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Perspectives of ICU Physicians on Antibiotic Use in Critically Ill Patients: A Qualitative Study from a Developing Country

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Abstract

Objective: To explore the experiences and perceptions of ICU consultants regarding antibiotic prescribing practices in critically ill patients within resource-limited healthcare settings.

Methodology: This qualitative study, based on a phenomenological approach, was conducted between January 1 and December 30, 2023, at the National Hospital & Medical Center and DHA Medical Center, Lahore, Pakistan. Six ICU consultants with more than two years of post-fellowship experience were recruited through purposive sampling. Data were collected via face-to-face, semi-structured interviews, audio-recorded with consent. Thematic analysis was performed until data saturation was achieved.

Results: Six major themes emerged. First, early initiation of antibiotics without confirmed diagnosis was reported as a routine and often necessary practice due to diagnostic uncertainty and delays in culture results. Second, barriers to antimicrobial stewardship (AMS) were noted, including the absence of formal AMS policies, poor interdepartmental coordination, and limited access to antibiograms—particularly in government hospitals. Third, factors influencing antibiotic selection included infection site, comorbidities, and family pressure, with variation between open and closed ICU models. Fourth, pharmaceutical incentives were largely deemed irrelevant in ICU prescribing due to the critical nature of decisions. Fifth, inflammatory markers like CRP and procalcitonin were valued for guiding antibiotic de-escalation, though high cost limited routine use. Finally, all participants expressed concern over the rise of antimicrobial resistance (AMR), highlighting the need for better microbiology infrastructure, public education, and regulated antibiotic access.

Conclusion: ICU antibiotic prescribing is shaped by clinical urgency, systemic limitations, and contextual pressures. To mitigate the threat of AMR in low-resource settings, it is crucial to strengthen AMS programs, expand diagnostic capacity, and enforce locally adaptable prescribing protocols.

Keywords: ICU, Critically Ill Patients, Antimicrobial Resistance, Antibiotic Prescribing, Antimicrobial Stewardship

Introduction

Intensive care units (ICUs) are high-stakes environments where clinicians must make urgent and complex decisions about antibiotic use under significant diagnostic uncertainty.[1] While signs of infection such as fever, leukocytosis, or elevated inflammatory markers may be present in ICU patients, these are often non-specific and may reflect non-infectious etiologies.[2] Differentiating bacterial from non-bacterial causes is essential, as inappropriate antibiotic use can lead to adverse outcomes such as Clostridioides difficile infections, disruption of normal flora, and the acceleration of antimicrobial resistance (AMR).[3] Conversely, delayed antibiotic administration in confirmed bacterial infections can significantly increase mortality.[4]

AMR is particularly alarming in ICUs due to the frequent use of broad-spectrum antibiotics, invasive procedures, immunocompromised states, and extended hospital stays.[5] While high-income countries have implemented structured antimicrobial stewardship (AMS) programs supported by real-time diagnostics, infectious disease consultation, and electronic prescribing systems, many low- and middle-income countries (LMICs) lack such infrastructure.[6] In LMIC settings, barriers such as limited microbiology capacity, delayed culture reports, and lack of standardized AMS policies hinder rational antibiotic use.[7] Additionally, external pressures—including expectations from patients and families for rapid clinical improvement—often lead to the overuse of antibiotics, particularly in private sector ICUs.

Despite growing global awareness of AMR, studies continue to report that up to 70% of ICU patients receive antimicrobials, with nearly half lacking microbiological confirmation.[8] This over-reliance on presumptive therapy is especially problematic in resource-constrained health systems where stewardship oversight is minimal. In response to this urgent need for contextualized insights, this study explores ICU clinicians' perspectives on presumptive antibiotic therapy, AMS barriers, external influences, and the perceived threat of AMR in a developing country context. It focuses on understanding the beliefs, attitudes, and decision-making patterns of ICU physicians

managing antibiotic use in critically ill patients in Pakistan.

Methodology

This qualitative study was conducted from 1st of January to 30th of December, 2023, at National Hospital & Medical Center, Lahore, and DHA Medical Center, Lahore, each with over 100 general beds and a minimum of 6 ICU beds. Both hospitals catered to a broad spectrum of critically ill patients, providing an appropriate setting to explore antibiotic prescribing practices in ICUs.

Study Design and Participants

A phenomenological approach was used to explore ICU consultants' lived experiences and decision-making processes regarding antibiotic use. Purposive sampling was employed to recruit six ICU with more than two years of post-fellowship clinical experience in critical care. Recruitment was stopped at six interviews, as thematic saturation was reached by the seventh, indicating no new insights were emerging. Participants included both senior ICU consultants and ICU physicians (senior and junior clinicians involved in daily ICU management). Only those actively prescribing antibiotics for ICU patients were selected to ensure relevance to the study objective. This diversity in roles and experience levels allowed for a broader range of perspectives.

Data Collection

Semi-structured, face-to-face interviews were conducted using an interview guide designed to explore key domains such as antibiotic prescribing behaviours, perceptions of AMR, and barriers to AMS. Interviews were conducted by an experienced ICU physician who had no affiliation with the participating hospitals. This outsider status helped reduce hierarchical influence and social desirability bias. All interviews were audio-recorded with participant consent, transcribed verbatim, and anonymized to maintain confidentiality. Informed consent was obtained from all participants. Ethical approval for the study was granted by the Institutional Review Board (IRB No. NHMC/021/8).

Given the sensitivity of prescribing decisions, particular attention was paid to minimizing bias. The Necessity-Concerns Framework (NCF) was used as a guiding lens to understand how ICU physicians balance the need for immediate antibiotic therapy with concerns about overuse and AMR.[9] A reflexive journal was maintained to document the research team's assumptions and reflections throughout the process. The study did not include member checking to preserve participant confidentiality in the small ICU physician community.

Data Analysis

Thematic analysis was performed using Braun and Clarke's six-step framework.[10] Transcripts were independently coded by three researchers using NVivo 12 software. An initial codebook was developed collaboratively after coding two transcripts, and the remaining transcripts were analyzed using this shared framework. Coding discrepancies were resolved through discussion until consensus was reached.

Themes were derived inductively, based on the data rather than preconceived categories. The final themes were refined through iterative review and verified against the original transcripts. To enhance credibility, data triangulation was achieved by involving multiple analysts, and an independent qualitative research expert reviewed the final thematic structure.

Results

A total of six ICU consultants and physicians participated in semi-structured interviews. Thematic saturation was achieved by the seventh interview. Analysis revealed six key themes related to antibiotic prescribing practices, AMS implementation, and perceptions of AMR in intensive care settings.

Table 1: Thematic Analysis of ICU Clinicians' Perspectives on Antibiotic Use

Theme	Key Insights	Supporting Quotes
1. Necessity of Early Antibiotic Initiation	-Empiric antibiotic therapy is routine due to delays in lab results and rapid clinical deterioration. - Clinical urgency often outweighs concerns of overtreatment.	"Almost 50% of the cultures we send are negative, but we still need to complete the course, we can't take the risk." (Consultant 2) "Broad-spectrum antibiotics are often started because outcomes can be grave if we delay." (Consultant 4) "It's not ideal, but we don't always have time to wait—our decisions are often based on experience and urgency." (Consultant 6)
2. Challenges in Implementing Antimicrobial Stewardship	- Lack of AMS policies, interdepartmental coordination, and antibiograms. -Government hospitals face resource constraints; private hospitals lack centralized protocols. - Public setups may enforce AMS better if leadership is committed.	"In government hospitals, there's often no stewardship program, no antibiograms, and labs are frequently unavailable."(Consultant 1) "Even in private hospitals, we lack centralized AMS policies." (Consultant 3) "Government hospitals can sometimes implement protocols better—there's more control and structure if leadership is committed." (Consultant 6)

3. Factors Influencing Antibiotic Selection	-Decisions based on comorbidities, infection site, previous antibiotic use, and clinical condition. - Family pressure in private hospitals often influences aggressive treatment. - ICU structure (open vs. closed) affects consistency in prescribing.	"Families want results fast—they push for stronger drugs even before we get labs." (Consultant 4) "In closed ICUs, protocols are easier to follow, but in open setups, every consultant may have their own approach." (Consultant 6)
4. Limited Role of Pharmaceutical Incentives in ICU Prescribing	-Pharma influence is minimal in ICUs due to focus on clinical urgency. - Influence may still be present in outpatient or non-critical care settings.	"Pharma influence is minimal in the ICU—we focus on what's clinically needed." (Consultant 1) "There's very little space for that in ICU—decisions are fast, high-stakes, and based purely on clinical need." (Consultant 6)
5. Use of Inflammatory Markers in Guiding Therapy	-CRP and PCT aid de-escalation but are limited by cost and availability. - These markers should support, not replace, clinical judgment.	"CRP and PCT are useful, but not practical for daily use due to cost." (Consultant 3) "We monitor them in respiratory illnesses, but they're part of the whole picture, not the decision-makers." (Consultant 6)
6. Perceptions and Impact of Antimicrobial Resistance	- AMR is a major concern linked to antibiotic misuse. - Need for stronger labs, proper diagnostics, and public education. - Resistance increasing even in first-line drugs.	"AMR is huge—we need stronger labs, proper antibiograms, and education from top to bottom." (Consultant 2) "We're now seeing resistance to drugs we used to rely on—soon we'll run out of options if this continues." (Consultant 6)

Discussion

This qualitative study explored how ICU physicians in a developing country context make decisions about antibiotic prescribing, their perceptions of AMR, and the systemic barriers to implementing AMS programs. Conducted in two private tertiary care hospitals in Lahore, the study captured the nuanced perspectives of experienced critical care physicians working under diagnostic and infrastructural constraints.

The findings illustrate that early antibiotic initiation—prior to microbiological confirmation, is a widely accepted and often unavoidable practice in ICU settings (Table 1). Clinicians emphasized that in critically ill patients, the cost of delayed therapy is too high, and diagnostic support is frequently insufficient. Blood culture results are often delayed or negative, which further necessitates relying on clinical acumen. This aligns with global literature indicating that in resource-limited ICUs, physicians often prioritize immediate clinical response over adherence to diagnostic-confirmed prescribing protocols. For example, a multi center study in Middle Eastern ICUs reported that over 60% of antibiotics were initiated before culture results, largely due to delays and unavailability of timely diagnostics.[11] Similarly, in Southern Europe, clinicians acknowledged the pressure to act fast even when culture data were lacking.[12] Unlike many high-income countries that benefit from real-time polymerase chain reaction (PCR)-based diagnostics, automated blood cultures, and infectious disease consult support, our participants described a reliance on empirical decision-making driven by patient acuity and the limitations of available lab services. This reflects a broader trend in LMICs, where weak laboratory infrastructure forces clinicians to favour immediate over ideal care.[13]

Despite understanding the importance of AMS, the participants consistently described significant challenges in its implementation. These included the absence of hospital-wide stewardship policies, lack of standardized antibiograms, poor interdepartmental coordination, and minimal administrative engagement. While private hospitals had better laboratory services than public-sector institutions, they too lacked centralized AMS programs and oversight committees. This also resonates with findings from Arab countries where stewardship is hindered by similar structural and leadership deficits.[14] In a review of stewardship efforts across the Middle East, Balkhy and colleagues (2016) noted that even where policies exist, their execution is hampered by fragmented healthcare governance and poor interprofessional collaboration.[15] In contrast, some Gulf Cooperation Council (GCC) nations have invested in national AMR surveillance systems and inter-hospital stewardship networks, which allow for shared guidelines and data-driven decision-making.[15] The lack of such regional frameworks in Pakistan highlights broader disparities in health system preparedness, even among resource-constrained countries.

The participants also expressed unanimous concern about the growing threat of AMR, identifying it as an escalating public health crisis that is already affecting ICU treatment outcomes. There was particular alarm over resistance to last-resort antibiotics, such as colistin, and the rising prevalence of multidrug-resistant organisms, including Acinetobacter baumannii and Klebsiella pneumoniae. Their observations align with global surveillance reports, such as those from the World Health Organization, which identify ICUs as hotspots for resistant infections due to high antibiotic consumption and vulnerable patient populations.[16] For instance, carbapenem-resistant Enterobacteriaceae have been shown to increase mortality in ICU patients by up to 40%, particularly when delays in initiating effective therapy occur.[17] The rapid spread of plasmid-mediated resistance enzymes like NDM-1 (New

Delhi Metallo-β-lactamase) in South Asia adds to the urgency, highlighting the interconnected nature of community misuse and hospital resistance patterns.

Our findings further suggest that external pressures, including expectations from families, inconsistent laboratory support, and limited staff availability, significantly shape antibiotic decision-making (Table 1). Physicians in private hospitals particularly noted that patients and families often demand immediate relief, which leads to the selection of broad-spectrum agents even before diagnostic data are available. This dynamic, while common in LMICs, remains underexplored in qualitative literature. The lack of dedicated personnel and funding remains a key challenge in implementing effective antimicrobial stewardship (AMS) programs, particularly in resource-constrained settings. Pulcini et al. (2017) emphasized that accurate human resource estimates and sustainable financing are urgently required to support AMS teams globally.[18] This complexity is further exacerbated in unregulated healthcare systems like Pakistan, where the lack of national prescription monitoring mechanisms facilitates inappropriate antimicrobial use not only in hospitals but also at the community level. As highlighted by Davey and Aveyard (2022), the effective involvement of nurses in antimicrobial stewardship within hospitals is often hindered by systemic gaps, including insufficient institutional support and undefined roles—challenges likely intensified in resource-limited and poorly regulated settings.[19]

The challenges of AMS in LMICs are well documented. Abdel-Aziz et al. (2025) highlighted that AMS implementation in resource-limited hospitals is often hindered by infrastructural deficits, lack of diagnostic support, and inadequate policy-level prioritization.[20] Our findings reinforce this, particularly regarding the limited use of inflammatory markers like C-reactive protein and procalcitonin, which, although deemed helpful by participants for guiding de-escalation, remain underutilized due to cost and limited availability, pointing to a persistent disparity between LMICs and high-income countries where such markers are routinely employed.[20]

Zay et al. (2022) observed that the COVID 19 pandemic further disrupted AMS efforts across both COVID 19 and non-COVID 19 settings, leading to increased empirical antibiotic use and a rise in antimicrobial resistance.[21] Our study echoes this concern, as participants reflected on post-pandemic ICU practices characterized by heightened reliance on broad-spectrum agents and diminished stewardship oversight.

The global recommendation for serial PCT measurements to support antibiotic de-escalation remains impractical in LMIC settings without subsidized access and strong institutional backing. Nielsen et al. (2023) emphasized that even in well-resourced ICUs, decisions around stopping antibiotics in critically ill patients are complex and highly context-dependent. Participants in our study echoed this complexity, stressing that biomarkers should never replace clinical judgment but instead be interpreted within the broader clinical context.[22]

This study, guided by the Necessity Concerns Framework (NCF), captured the psychological tension among ICU physicians who described antibiotic prescribing as a cognitive balancing act—between the perceived necessity to act promptly and concerns about long-term consequences like resistance. These internal conflicts, rarely examined in critical care research, are especially pronounced in unpredictable ICU environments in LMICs where any delay could have serious implications.[23]

While the study is limited to two tertiary care centers and a small sample of clinicians, the findings align with broader regional trends and provide insights applicable to comparable LMIC contexts.[20] Member checking was not conducted to preserve anonymity within close-knit ICU teams; nonetheless, credibility was strengthened through triangulation across researchers, external expert review, direct participant quotations, and alignment with international literature.

In conclusion, this study illustrates how systemic limitations, resource constraints, and post-pandemic pressures shape ICU antibiotic decisions in a developing country. It underscores the urgent need for AMS frameworks that are practical, policy-supported, and grounded in frontline clinician experience. Strengthening institutional stewardship policies, improving access to essential diagnostics, and addressing sociocultural drivers of misuse are critical steps to mitigate the rising threat of antimicrobial resistance in Pakistan and similar LMICs.[20,23]

Limitations

The small sample size, involving only six ICU consultants from two private tertiary care hospitals in a single city, restricts the diversity of perspectives and limits the transferability of findings to other ICU contexts, such as public-sector, rural, or lower-tier facilities. Additionally, participants were drawn exclusively from private institutions, which may not reflect the systemic constraints or prescribing behaviours prevalent in government hospitals.

The absence of member checking is another limitation. While it was intentionally avoided to protect the confidentiality of participants in a small, closely connected clinical community, it does limit the ability to verify the accuracy of researchers' interpretations from the participants' standpoint. Social desirability bias may also have influenced responses, given the sensitive nature of antibiotic prescribing practices. Although the interviewer was an external ICU physician, participants may still have provided idealized accounts.

Finally, the study focused only on physicians and did not include perspectives from pharmacists, microbiologists, or nursing staff who are also key stakeholders in antimicrobial stewardship. Including their voices could have offered a more comprehensive understanding of AMS dynamics in ICU settings.

Conclusion

Clinical urgency, limited diagnostic support, and external pressures often compel physicians to initiate treatment without microbiological confirmation, within a resource-limited healthcare environment. While clinicians are aware of antimicrobial resistance, structural and contextual challenges limit adherence to optimal prescribing practices.

Recommendations

- Strengthen diagnostic laboratory services to support timely and accurate infection identification.
- Establish dedicated antimicrobial stewardship committees with clear leadership and accountability structures.
- Develop AMS protocols tailored to local resource availability and ICU workflows.
- Educate clinicians, patients, and the broader community on responsible antibiotic use to reduce external pressures and misuse.
- Include multidisciplinary perspectives—including pharmacists and microbiologists—in stewardship planning and implementation.

Authors' Contributions: MK contributed to study design and manuscript writing; AT reviewed methodology; MAA assisted with data acquisition and generation of codes, and themes; FI contributed to theme validation and discussion writing; NL managed ethical approval, recruitment, and manuscript editing; all participants conducted interviews and thematic analysis.

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