

The gut-brain axis and neuropsychiatric manifestations: evaluating the mental health risks of antibiotic abuse in Pakistan

Laraib Majeed, Maira Tariq

Dear Madam, The recent study by Hamza et al. successfully highlights the therapeutic potential of synbiotics in neurodegeneration however their findings underscore the alarming reality of unchecked microbial destruction in Pakistan through antibiotic abuse.¹ While the gut microbiota has been long recognised for its functions related to immunity and vitamin production, emerging evidence reveals its pivotal role in bidirectional communication between the enteric and central nervous systems, the gut-brain axis. Notably, 90% to 95% of the body's serotonin is synthesised by the gut (modulated by the bacterial flora), subsequently influencing the brain via the vagus nerve.² This bidirectional communication implies that while antibiotics are life-saving, their destruction of normal microbiota directly impairs cognitive function and mood, potentially increasing the rates of anxiety and depression in Pakistan.

Recent evidence suggests that antibiotic-induced dysbiosis, beyond gastrointestinal distress, disrupts neurocognitive performance and emotional regulation as well.³ The depletion of specific bacterial strains, such as *Lactobacillus* and *Bifidobacterium*, reduces the precursors for GABA and serotonin. For instance, the depletion of GABA-producing *Lactobacillus* by Penicillins induces anxiety and the suppression of the Serotonin-BDNF pathway by Quinolones contributes to depressive phenotypes.³ Antibiotic exposure is associated with significant shifts in psychiatric risk. A large-scale study found that a single course of Quinolones (which are frequently overused in Pakistan) is associated with a 25% increased risk of depression (OR=1.25; 95% CI, 1.15–1.35), while repeated exposure of Penicillins (2 to 5 courses) leads to a 56% increased risk of depression (OR = 1.56; 95 % CI, 1.46–1.65).⁴

2nd Year MBBS Student, Fatima Jinnah Medical University, Lahore, Pakistan.

Correspondence: Laraib Majeed. e-mail: laraib.ab.majeed@gmail.com

ORCID ID: 0009-0005-9677-7184

Submission completed: 01-03-2026 **1st Revision received:** 18-03-2025

Acceptance: 22-04-2026

2nd Revision received: 21-04-2026

1.46–1.65).⁴

These global findings are particularly concerning in Pakistan, where widespread self-medication with unprescribed antibiotics, specifically Quinolones, significantly depletes the normal microbiota. This destruction likely contributes to the rising rates of depression and anxiety in Pakistan, which are estimated at nearly 34% which is significantly higher than global benchmarks.⁵ Furthermore, the frequent misuse of antibiotics for viral infections offers no benefit but causes extensive microbial destruction. Based on this evidence, we suggest two urgent interventions: pharmacies must strictly prohibit the sale of antibiotics without a valid prescription, and general practitioners must prioritize precise bacterial diagnosis before prescribing. Failure to address this culture of misuse could lead to a further drastic increase in the psychiatric burden across Pakistan.

Disclaimer: None.

Conflict of interest: None.

Funding disclosure: None.

DOI: <https://doi.org/10.47391/JPMA.40696>

References

1. Hamza M, Qasim AM, Taha M. Integration of Synbiotics in the management of non-motor symptoms of Parkinson's disease. *J Pak Med Assoc* 2025;75:1677-8. doi: 10.47391/JPMA.22870.
2. Appleton J. The Gut-Brain Axis: Influence of Microbiota on Mood and Mental Health. *Integr Med (Encinitas)* 2018;17:28-32.
3. Dahiya D, Nigam PS. Antibiotic-Therapy-Induced Gut Dysbiosis Affecting Gut Microbiota-Brain Axis and Cognition: Restoration by Intake of Probiotics and Synbiotics. *Int J Mol Sci* 2023;24:3074. doi: 10.3390/ijms24043074.
4. Lurie I, Yang YX, Haynes K, Mamtani R, Boursi B. Antibiotic exposure and the risk for depression, anxiety, or psychosis: a nested case-control study. *J Clin Psychiatry* 2015;76:1522-8. doi: 10.4088/JCP.15m09961.
5. Gadit AAM, Mugford G. Prevalence of depression in Pakistan: a systematic review. *J Pak Med Assoc* 2007;57:512-6.

Author Contribution:

LM: Concept, design, data analysis, drafting, final approval and agreement to be accountable for all aspects of the work.

MT: Data acquisition, critical revision, final approval and agreement to be accountable for all aspects of the work.