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Review Article

Azithromycin Misuse in Upper Respiratory Tract Infections in Pakistan: An Emerging Concern for Drug-Induced Liver Injury and Antimicrobial Resistance

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ABSTRACT

Upper Respiratory Tract Infections are among the most common conditions encountered in primary care and community healthcare settings particularly in developing countries such as Pakistan. Most URTIs are of viral origin and are self-limiting requiring only symptomatic management rather than antibiotic therapy. Despite this, antibiotics, particularly Azithromycin, are frequently used inappropriately for URTIs in Pakistan. Easy access to antibiotics through community pharmacies and drug stores, the practice of purchasing antibiotics mostly Azithromycin without a prescription or pharmacist advice, coupled with limited public awareness regarding their appropriate use, has contributed to the growing practice of self-medication. Patients often purchase Azithromycin from community pharmacies without prior medical consultation especially for mild symptoms such as pharyngitis, low-grade fever or cough. Such irrational use not only accelerates antimicrobial resistance but also increases the risk of adverse drug reactions including drug-induced liver injury. Therefore, there is an urgent need to educate both the public and healthcare professionals regarding the consequences of inappropriate Azithromycin use and to implement effective regulatory and stewardship measures to promote rational antibiotic use in Pakistan.

Keywords: Antibiotic Misuse, Antimicrobial Resistance, Azithromycin, Drug-Induced Liver Injury (DILI), Pakistan, Self-medication, Upper Respiratory Tract Infections.

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INTRODUCTION

Upper Respiratory Tract Infections (URTIs) comprise a group of conditions affecting the nose, sinuses (Sinusitis), pharynx (Pharyngitis) or Larynx (Laryngitis). They are commonly referred to as the common cold and typically present with symptoms such as nasal congestion, sore throat, cough and sneezing. These symptoms are generally self-limiting and usually resolve within 7-14 days which can be managed by rest and symptomatic relief rather than antibiotic therapy (Tobin *et al*., 2025).

The URTIs are highly prevalent in Pakistan, particularly in rural and Low income communities where access to healthcare services remains limited (Mir *et al*., 2022). Among URTIs, Sinusitis is one of the most commonly encountered conditions worldwide and poses a substantial healthcare burden in Low- and Middle-income countries such as Pakistan. Factors like Environmental pollution, allergic tendencies, and lack of healthcare regulations are some of the factors contributing to a high incidence rate (Gul, 2024).

Evidence suggests that the majority of URTIs are of viral origin. One study reported a diverse range of causative pathogens with viruses accounting for 81.7% of cases, bacteria of 11.6% and mixed viral and bacterial infections of 6.7%, Streptococcus pneumoniae colonization was identified in 8.0% of cases;however, most cases showed low bacterial density (mean=3.9 log CFU/ml) (Tang *et al*., 2019).

Despite this predominantly viral etiology of URTIs, these infections are frequently treated mostly with antibiotics particularly Azithromycin. A study investigating inappropriate antibiotic use among outpatient cohort study from December 2024 to February 2025, out of 384 patients, 168(43.8%) patients had a history of antibiotic use, mostly Azithromycin (51.2%). However, only 9.6% of the patients were considered to require antibiotics, highlighting a substantial discrepancy between clinical need and actual use (Zafar *et al*., 2025).

Most individuals who Self-medicate with antibiotics obtain them directly from community pharmacies without a prescription, use leftover medications from previous treatments, or acquire them from informal sources such as relatives, friends or online platforms

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(Aslam *et al*., 2020). Such practices contribute significantly to the development of Antimicrobial Resistance (AMR) which has emerged as a major public health concern, particularly in the northwestern regions of Pakistan (Nazir & Azim, 2017).

Furthermore, a study conducted among students from two Pakistani universities found that out of 1340 students selected, 922(68.8%) students practiced antibiotic self-medication. Doctor of Physical Therapy (DPT) students demonstrated the highest frequency of self-medication, accounting for 31.3% of cases, with Azithromycin being the most commonly used antibiotic (Rehman *et al*., 2026).

In addition to contributing to antimicrobial resistance, Azithromycin has been associated with Drug-Induced Liver Injury (DILI). Due to its wide spread use, it is frequently identified among the medications implicated in DILI and is often listed among the top ten causative agents in large case series. Histopathological findings may reveal bile duct loss, which in severe cases can progress to vanishing bile duct syndrome, chronic cholestatic liver failure and ultimately liver transplantation (National Institute of Diabetes and Digestive and Kidney Diseases, 2012).

Given these concerns, existing regulations need to be implemented through regular inspections and the imposition of penalties. Only certified pharmacists should be allowed to dispense medication, and their licenses should be prominently displayed. Moreover, awareness among people regarding the risks of self-medication through mass media and training for pharmacists regarding their legal and ethical responsibilities can help to further enhance pharmaceutical practice in Pakistan (Rashid *et al*., 2025).

This article aims to highlight the challenges associated with inappropriate use of Azithromycin in upper respiratory tract infections, including self-medication, antimicrobial resistance, and drug-induced liver injury, while proposing practical recommendations to promote rational antibiotic use and strengthen antimicrobial stewardship practices.

CHALLENGES

Upper Respiratory Tract Infections (URTIs) remain among the most common infectious diseases affecting all age groups and are a leading cause of outpatient visits and hospital admissions worldwide.

It is estimated that the rise in global antibiotic consumption increased from 21.1 to 34.8 billion Defined Daily Doses (DDD) between 2000 and 2015. The rise in global consumption of antibiotic drugs has been mainly due to the rising consumption of these drugs in Low- and Middle-Income Countries (LMIC), where Pakistan showed 65% increase. A research paper from the USA found that 51% of acute URTIs cases were being prescribed antibiotic drugs while 20% did not need them (Ullah *et al*., 2022). There was also an observed increase in the use of macrolides (+76%; from 2.26 to 3.99 DID) with macrolides expected to rise to 5.79 DID by 2028 (Saleem *et al*., 2026).

Poor adherence and inappropriate antibiotic use among patients remain major public health concerns. Financial incentives drive pharmaceutical companies to convince General Practitioners (GPs) to prescribe medications. Healthcare representatives from these companies promote prescriptions that are motivated by the profits. Usually, the unnecessary use of antibiotics becomes the norm when trying to reach a sales target instead of meeting any clinical requirements. The prescription of such medication becomes entirely patient-driven, whereby many patients visit their GPs with an expectation of being prescribed with antibiotics for self-limiting illnesses (Ahmed *et al*., 2025).

Over-the-Counter (OTC) sale of antibiotics involves the marketing and dispensing of antibiotics without a legitimate prescription issued by a health care professional with the authority to prescribe them. One of the primary concerns associated with OTC antibiotic sales is self-medication. The demand factors include self-prescription and self-medication, which stem from insufficient information regarding proper antibiotic use and inadequate access to health care services. Poor management of the country's public health care system, convenience, and the limited availability of time when visiting pharmacies and other medication dispensers significantly influence the occurrence of self-medication. Besides, there exist unregistered pharmacies and informal medicine sellers who are not subject to regulation but remain the sole accessible source of healthcare for impoverished and underserved communities (Melles-Brewer *et al*., 2024).

Furthermore, public awareness regarding the appropriate use of antibiotics and the consequences of antibiotic misuse in URTIs remains limited (Alghamdi *et al*., 2024).

Azithromycin is a rare cause of drug-induced idiosyncratic cardiac and liver injury. Azithromycin shows lesser number of protein interactions, whereas, QTc prolongation associated with Torsades de pointes (Tdp) and polymorphic ventricular tachycardia are commonly encountered in cardiovascular system. Azithromycin-induced liver injury demonstrated cholestatic component as indicated by a high ALT/ALP ratio less than 2ULN, leading to vanishing bile duct syndrome (Sadhu *et al*., 2024).

Azithromycin-induced liver injury typically develops between one to three weeks after initiation of Azithromycin therapy and is generally hepatocellular in nature (Martinez *et al*., 2015). In a case report, a 69-year-old woman was reported to have suffered cholestatic hepatitis after only four days of Azithromycin therapy for bronchitis with no prior history of liver disease (Lockwood *et al*., 2010).

The dedication of a country to the safety of medicines can be measured through the availability of PV policies. There is an explicit policy by Drug Regulatory Authority of Pakistan

(DRAP) regarding the safety of medicines. Yet, there is no Law-making Adverse Drug Reaction (ADR) reporting obligatory to stakeholders. In Pakistan, the ADR reporting mechanism is voluntary. Despite the establishment of the National Pharmacovigilance Centre (NPC) in 2015, a Pharmacovigilance Risk Assessment Expert Committee (PRAEC) had not been established at the time of assessment. The lack of PRAEC is one of the major reasons behind no safety signals being generated on Individual Case Safety Reports (ICSRs) by Pakistan. No pharmacovigilance centers have been established in all provincial health departments of Pakistan other than Punjab. Only Punjab is submitting safety reports to DRAP, where half of the population resides (Khan *et al*., 2022).

RECOMMENDATIONS

To reduce the irrational use of Azithromycin and other antimicrobials in Upper Respiratory Tract Infections (URTIs), strict implementation of antibiotic stewardship programs should be prioritized at both institutional and community levels (Gohil *et al*., 2025).

Clinical decision support systems, hospital policies, and patient education might help reduce the inappropriate use of antibiotics (Chan *et al*., 2019). Strict adherence to evidence-based prescribing guidelines is essential to minimize unnecessary antibiotic use for URTIs (Hashmi *et al*., 2021).

The Drug Regulatory Authority of Pakistan (DRAP) and appropriate health authorities should enforce stricter regulations regarding Over-The-Counter (OTC) antibiotics distribution through regular inspection of pharmacies, increased monitoring and fines on unlicensed dispensation of prescription drugs (Rasheed *et al*., 2019).

Educational programs focusing on rational antibiotic use should be conducted for community pharmacists. Such programs may improve rational antibiotic dispensing practices within communities. Training programs about antibiotic resistance will improve the knowledge of pharmacists concerning antibiotic stewardship (Alkadhimi *et al*., 2020).

Public awareness campaigns via television, social media, education systems, and community health care systems need to be initiated to raise public consciousness about the self-limiting nature of most Upper Respiratory Tract Infections (URTIs), risks associated with self-medication, antimicrobial resistance, and possible adverse reactions due to improper use of Azithromycin (Wakefield *et al*., 2010).

In addition to that, training programs related to Continuing Medical Education (CME) and antimicrobial stewardship should also be organized for physicians, pharmacists, and other health care providers so that they can prescribe drugs based on scientific evidence (Majumder *et al*., 2020).

Pharmacists are able to provide assistance regarding patient care and a multidisciplinary strategy to healthcare through collaboration with doctors and patients. Community pharmacy settings that emphasize patient counselling, trust-building, and collaborative care may contribute significantly to patient empowerment and rational medication use (Ciliberti & Bonsignore, 2025).

Using social media as a means to conduct public health campaigns allows healthcare organizations to effectively reach target populations using modern digital communication strategies in ways traditional mass media cannot (de Vere Hunt & Linos, 2022).

In order to facilitate safe usage of drugs, good pharmacovigilance practices should be implemented to guarantee rational use of data for the intended purpose. Multi-stakeholder participation along with standardized approaches to evaluate severity, causality, and preventability of potential adverse drug reactions in Pakistan are required (Hussain & Hassali, 2019).

Finally, better access to healthcare services at affordable rates, particularly for the underprivileged and rural populations, could reduce self-medication practices and dependence on informal healthcare providers, thus encouraging safer and more rational antibiotic use in Pakistan (Gizaw *et al*., 2022).

CONCLUSION

Hopefully, continued efforts in antimicrobial stewardship, public education, and pharmacovigilance will lead Pakistan toward safer and more rational antibiotic use in the future.

ABBREVIATIONS

ADR: Adverse Drug Reaction; **AMR:** Antimicrobial Resistance; **CME:** Continuing Medical Education; **DDD:** Defined Daily Doses; **DILI:** Drug-Induced Liver Injury; **DPT:** Doctor Of Physical Therapy; **DRAP:** Drug Regulatory Authority of Pakistan; **GPs:** General Practitioners; **ICSRs:** Individual Case Safety Reports; **LMIC:** Low and Middle Income Countries; **NPC:** National Pharmacovigilance Centre; **OTC:** Over-The-Counter; **PRAEC:** Pharmacovigilance Risk Assessment Expert Committee; **PV:** Pharmacovigilance; **Tdp:** Torsades De Pointes; **URTIs:** Upper Respiratory Tract Infections.

CONFLICT OF INTEREST

The author declare that there is no conflict of interest.

REFERENCES

Ahmed, S., Malik, N. I., Anjum, R., Leghari, I. U., Bhatti, R., *et al*.(2025). Healthcare providers' knowledge, attitude, and practice of antibiotic use and antimicrobial resistance in Southern Pakistan: A qualitative study. Research Square. https://doi.org/10.21203/rs.3.rs-7329893/v1

Alghamdi, M., Alghamdi, A. A., Alsalouli, F. A., Alkebiri, A. S., Oraidah, H. Z., *et al*.(2024). Awareness of antibiotic misuse in upper respiratory tract infections among adults in the Bisha Governorate in 2024. *Cureus*, 16(6), Article e62815. https://doi.org/10.7759/cureus.62815

Alkadhimi, A., Dawood, O. T., & Hassali, M. A. (2020). Dispensing of antibiotics in community pharmacy in Iraq: A qualitative study. *Pharmacy Practice*, 18(4), Article 2095. https://doi.org/10.18549/pharmpract.2020.4.2095

Aslam, A., Gajdács, M., Zin, C. S., Ab Rahman, N. S., Ahmed, S. I., *et al.* (2020). Evidence of the practice of self-medication with antibiotics among the lay public in low- and middle-income countries: A scoping review. *Antibiotics*, 9(9), 597. https://doi.org/10.3390/antibiotics9090597

Chan, Y. Y., Ibrahim, M. B., Wong, C. M., Ooi, C. K., & Chow, A. (2019). Determinants of antibiotic prescribing for upper respiratory tract infections in an emergency department with good primary care access: A qualitative analysis. *Epidemiology & Infection*, 147, Article e111. https://doi.org/10.1017/S095026881800331X

Ciliberti, R., & Bonsignore, A. (2025). New integrations in patient care: The role of the pharmacist between Couselling and medication adherence. *Journal of Preventive Medicine and Hygiene*, 66(1), E38-E44. https://doi.org/10.15167/2421-4248/jpmh2025.66.1.3222

de Vere Hunt, I., & Linos, E. (2022). Social media for public health: Framework for social media-based public health campaigns. *Journal of Medical Internet Research*, 24(12), Article e42179. https://doi.org/10.2196/42179

Gizaw, Z., Astale, T., & Kassie, G. M. (2022). What improves access to primary healthcare services in rural communities? A systematic review. *BMC Primary Care*, 23(1), Article 313. https://doi.org/10.1186/s12875-022-01919-0

Gohil, S. M., Patel, U. D., & Patel, A. K. (2025). Assessment of antibiotic prescribing patterns for upper respiratory tract infections in general practice clinics. *Journal of Heart Valve Disease*, 30(7), 71-74. +Gul, S. (2024). Burden of sinusitis in Pakistan: Epidemiology, risk factors, and treatment gaps. *Integrated Health Sciences Journal (IHSJ)*, 2(1), 11-19.

Hashmi, H., Sasoli, N. A., Sadiq, A., Raziq, A., Batool, F., *et al*.(2021). Prescribing patterns for upper respiratory tract infections: A prescription-review of primary care practice in Quetta, Pakistan and the implications. *Frontiers in Public Health*, 9, Article 787933. https://doi.org/10.3389/fpubh.2021.787933

Hussain, R., & Hassali, M. A. (2019). Current status and future prospects of pharmacovigilance in Pakistan. *Journal of Pharmaceutical Policy and Practice*, 12(1), Article 14. https://doi.org/10.1186/s40545-019-0178-x

Khan, M. A. A., Hamid, S., Ur-Rehman, T., & Babar, Z. U. D. (2022). Assessment of the current state of pharmacovigilance system in Pakistan using indicator-based assessment tool. *Frontiers in Pharmacology*, 12, Article 789103. https://doi.org/10.3389/fphar.2021.789103

Lockwood, A. M., Cole, S., & Rabinovich, M. (2010). Azithromycin-induced liver injury. *American Journal of Health-System Pharmacy*, 67(10), 810-814. https://doi.org/10.2146/ajhp080687

Majumder, M. A., Rahman, S., Cohall, D., Bharatha, A., Singh, K., *et al.* (2020). Antimicrobial stewardship: Fighting antimicrobial resistance and protecting global public health. *Infection and Drug Resistance*, 13, 4713-4738. https://doi.org/10.2147/IDR.S290835

Martinez, M. A., Vuppalanchi, R., Fontana, R. J., Stolz, A., Kleiner, D. E., *et al*.(2015). Clinical and histologic features of azithromycin-induced liver injury. *Clinical Gastroenterology and Hepatology*, 13(2), 369-376. https://doi.org/10.1016/j.cgh.2014.07.054

Melles-Brewer, M. M., Chiara, F., Mosissa, D., & Mathew, P. (2024). Over-the-counter sales of antibiotics: A call to action to ensure access and prevent excess. *The Lancet Global Health*, 12(8), e1227-e1228. https://doi.org/10.1016/S2214-109X(24)00215-8

Mir, F., Ariff, S., Bhura, M., Chanar, S., Nathwani, A. A., *et al*.(2022). Risk factors for acute respiratory infections in children between 0 and 23 months of age in a peri-urban district in Pakistan: A matched case-control study. *Frontiers in Pediatrics*, 9, Article 704545. https://doi.org/10.3389/fped.2021.704545

National Institute of Diabetes and Digestive and Kidney Diseases (US). (2012). LiverTox: Clinical and research information on drug-induced liver injury. National Institute of Diabetes and Digestive and Kidney Diseases. https://www.ncbi.nlm.nih.gov/books/NBK547852/

Nazir, S., & Azim, M. (2017). Assessment of antibiotic self-medication practice among public in the northwestern region of Pakistan. *European Journal of Hospital Pharmacy*, 24(4), 200-203. https://doi.org/10.1136/ejhpharm-2015-000733

Rasheed, H., Hoellein, L., Bukhari, K. S., & Holzgrabe, U. (2019). Regulatory framework in Pakistan: Situation analysis of medicine quality and future recommendations. *Journal of Pharmaceutical Policy and Practice*, 12(1), Article 23. https://doi.org/10.1186/s40545-019-0184-z

Rashid, A., Latif, Q. A., Badar, A., Fatima, W., & Ahmed, R. (2025). Over-the-counter medicine and antibiotic misuse in Pakistan: Patterns, risks, and regulatory gaps [Letter to the editor]. *Journal of Interventional Epidemiology and Public Health*, 8(4), Article 85. https://doi.org/10.37432/jieph-d-25-00176

Rehman, S., Sarfraz, M. R., Tariq, H., Ismail, A., Mansoor, M., *et al.* (2026). Antibiotic self-medication among healthcare students in Pakistan: A dual-center cross-sectional study. *Work*, 83(3), 713-724. https://doi.org/10.1177/10519815251382367

Sadhu, A., Manna, D., Datta, S., & Chatterjee, S. (2024). A review on cardio-hepatic toxic macrolide: Azithromycin. *International Journal of Health Sciences*, 8(S1), 854-865. https://doi.org/10.53730/ijhs.v8ns1.14966

Saleem, Z., Godman, B., Akbar, Z., Haseeb, A., Qamar, M. U., *et al.* (2026). Trends in antimicrobial consumption in Pakistan (2016-2028): Retrospective observational study with forecasting. *JMIR Public Health and Surveillance*, 12(1), Article e81288. https://doi.org/10.2196/81288

Tang, J., Chen, J., He, T., Jiang, Z., Zhou, J., *et al.* (2019). Diversity of upper respiratory tract infections and prevalence of *Streptococcus pneumoniae* colonization among patients with fever and flu-like symptoms. *BMC Infectious Diseases*, 19(1), Article 24. https://doi.org/10.1186/s12879-018-3662-z

Tobin, E. H., Thomas, M., & Bomar, P. A. (2025, May 4). Upper respiratory tract infections with focus on the common cold. In *StatPearls* [Internet]. StatPearls Publishing. https://www.ncbi.nlm.nih.gov/books/NBK532961/

Ullah, K., Baloch, M., Saleem, F., Khan, A. A., Saeed, H., *et al*.(2022). Antibiotic susceptibility patterns of bacterial isolates of patients with upper respiratory tract infections. *Brazilian Journal of Pharmaceutical Sciences*, 58, Article e20484. https://doi.org/10.1590/s2175-97902022e20484

Wakefield, M. A., Loken, B., & Hornik, R. C. (2010). Use of mass media campaigns to change health behaviour. *The Lancet*, 376(9748), 1261-1271. https://doi.org/10.1016/S0140-6736(10)60809-4

Zafar, U., Suleman, M., Iqbal, A., Ansar, F., Basit, A., *et al*.(2025). Inappropriate antibiotic use in upper respiratory tract infections: Prevalence and predictors from an outpatient cohort. *Open Health*, 6(1), Article e20250083. https://doi.org/10.1515/ohe-2025-0083

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