RATIONAL ANTIMICROBIAL USE IN OBSTETRIC CARE AS A STRATEGY FOR MATERNAL SEPSIS PREVENTION: RESULTS OF A POINT PREVALENCE SURVEY

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Abstract. *Antimicrobial resistance is one of the most pressing global health issues, requiring the rational use of antibacterial drugs and the improvement of antimicrobial control programs. The aim of this study was to evaluate the practice of prescribing antibiotics, quality indicators of antimicrobial therapy, and compliance with clinical recommendations in a specialized obstetric and gynecological hospital of the Republic of Uzbekistan. The study was conducted using the Point Prevalence Survey (PPS) method in accordance with the standardized methodology of the World Health Organization. Patients from six inpatient obstetric-genetic departments were included in the analysis. The frequency of antibiotic prescription, purpose of use, compliance with clinical recommendations, and indicators of rational use of antimicrobial drugs were evaluated. The obtained data made it possible to characterize the structure of antibiotic consumption in the obstetric-genetic hospital and to identify existing problems in antimicrobial practice. The research results emphasize the importance of regular monitoring of antibiotic prescriptions for the prevention of maternal sepsis, reducing the risk of developing antimicrobial resistance, and improving the quality of medical care.*

Keywords: *antimicrobial resistance, antibiotics, rational use of antibiotics, obstetrics, gynecology, maternal sepsis, Point Prevalence Survey, PPS, infection control, quality of medical care, Uzbekistan.*

Introduction

Antimicrobial resistance (AMR) is one of the most pressing global health threats; multidrug-resistant infections impact clinical outcomes and substantially elevated mortality risk compared to those with susceptible infections. Beyond these immediate clinical consequences, AMR carries significant economic burdens through increased healthcare expenditures, extended hospital stays, and lost productivity [1]. Multiple interconnected factors drive the emergence and spread of AMR, including overprescribing and inappropriate dispensing of antimicrobials by healthcare professionals, poor infection prevention and control practices, limited access to diagnostic testing, and a lack of effective surveillance systems [1,2]. In response to this crisis, several UN resolutions have tried to promote general awareness and implement measures to contain AMR; however these objectives can only be reached when accurate data on use and resistance are available [3].

To address critical data gaps on hospital antimicrobial use (AMU), particularly in low- and middle-income countries (LMICs), the WHO developed a standardised Point Prevalence Survey (PPS) methodology in 2018. The PPS approach provides a pragmatic alternative to continuous surveillance by capturing a snapshot of antibiotic use at a specific point in time. It requires substantially fewer resources than continuous surveillance systems [4]. This

methodology enables meaningful comparisons of antibiotic use across multiple parameters-including time, institutions, districts, countries, and regions-while facilitating standardisation in data collection, analysis, and interpretation. [4,5].

While antibiotic prescribing in general hospitals has been extensively characterised, AMU patterns in specialised obstetric-gynaecological (O&G) settings warrant specific attention. O&G wards show different prescribing profiles compared to other hospital departments, reflecting the predominance of surgical prophylaxis for caesarean delivery and gynaecological procedures over therapeutic prescriptions for infections. Additionally, patients admitted to these wards may present with common infections, such as community-acquired pneumonia or urinary tract infections. Finally, for accurate antibiotic selection, local resistance patterns must be considered, and pregnancy must be taken into account for dosage adjustment, potential teratogenicity of the substance, or interference with lactation.

In Nigeria, a 2020 PPS across multiple centres documented an overall antibiotic prevalence of 80.1%, but with substantially lower prevalence in obstetrics and gynaecology wards (72.9%) [9]. In Sierra Leone's national 2023 PPS, O&G wards showed the lowest antibiotic prevalence among all ward types at 65.7%, consistent with a pattern where O&G prescribing differs fundamentally from general hospital departments; the most common indications in O&G settings were surgical prophylaxis for obstetric and gynaecological procedures, representing 23.8% of all antibiotic prescriptions in one analysis [11].

A Latin American multicentre study documented that O&G patients exhibited distinct prescribing patterns, with surgical prophylaxis requiring particular scrutiny regarding the appropriateness of duration and spectrum [12]. In Mexico, a recent multicentre survey documented O&G departments as one of five key clinical areas studied, with obstetrics and gynaecology prophylaxis representing a significant portion of total antibiotic use [15]. In South Africa's 2021 multicentre survey, obstetrics and gynaecology prophylaxis comprised 14.0% of antibiotic indications [13], while in Pakistan, obstetric or gynaecological prophylaxis represented 16.5% of antibiotic indications [18].

While recent PPS studies have increasingly provided granular data on antibiotic use in general hospitals and specific wards, a significant evidence gap remains regarding specialised O&G hospitals. Published PPS data from specialised O&G hospital settings-particularly those in resource-limited contexts where both diagnostic capacity and guideline implementation may be constrained-are virtually absent from the literature. This gap is notable because O&G hospitals serve fundamentally different patient populations and have prescribing patterns that differ from those of general hospitals, and therefore, their antimicrobial stewardship needs differ from those of other hospitals.

The objective of this study is to address this knowledge gap by conducting a comprehensive assessment of antibiotic prescribing practices, quality indicators, and guideline adherence in a specialised obstetric-gynaecological hospital in Tashkent, Uzbekistan, using a WHO-standardised PPS methodology adapted to the local context.

Methods

Study design. This was a single-centre, cross-sectional point prevalence survey (PPS) of antimicrobial use conducted at the Republican Specialised Scientific and Practical Medical Centre of Maternal and Child Health State Institution in Tashkent, Uzbekistan. The study followed the standardised World Health Organization (WHO) methodology for PPS on antibiotic use in hospitals, version 1.1 (2018). This methodology was selected for its suitability in resource-limited

settings and its established use in comparable healthcare facilities across low- and middle-income countries.

Study setting and facility characteristics. The study was conducted at a specialised obstetric-gynaecological hospital in Uzbekistan. The institution operates a total of 160 inpatient beds distributed across six acute care departments with specialised intensive care capabilities. According to the WHO methodology, facilities with fewer than 500 inpatient beds require complete enumeration without patient sampling, and this hospital met this criterion.

Ward selection and study population. Six acute care inpatient wards met the inclusion criteria and were included in the survey. These comprised: (1) Obstetric Departments (50 beds, classified as adult medical wards or mixed adult/paediatric wards); (2) Gynaecology Departments (50 beds, classified as adult surgical wards for procedural patients and adult medical wards for medical management); (3) Pathology of Pregnant Women Departments (40 beds, classified as adult high-risk wards with expected elevated antibiotic utilization due to high-risk pregnancies); (4) Neonatal Pathology Department (20 beds, classified as neonatal medical ward); (5) Obstetric Intensive Care Unit (12 beds, classified as adult intensive care unit); and (6) Neonatal Intensive Care Unit (6 beds, classified as neonatal intensive care unit). The scientific and advisory polyclinic services were excluded as outpatient facilities per the WHO inclusion criteria.

The study population inclusion criteria specified that all patients hospitalised as inpatients at or before 08:00 hours on the survey day were included across all participating wards. Neonates born before 08:00 hours were counted as separate patients from their mothers, creating distinct patient records for maternal-neonatal dyads as per the WHO methodology for pregnant patients and their newborns.

Variables and data collection. Data collection followed the WHO PPS standardised forms, capturing information on patient demographics, hospitalisation status, and antibiotic prescriptions. For each patient, the following data were systematically extracted: (1) patient age and gender; (2) ward classification; (3) antibiotic agent name and dosage; (4) route of administration; (5) frequency of dosing; (6) indication for therapy (community-acquired infection, hospital-associated infection, medical prophylaxis, or surgical prophylaxis); and (7) evidence of microbiological confirmation. Special attention was given to surgical prophylaxis documentation, including classification as single preoperative dose (SP1), multiple doses within 24 hours (SP2), or extended administration beyond 24 hours (SP3).

Exclusion criteria followed WHO guidance and included topical applications, drops, and vaginal suppositories, which are not considered systemic antimicrobial therapy appropriate for prevalence assessment.

Data collection procedures. A research team was assembled, comprising a hospital coordinator with senior clinical experience and infectious disease expertise, or specialised knowledge in obstetric-gynaecological antimicrobial therapy; an infectious disease physician or consultant; a hospital pharmacist with knowledge of the obstetric-gynaecological formulary; and experienced ward nursing staff with access to patient medical records. The hospital coordinator assumed responsibility for institutional ethical clearance, team coordination, and dissemination of results.

Before the survey, a pilot study involving 10 patients across representative wards was conducted to establish inter-rater reliability and standardise data extraction procedures. This pilot emphasised the critical distinction between maternal and neonatal antibiotic administration and proper classification of surgical versus medical prophylaxis.

The survey was conducted over a maximum of three consecutive weeks, with each ward completed within a single day to minimise artefacts from patient movement. According to the recommendations, the survey timing avoided weekends and holiday periods to maintain a representative distribution of elective surgical procedures and prophylaxis patterns typical of normal operations. A sequential ward-by-ward approach was implemented, with investigator team capacity matched to ward size; larger departments were assigned multiple investigators to ensure single-day completion of each ward.

Data collection involved no direct interaction between the investigator team and patients, and the process did not interrupt patient care. Patient medical records and associated documentation were reviewed to extract relevant information. No patient identifiers were collected; instead, unique codes were assigned to each patient record to maintain anonymity throughout data collection and analysis.

Quality assurance and data validation. Comprehensive quality assurance measures were implemented to ensure the accuracy and reliability of data. These measures included systematic documentation of antibiotic indication compliance with local guidelines, assessment of the appropriateness of surgical prophylaxis duration, and evaluation of ratios of empirical prescriptions to culture-directed therapy.

A quality indicators assessment evaluated prescribing appropriateness, including adherence to local and WHO treatment guidelines, timing of surgical prophylaxis relative to the procedure, duration of prophylaxis relative to guideline recommendations, and the proportion of prescriptions with microbiological confirmation of the indication.

Definitions of key metrics. Antimicrobial use (AMU) prevalence refers to the percentage of hospitalised in-patients who received one or more antimicrobial agents (for prophylactic or therapeutic purposes) at the time of the survey. This metric quantifies the burden of antimicrobial exposure within a hospital population and enables comparison across different healthcare facilities and patient populations. For example, a 40.8% prevalence indicates that approximately 4 of every 10 hospitalised patients are exposed to antimicrobials on any given day.

Antimicrobial consumption density (also termed “antimicrobial courses per treated patient”) represents the average number of distinct antimicrobial courses prescribed to each patient receiving antimicrobial therapy at the time of survey. It is calculated as: (total number of antimicrobial courses) / (number of patients on antimicrobials). This metric captures the complexity and intensity of antimicrobial prescribing, independent of prevalence. A consumption density of 1.4 courses per treated patient indicates that patients on antimicrobials are receiving an average of 1.4 distinct treatment courses, reflecting combination therapy in some patients or sequential monotherapy in others. For example, a patient receiving both intravenous ceftriaxone AND oral metronidazole simultaneously would represent two courses; a patient receiving only ceftriaxone would represent one course.

Ethical considerations. Institutional ethical review was obtained for the study with particular attention to patient privacy in specialised care settings. The study implemented a "no-blame" approach to evaluate prescribing practices, ensuring that the assessment of antimicrobial use was conducted for quality improvement purposes without stigmatising individual prescribers or clinical teams.

Patient anonymisation protocols were implemented and required careful attention due to the potentially identifiable nature of rare conditions or procedures in a specialised obstetric-gynaecological setting.

The study was registered and conducted in accordance with institutional policies and national antimicrobial stewardship guidelines.

Results

Patient demographics. The point-prevalence survey was conducted in November 2025 at a 160-bed specialised obstetric-gynaecological hospital. The survey captured 142 hospitalised inpatients distributed across six acute care ward types: intensive care units (n=10), surgical wards (n=86), paediatric/neonatal wards (n=15), and therapeutic/high-risk pregnancy wards (n=31).

The study population included 124 adults (87.3%) and 18 children (12.7%). Among the 142 inpatients, 58 (40.8%; 95% CI 32.6–49.2%) were receiving antimicrobial therapy or prophylaxis at the time of the survey. The prevalence of antimicrobial use differed between age groups, with 55.5% (10/18) of children and 38.7% (48/124) of adults receiving antimicrobial agents, though this difference was not statistically significant ($\chi^2 = 1.24$, $p > 0.05$).

Table 1. Patient demographics and antimicrobial use by age group (n=142). AM, antimicrobial

Age group	Without AM (n)	On AM (n)	Prevalence (%)	Total (n)
Children	8	10	55.5	18
Adults	76	48	38.7	124
TOTAL	84	58	40.8	142

Overall antimicrobial use density.

The 58 patients on antimicrobial therapy were prescribed a total of 82 distinct treatment courses utilising 16 different antimicrobial agents. The overall AMU density was 1.4 courses per treated patient. Analysis by age group revealed that AMU density was higher in children (1.8 courses per treated child) than in adults (1.3 courses per treated adult), reflecting the complexity of paediatric and neonatal infections, which often require combination therapy.

AMU prevalence and density varied across different ward categories. Intensive care units demonstrated the highest prevalence (100%) with 1.8 courses per treated patient; paediatric and therapeutic wards demonstrated an intermediate prevalence (45–47%) and higher consumption density (1.2–2.4 courses per treated patient; surgical wards, despite managing high-acuity obstetric and gynaecological procedures, demonstrated the lowest AMU prevalence (31.3%) but with moderate consumption density (1.3 courses per treated patient), reflecting the predominance of surgical prophylaxis over therapeutic use in these settings.

Table 2. Antimicrobial Prevalence and Consumption Density by ward category. "Cons. Density", consumption density (courses per treated patient); "Prophyl", prophylactic antimicrobial use percentage (see Methods)

Ward Type	Patients (n)	On AM (n)	AMU Prevalence (%)	Cons. Density	Prophyl. (%)
Intensive Care Units	10	10	100	1.8	50
Paediatric Wards	15	7	46.7	2.4	43
Therapeutic Wards	31	14	45.1	1.2	7

Surgical Wards	86	27	31.3	1.3	70
TOTAL	142	58	40.8	1.4	48

Prophylactic and therapeutic use. The overall distribution of antimicrobial prescribing in this 160-bed specialised O&G hospital showed nearly equal division between prophylactic and therapeutic uses. Of the 58 patients on antimicrobials, 28 (48.3%) received prophylactic agents, while 30 (51.7%) received therapeutic antimicrobials. However, this overall facility-level balance masked substantially different prescribing patterns across individual ward types (see Table 2).

Intensive care units demonstrated balanced prophylaxis-to-therapy ratios (50%). Still, surgical wards were heavily prophylaxis-focused with 70% of antimicrobial courses administered for surgical prophylaxis, as expected given the predominance of caesarean deliveries and gynaecological surgical procedures. In contrast, therapeutic wards managing high-risk pregnancies were predominantly therapy-focused, with only 7% of antimicrobial courses used for prophylaxis and 93% directed toward treatment of documented or suspected infections. Paediatric wards showed an intermediate pattern with 43% of courses representing prophylactic purposes.

Antimicrobial distribution according to the WHO AWaRe classification. The 82 antimicrobial courses distributed across 16 distinct agents demonstrated substantial variation in prescribing patterns. The five most frequently prescribed antimicrobials accounted for almost three-quarters of all prescriptions (70.7%). Ceftriaxone was the most common agent (20/82; 24.4%), followed by cefazolin (11/82; 13.4%), cefoperazone + sulbactam (9/82; 11.0%), nitroxoline (8/82; 9.8%), and ampicillin (6/82; 7.3%).

The predominance of broad-spectrum agents was evident, with 40.2% of prescriptions including a *Watch* category antibiotic and 35.4% *Access* category antibiotics. It should be highlighted that 20.7% of the antibiotics belonged to the Unclassified category. This distribution indicates that 60.9% of antimicrobial prescriptions (50/82 courses) included broad-spectrum or unclassified agents, suggesting prescribing patterns characterised by empiric, rather than targeted, indication-specific selection.

Table 3. Antimicrobial agent distribution according to the WHO AWaRe Classification, number of courses and age.

Antimicrobial Agent	**Courses n (%)**	**Adults n (%)**	**Children n (%)**	**TOTAL**
Ceftriaxone	20	20	0	20
Cefazolin	11	11	0	11
Cefoperazone+Sulbactam*	9	4	5	9
Nitroxoline	8	8	0	8
Ampicillin	6	0	6	6
Gentamycin				5
Erythromycin				4
Ampicillin+Sulbactam				4
Metronidazole				4
Fosfomycin				3
Vancomycin				3
Cefotaxim				1
Azithromycin				1

Cefepime				1
Clarithromycin				1
TOTAL	**82**			**82**

*Cefoperazone + sulbactam is currently classified as "not recommended" by the WHO.

Adults predominantly received ceftriaxone (24.4%), cefazolin (13.4%), and nitroxoline (9.8%). In contrast, children more frequently received combination agents including cefoperazone + sulbactam (27.8%), ampicillin (27.8%), and gentamicin (27.8%).

Indication-specific prescribing patterns and appropriateness. Cross-tabulation of antimicrobial agents and clinical indications shows clear prescribing patterns. Ceftriaxone was mostly used for surgical prophylaxis (16/20 indications), respiratory tract infections (2/20), and surgical site infections (2/20). The Access cefazoline was used only for surgical prophylaxis (11 indications). The combination of cefoperazone + sulbactam was most commonly used for UTIs (8/9 indications), and nitroxoline was used for urinary tract infections (7/7 indications) (see Table 4).

Table 4. Antimicrobial agents prescribed for different clinical indications (n=82 courses). RTI, respiratory tract infection; UTI, urinary tract infection; SI, surgical infection; Surg Pr, surgical prophylaxis; Med Pr, medical prophylaxis; Cef+Sulb, cefoperazone + sulbactam.

Antimicrobial Agent	**UTI**	**Surg Pr**	**Med Pr**	**RTI**	**SI**	**TOTAL**
Ceftriaxone	1	12	—	6	1	20
Cefazolin	1	10	—	—	—	11
Cefoperazone+Sulbactam	1	—	3	5	—	9
Nitroxolin	8	—	—	—	—	7
Ampicillin	—	—	4	2	—	6
Gentamycin	—	—	—	4	1	5
Erythromycin	—	—	—	-	—	4
Ampicillin+Sulbactam	—	—	—	4	—	4
Metronidazole	—	2	—	2	—	4
Fosfomycin	2	—	—	1	—	**20**
Vancomycin	—	—	—	2	1	**11**
Cefuroxime	—	1	—	-	—	**9**
Cefotaxim	—		—	1	—	**8**
Azithromycin	—	1	—	—	—	**6**
Cefepime	—	—	—	—	—	**5**
Clarithromycin	—	—	—	1	—	**4**
TOTAL	**13**	**26**	**11**	**29**	**3**	**4**

Table 4 X presents the distribution of antimicrobial agents according to the indication for use. A total of 82 antimicrobial prescriptions were recorded during the study period, with respiratory tract infections (RTIs) accounting for the largest proportion of prescriptions (n=29), followed by surgical prophylaxis (n=26), urinary tract infections (UTIs) (n=13), medical prophylaxis (n=11), and skin infections (SIs) (n=3).

For the management of UTIs, four antimicrobial agents were prescribed. Nitroxoline was the most frequently used drug (n=8), followed by fosfomycin (n=2), while ceftriaxone, cefazolin, and cefoperazone/sulbactam were each prescribed once. Surgical prophylaxis was primarily based on ceftriaxone (n=12) and cefazolin (n=10), which together accounted for 84.6% of all

prescriptions for this indication. Metronidazole (n=2), cefuroxime (n=1), and azithromycin (n=1) were used less frequently.

Medical prophylaxis included 11 prescriptions and was mainly represented by ampicillin (n=4) and cefoperazone/sulbactam (n=3), while the remaining prescriptions were distributed among other agents. RTIs represented the most common indication for antimicrobial therapy, with ceftriaxone (n=6) and cefoperazone/sulbactam (n=5) being the most frequently prescribed antibiotics. Gentamicin and ampicillin/sulbactam were each used in four prescriptions, whereas vancomycin, metronidazole, fosfomycin, cefotaxime, and clarithromycin were prescribed less often.

Only three prescriptions were related to skin infections, for which ceftriaxone, gentamicin, and vancomycin were prescribed. Overall, ceftriaxone was the most commonly used antimicrobial agent (n=20), followed by cefazolin (n=11), cefoperazone/sulbactam (n=9), nitroxoline (n=7), and ampicillin (n=6). The predominance of third-generation cephalosporins reflects their extensive use both for prophylactic purposes and for the treatment of respiratory and urinary tract infections.

Surgical prophylaxis duration. As shown in Table 5, among the 28 patients receiving antimicrobial prophylaxis, 24 (85.7%) received it for surgical procedures, predominantly caesarean deliveries and gynaecological surgery.

Table 5. Surgical prophylaxis duration. Compliance (n=24 surgical prophylaxis cases). SP1, single preoperative dose (guideline-compliant); SP2, double dose within 24 hours (non-compliant); SP3, extended beyond 24 hours (non-compliant).

Duration Category	Clinical Definition	Number (n)	%
SP1 (Guideline-Compliant)	Single preoperative dose, no continuation	6	25.0
SP2 (Non-Compliant)	Two doses administered within 24 hours	4	16.7
SP3 (Non-Compliant)	Multiple doses extending beyond 24 hours	11	45.8
Unknown/Unclear Documentation	Unable to classify duration	3	12.5
NON-COMPLIANT (SP2+SP3)		15	62.5

Only six patients (25.0%) received guideline-compliant single-dose surgical prophylaxis (SP1), the evidence-supported standard. Four patients (16.7%) received double-dose prophylaxis within 24 hours (SP2), and 11 patients (45.8%) received multiple doses extending beyond 24 hours (SP3). This SP3 pattern of extended prophylaxis was documented in 62.5% of surgical prophylaxis cases (15/24).

Therapeutic indications and microbiological confirmation. Therapeutic antimicrobial use (30 courses) was concentrated in three primary infection sites: respiratory tract infections (60%, 18/30 courses), urinary tract infections (36.7%, 11/30 courses), and surgical infections (3.3%, 1/30 courses). Respiratory tract infections were the predominant therapeutic indication, accounting for 18 courses: 13 in adults and 5 in children, reflecting the high prevalence of pneumonia and respiratory tract infections in hospitalised populations. Urinary tract infections accounted for 11 courses, exclusively in adult patients. A single surgical infection was identified and managed.

Infection site-specific microbiological confirmation rates revealed important diagnostic patterns and significant opportunities for improvement. Respiratory tract infections demonstrated the highest confirmation rate at 44.4% (8/18 cases with documented microbiological evidence, such as sputum culture or lower respiratory tract sampling). Urinary tract infections demonstrated a substantially lower rate of confirmation at 27.3% (3/11 cases), despite the relative accessibility and ease of urine culture diagnostics. The single case of surgical infection lacked microbiological confirmation. Overall, only 36.7% (11/30) of the 30 therapeutic courses demonstrated documented microbiological confirmation through positive culture or serology, indicating that 63.3% of therapy was empirically prescribed without documented laboratory evidence of causative organisms.

Table 6. Microbiological confirmation rates for therapeutic antimicrobial courses by infection site. Microbiological confirmation includes a documented positive culture or serology that supports the antimicrobial selection. Overall confirmation rate: 36.7% (11/30 therapeutic cases); empiric therapy without confirmation: 63.3%.

Infection Site	**Total Cases (n)**	**Microbiologically Confirmed (n)**	**Confirmation Rate (%)**	**Adults/Children**
Respiratory Tract Infections	18	8	44.4	13/5
Urinary Tract Infections	11	3	27.3	11/0
Surgical Infections	1	0	0	1/0
Total therapeutic use	30	11	36.7	25/5

Guideline concordance. Overall guideline concordance-defined as antimicrobial selection appropriate for documented indication, patient age, and renal function-was 72.4% (42/58 patients), indicating reasonable but improvable adherence to evidence-based practices. Concordance was significantly higher in adult patients (77.1%, 37/48) compared to paediatric patients (50%, 5/10), suggesting that paediatric prescribing represents a particular stewardship vulnerability requiring enhanced guideline-based education and clinical decision support.

Ward-level analysis revealed substantial variation in concordance, with critical performance gaps identified in specific units, and these results will be used for stewardship purposes.

Documentation quality and guideline adherence. Medical record documentation of key antimicrobial prescribing parameters was generally strong throughout the facility. Indications for antimicrobial use were documented in 89.6% of prescriptions (52/58 cases), and discontinuation or review dates were documented in 89.6% of cases (52/58). Appropriate dosing for the indicated infection and antimicrobial agent was confirmed in 100% of cases (58/58), and appropriate route of administration (intravenous versus oral) was confirmed in 100% (58/58 cases). These high documentation rates regarding indication, dosing, and route suggest strong basic prescribing documentation practices within the facility, providing a solid foundation for stewardship improvement initiatives.

In contrast, microbiological confirmation rates—defined as documented evidence of positive culture, serology, or antigen detection supporting the antimicrobial selection—were substantially limited. Of 30 therapeutic courses, only 11 (36.7%) had microbiological confirmation, indicating that approximately two-thirds of therapeutic prescriptions were empirically selected without documented laboratory evidence.

Discussion

To our knowledge, this represents one of the first point prevalence surveys conducted in a specialised obstetric-gynaecological hospital with neonatal services in a resource-limited setting. This survey documented an overall antimicrobial prevalence of 40.8% (95% CI 32.6-49.2%) at this 160-bed specialised facility in Uzbekistan. The antimicrobial use density was 1.4 courses per treated patient, higher in children (1.8) than adults (1.3). A substantial ward-level variation was observed: as expected, intensive care units had a 100% prevalence, while, surprisingly, surgical wards had a 31.3% prevalence. The concordance with the existing guidelines was reasonable at 72.4% overall (77.1% adults vs. 50% children), with a range of 33.3-100% across wards, which means that there is space for improvement through antimicrobial stewardship actions.

The 40.8% prevalence is lower than published AMU data, according to PPS research in general hospitals; for example, Sierra Leone's 2023 national PPS reported 65.7% in obstetrics and gynaecology wards, and Nigeria's 2020 multicentre study documented 72.9% [6,7]. It should be highlighted that the low surgical ward use prevalence (31.3%) observed in this PPS in Uzbekistan likely reflects the inclusion of immediate post-operative patients requiring no therapeutic intervention beyond prophylaxis.

Surgical prophylaxis comprised 48% of all courses, consistent with the surgical nature of obstetric-gynaecological practice. Latin American multicentre studies similarly documented O&G prophylaxis as a significant portion of total antimicrobial use [8].

Surgical prophylaxis. A critical finding is the suboptimal adherence to surgical prophylaxis guidelines. Of 24 surgical prophylaxis cases, only 25.0% received guideline-compliant single-dose prophylaxis (SP1). In contrast, 62.5% received extended prophylaxis beyond 24 hours (SP3), and 16.7% received double-dose prophylaxis (SP2). Current evidence-based guidance consistently recommends single-dose perioperative prophylaxis for major obstetric and gynaecological procedures;[12] extended prophylaxis increases antimicrobial exposure without demonstrable clinical benefit. This 62.5% non-compliance rate found in this PPS substantially exceeds compliance gaps documented in some high-income countries, representing a highly actionable stewardship opportunity.

Diagnostic confirmation and empirical therapy. Only 36.7% (11/30) of therapeutic antimicrobial courses had microbiological confirmation, indicating that 63.3% were empiric therapy without laboratory evidence. Urinary tract infections were particularly poorly confirmed (27.3%) despite the availability of urine culture. Respiratory tract infections were confirmed in 44.4% of cases. Microbiology samples should be collected before starting empiric antibiotic therapy [13]; this is important because it is the best way to switch treatment if necessary once the results arrive, if the infection has not been solved yet, and, additionally, it is the best way to obtain systematic microbiology data to have data on the local aetiology and resistance patterns. Our findings highlight a gap in diagnostic-driven prescribing that compromises de-escalation strategies, a cornerstone of antimicrobial stewardship. Low confirmation rates suggest either inadequate diagnostic utilisation or system delays in communicating results, preventing clinicians from acting on available data. The lack of local resistance data is a driver of inappropriate

prescribing, pushing clinicians toward broad-spectrum or last-resort antibiotics due to uncertainty about the local resistance patterns. [14, 15]

Broad-spectrum agents comprised 60.9% of prescriptions, with *Watch* category at 40.2% (primarily ceftriaxone 24.4%, cefoperazone + sulbactam 11.0%) and *Access* category at 35.4%. This distribution indicates empirical rather than targeted selection. Ceftriaxone use for conditions such as uncomplicated urinary tract infection suggests possible overuse, as WHO AWaRe Access agents are preferred for such indications.[16] Notably, cefoperazone + sulbactam, traditionally classified by WHO as "not recommended, comprised 11% of courses. Although there can be local adaptations to practices recommended by the WHO, it is important that these adaptations are based on high-level evidence or local resistance data. However, the WHO Expert Group is reconsidering the classification of this fixed-dose combination under the Watch category, given its extended use, particularly in Asian countries [17].

Documentation quality. The facility demonstrates strong documentation of basic parameters. For example, the indication of use, one of the added values of PPS compared with other drug utilisation methods, was complete in 90% of cases, a proportion higher than in other surveys, such as a three-year PPS in Chinese hospitals, where the indication of use was available in only 55% of cases. [18] Other variables, such as discontinuation/review dates, dosing appropriateness, and route selection, were collected in 90-100% of patients. However, there is a relevant gap between documented indications (90%) and microbiological confirmation (36.7%), suggesting that prescribers document the clinical suspicion but do not obtain samples for microbiological testing, or don’t record or analyse these data. Diagnostic stewardship is a relatively new concept that involves interventions to improve the appropriate use of microbiological testing and diagnostics to guide clinical decisions. Underutilisation of diagnostic tests can negatively affect patient outcomes. [19] This is an opportunity to strengthen the review processes, assessing whether culture results are obtained and acted upon.

Study limitations. PPS has several advantages over other quantitative drug utilisation studies, but they also have well-known limitations. This single-centre, single-day snapshot per the WHO methodology cannot assess temporal variation, seasonal differences, or practice changes over time, unless the PPS is repeated periodically. The 142-patient sample, while representing complete enumeration, yields wide confidence intervals (32.6-49.2%) and limits power in small subgroups, particularly the 18 paediatric patients. Cluster effects within wards are not accounted for.

As previously highlighted, one of the PPS’s added values is information about the indication of use; however, the indication relies on the investigator's assessment of the documented clinical rationale. The WHO-AWaRe “unclassified” antimicrobial category accounted for 20.7% of the antimicrobials used in this study; the predominant substances in this classification were nitroxoline and the fixed-dose combination of cefoperazone and sulbactam. However, it should be noted that the AWaRe classification is dynamic and depends on the available evidence; WHO has already received a petition to reconsider some substances in this category. [17] Microbiological confirmation depends on documentation in the medical record; unreported results would underestimate the use of diagnostic-driven therapy.

Finally, the assessment required the investigator's judgment regarding "appropriateness. Reliance on documented clinical data meant that missing information (renal function, allergy history) could limit the assessment's completeness.

The way forward. The results of this PPS should serve as the basis for designing specific stewardship activities in the study hospital. Additionally, the method, piloted in this centre, could be replicated in other branches of the hospital or in other types of hospitals. Even this study could be considered a successful pilot for adaptation by other countries in the Region.

According to the main results, the hospital's stewardship implementation should prioritise optimising surgical prophylaxis protocols (to address 62.5% non-compliance), enhancing diagnostic-driven therapy through microbiological confirmation, and improving paediatric prescribing practices, supported by a formal stewardship committee with quarterly audit-and-feedback mechanisms. Secondary priorities include restricting the use of inappropriate broad-spectrum agents (particularly cefoperazone + sulbactam) and establishing system-level performance indicators to track compliance, de-escalation rates, and clinical outcomes longitudinally.

Conclusion

This survey identified substantial opportunities for antimicrobial stewardship improvement in surgical prophylaxis duration (62.5% non-compliance), diagnostic confirmation of therapeutic indications (63.3% empirical), and paediatric prescribing (50% concordance). The facility has demonstrated reasonable guideline concordance (72.4%) and appropriate agent selection, suggesting prescriber awareness of evidence-based practices provides a foundation for targeted interventions.

The five priority recommendations—surgical prophylaxis optimisation, diagnostic-driven therapy, paediatric guidelines, broad-spectrum agent stewardship, and system-level implementation—are aligned with WHO stewardship principles and are feasible for specialised facilities in resource-limited settings.] As one of the first detailed point prevalence surveys from a specialised obstetric-gynaecological hospital with neonatal services in a resource-limited setting, this study addresses a critical evidence gap and provides findings that can inform antimicrobial stewardship practice in similar specialised facilities throughout Central Asia and comparable healthcare systems.

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