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Original Research Article

Evaluation of antibiotic utilization pattern in indoor patients of obstetrics and gynaecology in a tertiary care hospital of central India

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ABSTRACT

Background: Understanding prescribing patterns is vital to address irrational antibiotic use, a key contributor to antimicrobial resistance. The aim of the study was to evaluate antibiotic prescription practices among hospitalized patients and examine the presence of an antibiotic stewardship program in a tertiary care hospital. The findings may aid in developing stewardship initiatives to promote rational antibiotic use.
Methods: A prospective observational study was conducted from March 1 to August 30, 2024, at Government Medical College and Hospital, Gondia, Maharashtra. Data were collected using WHO prescribing drug indicators and analysed using SPSS Version 25.
Results: The mean difference in final and initial serum creatinine values were observed to be 0.32 and 0.52 with a standard deviation of 0.228 and 0.387 in AM and GM group respectively. This difference was statistically significant with p value of 0.007. The mean difference in final and initial creatinine clearance values were observed to be 18.82 and 24.76 with a standard deviation of 10.14 and 11.93 in AM and GM group respectively. This difference was also statistically significant with p value of 0.013. Nephrotoxicity occurred in 9 out of 50 patients (18%) in AM group out of which 12% were male and 6% were female whereas in case of GM group nephrotoxicity occurred in 16 out of 50 patients (32%) in which 26% were male and 6% were female.
Conclusions: Prescribing patterns deviated from WHO indicators, with high empirical use. Strengthening antimicrobial stewardship and increasing microbiological testing are essential to improve antibiotic practices.

Keywords: WHO-DUI, Prescribing pattern, Antibiotic stewardship program, India

INTRODUCTION

Antibiotics are used for bacterial infections and are indispensable and vital in health care system.[1] Antibiotics are most frequently prescribed medications in hospitalized patients world-wide but are used inappropriately contributing to development of resistance.[2] There has been global increase in antibiotic usage until past few decades especially in low- and middle-income courtiers of south Asian subcontinent. Also, their use in non-medical sectors like agriculture and animal husbandry, poor infection control practices, substandard healthcare, self-medication further complicate situation. Increased antibiotic use and irrational use contribute to increased prevalence of resistance that accelerated and spread resistant organisms like pandemic.[5] Antibiotic resistances has become a global public health challenge. Antibiotic resistance caused deaths of 70000 per year and as per WHO will rise to 10 million next 5 years. MDR and XDR pose challenges for treating infections. Patient with such infections experience ineffective treatments, recurrent infections, prolonged infections and even deaths.[4] 6.15% morbidity/mortality in hospitalized patients in developing countries is related to inappropriate prescribing of antibiotics which can be

prevented. In developing countries antibiotics are not only misused but underused also, due to financial constraints and inadequate lab culture-sensitivity facility, lac institutional policy on antibiotic use and lac of stewardship program. CDCP recommends establishing antibiotic stewardship program (ASP) and rational use of antibiotics is much needed.[3] ASP is of utmost importance to optimize use of antibiotics to prevent emergence of resistance, increase quality of healthcare, reduce therapy cost and adverse drug reactions.[4] Studies on prescribing patterns monitors and evaluates prescribing practices and suggest modifications in prescribing habits of practitioners.[7,8] Poor infection control, weak laboratory facility for culture-sensitivity testing, lac of ASP is main factors in irrational use of antibiotics.[6] Understanding local resistance pattern and antibiotic usage may help to define appropriate empirical prescription regime. Many previous studies conducted in Indian OPDs have reported high prevalence of antibiotic resistance, but very limited data are available regarding antibiotic prescribing pattern based on WHO-DUI among hospitalised patient in resource limited settings.

The aim of the study was to investigate prescribing- pattern of antibiotics in indoor hospitalized patients of obstetrics and gynaecology in tertiary care hospital. To identify most frequently prescribed antibiotics for hospitalised patients and reasons of it.

METHODS

Study setting

The study was conducted on indoor hospitalized patients in obstetrics- gynaecology ward (OBGY) of a tertiary care teaching hospital, Government Medical College and Hospital, Gondia, Maharashtra.

Study design and period

The study was prospective cross sectional observational study from 01 March 2024 to 30 August 2024.

Study population

All patients hospitalised in OBGY ward were the source of population admitted during study period. Inclusion criteria: All newly admitted patients in wards during study period. Exclusion criteria: Patients on long term antibiotic like anti-tubercular, anti-retroviral were excluded.

Sample size

The sample size was 140 indoor patients.

Study variables

Socio-demographic data (age, gender, residence, diagnosis, antibiotic information: indication, regime/ combination, frequency, antibiotic culture- sensitivity information were studied.

Data collection tools

WHO prescribing indicators was the tool used.

Data collection procedure

Data was collected in Case Record Form using patient's medical chart and included: Socio- demographic characteristics and diagnosis; type and number of antibiotics prescribed; antibiotic choice, route, dose, duration frequency, specific instructions if any.

Data analysis and statistics

Data were entering using excel spread sheets and analysed using software SPSS version 25. Data was expressed as (mean±SD) for continuous variation and for descriptive statistics i.e. for categorical data percentage (%) and frequencies were used.

Ethical approval

Ethical clearance and approval were obtained from IEC with reference number 96/31/08. Study was conducted in accordance with Declaration of Helsinki. written informed consent was obtained from each participant before the conduct of study participants information was kept confidential and privacy were kept by eliminating personal identifiers and curbing data access. Right of patient to withdraw/not was respected.

RESULTS

Socio-demographic characteristics

A total of 140 female patients at least on one antibiotic were included in this study. Majority of them were from rural poor background involved in daily wedges labour work. The mean age of patient was (28±7) (Table 1).

Table 1: Socio-demographic characteristics of patients (n=140).

Variables	Category	Values
Gender	Female	140
Age in years	-	28±07
Residence	Rural/urban	135/05
Marital status	Married/unmarried	140/Nil
Occupation	Labour/normal	98%/ 02%
Diagnosis	Infection/surgical cases	52 (37.15%)/ 88 (62.86%)

The detailed values of infection and surgical cases under diagnosis are shown in Figure 1 and 2.

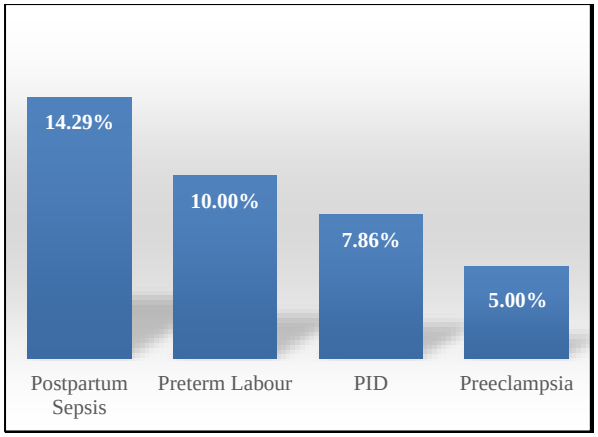

Figure 1: Diagnosis of infection (n=52).

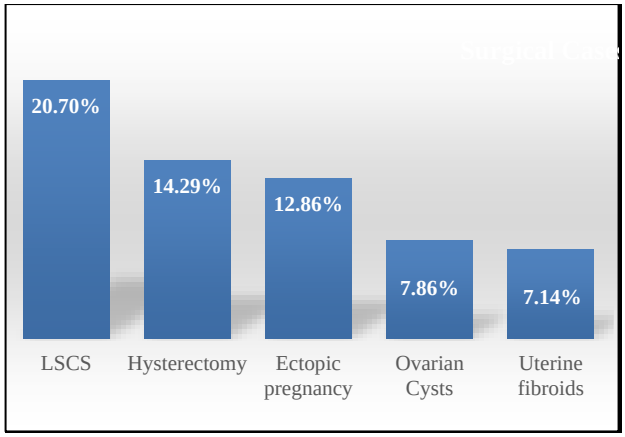

Figure 2: Diagnosis of surgical cases (n=58).

Table 2: WHO prescribing indicators (n=230).

Prescribing indicator	Values	Percentage (%)	WHO optimal
Average no. of antibiotics per patient	2.48±0.6	-	1.6-1.8
Percentage antibiotics prescribed by generic names	230	100	100
Percentage antibiotic prescribed from hospital list/ National Essential Medicines List (NEML)	2300	100	100
Percentage of injectable used	59	42.14	13.4 -24.1
Percentage broad spectrum/combinations of antibiotics used	67	47.86	
Percentage antibiotic use after culture/sensitivity	44	31.43	
Average duration of prescribed antibiotics	4.2±02		
Percentage antibiotic for therapeutic (infection) purpose	80	55	

Table 2 shows prescribing pattern as per WHO indicators. Out of 140 admitted patients total (230) antibiotics were prescribed. Average number of antibiotics prescribed per patient was found to be 2.48±0.62.

Highest number of antibiotics i. e. 4 antibiotics were prescribed for surgical indications for duration of (4.2-2.3 days) and longest duration of antibiotic use was i. e. (11 days) observed for infections.

Percentage of antibiotic prescribed referring hospital list and using generic names were (100%). Injectable antibiotic use was in 59 (42.14%) while oral form used in 81 (57.86%). Broad spectrum or combinations of antibiotics used were 67 (47.86%). Out of 140 cases just in 44 cases (31.43%) culture-sensitivity testing of antibiotic were done. Rest received antibiotics empirically used. 80 (55%) of the antibiotic were prescribed for therapeutic (infection) purpose for treating postpartum sepsis and 45 (15%) for prophylactic purpose (surgical) mostly for LSCS.

Hospital and patient care indicators

The hospital had hospital drug list containing 55 general antibiotics. The hospital also had a drug and therapeutic audit committee which is partially functional. No STG existed in hospital for infectious diseases. During study period 80% of antibiotics were available in the stock. For average of 8.8 days the key antibiotics were out of stock in a month during study period. Patient took antibiotics for average (4.2±2.3) days during hospital stay. Majority i.e.; 60% of antibiotic were prescribed for a duration greater than 7 days. 24.8% i.e.; nearly one quarter of the patient took antibiotic for 5-7 days and only 9.2% for less than 3 days (Figure 3). Rational use with respect to appropriate choice, duration and frequency were achieved in 74 (53%) cases however only 50 (35.7%) and 66 (47%) mentioned proper dose and explicit instructions for follow-ups that is a crucial component of effective treatment and patient compliance respectively (Table 3). The commonly preferred antibiotics was amoxicillin and clavulanic acid (22.86%) followed closely by ciprofloxacin (22.14%) ceftriaxone (21.43%), metronidazole (18.57%,) azithromycin (15%), amikacin (2.1%), vancomycin (2.1%), combinations (21.43%) (Table 4).

Table 3: Rational use of antibiotics (n=140).

Indicators	Value (%)
Correct choice	74 (53)
Correct dose	50 (35.7)
Correct duration	74 (53)
Correct frequency	74 (53)
Follow-up instructions	66 (47)
Rational use	74 (53)

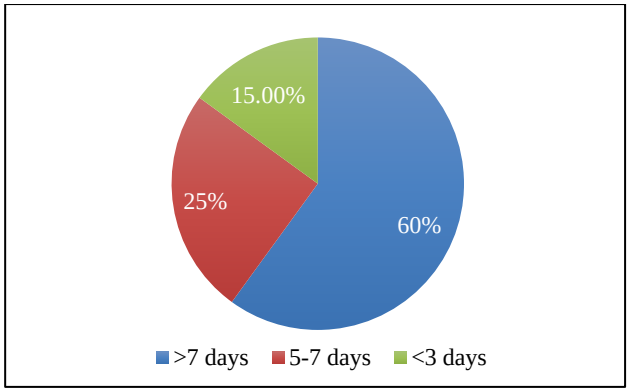

Figure 3: Duration of treatment in days.

Table 4: Type of antibiotic prescribed (n=230).

Indicators	Value (%)
Amoxicillin clavulanic acid	32 (22.86)
Ciprofloxacin	31 (22.14)
Ceftriaxone	30 (21.43)
Metronidazole	26 (18.57)
Azithromycin	21 (15)
Amikacin	5 (2.1)
Vancomycin	5 (2.1)
Combinations	30 (21.43)

DISCUSSION

The WHO, in collaboration with the International Network for the Rational Use of Drugs (INRUD), developed a set of core drug use indicators aimed at assessing drug utilization in healthcare facilities. These indicators are essential tools for promoting rational drug use, evaluating drug use practices, and understanding medication use trends at national, regional, or facility levels. The core indicators are grouped into three categories: prescribing indicators, which assess how medications are prescribed; patient care indicators, which evaluate the quality of services provided to patients; and health facility indicators, which examine the infrastructure and systems supporting rational drug use.

In the current study, the pattern of antibiotic prescriptions was assessed in the OBGY wards of a tertiary care teaching hospital, utilizing the WHO prescribing indicators. The aim was to inform the future development of an ASP for better infection management. Notably, this hospital currently lacks both an institutional STG and an ASP to guide antibiotic therapy. During the study period, the antibiotic prescribing rate was observed to be 100%, significantly higher than the WHO-recommended rate of 20-25.4%. Excessive use contributes to bacterial resistance. This figure was higher than those observed in previous studies conducted in Ethiopia (82.1%), Ghana (73%), Nigeria (72.1%), central India (74%), Pakistan (56.7%).[9-13]

In this study, 32% of patients were prescribed at least one antibiotic, a proportion that is comparable to findings from Ethiopia (52.3%) but notably higher than reports from Denmark (12.1%).[6,15] This variation may be attributed to differences in study populations; while the Ethiopian and Danish studies focused on community-dwelling outpatients receiving oral antibiotics, our study involved hospitalized patients receiving both oral and injectable antibiotics. The average number of antibiotics per patient was 2.48±0.62, surpassing the WHO recommended range of 1.6-1.8. This value is similar to data reported from Kerala (2.2), Gujarat (2.1) but higher compared to Pakistan (20.17%).[16-18]

An important observation was that all prescribed antibiotics (100%) were selected from the hospital's formulary and the National Essential Medicines List (NEML) of India. This aligns with findings from Ethiopia, where antibiotic prescriptions were also fully aligned with the NEML.[7] A plausible explanation for this trend is that public hospitals in India predominantly procure medications through government channels, which prioritize essential medicines listed in the NEML. However, several studies have shown variations from the WHO's benchmark of 100% adherence- such as Tanzania (99.8%), Nepal (67%).[19,20]

Another significant outcome was the high rate of injectable antibiotic use, recorded at 42.14%. This rate mirrors findings from Ethiopia (35.8%), but is higher compared to studies in Zambia (28.4%), Nepal (28%).[20-23] where lower usage may be linked to outpatient-focused research. Injectables are typically reserved for hospitalized patients, which may explain the increased use in our study. Nonetheless, the overuse of injectable antibiotics can be considered irrational prescribing. Prescribers should be encouraged to opt for oral formulations when appropriate, as this could help minimize risks associated with injections (such as infections and anaphylaxis), reduce the length of hospital stays, and lower healthcare costs.

Out of the 55 essential antibiotics assessed during the study period, 80% were found to be available in stock, which is comparable to findings from Ethiopia (81.3%).[15] However, this availability was higher than what was reported in Pakistan (72.4%), and Sudan (62.2%).[18,24,33] Despite this, the availability rate falls short of the WHO recommendation, which states that key antibiotics should always be in stock. Limited availability can influence prescribers to opt for less effective or more expensive alternatives, thereby contributing to antimicrobial resistance. In this study, key antibiotics were out of stock for an average of 8.8 days per month. This duration is longer than that reported in several middle-income countries, but shorter than in South Africa.[21,22,29,32]

Another observation from the study was that patients received antibiotics for an average of 4.2±2.3 days during hospitalization, which is shorter than the recommended standard. It was noted that in 60% of cases, antibiotics

were administered for more than 7 days, while 9.9% of patients received them for fewer than 3 days. These findings are similar to data from Eristria (6.36 both overuse and underuse of antibiotics in hospitals may be addressed by implementing institutional STGs.[14,28]

A positive finding in our study was that all antibiotics were prescribed using their generic names, in line with WHO recommendations. Generic prescribing ensures access to affordable, quality-assured antibiotics. This rate surpasses those observed in Ethiopia (97.6%), Zambia (96.5%). reflecting a strong adherence to rational prescribing practices that should be sustained and promoted.[15,20,21,30]

In terms of prescribing patterns, five types of antibiotics were used either as monotherapy or in combinations. However, antibiotic susceptibility testing was performed in only 31.43% of cases, with the majority of antibiotics being prescribed empirically. A similar trend was observed in Ethiopia, where 60% of antibiotics were prescribed without culture sensitivity testing.[25,27] The most frequently prescribed antibiotics in our study were amoxicillin-clavulanic acid (22.86%), ciprofloxacin (22.14%), ceftriaxone (21.43%), metronidazole (18.57%), azithromycin (15%), and both amikacin and vancomycin (2.1% each). Combination therapy accounted for 21.43% of prescriptions.

In a related study from Northwest Ethiopia amoxicillin (28.5%) and ciprofloxacin (12%) were the most prescribed antibiotics.[25]

For hospitalized patients in the OBGY department, the primary indications for antibiotic use included postpartum infections, sexually transmitted infections treated with azithromycin, MRSA-related skin and soft tissue infections managed with vancomycin, and surgical site infections typically treated with ceftriaxone- similar to observations in study of Ethiopia.[15] In contrast, a study from Zambia reported amoxicillin (23.4%), ciprofloxacin (8%), ceftriaxone (7.4%) as the most prescribed antibiotics.[21] This difference may stem from the nature of our study setting- a tertiary care teaching hospital- where prescribers are more likely to consider resistance patterns and choose antibiotics accordingly for complex cases referred from primary healthcare centre (PHC).

Limitations

Our study has certain limitations. As the antibiotic prescribed pattern was investigated from single hospital, the result cannot be generalized to all hospital in central India and not for outpatients. We found very limited data on antibiotic prescribed indicators in indoor patient hence we compared with outpatient data mostly.

CONCLUSION

Our study evaluated prescribing pattern of antibiotic in OBGY ward. In this study more than half of the patients were on at least one antibiotic. All antibiotics were prescribed from hospital list/NEML using generic names however with less culture-sensitivity testing. The prescribing pattern of antibiotic in the hospital deviates and non-compliant with WHO-standard. This problem may be reduced by developing an ASP, adherence to practices of prescribing antibiotics with the aid of culture-sensitivity testing, developing institutional STG for infections etc.[25,27]

Recommendation

This work will add evidence for policy market to design strategies and intervention to enhance rational prescriptions of antibiotics among hospitalised patient in India and to develop antibiotic prescribing guidelines and antibiotic stewardship program as intervention at institutional level.

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Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

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