

Appropriateness of antimicrobial prophylaxis practices according to the guidelines in two common gynaecological surgeries

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ABSTRACT

Background: Most postsurgical infections can be prevented through the effective use of antimicrobial. This study was conducted to investigate the antimicrobial prophylaxis practices and adherence to guidelines in gynecological surgeries.

Methods: An audit based prospective study was carried out between February and April 2019 in the gynecological ward in a teaching hospital, Peshawar, Pakistan. This study included women who had two common surgical procedures (caesarean surgery and hysterectomy), did not undergo any previous surgery and having no infection at the time of surgery. The indication, choice/selection, timing and pattern of antimicrobials were the main evaluated parameters. The required information was collected from medical records through standardized data collection proforma. Observed prescribing practices were compared with antimicrobial prophylaxis guideline.

Results: A total of 264 patients (caesarean surgery $n = 173$ and hysterectomy $n = 91$) with mean age: 32.6 ± 6.3 years were recruited in the analysis. Antimicrobial was prescribed to 241 patients (91.3%). The selection and timing of antimicrobial were adhered to guidelines in 40.7% and 56.4% cases, respectively (optimal value 100%). There was a statistically significant difference between guideline recommendations and antimicrobial practice in surgical procedures ($P = 0.000$). The commonly prescribed antimicrobials were ceftriaxone (22.4%) and cefazolin (22%). The combination usage of antimicrobial was also observed.

Conclusion: Inappropriate use of antimicrobial prophylaxis and low adherence to standard guidelines was observed. Periodic audit and awareness about standard guidelines are required for the judicial use of antimicrobials in surgery.

Key words: Antimicrobials; audit; hospital; infection; Pakistan; surgery.

Introduction

Most postsurgical infections can be prevented through the effective use of antimicrobial prophylaxis.^[1-4] Inappropriate utilization of antimicrobial is the main factor for increased resistance, risk of adverse events; therefore, the judicial use of antimicrobials is crucial for the prevention of unwanted effects.^[2,5,6] Previously published studies reported the

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overconsumption, unnecessary utilization of broad-spectrum antimicrobials and inappropriate timing of administration in their health care settings.^[1,6,7]

The incidence rate of infection is higher in gynecological procedures as compared with other surgeries.^[7] Nonadherence with appropriate usage of surgical antimicrobial prophylaxis and timing ultimately reduces its efficacy and increases the risk of surgical infections.^[7-10] Gynecological surgeries are the common procedure and more vulnerable to surgical infection.^[7] Furthermore, very little is known about antimicrobial prophylaxis usage in women who underwent gynecological surgeries in our health care settings. Therefore, this study was carried out to audit antimicrobial prophylaxis practice (selection, timing and pattern of antimicrobials) and investigate compliance with standard guidelines in two most common gynecological procedures (Caesarean surgery and hysterectomy) in a teaching hospital.

Methods

Study design

An audit based prospective study was carried out between February and April 2019 in the gynecological ward in Khyber Teaching Hospital (KTH), Peshawar, Pakistan. This is a more than 600-beds government-funded tertiary care teaching hospital.

Inclusion criteria

Women who had selected surgical procedures (caesarean surgery and hysterectomy), did not undergo any previous surgery and having no infection at the time of surgery were included.

Exclusion criteria

Medical charts of the patients with missing information, received antimicrobial for other purposes and those who underwent more than one surgical procedure were excluded from this study.

Evaluated parameters

The indication, choice/selection, timing and pattern of antimicrobials were the main evaluated parameters in this study.

Data collection and analysis

The required information was collected from medical records through standardized data collection proforma. Observed prescribing practices were compared with antimicrobial prophylaxis guideline.^[9] All the prescriptions were evaluated against each aforementioned recommendation and adherence

rate was calculated by dividing the adherent cases to total cases. The detail criteria to International evidence-based guidelines are presented in supplementary file 1.

Statistical analysis

Finally, the data were entered into SPSS 22.0 statistical software package for descriptive statistics (frequency, percentages) and Chi-square analysis. A *P* value of 0.05 or less was defined as statistically significant.

Ethical approval

The study was approved by ethical review board of concerned hospital.

Results

A total of 272 surgical procedures were included and out of these 8 (2.9%) patients were excluded due to the missing information (3 patients), received antimicrobial for other purposes (2 patients) and having previous surgery (3 patients). Finally, 264 surgical cases (caesarean surgery *n* = 173, hysterectomy *n* = 91) of patients with mean age: 32.6 ± 6.3 years were recruited in the analysis.

Indication

According to the protocols, antimicrobials were indicated for all surgical procedure, however non-use of antimicrobial was observed in 8.9% of cases. A total of 23 patients did not receive antimicrobial: 14 patients in caesarean surgery and 9 in hysterectomy. Antimicrobials were prescribed to 241 patients (91.3%). There was a statistically significant difference between guideline recommendations and antimicrobial usage (*p* = 0.013) [Table 1].

Choice of antimicrobial

The choice of antimicrobial adhered to guidelines in 98 patients out of 241 patients who received antimicrobials. The rate of the correct choice of antimicrobial was more in hysterectomy (62.2%) as compared to caesarean surgery (29.5%); *P* = 0.000. A total of 143 (59.3%, consisting of 112 in caesarean surgery and 31 in hysterectomy) patients received antimicrobials differing from the recommended option of the guidelines [Table 1].

Timing

The appropriate timing of administration within an optimal range (within 30–60 min before surgical incision) was noted in more than half of the patients (56.4%). The timing was inappropriate in 43.6% of the patients (caesarean surgery *n* = 61 and hysterectomy *n* = 44) [Table 1]. There was

also a statistically significant difference between guideline recommendations and timing of administration in selected surgical procedures; $P = 0.000$ [Table 1].

Utilization pattern of antimicrobials

The most commonly prescribed antimicrobials were ceftriaxone (22.4%) and cefazolin (22%). The combination of ampicillin/sulbactam (9.5%), piperacillin/tazobactam (9.5%), and amoxicillin/clavulanic acid were also prescribed for prophylaxis. Different types of antimicrobial regimens were used to manage caesarean and hysterectomy surgical patients. The details are summarized in Table 2.

Discussion

A comprehensive assessment about appropriate prescribing practices of antimicrobial prophylaxis amongst two most common gynecological procedures in a tertiary care hospital was investigated in this study. To the best of our knowledge, this kind of research has not been previously conducted in our setting. This study revealed inappropriate surgical antimicrobial prophylaxis contradictory with evidence based standard treatment guidelines. Gynecological surgeries (mainly caesarean surgery and hysterectomy)

are the most common surgical procedure in our settings and classified as clean-contaminated wound surgeries. The finding of this study should be valuable and important for the antimicrobial stewardship strategies.

Most of the patients received surgical antimicrobial prophylaxis in this audit-based study. However, the nonuse when it is recommended in 8.7% (23 out of 264) cases leads to increase chances of infection development and its related consequences with increasing length of stay, morbidity, and mortality.^[7,11] Among the recommended (91.3%) indication according to standard protocols, only 40.7% of the selection were adequate. The poor compliance with international guidelines was also reported in previous studies.^[3,7,12-14] The general lack of awareness by health care practitioners towards international guidelines and the absence of local clinical guidelines were demonstrated through these results.^[11,4,7,15]

The use of narrow-spectrum antimicrobials advocates by International guidelines for the surgical procedure.^[2,9] Cefazolin is the recommended first choice and provide adequate coverage for surgical infections.^[9] Cefazolin was easily available in our health care setting, but the results

Table 1: Antimicrobial prophylaxis practices in gynaecological surgeries (n=264)

Indicators	Caesarean surgery (n=173)	Hysterectomy (n=91)	Total n (%)	Guidelines optimal value	P
Non-usage of antimicrobial n (%)	14 (8)	9 (9.9)	23 (8.7)	-	0.013
Use of antimicrobial n (%)	159 (92)	82 (90.1)	241 (91.3)	100%	
Choice of antimicrobial					
Appropriate n (%)	47 (29.5)	51 (62.2)	98 (40.7)	100%	0.000
Inappropriate n (%)	112 (70.5)	31 (37.8)	143 (59.3)	-	-
Timing of antimicrobial					
Appropriate n (%)	98 (61.6)	38 (46.3)	136 (56.4)	100%	0.000
Inappropriate n (%)	61 (38.4)	44 (53.7)	105 (43.6)	-	-

n=Number; % Percentage; A $P=0.05$ or less was defined as statistically significant

Table 2: Utilization pattern of antimicrobials in surgical procedures (n=241)

Antimicrobials	Dose	Caesarean surgery n (%)	Hysterectomy n (%)	Total n (%)
Ceftriaxone	2 g	41 (25.8)	13 (15.8)	54 (22.4)
*Cefazolin	2 g	35 (22)	18 (21.9)	53 (22)
*Ampicillin-sulbactam	3 g	8 (5)	15 (18.3)	23 (9.5)
Piperacillin/tazobactam	4.5 g	15 (9.4)	8 (9.7)	23 (9.5)
Ciprofloxacin	400 mg	19 (11.9)	3 (3.6)	22 (9.1)
Amoxicillin/clavulanic acid	1.2 g	13 (8.1)	2 (2.4)	15 (6.2)
**Gentamicin	5 mg/kg	12 (7.5)	3 (3.6)	15 (6.2)
*Cefotetan	2 g	2 (1.2)	10 (12.1)	12 (4.9)
Cephadrine	1 g	6 (3.7)	1 (1.2)	7 (2.9)
Metronidazole	400 mg	5 (3.1)	2 (2.4)	7 (2.9)
*Cefoxitin	2 g	0	4 (4.9)	4 (1.6)
**Vancomycin	15 mg/kg	3 (1.9)	1 (1.2)	4 (1.6)
Amikacin	500 mg		2 (2.4)	2 (0.8)
Total		159 (100)	82 (100)	241 (100)

n=Number; % Percentage; g=Gram, mg=Milligram, *first options and **alternative guideline-recommended option

of this audit showed that third-generation cephalosporins specifically ceftriaxone was frequently used for prophylaxis. This finding was supported by the studies conducted in Ethiopia^[1], Sudan^[12], Nigeria^[7], and Turkey.^[13] Ceftriaxone is not mainly recommended for prophylaxis purposes due to the emergence of bacterial resistance, less coverage against staphylococcus, and higher cost.^[1,12]

The timing of prophylaxis was another important indicator and often inappropriately reported by different studies.^[1,7,11,13,14] According to guidelines, the correct time of administration is within 30–60 min before the surgical incision.^[2,9] A total of 136 (56.4%) patients received antimicrobial within optimal time according to this study. The studies carried out in Turkey (59.2%)^[13] and Ethiopia (52.3%)^[1] also reported similar findings. Compliance rate with timing of antimicrobial was higher than the studies of Abubakar U *et al.*^[7] (16%) and Saied T *et al.*^[16] (2%), however lower than Elbur A *et al.*^[17] (70.4%) study. Less protection was received by patients who did not receive the antimicrobial at the optimal time, as described in the literature.^[1,2,7,9,13]

The important role of guidelines for the improved quality of antimicrobial usage was indicated in several previous studies.^[1,12-14] The consensus among surgeons is one of the main factors for the development and implementation of standard guidelines.^[1,13] Currently, there are no national standards or guidelines in Pakistan. There is also unavailability of guidelines in our study setting. The infection control staffs and therapeutic drug committees of any hospital are responsible for the periodic audit of antimicrobial use. Unfortunately, despite the presence infection control staffs and therapeutic drug committees in selected hospital, there were no data available about the actual consumption of antimicrobials. Low compliance rate in this study could be due to the lack of protocol for surgical antimicrobial prophylaxis. Similar reason was also reported in previously published studies.^[1,4,7,16]

Study limitations

This study has several limitations which should be considered. First, patient's co-morbidities, duration of antimicrobial prophylaxis and surgery were not evaluated in this audit-based study. Secondly, the study did not monitor the postsurgical infection rate. Therefore, we do not know if the nonadherence to the guidelines had any clinical consequences. Finally, this study uses published recommendations of Clinical Practice Guidelines for antimicrobial prophylaxis in Surgery to measure appropriateness of antimicrobial practices according to evidence-based international standards, as there were no local consensus guidelines available in our hospital.

Conclusions

In conclusion, 91% of women who underwent surgical procedures received antimicrobials. Low adherence rate with standard guidelines was observed. The selection and timing of surgical antimicrobial prophylaxis were the main nonadherent parameters in this study. Periodic audit, future research studies, awareness about standard guidelines and implementation of antimicrobial stewardship programs are required for the judicious use of antimicrobials in surgery.

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Conflicts of interest

There are no conflicts of interest.

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