Journal of Antimicrobial Stewardship Practices and Infectious diseases

JASPI

March 2025/ Volume 3/Issue 1

Editorial

Community-Level Antimicrobial Stewardship: A Call for Action in The Wake of the Pune Guillain-Barré Syndrome Outbreak

Elantamilan Durairaj[1*], *Jyotismita Rajbongshi*[2], *Mangayarkarasi V*[1]

1- Department of Microbiology, All India Institute of Medical Sciences, Madurai, India.
2- Department of Microbiology, ESIC Medical College & PGIMSR, Chennai, India.

*** Corresponding author:** Dr. Elantamilan D, Associate Professor, Department of Microbiology, All India Institute of Medical Sciences, Madurai, Temporary campus, Govt. Ramanathapuram Medical College, Pattinmakathan, Ramanathapuram, Tamil Nadu - 623503, India.
Email: dentamilan@gmail.com

INTRODUCTION

The city of Pune is experiencing a significant outbreak of Guillain-Barré Syndrome (GBS), with a few cases also reported in other parts of Maharashtra. This outbreak was first detected in early January 2025. As of February 7, 2025, within a span of one month, 173 cases and six deaths have been reported.[1] With these numbers, this could be one of the largest recorded GBS outbreaks globally and the largest in India to date.[2] Analysis of stool samples from affected patients revealed the presence of *Campylobacter jejuni*, suggesting a waterborne transmission. The state health department reported that water contamination with *C. jejuni* was the likely source, with contamination occurring possibly within the water distribution system.[3]

GBS is a rare but severe autoimmune disorder characterized by progressive muscle weakness and paralysis.[4] Although the exact mechanisms leading to GBS remain unclear, a strong association has been established between GBS and preceding infections, particularly those caused by *Campylobacter jejuni*. *C. jejuni* is one of the leading causes of bacterial diarrhea worldwide and is implicated in approximately one-third of GBS cases.[4] In addition to *C. jejuni*, viral infections such as Norovirus, Epstein-Barr virus, Cytomegalovirus, and Zika virus have also been associated with GBS.[5] The recent GBS outbreak in Pune emphasizes the urgent need to improve community-level antimicrobial stewardship practices.

This editorial specifically highlights the critical role of responsible antibiotic use in mitigating the risk of such outbreaks and preventing the broader consequences of antimicrobial misuse.

THE PROBLEM: RISING GBS INCIDENCE AND THE ROLE OF ANTIBIOTIC USE:

The GBS outbreak in Pune highlights a troubling rise in the incidence of this debilitating illness. The strong association between *Campylobacter jejuni* infections and GBS is well-documented in the literature. In most cases, GBS develops following *C. jejuni* infection, where molecular mimicry between bacterial lipopolysaccharides and human gangliosides triggers an autoimmune response. The cross-reactive antibodies formed subsequently attack both bacterial components and the host's peripheral nervous system.[4]

Moreover, inappropriate antibiotic use plays a central yet complex role in this setting. Antibiotic use disrupts the gut microbiome, a crucial ecosystem that maintains immune homeostasis. Antibiotic-induced dysbiosis may

Citation: Durairaj E, Rajbongshi J, V M.Community-Level Antimicrobial Stewardship: A Call for Action in The Wake of the Pune Guillain-Barré Syndrome Outbreak. JASPI. 2025;3(1):9-12

increase susceptibility to *Campylobacter* infections and, consequently, the risk of GBS development.[6,8] Studies have demonstrated that depletion of gut microbiota by antimicrobial agents dysregulates immune responses, predisposing individuals to GBS following *Campylobacter* infection. A study by Brooks et al. found a significant correlation between alterations in gut microbial composition and the development of GBS-associated autoantibody responses in mice after *Campylobacter* infection, strengthening the link between antibiotic-induced microbiome disruption and the severity of GBS.[6]

The real challenge lies in distinguishing between appropriate and inappropriate antibiotic use in community settings. While antibiotics are essential for treating bacterial infections, their misuse contributes significantly to the problem. Studies in various regions, including India, reveal extensive antibiotic usage, often inappropriately.[9,10] This answers the need for improved diagnostic tools and stricter adherence to treatment guidelines to curb indiscriminate antibiotic prescribing.

POTENTIAL COMPLICATIONS OF ANTIBIOTIC OVERUSE

The consequences of indiscriminate antimicrobial use extend far beyond an increased risk of GBS. Overuse of antibiotics contributes to the emergence of antimicrobial-resistant (AMR) infections, a global crisis that threatens the efficacy of life-saving treatments. The rise of multidrug-resistant (MDR) pathogens, including foodborne bacteria like *Campylobacter*, undermines public health efforts, leading to increased morbidity, mortality, and healthcare costs. The economic burden of AMR is significant, straining healthcare systems worldwide and impacting other sectors, including agriculture, where resistant bacteria reduce productivity.[11]

While AMR infections pose a direct threat, antibiotic overuse also has broader implications. Disruption of the gut microbiome can affect immune function, metabolism, and overall health. Dysbiosis caused by antibiotic exposure has been linked to increased susceptibility to opportunistic infections and immune dysregulation. Although the long-term effects of antibiotic-induced microbiome alterations remain under investigation, current evidence strongly supports the need to preserve gut microbiome integrity for overall well-being. This is particularly crucial given the complex relationship between gut microbiota and immune function, as exemplified by the association between *Campylobacter* infections and the recent GBS outbreak.[6]

SOLUTIONS: A MULTIFACETED APPROACH

Addressing antimicrobial misuse requires a multidimensional strategy, including education, improved diagnostics, evidence-based prescribing, enhanced surveillance, collaboration, and infection prevention.

Education: Public awareness campaigns targeting both patients and healthcare providers are crucial. These should emphasize completing prescribed antibiotic courses, distinguishing bacterial from viral infections, and discouraging self-medication. Shehadeh et al. demonstrated that targeted educational interventions improve knowledge, though behavioral change requires sustained effort.[12]

Diagnostic stewardship: The use of rapid diagnostic tests (RDTs) with high sensitivity and specificity can help differentiate viral from bacterial infections, reducing unnecessary prescriptions. Timely results from RDTs enable informed decision-making, particularly in resource-limited settings.[13]

Prescribing guidelines and surveillance: Developing regional, evidence-based prescribing guidelines and ensuring adherence through audits and feedback is essential. Continuous surveillance of antimicrobial use and resistance patterns helps identify emerging threats and guide policy decisions.[13]

Collaboration: Effective antimicrobial stewardship depends on collaboration among physicians, pharmacists, public health agencies, and policymakers. Multidisciplinary teams and therapeutics committees can facilitate knowledge-sharing and improve stewardship initiatives.[14]

Infection prevention: Preventing infections reduces antibiotic use. Hygiene measures such as handwashing and safe food handling are critical. Strategies to lower *Campylobacter* infections should include proper poultry cooking and preventing cross-contamination, as undercooked meat poses a higher risk. Addressing knowledge gaps about transmission is vital for effective prevention.[15]

CALL TO ACTION: THE NEED FOR A UNIFIED RESPONSE

The Pune GBS outbreak reminds the consequences of antibiotic misuse. It emphasizes again the need for

ISSN: 3048-4510 (Online)
DOI: 10.62541/jaspi072

community-level antimicrobial stewardship to focus on appropriate antibiotic use, microbiome protection, real-time diagnostic stewardship, and public health integration to prevent both antimicrobial resistance and unintended complications like GBS. Only through sustained, evidence-based antimicrobial stewardship we can mitigate future outbreaks and preserve the efficacy of life-saving antibiotics. Policymakers, clinicians, and the public must unite in this effort—the cost of inaction is too high (Box 1).

Box 1: Call of actions during any GBS or similar outbreaks

1. **Judicious antibiotic use** – restrict antibiotics in gastroenteritis to high-risk cases to prevent unnecessary exposure and resistance selection.
2. **Microbiome protection** – avoid broad-spectrum antibiotics to maintain gut microbiome balance and reduce autoimmune risks like GBS.
3. **Diagnostic stewardship** – integrate real-time microbiological data to guide targeted therapy and avoid empirical antibiotic overuse.
4. **Infection control & public health** – strengthen sanitation measures to reduce infections and minimize the need for antimicrobials.
5. **Education & awareness** – train clinicians on post-infectious complications like GBS and emphasize antibiotic restraint in self-limiting infections.

CONFLICTS OF INTEREST STATEMENT

The authors declare no conflict of interest.

SOURCE OF FUNDING

None

REFERENCES

1. Suryawanshi S. Rise in Guillain-Barré Syndrome cases in Maharashtra. *The New Indian Express*. Published February 6, 2025. Accessed February 7, 2025. https://www.newindianexpress.com/nation/2025/Feb/06/rise-in-guillain-barre-syndrome-cases-in-maharashtra
2. Wachira VK, Farinasso CM, Silva RB, Peixoto HM, de Oliveira MRF. Incidence of Guillain-Barré syndrome in the world between 1985 and 2020: A systematic review. *Glob Epidemiol*. 2023;5:100098. doi:10.1016/j.gloepi.2023.100098
3. Health officials confirm bacteria *C. jejuni* caused Pune Guillain-Barré Syndrome surge, say it was in water, not food. *The Times of India*. Published February 5, 2025. Accessed February 7, 2025. https://timesofindia.indiatimes.com/city/pune/health-officials-confirm-bacteria-c-jejuni-caused-pune-guillain-barr-syndrome-surge-say-it-was-in-water-not-food/articleshow/117927066.cms
4. Finsterer J. Triggers of Guillain–Barré Syndrome: *Campylobacter jejuni* predominates. *Int J Mol Sci*. 2022;23(22):14222. doi:10.3390/ijms232214222
5. Bellanti R, Rinaldi S. Guillain‐Barré syndrome: A comprehensive review. *Eur J Neurol*. 2024;31(8):e16365. doi:10.1111/ene.16365
6. Brooks PT, Brakel KA, Bell JA, et al. Transplanted human fecal microbiota enhanced Guillain-Barré syndrome autoantibody responses after *Campylobacter jejuni* infection in C57BL/6 mice. *Microbiome*. 2017;5(1):92. doi:10.1186/s40168-017-0284-4
7. Patangia DV, Ryan CA, Dempsey E, Ross RP, Stanton C. Impact of antibiotics on the human microbiome and consequences for host health. *Microbiol Open*. 2022;11(1):e1260. doi:10.1002/mbo3.1260
8. Bhalodi AA, Van Engelen TSR, Virk HS, Wiersinga WJ. Impact of antimicrobial therapy on the gut microbiome. *J Antimicrob Chemother*. 2019;74(Suppl 1):i6-i15. doi:10.1093/jac/dky530
9. Singh SK, Sengupta S, Antony R, et al. Variations in antibiotic use across India: Multi-centre study through Global Point Prevalence survey. *J Hosp Infect*. 2019;103(3):280-283. doi:10.1016/j.jhin.2019.05.014
10. Belachew SA, Hall L, Selvey LA. Non-prescription dispensing of antibiotic agents among community drug retail outlets in Sub-Saharan African countries: A systematic review and meta-analysis. *Antimicrob Resist Infect Control*. 2021;10(1):13. doi:10.1186/s13756-020-00880-w
11. Poudel AN, Zhu S, Cooper N, et al. The economic burden of antibiotic resistance: A systematic review and meta-analysis. *PLoS One*. 2023;18(5):e0285170. doi:10.1371/journal.pone.0285170

12. Shehadeh MB, Suaifan GARY, Hammad EA. Active educational intervention as a tool to improve safe and appropriate use of antibiotics. *Saudi Pharm J.* 2016;24(5):611-615. doi:10.1016/j.jsps.2015.03.025
13. Lim JM, Singh SR, Duong MC, Legido-Quigley H, Hsu LY, Tam CC. Impact of national interventions to promote responsible antibiotic use: A systematic review. *J Antimicrob Chemother.* 2020;75(1):14-29. doi:10.1093/jac/dkz348
14. Godman B, Haque M, McKimm J, et al. Ongoing strategies to improve the management of upper respiratory tract infections and reduce inappropriate antibiotic use particularly among lower- and middle-income countries: Findings and implications for the future. *Curr Med Res Opin.* 2020;36(2):301-327. doi:10.1080/03007995.2019.1700947
15. Same RG, Tamma PD. *Campylobacter* infections in children. *Pediatr Rev.* 2018;39(11):533-541. doi:10.1542/pir.2017-0285