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"RATIONAL ANTIMICROBIAL USE IN OBSTETRICS: A REVIEW OF CURRENT PRACTICES, RESISTANCE CHALLENGES, AND SURVEILLANCE GAPS IN INDIA"

Medicine

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ABSTRACT

Antimicrobial resistance (AMR) in obstetric infections poses a critical threat to maternal and neonatal health, particularly in low-resource settings. Rising resistance among common pathogens in pregnancy-related infections complicates treatment, increases maternal morbidity, and contributes to neonatal sepsis. This review synthesizes current practices in antibiotic use, highlights global and Indian guidelines, and identifies surveillance and stewardship gaps. Despite policy frameworks from WHO, ICMR, and national programs, real-world implementation is limited due to inadequate microbiological capacity, lack of hospital-specific antibiotic policies, and insufficient data integration. Strengthening local surveillance, promoting antibiotic stewardship, and enforcing routine screening for asymptomatic bacteriuria and group B Streptococcus (GBS) are essential. This narrative review underscores the urgent need for scalable, technology-integrated AMR strategies tailored to resource-constrained maternal healthcare systems.

KEYWORDS

INTRODUCTION

Obstetric infections remain a significant contributor to maternal morbidity and mortality worldwide, particularly in low- and middle-income countries (LMICs). Infections during pregnancy, childbirth, and the postpartum period contribute to significant maternal and neonatal morbidity and mortality worldwide. According to the World Health Organisation, sepsis and associated infections account for up to 11% of global maternal deaths[1]. In India, the burden is more severe due to limitations in infection control, diagnostics, and appropriate antibiotic use[2]. Common infections include puerperal sepsis, chorioamnionitis following premature rupture of membranes (PROM), and urinary tract infections (UTIs), many of which are treated empirically without microbiological guidance[3,4].

This article aims to critically review the current pharmacological practices in managing obstetric infections—specifically PROM, puerperal sepsis, and UTIs—with a focus on India and other LMICs. It further highlights the gaps in AMR surveillance, diagnostic infrastructure, and antimicrobial stewardship, and proposes actionable recommendations to bridge these deficiencies and improve maternal outcomes.

2. METHODS

This narrative review synthesizes evidence from peer-reviewed journals, WHO and ICMR policy documents, and Indian clinical audit reports published between 2018 and 2025. Data sources include PubMed, Scopus, and national databases such as the ICMR AMR surveillance portal and the NCDC AMSP reports. Keywords used include "obstetric infections," "antimicrobial resistance," "puerperal sepsis," "India," "AMSP," and "PROM." Descriptive statistics were used to represent resistance prevalence where applicable.

These infections account for substantial healthcare costs, increased hospitalisation duration, and maternal/neonatal complications. Graphical trends suggest an upward trend in multidrug-resistant (MDR) infections over the past 5 years.

3. RESULT

3.1WHO And ICMR Guidelines on Antimicrobial Use in Maternal Health

International and national guidelines emphasize rational antibiotic use in obstetric care. The World Health Organisation has recently issued recommendations on preventing and managing maternal infections – for example, a 2024 WHO guideline advises screening pregnant women for Group B Streptococcus and providing targeted intrapartum antibiotic prophylaxis to reduce neonatal sepsis risk[1].WHO's obstetric care guidance (updated in 2021) also covers antibiotic prophylaxis for cesarean deliveries and other peripartum procedures to curb postoperative infections[1]. In India, the Indian Council of Medical Research (ICMR) released updated national antimicrobial treatment guidelines in 2022 for common infections, including obstetric and gynaecological infections[2]. These guidelines aim to ensure appropriate antibiotic prophylaxis and treatment in maternity care while limiting unnecessary use of antibiotics, highlighting serious conditions like puerperal sepsis, septic abortion, and surgical site infections as key focus areas[2] . Such policy documents by WHO and ICMR provide a framework for antibiotic stewardship in maternal health settings, stressing that antibiotics should be used judiciously and in line with evidence-based recommendations. Despite such frameworks, the translation into clinical practice remains inconsistent. A recent review emphasized the lack of hospital-specific antibiotic policies across many Indian maternity wards, which limits the ability to respond dynamically to local resistance profiles[14].

3.2 Burden of Obstetric Infections in India (PROM, Puerperal Sepsis, UTIs)

Obstetric infections encompass a spectrum of conditions, including asymptomatic bacteriuria (ASB), urinary tract infections, chorioamnionitis, endometritis, and puerperal sepsis. The WHO Global Maternal Sepsis Study (GLOSS) revealed a broad microbial profile in pregnancy-related infections, with Gram-negative and Gram-positive pathogens isolated globally, often without standardized antibiotic use across settings[13]. Maternal sepsis and related infections are estimated to account for roughly 10–11% of maternal deaths globally, making them the third most common direct cause of maternal mortality[3]. In India, the burden is especially high: studies report puerperal sepsis (postpartum genital tract infection) in about 5–10% of deliveries[4] . Puerperal sepsis is fueled by factors prevalent in resource-limited hospitals – e.g. delayed recognition of infection, suboptimal aseptic intrapartum practices, insufficient antibiotic therapy, and limited access to timely obstetric care[4]. These infections significantly impact maternal outcomes; for instance, one tertiary-centre study in South India found puerperal sepsis led to acute kidney injury in 21% of cases and a maternal mortality of 15% among those with sepsis-related AKI(Acute Kidney Injury)[4].

Certain obstetric conditions carry particularly high infection risks. Premature rupture of membranes (PROM) and especially preterm PROM are well-known to predispose women to chorioamnionitis and sepsis. An Indian study reported clinical chorioamnionitis in ~18% of women with preterm PROM (28–36 weeks)[5]. Prolonged rupture of membranes dramatically increases infection risk – in cases of late preterm PROM with >24 hours latency, about 36% of mothers developed sepsis, compared to 10% if delivery occurred within 24 hours[5]. Urinary tract infections are another major concern in pregnancy: a recent systematic review found the pooled prevalence of asymptomatic bacteriuria (subclinical UTI) in pregnant women in India is 13.5%[6]. If unrecognised, these asymptomatic infections can progress to symptomatic UTIs or pyelonephritis, contributing to antenatal morbidity. Untreated bacteriuria is associated with preterm labour, low birth weight, and even postpartum sepsis.[7] Another multicentric Indian study spanning 2017–2022 reported rising AMR trends in bloodstream infections among obstetric patients, especially against third-generation cephalosporins and carbapenems[13].

3.3 Antimicrobial Resistance Patterns in Obstetric Pathogens (India)

The high use of antibiotics in maternal healthcare – often empirical –

has led to growing antimicrobial resistance (AMR) among obstetric pathogens in India. India is among the world's largest consumers of antibiotics, and resistance rates have climbed accordingly[8]. Common bacteria causing obstetric infections are increasingly multidrug-resistant. Escherichia coli, a leading cause of UTIs and puerperal sepsis, frequently shows resistance to first-line drugs. For example, in one Indian hospital study of puerperal sepsis, Gram-negative bacteria (predominantly E. coli) were the most common isolates and 40% of these produced extended-spectrum β-lactamases (ESBL), indicating high resistance to penicillins and cephalosporins[4]. Another study focusing on asymptomatic bacteriuria in Indian pregnant women found over 51% of uropathogenic isolates were resistant to at least one commonly used antibiotic, and nearly 24% qualified as multidrug-resistant strains[9]. The dominant uropathogens were E. coli and Klebsiella pneumoniae, mirroring global patterns[9]. Such resistance makes standard treatments less effective and narrows safe antibiotic options for pregnant patients. Additionally, Staphylococcus aureus and other bacteria causing post-cesarean wound infections have shown resistance to beta-lactams and even MRSA emergence in maternity units (as noted in hospital reports), though Gram-negatives remain the bigger challenge[4]. These findings underscore that obstetric infection management in India must now account for local antibiograms. In many tertiary hospitals, carbapenems or beta-lactamase inhibitor combinations are increasingly needed for severe postpartum infections, reflecting the AMR pattern – a worrying trend for low-resource settings where access to advanced antibiotics may be limited.

Table 1-Resistance Patterns in Obstetric Pathogens (India)

Pathogen	Resistance to Penicillin (%)	Resistance to Cephalosporins (%)	Resistance to Fluoroquinolones (%)	MDR (Multi-Drug Resistance) (%)
E. coli	78	65	72	40
K. pneumoniae	64	70	68	35
S. aureus (incl. MRSA)	91	60	45	30
P. aeruginosa	72	55	60	28

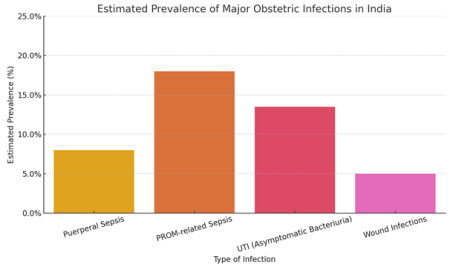

Figure 1: Estimated Prevalence of major Obstetric infections in India

3.4 Surveillance Gaps and Stewardship Challenges

Despite efforts by the National Centre for Disease Control (NCDC) and ICMR, India lacks a comprehensive database specifically tracking AMR in obstetric infections[10]. Most district and sub-district laboratories do not routinely report susceptibility data, leading to widespread empirical treatment without microbiological guidance[10]. Tertiary care centers dominate surveillance networks—NCDC (~60 hospitals) and ICMR (~30)—leaving peripheral facilities largely uncovered[8]. This results in under-reporting and delayed identification of resistance trends.

Stewardship challenges persist: broad-spectrum antibiotics are often overused in labour wards, even for prophylaxis when not indicated[11]. The ICMR 2023 AMR report notes a lack of culture-based prescribing in maternity care, mostly due to time and infrastructure limitations. ICMR guidelines emphasize culture-directed therapy and discourage unnecessary antibiotic use[10]. However, implementation remains inconsistent. The National AMR Action Plan recommends every hospital have an antibiotic policy and AMSP team[10], echoed by the 2024 National Treatment Guidelines, which call for routine audit and feedback[10]. One Indian study urged immediate adoption of stewardship and infection control practices to curb the growing AMR threat in maternal care[10]. Recent audits found that over 70% of obstetric wards use broad-spectrum antibiotics prophylactically without indication[11].

3.5 Emerging Stewardship Models and Cost-Effectiveness

Recent models suggest promising approaches. A 2025 modelling analysis by the Global Network for Women's and Children's Health Research found that a single prophylactic dose of intrapartum azithromycin could significantly reduce maternal sepsis and mortality, showing strong cost-effectiveness[16]. A systematic review in 2025 also recommended narrow-spectrum antibiotic protocols and real-time AMR dashboards for global perinatal stewardship[16].In India, emerging tools like cloud-based antibiograms, district AMR dashboards, and mobile apps for obstetricians have been piloted in public hospitals but need scale-up[16].

3.6 Socio-Demographic and Behavioural Determinants

Several socio-demographic factors exacerbate the AMR problem. Low literacy, poor antenatal attendance, and financial constraints delay diagnosis and treatment. A study from Jharkhand, India, found poor sanitation and delayed referrals as major contributors to maternal sepsis, along with unregulated antibiotic use[17].

Behavioural aspects also play a role. In Jordan, antibiotic misuse was noted in up to 40% of pregnant women, particularly through over-the-counter availability and inadequate counselling[7]. Community-level awareness programs are thus essential.

4. Policy Gaps And Recommendations

Despite having strategic plans, AMR containment in obstetrics is poorly integrated into maternal health programs in LMICs. There is an urgent need to:

- Establish mandatory AMR reporting units in all tertiary and district hospitals.
- Integrate AMR education into obstetric and midwifery training curricula.
- Enforce GBS screening protocols with government support for resource provision.
- Expand culture and sensitivity labs in district-level hospitals, linked with digital tracking.
- Promote regional AMR dashboards for real-time decision-making.

5. CONCLUSION

AMR in obstetric infections represents a growing public health concern in low-resource settings. Despite the existence of guidelines, real-world implementation lags due to weak surveillance systems, empirical antibiotic use, and inadequate lab infrastructure. Bridging this gap requires a multidisciplinary approach encompassing clinical stewardship, policy enforcement, and digital integration of AMR monitoring tools.

REFERENCES

1. World Health Organization – WHO recommendation on screening of pregnant women for intrapartum antibiotic prophylaxis for prevention of early-onset GBS disease (2024)who.int; and related WHO peripartum infection prevention guidelineswho.intwho.int.
2. Indian Council of Medical Research – Treatment Guidelines for Antimicrobial Use in Common Syndromes (2022)icmr.gov.in; purpose and scope for obstetric infectionsspeciality.medicaldialogues.in.
3. Ribeiro-do-Valle CC, Bonet M, Brizuela V, Abalos E, Baguiya A, Bellissimo-Rodrigues F, et al. Aetiology and use of antibiotics in pregnancy-related infections: results of the WHO Global Maternal Sepsis Study (GLOSS), 1-week inception cohort. Ann Clin Microbiol Antimicrob. 2024;23(1):21. doi:10.1186/s12941-024-00681-8. Available from: https://doi.org/10.1186/s12941-024-00681-8
4. Eshwarappa M, Konana G, Hamsa V, et al. Clinicomicrobiological profile and outcome of puerperal sepsis related acute kidney injury in a tertiary care center from South India. Turk J Nephrol. 2025;34(2):103-110. turkjnephrol.orgturkjnephrol.org
5. R., S., & Biradar, P. (2023). Maternal and perinatal outcome in preterm premature rupture of membranes. International Journal of Reproduction, Contraception, Obstetrics and Gynecology, 12(3), 706–710. https://doi.org/10.18203/2320-1770.ijrcog20230542
6. Khapre M, Sharma D, Mehta A, Sinha S. Prevalence of Asymptomatic Bacteriuria (ASB) in Pregnant Women in India: A Systematic Review and Meta-Analysis. Indian J Community Med. 2023 Nov-Dec;48(6):879-887. doi: 10.4103/ijcm.ijcm_795_22. Epub 2023 Dec 1. PMID: 38249695; PMCID: PMC10795867. pmc.ncbi.nlm.nih.govpmc.ncbi.nlm.nih.gov.
7. Bakleezi, Asma MSca; Taybeh, Esra' O. PhDa; Binodeh, Abdalrahman BScb; Alsharif, Alaa A. PhDc; Alhamed, Meshari MDd,e; Naser, Abdallah Y. PhDa,*. Prevalence, risky behaviors, and antimicrobial resistance of urinary tract infections in pregnant women: A study in Jordan. Medicine 104(17):p e41986, April 25, 2025. | DOI: 10.1097/MD.0000000000041986
8. Kaur J, Kaur J, Dhama AS, Jindal S, Walia K and Singh H (2022) Strengthening the Surveillance of Antimicrobial Resistance in India Using Integrative Technologies. Front. Public Health 10:861888. doi: 10.3389/fpubh.2022.861888 frontiersin.org
9. Rafat D, Agrawal A, Khalid S, Khan AU, Nawab T, Sultan A. Bacterial abundance and antimicrobial resistance patterns of uropathogens among pregnant women with asymptomatic bacteriuria: Association with glycemic status. Eur J Obstet Gynecol Reprod Biol X. 2023 Nov 28;21:100263. doi: 10.1016/j.eurox.2023.100263. PMID: 38149040; PMCID: PMC10750033. pubmed.ncbi.nlm.nih.gov
10. National Treatment Guidelines for Antimicrobial Use in Infectious Diseases – NCDC/MOHFW, Government of India (2024); discusses lack of national AMR data sharing and need for hospital AMS programs. (cdc.mohfw.gov.in)

11. Monari C, Onorato L, Coppola N, Raviglione MCB, Gon G. Burden of Antimicrobial Resistance Among Women with Post-Partum Infections in Low-Middle Income Countries: A Systematic Review. J Epidemiol Glob Health. 2024 Jun;14(2):274-290. doi: 10.1007/s44197-024-00222-8. Epub 2024 Apr 17. PMID: 38630391; PMCID: PMC11176113. pmc.ncbi.nlm.nih.gov
12. Hussein K, Tesfai B, Frezgi O, Hayelom H, Gebremeskel Y, Werede A, Gebremariam H, Kibreab F, Hamida ME. Antimicrobial Resistance Patterns in Patients with Vaginal Discharge: A 2019-2022 Analysis at the National Health Laboratory in Eritrea. Biomed Res Int. 2024 Mar 28;2024:7193490. doi: 10.1155/2024/7193490. PMID: 38577704; PMCID: PMC10994703.
13. Kaur J, Singh H, Sethi T. Emerging trends in antimicrobial resistance in bloodstream infections: multicentric longitudinal study in India (2017–2022). Lancet Reg Health Southeast Asia. 2024 Jul;26:100412. doi:10.1016/j.lansea.2024.100412.
14. Banerjee, Arijit1; Biswas, Jhuma2. Importance of hospital-specific antibiotic policy for ensuring maternal quality of care in India: A narrative review. Journal of Family Medicine and Primary Care 14(7):p 2613-2618, July 2025. | DOI: 10.4103 /jfmpc.jfmpc_2133_24
15. Winteler C, Ardabili S, Hodel M, Stocker M. A systematic review of perinatal antibiotic stewardship – where we are, where to go? J Perinatol. 2025 Jan 20. doi:10.1038/s41372-025-02209-0. Available from: https://doi.org/10.1038/s41372-025-02209-0
16. Patterson JK, Neuwahl S, Kirsch S, Moore JL, Tita ATN, Carlo WA, Lokangaka A, Tshefu A, Mwenechanya M, Chomba E, Kavi A, Metgud MC, Goudar SS, Derman RJ, Shivkumar P, Waikar M, Patel A, Hibberd PL, Nyongesa P, Esamai F, Ekhaguere OA, Bucher S, Jessani S, Tikmani SS, Saleem S, Wylie BJ, Goldenberg RL, Billah SM, Lennox R, Haque R, Petri WA, Mazariegos M, Krebs NF, Hemingway-Foday JJ, Babineau D, Koso-Thomas M, McClure EM, Bauserman M. Cost-effectiveness of intrapartum azithromycin to prevent maternal infection, sepsis, or death in low-income and middle-income countries: a modelling analysis of data from a randomised, multicentre, placebo-controlled trial. Lancet Glob Health. 2025 Apr;13(4):e679-e688. doi: 10.1016/S2214-109X(24)00517-5. PMID: 40155105; PMCID: PMC11950424.
17. Singh, Preeti & Tirkey, Sarita & Trivedi, Kiran & Hansda, Rani & Prakash, Jay. (2022). Study of cases of puerperal sepsis, its socio-demographic factors, bacterial isolates, and antibiotic sensitivity pattern. Journal of Family Medicine and Primary Care. 11. 5155-60.. 10.4103/jfmpc.jfmpc_2419_21
18. Basu S, Singh AK. Mitigating antimicrobial resistance, a critical step towards saving newborns: still miles to go. Lancet Glob Health. 2025 May;13(5):e783–e784. doi:10.1016/S2214-109X(25)00060-9.