



## PRESCRIBING FREQUENCY, TRENDS, AND PATTERNS OF ANTIMICROBIAL THERAPY IN PATIENTS WITH ACUTE TONSILLITIS: A REVIEW

Nimra Zaman<sup>1\*</sup>, Komal Zaman<sup>2</sup>, Faryal Zaman<sup>3</sup> and Bushra Zaman<sup>4</sup>

<sup>1</sup>Department of Community Medicine and Public Health Sciences, LUMHS, Pakistan

<sup>2</sup>College of Pharmacy, Liaquat University of Medical and Health Sciences Jamshoro, Pakistan

<sup>3</sup>Kings College Hospital London. United Kingdom.

<sup>4</sup>Peoples University of Medical And Health Sciences for Women, Nawabshah, Pakistan

**Background:** Diseases of the ear, nose, and throat (ENT) are among the most prevalent illnesses impacting the global population. Tonsillitis, otitis media, pharyngitis, nasopharyngitis, and other common ENT diseases are known as acute respiratory infections (ARI). **Summary:** ARI is responsible for roughly 30% of consultations in all patients and 25% of hospitalization in children, according to the World Health Organization (WHO). Antibiotics are commonly used to treat ENT diseases, and the antibiotic prescribing pattern is critical in terms of patient safety, disease management, and cost-effectiveness. Tonsillitis is an inflammation of the tonsils with signs and symptoms including Sore throat, fever, tonsil enlargement, difficulty gulping, and large lymph hubs around the neck are all possible side effects. Acute tonsillitis is treated with different groups of antibiotics including Penicillin followed by Cephalosporin, Macrolide, Fluoroquinolones, and Sulfonamides.  $\beta$ -hemolytic Streptococci, coagulase-positive Staphylococci, Pneumococci, and coagulase-positive Staphylococci and Pneumococci are most commonly isolated microorganisms from acute tonsillitis patients. **Key messages:** Antibiotic prescribing patterns that are irrational are widely documented across the world, and it is one of the biggest health concerns when it comes to patient safety. Increased irrational prescribing causes patients to develop drug resistance, as well as adverse drug reactions (ADRs) and higher therapy costs.

**Keywords:** tonsillitis, antibiotics, drug resistance, Cephalosporin, irrational prescribing

### INTRODUCTION

Ear, nose, and throat (ENT) diseases are among the most frequent illnesses afflicting the world's population.<sup>1&2</sup> ENT disorders impact both children and adults, as well as people's day-to-day activities. Tonsillitis, otitis media, pharyngitis, nasopharyngitis, and other common ENT diseases are known as acute respiratory infections (ARI).<sup>3&4</sup> ARI are responsible for roughly 30% of all consultations and 25% of admissions in children, according to the World Health Organization (WHO).<sup>3</sup> Respiratory infections

are the fourth leading cause of mortality globally, accounting for 94.6 disability-adjusted life years (DALYs) out of 316 illnesses, according to a global report released in 2015.<sup>5</sup> Antibiotics are widely used to treat ENT disorders, and the antibiotic prescription pattern is critical in terms of patient safety, disease management, and cost effectiveness<sup>6</sup>. Antibiotic prescribing patterns that are irrational are widely documented across the world, and it is one of the biggest health concerns when it comes to patient safety.<sup>7&8</sup> Increased irrational prescription causes patients to

acquire medication resistance, as well as adverse drug reactions (ADRs) and higher therapy costs.<sup>9</sup>

### What is Tonsillitis?

Tonsillitis is an inflammation of the tonsils that usually develops quickly. Sore throat, fever, tonsil enlargement, difficulty gulping, and large lymph hubs around the neck are all possible side effects.<sup>10</sup> Tonsillitis is most commonly caused by a viral infection, with bacterial infections accounting for around 5% to 40% of cases.<sup>11</sup> To relieve pain, paracetamol (acetaminophen) and ibuprofen can be used. If strep throat is present, the anti-infection penicillin is offered. Cephalosporins or macrolides may be used in people who are hypersensitive to penicillin.<sup>12</sup> Tonsillectomy reduces the risk of future risk in children who have had previous exposure to tonsillitis. In any three-month period, about 7.5% of people experience an inflamed throat, and 2% of people see a specialist for tonsillitis each year. It is common in school-aged children and occurs primarily in the fall and winter months. With or without medication, the majority of people recover. Regardless of whether streptococcus is accessible or not, 40% of people have symptoms within three days, and 80% experience adverse effects within a week.<sup>13</sup>

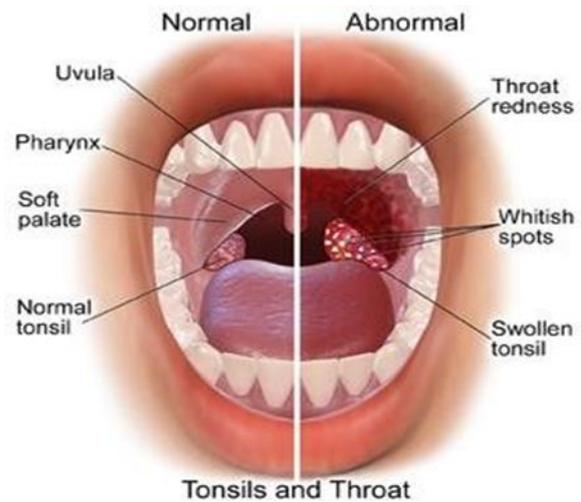


**Fig. 1:** Inflamed tonsillitis<sup>14</sup>

### Major signs and symptoms

An overall feeling of being ill (malaise), A ringing in the ears or a throbbing in the neck Headache, exhaustion, a scratchy throat, Tonsils that are red and swollen, fever, Chills,

losing weight, difficulty swallowing, sleeping difficulties, white pus-filled patches on the tonsils neck lymph nodes (glands) that are swollen.<sup>15</sup>



**Fig. 2:** Normal and abnormal tonsil and throat<sup>16&17</sup>

### Cause

Tonsillitis affects 50-80% of people. Adenovirus, rhinovirus, influenza, parainfluenza, coronavirus, and respiratory syncytial illness are all common. Epstein-Barr virus infection, herpes simplex infection, cytomegalovirus infection, or HIV infection are all known causes. Epstein-Barr infection is responsible for around 1-10% of all cases. The second most common cause is bacterial contamination, with Group A *beta-hemolytic streptococcus* (GABHS), which causes strep throat, being the most common.<sup>18&19</sup> The underlying viral illness is usually pursued by bacterial infection of the tonsils.

*Staphylococcus aureus* (including methicillin-resistant *Staphylococcus aureus*, or MRSA), *Streptococcus pneumonia*, *Mycoplasma pneumonia*, *Chlamydia pneumonia*, *Bordetella pertussis*, *Fusobacterium sp.*, *Corynebacterium diphtheria*, *Treponema pallidum*, and *Neisseria gonorrhoea* are some of the less common bacterial causes. Tonsillitis has been linked to anaerobic microscopic organisms, and a few clinical and logical theories support their role in the severe incendiary procedure.<sup>20</sup> Infections and germs enter the body through the nose and mouth and are filtered in the tonsils under normal circumstances. White platelets of the

insusceptible framework pulverize infections or microorganisms inside the tonsils by producing incendiary cytokines like phospholipase A2, which also cause fever.<sup>21</sup> The illness may also be present in the throat and surrounding areas, producing pharyngeal discomfort. Tonsillitis is occasionally caused by a *spirochaeta* and *Treponema* infection, which is known as Vincent's angina or Plaut-Vincent angina.<sup>22</sup>

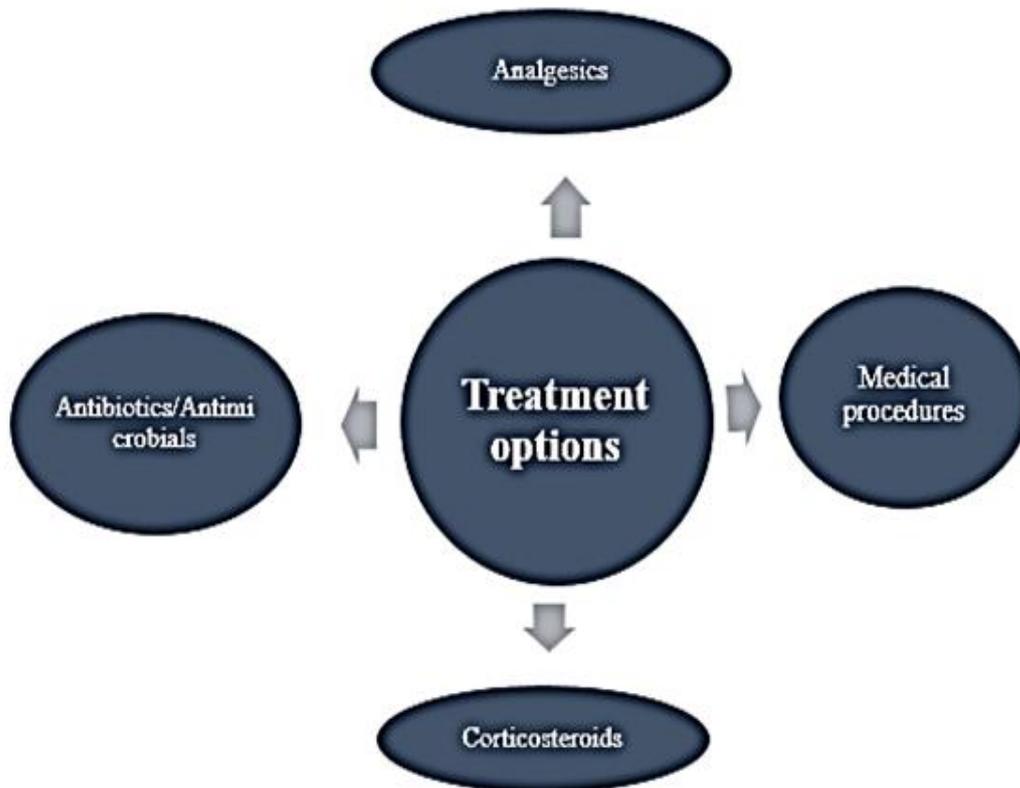
### Diagnosis

Centor criteria are used in critical care settings (healthcare institutions) to determine the likelihood of contracting group A *beta-hemolytic streptococcus* (GABHS) illness in severe tonsillitis and the necessity for anti-infection medicines for tonsillitis therapy. In any event, the Centor criteria have flaws when it comes to determining accurate results for adults.<sup>23</sup> It is also insufficient in making any conclusions in children and in auxiliary consideration settings (emergency clinics). The presence of tonsillar exudate, problematic neck lymph hub, history of fever, age between 5-15 years, and the absence of hack are all important factors in the Centor score.<sup>24</sup> With the increasing score, the likelihood of GABHS exposure increases. For a score of 1, the chances of acquiring GABHS are 2 -23%, and for a score of 4, the chances are 25 - 85%. The culture of tests obtained by swabbing the throat and plating them on sheep blood agar medium can confirm the diagnosis of GABHS tonsillitis.<sup>25</sup> By establishing the way of life under anaerobic circumstances and using certain development medium, the detachment rate can be increased. A single throat culture has a 90–95% affectability for detecting GABHS (which means that GABHS is present 5-10% of the time when the way of life result suggests that it is absent). This small percentage of false negative results is one of the characteristics of the tests used, although it is possible if the patient has received anti-infection medications prior to testing. By culture, distinguishing evidence takes 24 to 48 hrs, although fast screening tests (10/hr) with an affectability of 85-90% are

available.<sup>26</sup> Genuine GABHS contamination, as opposed to colonization, is defined as the presence of more than 10 provinces of GABHS per blood agar plate. However, because of the cover among carriers and poisoned patients, this approach is difficult to implement.<sup>27</sup> The throat culture can be used in 40% of people who have no symptoms. As a result, a throat culture isn't commonly used in clinical practice to identify GABHS. Surface Lancefield bunch, a sugar, is distinguished by more established antigen assays. GABHS serotypes may now be distinguished by nucleic acid corrosive (DNA) testing or polymerase chain reaction (PCR). In the event of a negative rapid streptococcal test, a bacterial culture may be necessary. A month and a half after the strong contamination, an increase in antistreptolysin O (ASO) streptococcal counteracting agent titer 3 can provide review confirmation of GABHS disease and is regarded as comprehensive verification of GABHS contamination.<sup>28</sup> Individuals who may have persistent mononucleosis with a common lymphocyte included in a full blood check result can try Epstein Barr infection serology. Expanded estimations of released phospholipase A2 and modified unsaturated fat digestion in people with tonsillitis may have analytic utility.<sup>29</sup> Blood exams are essential for those with medical clinic confirmation and required intravenous antimicrobial. Nasoendoscopy can be used to prevent hidden epiglottitis and supraglottitis in people who have severe neck pain and are unable to swallow any drinks. Nasoendoscopy is not recommended for children on a regular basis.<sup>30</sup>

### Treatment

Pain and fever-reducing medications, such as paracetamol (acetaminophen) and ibuprofen, are used to relieve the discomfort of tonsillitis.<sup>31</sup> When tonsillitis is caused by an infection, the length of the illness is determined by which infection is present. In most cases, complete recovery takes around a week; nevertheless, symptoms might last up to 2 weeks.<sup>32</sup>



**Fig. 3:** Available treatment options for tonsillitis

#### **Anti-microbial agents/antibiotics**

If the tonsillitis is caused by group A streptococcus, anti-infection medications are necessary, with penicillin or amoxicillin being the most important options. In the intensive environment, Cephalosporins and macrolides are seen as excellent alternatives to penicillin. For people who are allergic to penicillin, a macrolide such as an azithromycin or erythromycin is used.<sup>33</sup> People who are resistant to penicillin may react to antibiotics that are effective against beta-lactamase-producing bacteria, such as clindamycin or amoxicillin-clavulanate. In the tonsillar tissues, oxygen-consuming and anaerobic beta-lactamase-producing microorganisms can "shield" a streptococcus against penicillin. In the treatment of tonsillitis, there are no significant differences in the viability of various anti-infection drugs.<sup>34&35</sup> Intravenous antimicrobials can be used for people who are unable to swallow and have entanglements while in the hospital. If the patient is clinically improved and ready to swallow, oral anti-toxins can be continued right away.<sup>36</sup>

#### **Analgesics**

For the relief of pain, paracetamol is recommended. Despite the fact that nonsteroidal anti-inflammatory drugs (NSAIDs, such as ibuprofen) and narcotics, such as codeine and tramadol, are both powerful, caution should be taken because NSAIDs can cause peptic ulcer and are bad for the kidneys, while narcotics can cause respiratory issues. Additionally, paracetamol and NSAIDs can cause utilized in children.<sup>37</sup>

#### **Corticosteroids**

Corticosteroids are effective in reducing pain and improving symptoms within 24 to 48 hrs. Except if the patient is unable to take medications, oral corticosteroids are prescribed.<sup>38</sup>

#### **Medical procedure**

Medical procedure Incessant cases can be treated with tonsillectomy (careful removal of the tonsils) as a therapy option. Tonsillectomy for frequent bouts of tonsillitis has only yielded a minor benefit in children.<sup>39</sup>

**Table 1:** Overview of the reviewed sources (local studies)

Country	Title	Findings	References
Pakistan	Irrational use of cephalosporin and quinolones in public and private sectors hospitals of Karachi	A research investigated bioinformatics based structural characterization of glucose dehydrogenase against hepatoprotective activity conducted on all 70 solutions from both public and private emergency clinics; the findings show that 40 patients (57.14%) received irrational treatment, while 30 patients (42.85%) received rational treatment of cephalosporin and quinolone, anti-toxin, and antibiotics. <sup>41</sup>	Naveed, S., <i>et al.</i> ; 2014
Pakistan	Prescribing practices of antibiotics in the outpatient setting of a tertiary care hospital in Karachi, Pakistan: An observational study.	The study concluded that an immediate investigation on persistent anti-infection treatment in outpatient settings should be conducted. In Karachi, 500 remedies were analyzed to identify irrational anti-toxin use, and 260 of them were found to be irrational. <sup>42</sup>	Ali, S. I., <i>et al.</i> ; 2014
Pakistan	Use of antibiotics in hospitals; current situation.	Study was conducted in tertiary care clinics in Karachi to investigate the over prescribing and polypharmacy pattern. A total of 54 patients from paediatric wards, cardiology wards, and female prescription wards were chosen to assess the excessive use of anti-infection agents. When compared to other wards, cardiology had a lower level of irrational endorsing. Cardiology patients had the most severe symptoms of hypertension and diabetes. while in paediatric ward the level of polypharmacy and abuse was 24.07% and in female medication ward rate was 12.76%. The conclusion of the study demonstrates that the standard treatment rules were not followed. <sup>44</sup>	Anjum, F., <i>et al.</i> ; 2015
Pakistan	Irrational drug use based on self-medication for some common clinical conditions in an educated population of Karachi.	Cross-sectional research in Karachi, Pakistan among females assessing the irrational utilization of prescription and self-consumption. The findings showed that 63.78% of respondents were involved in self-drug utilization. Most common ailments identified in self-drug utilization were for the treatment of fever (96.52%), cerebral pain (58.70%) and respiratory infections (80%), gastrointestinal abnormalities (61.30%) and Menstrual pain (73.91%). <sup>45</sup>	Bano, N., <i>et al.</i> ; 2012
Pakistan	Prescribing practices of antibiotics in ARI under the age of five and factors influencing prescribing antibiotics	Cross-sectional research carried out in in public and private health care settings in Karachi with study subjects being children under the age of five suffering from acute respiratory tract infection. The study reveals that the prescribing practices of antimicrobials in kids with ARI were completely irrational. <sup>48</sup>	Khalid, K., <i>et al.</i> ; 2013
Pakistan	Rational use of antibiotics-- a quality improvement initiative in hospital setting.	A research was carried out at Aga Khan maternal and youth care center Kharadar Karachi. During study period it was seen that in gynecology patients' antimicrobials were prescribed quite frequently. Investigator designed the guidelines of rational prescribing of antimicrobials eventual outcome of the examination shows that with the use of embracing guidelines, irrational use was decline. <sup>51</sup>	Nausheen, S., <i>et al.</i> 2013

**Table 2:** Overview of the reviewed sources (international studies)

Country	Title	Findings	References
India	Preparation and characterization of curcumin-piperine dual drug-loaded nanoparticles	A study on the synthesis and characterization of curcumin-piperine dual drug loaded nanoparticles, which revealed the erroneous use of antimicrobials in children and babies in Erode's network drug store. The findings revealed that out of 708 solutions, 66% contain anti-microbials, despite the fact that anti-infections have no role in viral contamination and there is no proof of bacterial disease endorsing anti-microbial will lead to the unnecessary use of anti-toxins. Further 33.07% contain anti-toxins for bacterial contamination, despite the fact that anti-toxins have no role in bacterial contamination with no proof of bacterial disease endorsing anti-microbial. <sup>37</sup>	Moorthi, C., <i>et al.</i> ; 2012
Iran	Factors associated with irrational drug use at a district hospital in Zambia: patient record-based observations	A study was conducted to assess the use of anti-infection in outpatient settings of showing emergency clinics and its relationship with obstruction, and normal analysis with respiratory tract contamination as a regular cold (29.2%), sore throat (11.8%), and sign heading of 58% of anti-microbials as levelheaded or satisfactory, while 42% of anti-infection suggesting was unjustified or illogical. <sup>38</sup>	Hashemi, S., <i>et al.</i> ; 2013
Zambia	Effect of diabetes mellitus on survival in patients with pancreatic cancer: a systematic review and meta-analysis	A study on the topic of irrational use of pharmaceuticals was conducted. The biggest drug-related issues discovered in hospitals was increased antibiotic use, poly pharmacy and prescriptions with generic names. The prevalence of irrational drug use was reported to be 51.4%. The most prevalent drug-related issues identified were increased antibiotic use (65.4%) and polypharmacy (52.2%). <sup>39</sup>	Lukali, V., <i>et al.</i> ; 2015.
USA	Effect of diabetes mellitus on survival in patients with pancreatic cancer: a systematic review and meta-analysis.	The study concluded that the pattern of irrational medication use was consistent with poly pharmacy accounting for 15.91% of the total. Another factor is financial incentives given to specialists by suppliers for endorsing their expensive anti-infection agents, resulting in more benefit with anti-microbial overprescribing. Lack of information and lack of compelling guideline control is also a significant factor for nonsensical anti-toxin use. <sup>40</sup>	Mao, Y., <i>et al.</i> ; 2015
USA	Standards of psychosocial care for parents of children with cancer.	A study was conducted on Standards associated with Parents presented with cancer and it was concluded that an explicating study was led to assess the recurrence of erroneous anti-microbial use among the study population. The author also mentioned that irrational anti-toxin use has nothing to do with education, as many educated people engage in irrational use as uneducated people. According to the findings, 59% did not take anti-infections at the right time or overlooked the dose, 55% used anti-infections without doctor's recommendation, 52% used Liquor during antimicrobial treatment and did not accept any expert advice on how to utilize it while on antimicrobial treatment Only one respondent out of a hundred did not engage in the previously indicated behaviors, while the other 99 were indulged in irrational and wrong utilization of anti microbials. <sup>43</sup>	Kearney, J. A., <i>et al.</i> ; 2015

Country	Title	Findings	References
Tanzania	Self-medication with antimalarial is a common practice in rural communities of Kilosa district in Tanzania despite the reported decline of malaria.	This study concluded that self-prescription was a successive practice among respondents, patients with fever were reportedly utilizing the antimalarial drugs. The results of the study show that the main motivations for people to go for self-prescription are a lack of medications in clinics and outpatient settings, long waiting time doctors' offices, and a lack of information. <sup>46</sup>	Chipwaza, B., <i>et al.</i> ; 2014
South Africa	Prescribing patterns of antibiotics in dental practice.	A total of 500 patients were included in the trial, with 215 (43%) males and 285 (57%) females. Antimicrobials were recommended for 2 to 3 days, which was unethical; the most usually recommended antimicrobials were amoxicillin and metronidazole, despite the fact that the treatment time did not follow WHO criteria. Prescription practices were irrational, which might be addressed by employing an emergency clinic model with antimicrobials recommending regulations and drug data. <sup>47</sup>	Manasa, C. R., <i>et al.</i> ; 2013
Ghana	Susceptibility pattern of uropathogens to ciprofloxacin at the Ghana police hospital	Cross-sectional study at the outpatient division of the Ghana police emergency clinic. The findings show that 62.2 % of the solutions contained drugs with common names, 53.6% followed the basic medication list, 24.2% received recommended tranquillizer from the hospital. The medication used at an emergency clinic was irrational. <sup>49</sup>	Afriyie, D. K., <i>et al.</i> , 2015
United Kingdom	Rational use of medicines in Nigeria: A critical review.	The findings of the study show that the medication prescribing model in Nigeria can be improved by providing health education, consistent training to the healthcare providers, and ensuring that patients and the public have adequate information about safe medication use. All of these measures can surprisingly improve the correct use of medication. <sup>50</sup>	Alfa, J., <i>et al.</i> ; 2014

## Conclusion

Antibiotic resistance, according to the World Health Organization, is one of the world's most critical health-care issues, with irrational drug use as the root reason. The anti-microbial agents will harm both patients and society when used inappropriately. Antitoxins have the same effect on host cells as they do on bacteria; trimethoprim. Antimicrobial therapy must be evaluated and monitored on a regular basis in order to develop future tactics that maximize therapeutic effectiveness while minimizing side effects and reducing resistance through the appropriate management plan. These measures assist clinicians and pharmacists in developing protocols and guidelines that include drug manuals/information and promote appropriate medication use, as well as educating and counselling patients. They

will also be required to assist in the development of more effective interventions and strategies to promote prudent antimicrobial use and good antibiotic stewardship.

## Conflict of Interest Statement

The authors have no conflicts of interest to declare.

## Funding Sources

Authors received no funding or support for this study.

## REFERENCES

1. Njoroge, N. Grace, and R. W. Bussmann, "Traditional management of ear, nose and throat (ENT) diseases in Central

- Kenya", *Journal of Ethnobiology and Ethnomedicine*, 2, 54 (2006). <https://doi.org/10.1186/1746-4269-2-54>
2. P. Sivakumar, R. T. Abdu, and P. Perumal, "Drug utilization pattern of antimicrobials in ENT Patients", *Asian Journal of Pharmaceutical and Clinical Research*, 4 Suppl 1, 123-125 (2011)
  3. World Health Organization, "Chronic suppurative otitis media: burden of illness and management options", (2004).
  4. Jain, Neemisha, R. Lodha, and S. K. Kabra, "Upper respiratory tract infections", *The Indian Journal of Pediatrics*, 68(12) 1135-1138. (2001) <https://doi.org/10.1007/BF02722930>
  5. C.J. Murray, R.M. Barber, K.J. Foreman, A.A. Ozgoren, F. Abd-Allah, S. F. Abu-Rmeileh, V. Aboyans, I. Abubakar, L.J. Abu-Raddad J. P. Abraham, N.M. Abu-Rmeileh, "Global, regional, and national disability-adjusted life years (DALYs) for 306 diseases and injuries and healthy life expectancy (HALE) for 188 countries, 1990–2013: quantifying the epidemiological transition", *The Lancet*, 386(10009), 2145-2191 (2015).
  6. A. Remesh, S. Salim, A. M, Gayathri, U. Nair, and K. G. Retnavally, "Antibiotics prescribing pattern in the in-patient departments of a tertiary care hospital", *Archives of Pharmacy Practice*, 4(2), 71-76 (2013). <https://doi.org/10.4103/2045-080X.112987>
  7. Kumar, Jeetendra, M. M. Shaik, M. C. Kathi, A. Deka, and S. S. Gambhir, "Prescribing indicators and pattern of use of antibiotics among medical outpatients in a teaching hospital of Central Nepal", *Journal of College of Medical Sciences-Nepal*, 6(2), 7-13 (2010). <https://doi.org/10.3126/jcmsn.v6i2.3610>
  8. S.Gjelstad, I. Dalen, and M. Lindbæk, "GPs' antibiotic prescription patterns for respiratory tract infections—still room for improvement", *Scandinavian Journal of Primary Health Care*, 27(4), 208-215(2009). <https://doi.org/10.3109/02813430903438718>
  9. T.Einarson, "Pharmcoepidemiology", A Text book of Clinical Pharmacy Practice essential concepts and skills", 1st ed, *Hyderabad: Universities Press (India) Limited*, 2008, p. 405-423.
  10. M. Carneiro, T. Ferraz, M. Bueno, B.E. Koch, C. Foresti, V.F. Lena, and D.M. Lazaroto, "Antibiotic prescription in a teaching hospital: a brief assessment", *Revista da Associação Médica Brasileira (English Edition)*, 57(4), 414-417 (2011).
  11. C. Glanzmann, B. Frey, B, C. R. Meier, and P. Vonbach, "Analysis of medication prescribing errors in critically ill children", *European Journal of Pediatrics*, 174(10), 1347-1355 (2015).
  12. K. E. Walsh, R. Kaushal, and J.B. Chessare, "How to avoid paediatric medication errors: a user's guide to the literature", *Archives of Disease In Childhood*, 90(7), 698-702 (2005)
  13. M. U. Khayyam, "Medication Errors Assessment and Prevention by a Clinical Pharmacist in Pediatric Wards of RMI Hospital Peshawar, KPK- Pakistan", *Annals of Pakistan Institute of Medical Sciences*, 11(3), 124 -129 (2015).
  14. Raue, C. Godlove, 4<sup>th</sup> Edition, Reprint, "Special Pathology and Diagnostic with Therapeutic Hints", *B. Jain Publisher (P) Ltd, New Delhi*, 1990
  15. Schröder, Wiebke, H. Sommer, B. Primrose Gladstone, F. Foschi, J. Hellman, B. Evengard, and E. Tacconelli. "Gender differences in antibiotic prescribing in the community: a systematic review and meta-analysis.", *Journal of Antimicrobial Chemotherapy*, 71(7), 1800-1806 (2016) <https://doi.org/10.1093/jac/dkw054>
  16. Aabenhus, Rune, M. Plejdrup Hansen, L. T. Saust, and L. Bjerrum, "Characterisation of antibiotic prescriptions for acute respiratory tract infections in Danish general practice: a retrospective registry based cohort study.", *NPJ Primary Care Respiratory Medicine*, 27(1), 1-6 (2017) <https://doi.org/10.1038/s41533-017-0037-7>
  17. Ali, S. Rehan, S. Ahmed, and H. Lohana, "Trends of empiric antibiotic usage in a

- secondary care hospital, Karachi, Pakistan", *International journal of pediatrics*, 2013, 832857 (2013). <https://doi.org/10.1155/2013/832857>
18. D. Sheikh, U. V. Mateti, S. Kabekkodu, and T. Sanal, "Assessment of medication errors and adherence to WHO prescription writing guidelines in a tertiary care hospital", *Future Journal of Pharmaceutical Sciences*, 3(1), 60-64 (2017). <https://doi.org/10.1016/j.fjps.2017.03.001>
  19. A.E. Horace, and F. Ahmed, "Polypharmacy in pediatric patients and opportunities for pharmacists' involvement", *Integrated pharmacy research & practice*, 4,113-126 (2015) <https://dx.doi.org/10.2147%2FIPRP.S64535>
  20. H. Leblebicioglu, S. Canbaz, Y. Peksen and M. Gunaydin, "Physicians' antibiotic prescribing habits for upper respiratory tract infections in Turkey", *Journal of Chemotherapy*, 14(2), 181-184 (2002). <https://doi.org/10.1179/joc.2002.14.2.181>
  21. Ball, P, F. Baquero, O. Cars, T. File, J. Garau, K. Klugman, D. E. Low, E. Rubinstein, R. Wise, and The Consensus Group on Resistance and Prescribing in Respiratory Tract Infection, "Antibiotic therapy of community respiratory tract infections: strategies for optimal outcomes and minimized resistance emergence", *Journal of Antimicrobial Chemotherapy*, 49(1), 31-40, (2002) <https://doi.org/10.1093/jac/49.1.31>
  22. S.A. Dosh, J. M. Hickner, A.G.Iii Mainous, and M. H. Ebell, "Predictors of Antibiotic Prescribing for Nonspecific Upper Respiratory Infections, Acute Bronchitis, and Acute Sinusitis", *Journal of Family Practice*, 49(5), 407-415 (2000)
  23. Z. Zhang, Y. Hu, G. Zou, M. Lin, J. Zeng, S. Deng, R. Zachariah, J. Walley, J.D. Tucker and X. Wei, "Antibiotic prescribing for upper respiratory infections among children in rural China: a cross-sectional study of outpatient prescriptions", *Global Health Action*, 10(1), 1287334(2017). <https://doi.org/10.1080/16549716.2017.1287334>
  24. K. Donelan, C. A. Hill, C. Hoffman, K. Scoles, P. H. Feldman, C. Levin and D. Gould, "Challenged to care: Informal caregivers in a changing health system", *Health Affairs*, 21(4), 222-231 (2002). <https://doi.org/10.1377/hlthaff.21.4.222>
  25. K. Seden, J.J. Kirkham, T. Kennedy, M. Lloyd, S. James, A. Mcmanus, A. Ritchings, J. Simpson, D. Thornton, A. Gill, C. Coleman, B. Thorpe and S.H. Khoo, "Cross-sectional study of prescribing errors in patients admitted to nine hospitals across North West England", *BMJ open*, 3(1), e002036. (2013).
  26. A. H. M. A. Alabid, M. I. M. Ibrahim, and M. A. Hassali, "Antibiotics Dispensing for URTIs by Community Pharmacists (CPs) and General Medical Practitioners in Penang, Malaysia: A Comparative Study using Simulated Patients (SPs)", *Journal of clinical and diagnostic research, JCDR*, 8(1), 119-123 (2014). <https://dx.doi.org/10.7860%2FJCDR%2F2014%2F6199.3923>
  27. S.C. Reddy, J.T. Jacob, J. B. Varkey and R.P. Gaynes, "Antibiotic use in US hospitals: quantification, quality measures and stewardship", *Expert Review of Anti-Infective Therapy*, 13(7), 843-854. (2015). <https://doi.org/10.1586/14787210.2015.1040766>
  28. S.F. Akter, Kulliyah, M. F. A. Rani, J. A. Rahman, M. S. Nordin, S. Satwi, M. B. Awang, M.Y. Rathor, M.A.B. Md. Aris, "Antimicrobial use and factors influencing prescribing in medical wards of a tertiary care hospital in Malaysia", *International journal of environmental science and technology*, 1(4), 274-284 (2012).
  29. C. L. Teng, S. F. Tong; E.M. Khoo, V. Lee, A. H. Zailinawati, O. Mimi, W.S. Chen and S. Nordin, "Antibiotics for URTI and UTI: prescribing in Malaysian primary care settings", *Australian family physician*, 40(5), 325-329 (2011). <https://search.informit.org/doi/10.3316/infornit.977412121468498>
  30. A.T. Rodrigues, F. Roque, A. Falcão, A. Figueiras, and M.T. Herdeiro,

- "Understanding physician antibiotic prescribing behaviour: a systematic review of qualitative studies", *International Journal of Antimicrobial Agents*, 41(3), 203-212 (2013).  
<https://doi.org/10.1016/j.ijantimicag.2012.09.003>
31. A. Annotated, "Academy of Managed Care Pharmacy (AMCP)", *Alexandria, Virginia, USA*, 2010.
  32. K. Lahon, H. Shetty, A. Paramel, and G. Sharma, "A retrospective drug utilization study of antidepressants in the psychiatric unit of a tertiary care hospital", *Journal of clinical and diagnostic research, JCDR*, 5(5), 1069-1075 (2011).
  33. A.A. Almeman, M.I.M. Ibrahim, and S. Rasool, "Cost analysis of medications used in upper respiratory tract infections and prescribing patterns in university sans Malaysia, Penang, Malaysia", *Tropical Journal of Pharmaceutical Research*, 13(4), 621-626 (2014).
  34. D. M. Sievert, P. Ricks, J.R. Edwards, A. Schneider, J. Patel, A. Srinivasan, and S. Fridkin, "Antimicrobial-resistant pathogens associated with healthcare-associated infections summary of data reported to the National Healthcare Safety Network at the Centers for Disease Control and Prevention 2009–2010", *Infection Control & Hospital Epidemiology*, 34(1), 1-14 (2013).
  35. H. Sözen, I. Gönen, A. Sözen, A. Kutlucan, S. Kalemci, and M. Sahan, "Application of ATC/DDD methodology to evaluate of antibiotic use in a general hospital in Turkey", *Annals of Clinical Microbiology and Antimicrobials*, 12(1), 23 (2013).
  36. B.L. Strom, "Basic principles of clinical epidemiology relevant to pharmacoepidemiologic studies", *Pharmacoepidemiology*, 44 -59 (35-53) (2019).
  37. S. Shamsuddin, M.E. Akkawi, S.T.R. Zaidi, L.C. Ming, L. C and M.M. Manan, "Antimicrobial drug use in primary healthcare clinics: a retrospective evaluation", *International Journal of Infectious Diseases*, 52, 16-22 (2016).
  38. D. Bansal, S. Mangla, K. Undela, K. Gudala, S. D'Cruz, A. Sachdev, and P. Tiwari, "Measurement of adult antimicrobial drug use in tertiary care hospital using defined daily dose and days of therapy", *Indian Journal of Pharmaceutical Sciences*, 76(3), 211-217 (2014).
  39. J. Wang, P. Wang, X. Wang, Y. Zheng, and Y. Xiao, "Use and prescription of antibiotics in primary health care settings in China", *Journal of the American Medical Association internal medicine*, 174(12), 1914-1920 (2014).
  40. C. Moorthi, K. Krishnan, R. Manavalan, and K. Kathiresan, "Preparation and characterization of curcumin–piperine dual drug loaded nanoparticles", *Asian Pacific journal of tropical biomedicine*, 2(11), 841-848 (2012).
  41. S. Hashemi, A. Nasrollah, and M. Rajabi, "Irrational antibiotic prescribing: a local issue or global concern?", *EXCLI Journal*, 12, 384-395 (2013).
  42. V. Lukali, and C. Michelo, "Factors associated with irrational drug use at a district hospital in Zambia: patient record-based observations", *Medical Journal of Zambia*, 42(1), 25-30 (2015).
  43. Y. Mao, M. Tao, X. Jia, H. Xu, K. Chen, H. Tang, and D. Li, "Effect of diabetes mellitus on survival in patients with pancreatic cancer: a systematic review and meta-analysis", *Scientific Reports*, 5, 17102 (2015).
  44. S. Naveed, G. Sarwar, R. Hassan, S. Khan, S. Afzal, S. Naz, and S. Yasmeen, "Irrational use of cephalosporin and quinolones in public and private sectors hospitals of Karachi", *Journal of Applied Pharmacy*, 6(3), 252-260 (2014).
  45. S.I. Ali, A. Abbas, S. Tanwir, F.R. Ahmed, A. Sabah, E. Ejaz, E.F. Jaffery, "Prescribing practices of antibiotics in outpatient setting of a tertiary care hospital in Karachi, Pakistan: An observational study", *Intercontinental Journal Of Pharmaceutical Investigational Research*, 1(1), 1-4 (2014).
  46. J.A. Kearney, C.G. Salley, and A.C. Muriel, "Standards of psychosocial care

- for parents of children with cancer", *Pediatric Blood & Cancer*, 62(Supl 5), S632-S683 (2015).
47. F. Anjum, S. Ghayas, M. Khalid, Y. Anwar, M. Aslam, and N. Aziz, "Use of antibiotics in hospitals; current situation", *World Journal of Pharmacy And Pharmaceutical Sciences*, 4(1), 61-71 (2014).
  48. N. Bano, R. Najam, and F. Qazi, "Irrational drug use based on self-medication for some common clinical conditions in an educated population of Karachi", *Pakistan Journal of Medical Sciences*, 28(3), 359-362 (2012).
  49. B. Chipwaza, J. P. Mugasa, I. Mayumana, M. Amuri, C. Makungu, and P. S. Gwakisa, "Self-medication with anti-malarials is a common practice in rural communities of Kilosa district in Tanzania despite the reported decline of malaria", *Malaria Journal*, 13(1), 252 (2014).
  50. C. R. Manasa, and A.P. Dass, "Prescribing patterns of antibiotics in dental practice", *International Journal of Basic and Applied Medical Sciences*, 3(2), 336-339 (2013).
  51. K. Khalid, H. Ahmadullah, J. Iqbal, A.A. Salam, and A. Waqar, "Prescribing practices of antibiotics in ARI under the age of five and factors influencing prescribing antibiotics", *Indian journal of pharmacy practice*, 6, 2 (2013).
  52. D. K. Afriyie, M. Gyansa-Lutterodt, S.K. Amponsah, G. Asare, V. Wiredu, E. Wormenor, and K.A. Bugyei, "Susceptibility pattern of uropathogens to ciprofloxacin at the Ghana police hospital", *Pan African Medical Journal*, 22, 87 (2015).
  53. J. Alfa, and O. P. Adigwe, "Rational use of medicines in Nigeria: A critical review", *Journal of Biology Agriculture and Healthcare*, 4(16), 89 -99 (2014).
  54. S. Nausheen, R. Hammad, and A. Khan, "Rational use of antibiotics-a quality improvement initiative in hospital setting", *Journal Pakistan Medical Association*, 63(1), 60-64 (2013).



## نشرة العلوم الصيدلانية جامعة أسيوط



### وصف ، تواتر ، واتجاهات وأنماط العلاج المضاد للميكروبات في مرضى التهاب اللوزتين الحاد: مراجعة

نمرة زمان<sup>١</sup> - كومال زمان<sup>٢</sup> - فريال زمان<sup>٣</sup> - بشرى زمان<sup>٤</sup>

<sup>١</sup> قسم طب المجتمع وعلوم الصحة العامة ، LUMHS ، باكستان

<sup>٢</sup> كلية الصيدلة ، جامعة لياقت للعلوم الطبية والصحية جامشورو ، باكستان

<sup>٣</sup> مستشفى كينجز كولينج لندن. المملكة المتحدة.

<sup>٤</sup> جامعة الشعوب للعلوم الطبية والصحية للنساء ، نوابشة ، باكستان

**الخلفية:** تعتبر أمراض الأذن والأنف والحنجرة من أكثر الأمراض انتشاراً التي تصيب سكان العالم. يُعرف التهاب اللوزتين و التهاب الأذن الوسطى و التهاب البلعوم و التهاب البلعوم الأنفي وأمراض الأنف والأذن والحنجرة الشائعة الأخرى باسم التهابات الجهاز التنفسي الحادة (ARI).

**الملخص:** التهابات الجهاز التنفسي الحادة مسؤولة عن ما يقرب من ٣٠٪ من الاستشارات في جميع المرضى و ٢٥٪ من الاستشفاء عند الأطفال ، وفقاً لمنظمة الصحة العالمية (WHO). تستخدم المضادات الحيوية بشكل شائع لعلاج أمراض الأنف والأذن والحنجرة ، ونمط وصف المضادات الحيوية أمر بالغ الأهمية من حيث سلامة المرضى وإدارة المرض والفعالية من حيث التكلفة. التهاب اللوزتين هو التهاب يصيب اللوزتين مع ظهور علامات وأعراض ، بما في ذلك التهاب الحلق والحمى وتضخم اللوزتين وصعوبة البلع والمحاور الليمفاوية الكبيرة حول الرقبة ، وكلها آثار جانبية محتملة. يعالج التهاب اللوزتين الحاد بمجموعات مختلفة من المضادات الحيوية بما في ذلك البنسلين يليه السيفالوسبورين وماكرولايد والفلوروكينولون والسلفوناميدات. تعد المكورات العنقودية الانحلالية β ، والمكورات العنقودية الإيجابية للتخثر ، والمكورات الرئوية ، والمكورات العنقودية والمكورات الرئوية الموجبة للتخثر من الكائنات الحية الدقيقة المعزولة بشكل شائع عن مرضى التهاب اللوزتين الحاد.

**الرسائل الرئيسية:** تم توثيق أنماط وصف المضادات الحيوية غير المنطقية على نطاق واسع في جميع أنحاء العالم ، وهي واحدة من أكبر المخاوف الصحية عندما يتعلق الأمر بسلامة المرضى. تؤدي زيادة الوصفات غير المنطقية إلى تطوير المرضى لمقاومة الأدوية ، فضلاً عن التفاعلات الدوائية الضارة (ADRs) وارتفاع تكاليف العلاج.