال الصغار.

الكلمات المفتاحية: عدوى الجهاز التنفسي العلوي، المضاد الحيوي، الأطفال، أقل من خمس سنوات

worldwide have realized that urgent action is required. [World Health Organization. Antimicrobial Resistance, 2014]. The overuse and abuse of

1.1.Introduction:

Antimicrobial resistance (AMR) is becoming a more significant global issue, and specialists

Academy of Pediatrics (2018), antibiotic stewardship is the practice of only using antibiotics when absolutely required and, when they are, focusing on the spectrum of activity and using the right dosage, route, and length of therapy to maximize clinical results while reducing the unfavorable effects of antibiotic use.

1.2. Significance of the study

The importance of this study comes from the fact that it contributes to determining the level of awareness among pharmacists regarding the use of antibiotics in the treatment of upper respiratory tract infections in children under 5 years, and identifying the problems and challenges faced by pharmacists in this regard. The results can also contribute to the development of targeted training and education plans for pharmacists and healthcare workers in general, to promote the correct and effective use of antibiotics in the treatment of upper respiratory tract infections in children under 5 years.

1.3. Study problem

The role of pharmacists in managing antibiotic therapy is crucial. However, there seems to be a gap in their understanding of the appropriate use of antibiotics for upper respiratory infections (URIs) in pediatric patients. This study aims to examine the extent of this knowledge, their prescribing practices, and the implications for patient safety and public health. Children are vulnerable to various serious upper respiratory tract conditions that often require prompt medical intervention. While several medications are available for these conditions, it is important to note that not all are suitable for use in children. Additionally, some upper respiratory infections may not need antibiotic treatment and can be effectively managed with symptomatic relief. This research highlights the need for pharmacists to improve their awareness and understanding of antibiotic use in treating upper respiratory infections in children under five years of age.

1.2. Objectives of the Study

antibiotics (AB) is the primary cause of the evolution of resistant bacteria in humans. Upper respiratory tract infections (URTIs) are a prevalent ailment, particularly in children, and they represent a significant percentage of family doctor consultations globally. Every year, children typically get four to six respiratory tract infections [World Health Organization, 1995]. AB is frequently used to treat URTIs, even though bacteria account for less than 10% of cases [Arroll B., et al., 2008].

According to earlier research, AB has a very minor impact on URTIs, suggesting that the diseases frequently go away on their own [Arroll B., et al., 2008]. The amount of AB consumed might be greatly decreased by reducing its use for URTIs. When a change in children's AB use is required, parental knowledge, beliefs, and attitudes have been found to be crucial aspects to take into account [Andrews T. et al., 2012]. By combining the findings of several qualitative studies conducted in Western nations, researchers have thoroughly examined the reasons why parents seek doctors and their opinions about the choices they make [Cabral C. et al., 2014; Lucas PJ., et al., 2015].

The most often prescribed drug class for kids is antibiotics (Chai G. and others, 2002.) Antibiotic medication has saved many lives, but using them excessively might be harmful. Clostridium difficile infections (CDIs), antibiotic resistance, and other drug-related side effects such end-organ toxicities, diarrhea, rashes, cytopenia, and allergy can all result from antibiotic exposure. Antibiotic-resistant bacteria are thought to be responsible for approximately 3 million illnesses and 35,000 fatalities annually in the US, according to the Centers for Disease Control and Prevention (CDC) (The Centers for Disease Control and Prevention, 2019). Both pediatric inpatient and outpatient settings commonly use antibiotics, while a sizable percentage of antibiotic use is deemed unnecessary (Soyka LF., et al., 1975).

Many antibiotics are thought to be unneeded (Soyka LF., et al., 1975). According to the American

2.5. Sample Size

The total sample was 116 male and female pharmacists.

2.6. Data Collection and Analysis

The data were collected through a questionnaire to elicit the required information related to the topic under study. It consisted of three sections. The first section is demographic information of the participants including educational level and years of experience. The second section seeks to find out the awareness of pharmacists regarding antibiotics used. The third section aims to find out the most common upper respiratory diseases in Damar City. The obtained data were analyzed using SPSS.

2.7. Ethical Consideration

This study was approved by Applied College of Science and Technology for Continuous Education. Oral consent was obtained from all participating pharmacists to participate. Participation was voluntary and without any incentive or pressure from the researchers.

3. Results

The general objective is to assess the awareness of pharmacists of the antibiotics used in the treatment of upper respiratory infections in children under five years in Dhamar City.

The specific objectives include:

- a- Determining the awareness of pharmacists about diseases of the upper respiratory tract in children.
- b- Determining the awareness of the pharmacists about the diseases that affect the upper respiratory tract in children that do not need an antibiotic in the treatment.
- c- Knowledge of the risks of antibiotics in children under five years.

2. Methods & Materials

2.1. Study Design

A descriptive cross-sectional study design was adopted to assess the awareness among pharmacists regarding the use of antibiotics in upper respiratory tract infections in children under 5 years in Dhamar City.

2.2. Study Setting

The study was conducted at all pharmacies in Dhamar City.

2.3. Population of the Study

The population of the study was all the pharmacists working at the pharmacies in Dhamar City.

2.4. Sampling Method

A convenience sampling method was employed to select a total of 116 pharmacists, both male and female. Data were gathered through a questionnaire and analyzed using SPSS.

Table No. (1) shows the reliability coefficient for the research variables.

Search variables	Number of items	Stability coefficient
Safe antibiotics to treat upper respiratory diseases	9	0.683
The most common respiratory diseases in Dhamar City	7	0.752

Safe and unsafe medications for treating upper respiratory diseases	8	0.778
Total	24	0.761

Table No. (1), it is clear that they are high for all the research variables reached (0.761), which makes the tool used a suitable tool for all research data, and the following table shows this.

Table No. (2) shows the frequency distribution and percentages of sample members by educational level

Educational level	Total	
Items	Frequency	Percent
Diploma	64	55.2%
Bachelor	52	44.8%
Total	116	100.0%

Table No. (2) shows that most participants (55.2%) held a diploma, while 44.8% had a bachelor's degree. None had a master's, doctorate, or other qualifications, indicating a predominance of basic education. The sample mainly includes young individuals with limited work experience.

Table No. (3) shows the frequency distribution and percentages of sample members by Age.

Years of Experience	Total	
Items	Frequency	Percent
less than one year	45	38.8%
From one year to less than five years	41	35.3%

From 5 years to less than 10 years	29	25.0%
From 10 years to less than 15 years	1	0.9%
15 years and over	0	0.00%
Total	116	100.0%

Table No. 3 illustrates the experience levels of participants, shows that 38.8% of respondents have less than one years of experience, while 0% represent those with 15 years or more, indicating a lack of respondents in that demographic. This trend highlights a workforce with predominantly limited experience.

Table (4): Pharmacists' awareness level of safe antibiotics in treating upper respiratory tract infections in Dhamar City, Yemen (n=116)

Name of Drugs	Yes\No	Frequency	Percent (%)
Amoxicillin	Yes	68	58.6%
	No	48	41.4%
Ceftriaxone	Yes	67	57.8%
	No	49	42.2%
Levofloxacin	Yes	82	70.7%
	No	34	29.3%
Azithromycin	Yes	49	42.2%
	No	67	57.8%
Doxycycline	Yes	80	69.0%
	No	36	31.0%
Lincomycin	Yes	63	54.3%
	No	53	45.7%
Cefotaxime	Yes	58	50.0%
	No	58	50.0%
Rifampicin	Yes	81	69.8%
	No	35	30.2%
Cefoxitin	Yes	84	72.4%
	No	32	27.6%

It is clear from Table No. (4) that the sample to which it was applied in the city of Dhamar agreed that the most common type of drug for upper respiratory diseases in children under the age of 5 years is (Cefoxitin). The number of those who agreed with that reached (84) individuals, including (72.4%) of the total sample members (116) individuals. It is an antibiotic from the second-generation cephalosporin group. It has an antibiotic effect against gram positive bacteria such as Staphylococcic, and an antibiotic against some gram-negative bacteria. While the least safe antibiotic was (Azithromycin), the number of those who agreed with that reached (49) individuals, representing (42.2%) of the total sample of (116) individuals. This could be due to the insufficient experience possessed by pharmacists. In the city of Dhamar, the educational level is simple.

Table No (5) Pharmacists' awareness level of the most common upper respiratory diseases

Name of disease	Yes/No	Frequency	Percent (%)
Inflammation of the middle ear	Yes	84	72.4%
	No	32	27.6%
Whooping cough	Yes	65	56.0%
	No	51	44.0%
Diphtheria or diphtheria	Yes	53	45.7%
	No	63	54.3%
Pneumonia	Yes	69	59.5%
	No	47	40.5%
Tonsillitis	Yes	89	76.7%
	No	27	23.3%
Colds	Yes	94	81.0%
	No	22	19.0%
Lymphadenitis	Yes	61	52.6%
	No	55	47.4%

It is clear from Table No. (5) that the majority of the participants stated that the most common type of respiratory diseases is the common cold with a frequency of (94), representing (81.0%.) out of the total sample (116). This could be due to the fact that Dhamar City is considered one of the areas characterized by a high incidence of cold, and this is a logical answer, while the least common respiratory disease was diphtheria(45.7%). This may be due to the fact that this disease is more widespread in coastal areas.

Table (6). Pharmacists' awareness level of the safe and unsafe antibiotics for treating upper respiratory diseases, Dhamar city, Yemen (n=116)

Name of Drugs	Yes\No	Frequency	Percent (%)
Lincomycin is used in children under 5 years of age to treat tonsillitis	Yes	85	73.3%
	No	31	26.7%
Doxycycline is safe for use in children	Yes	52	44.8%
	No	64	55.2%
Azithromycin is the best medication used for children to treat respiratory infections	Yes	81	69.8%
	No	35	30.2%
We treat colds with antibiotics	Yes	64	55.2%
	No	52	44.8%
Asthma is treated with azithromycin	Yes	55	47.4%
	No	61	52.6%
Antibiotics are used from the first day the child has a respiratory infection	Yes	53	45.7%
	No	63	54.3%
Antibiotics can be given to children without a prescription	Yes	67	57.8%
	No	49	42.2%
Random use of antibiotics affects the child's immunity	Yes	68	58.6%
	No	48	41.4%

Table No. (6) reveals that the majority of respondents (85) with a percentage of (73.3%) agreed that the safe medicines for treating upper respiratory diseases including tonsillitis is (Lincomycin). It is an antibiotic that works to treat bacterial infections, while the number of those who agreed that Doxycycline is safe for children was (52) individuals, i.e. (44.8%) of the total sample of (116). This may be due to the sample's lack of experience.

Table (7): Relationship between antibiotics and respiratory diseases and safe and unsafe medications

Variables	r or rho*	P-value
Antibiotics, Upper respiratory diseases	0.194*	0.037
Safe and unsafe medicines, Antibiotics	0.432**	0.000

We notice from Table No. (7) that there is a correlation between antibiotics and upper respiratory system diseases because the significance level = (0.037), which is less than (0.05), and the correlation reached (0.194*). There is also a correlation between antibiotics and safe and unsafe medicines. This is because the significance level = (0.000), which is less than (0.05), and the correlation reached (0.432**).

Are there statistically significant differences in awareness of which antibiotics are safe for children under 5 years of age in treating upper respiratory infections according to the variables (educational level and years of experience)? The Krusical-Wallis test was used to find differences as follows:

Table 8 (Antibiotics): Mean score with respect to demographics

Characteristics		Antibiotics. Score Mean rank	P-value
Educational level	Diploma	60.48	0.475
	Bachelor	56.06	
Years of Experience	less than one year	66.36	0.096
	From one year to less than five years	58.54	
	From 5 years to less than 10 years	46.76	
	From 10 years to less than 15 years	44.00	
	15 years and over	0.00	

From Table No. (8), it is clear that there are no significant differences in the level of awareness of pharmacists in the city of Dhamar as to which antibiotics are safe in children under the age of 5 years for upper respiratory tract infections according to the variables (educational level and years of experience). This is because the level of significance in all variables is greater than (0.05).

Are there statistically significant differences in awareness of the most common upper respiratory diseases in the city of Dhamar according to the variables (educational level and years of experience)? The Krusical-Wallis test was used to find differences as follows:

Table 9(Upper respiratory diseases): Mean score with respect to demographics

Characteristics		Upper respiratory diseases. score Mean rank	P-value
Educational level	Diploma	59.26	0.784
	Bachelor	57.57	
Years of Experience	less than one year	64.24	0.241
	From one year to less than five years	56.44	
	From 5 years to less than 10 years	51.22	
	From 10 years to less than 15 years	95.50	

	From 15 years and over	0.00	
--	------------------------	------	--

From Table No. (9), it is clear that there are no significant differences in the level of awareness of pharmacists in the city of Dhamar regarding the prevalence of upper respiratory system diseases in the city of Dhamar according to the variables (educational level and years of experience), because the level of significance in all variables is greater than (0.05).

(64.5%) and compared with drugs active and safe in children under five years. Additionally, **Jin X, Ren J.**, and others conducted a study in (2021), [**Jin X., et al., 2021**], which examined the global impact of upper respiratory infections across 204 countries and territories from 1990 to 2019. Their research indicated that cases of URIs reached 17.2 (with a 95% uncertainty interval of 15.4 to 19.3) billion in 2019, accounting for 42.83% (with a range of 40.01% to 45.77%) of all reported cases.

Regarding safe and unsafe antibiotics used in treating children under 5 years, results are in concordance with **Wald ER, et al. 2013** this study conclude the clinician should prescribe antibiotic therapy for acute bacterial sinusitis in children with severe onset or worsening course. The clinician should either prescribe antibiotic therapy or offer additional observation for 3 days to children with persistent illness. Amoxicillin with or without clavulanate is the firstline treatment of acute bacterial sinusitis.

Conclusion

At the end of our study, we found that it is needed to improve the level of awareness among pharmacists in this field in order to provide better health care to children. The level of awareness among pharmacists about the use of antibiotics to treat upper respiratory infections in children under the age of 5 years was moderate as there was a lack of knowledge about the timing of referral to a doctor and the appropriate medications to treat such cases. The study also revealed that there is a need to train pharmacists and improve their skills. To ensure proper practices in the use of antibiotics to treat upper respiratory infections in children, we also review antibiotics that are harmful to children.

4. Discussion of the Results

The primary aim of this research is to assess pharmacists' awareness regarding the use of antibiotics for treating upper respiratory infections in children under five years old. Based on the results from the analysis of the questionnaire data, the first section focuses on social demographics; a majority of pharmacists demonstrated moderate awareness about using antibiotics for upper respiratory bacterial infections in this age group. One of the most significant findings from our study was regarding the educational qualifications of the participants 55.2% held a diploma and 44.8% had a bachelor's degree. In terms of professional experience, 38.8% of the pharmacists had less than one year of experience, while 35.3% had between one year and less than five years, 25.0% had between five and less than ten years, 0.9% had between ten and less than fifteen years, and no pharmacists had fifteen years or more experience.

Regarding the second section, which antibiotic is safe in children under 5 years treatment of upper respiratory infection, results were in concordance with studies Katundu DR. and [**Katundu DR, et al., 2023**] whose study was about Usage and parental knowledge of antibiotics in children undergoing (adeno) tonsillectomy in northern Tanzania.

In the third section, it was noted that upper respiratory tract infections are the most prevalent, aligning with the findings of **Taketomo CK et al. (2022)**, [**Taketomo CK, 2022**]. Their study focused on the Pediatric Dosage Handbook International and found that the rate of accurate dosing in prescriptions from non-pediatricians for children under 5 years old is merely 31%. Dosing errors were significantly more frequent in infants (90%) compared to older children

outpatient prescription drug use in US children, 2002-2010. *Pediatrics*. 2012; 130(1):23-31

Fitzpatrick T., Malcolm W., McMenamin J., Reynolds A., Guttman A., Hardelid P.[2021] Community-Based Antibiotic Prescribing Attributable to Respiratory Syncytial Virus and Other Common Respiratory Viruses in Young Children: A Population-Based Time-series Study of Scottish Children. *Clin Infect Dis*. 2021 Jun 15;72(12):2144-2153. doi: 10.1093/cid/ciaa403. PMID: 32270199.

Jin X, Ren J., Li R, Gao Y., Zhang H., Li J., Zhang J., Wang X., Wang G.[2021] Global burden of upper respiratory infections in 204 countries and territories, from 1990 to 2019. *EClinicalMedicine*. 2021 Jun 28;37:100986. doi: 10.1016/j.eclinm.2021.100986. PMID: 34386754; PMCID: PMC8343248.

Katundu DR., Hannink G., Lyimo JG., Rovers M., van Heerbeek N.[2023] Usage and parental knowledge of antibiotics in children undergoing (adeno) tonsillectomy in northern Tanzania. *Pan Afr Med J*. 2023 Oct 17;46:59. doi: 10.11604/pamj.2023.46.59.41190. PMID: 38223875; PMCID: PMC10787135.

Lucas PJ et al.[2015] A systematic review of parent and clinician views and perceptions that influence prescribing decisions in relation to acute childhood infections in primary care. *Scand J Prim Health Care* 2015; 33: 11-20.

Soyka LF., Robinson DS., Lachant N., Monaco J.[1975] The misuse of antibiotics for treatment of upper respiratory tract infections in children. *Pediatrics*. 1975; 55(4):552-556

Taketomo CK eds.[2022], *Pediatric Dosage Handbook International* – available online: <https://uptodate.chq.health.qld.gov.au/> [Accessed 25 August 2022].

5. Recommendations

Based on the findings of the study, we recommend the following:

- Conducting regular training programs for pharmacists on correct practices in prescribing and dispensing antibiotics.
- Developing an updated guideline for pharmacists regarding the treatment of upper respiratory tract infections in children.
- Strengthening coordination between pharmacists and doctors to ensure the rational use of antibiotics.

References

American Academy of Pediatrics[2018]. Antimicrobial Resistance and Antimicrobial Stewardship: Appropriate and Judicious Use of Antimicrobial Agents. In: Kimberlin DW, Brady MT., Jackson MA., Long SS., eds. *Red Book: 2018 Report of the Committee on Infectious Diseases*. Elk Grove Village, IL: American Academy of Pediatrics; 2018: 906-910.

Andrews T et al.[2012] Interventions to influence consulting and antibiotic use for acute respiratory tract infections in children: a systematic review and meta-analysis. *PLoS One* 2012; 7: e30334.

Arroll B., Kenealy T., Falloon K.[2008] Are antibiotics indicated as an initial treatment for patients with acute upper respiratory tract infections? A review *N Z Med J* 2008; 121: 64-70.

Cabral C et al.[2014] How communication affects prescription decisions in consultations for acute illness in children: a systematic review and meta-ethnography. *BMC Fam Pract* 2014; 15: 63.

Chai G., Governale L., McMahon AW., Trinidad JP., Staffa J., Murphy D.[2012] Trends of

The Australasian Neonatal Medicines Formulary Steering group[2022].

<https://www.anmfonline.org/clinical-resources/>
[Accessed 25 August 2022].

The Centers for Disease Control and Prevention[2019]. Antibiotic / antimicrobial resistance (AR / AMR): biggest threats and data. Available at: www.cdc.gov/DrugResistance/Biggest-Threats.html. Accessed December 7, 2019

Wald ER, Applegate KE, Bordley C, Darrow DH, Glode MP, Marcy SM, Nelson CE, Rosenfeld RM, Shaikh N, Smith MJ, Williams PV, Weinberg ST; American Academy of Pediatrics. Clinical practice guideline for the diagnosis and management of acute bacterial sinusitis in children aged 1 to 18 years. *Pediatrics*. 2013 Jul;132(1):e262-80. doi: 10.1542/peds.2013-1071. PMID: 23796742.

World Health Organization[2014]. Antimicrobial Resistance: Global Report on Surveillance. Geneva: WHO, 2014.

World Health Organization[1995]. The Management of acute respiratory infections in children: practical guidelines for outpatient care. Geneva, 1995.