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Original Research Article

Antibiotic prophylaxis versus empirical therapy in routine abdominal hysterectomy in tertiary care hospital

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ABSTRACT

Background: Surgical site infection remains an important cause of postoperative morbidity after abdominal hysterectomy. Although antibiotic prophylaxis is widely recommended, empirical postoperative antibiotic therapy is still commonly practiced in many tertiary care settings. This study aimed to compare the clinical outcomes of antibiotic prophylaxis and empirical therapy in routine abdominal hysterectomy.
Methods: This comparative study included 88 women undergoing routine abdominal hysterectomy in the Department of Obstetrics and Gynaecology, Chittagong Medical College Hospital. Participants were divided into two groups of 44 patients each. Group-A received antibiotic prophylaxis with intravenous ceftriaxone 1 g, administered 30 minutes before surgery. Group-B received the same preoperative dose followed by intravenous ceftriaxone 1 g 12-hourly for 72 hours and oral cefixime 400 mg twice daily for 7 days. Patients were followed for 30 days. Outcomes included superficial surgical site infection, postoperative complications, further antibiotic requirement, wound condition and duration of hospital stay.
Results: Superficial surgical site infection occurred in 5 patients (11.4%) in Group-A and 7 patients (15.9%) in Group-B, with no statistically significant difference (p=0.534). Postoperative complications were observed in 43.2% of Group-A and 36.4% of Group-B patients (p=0.513). Further antibiotic use was required equally in both groups, 8 patients (18.2%) each (p=1.000). Healthy wound condition during follow-up was observed in 88.6% and 86.4% of patients, respectively (p=0.747). Mean hospital stay was 6.75±4.27 days in Group-A and 8.18±6.42 days in Group-B (p=0.221).
Conclusions: Single-dose antibiotic prophylaxis showed comparable clinical outcomes to empirical postoperative therapy in routine abdominal hysterectomy and may support rational antibiotic use.

Keywords: Abdominal hysterectomy, Antibiotic prophylaxis, Antimicrobial stewardship, Ceftriaxone, Empirical therapy, Postoperative morbidity, Surgical site infection, Tertiary care hospital

INTRODUCTION

Abdominal hysterectomy is one of the most frequently performed major gynaecological operations worldwide for the management of benign uterine conditions such as uterine fibroids, abnormal uterine bleeding, adenomyosis and endometriosis. Despite advances in surgical techniques, anaesthesia and perioperative care, postoperative infectious complications remain an important cause of morbidity following hysterectomy. Surgical site infection (SSI), febrile morbidity, urinary tract infection and pelvic infections can adversely affect postoperative recovery, prolong hospital stay and increase the need for additional antibiotic therapy.[1,2] Consequently, effective strategies for infection prevention have become an essential component of modern gynaecological surgery. Antibiotic prophylaxis has been established as one of the most effective interventions for reducing postoperative infectious morbidity. International guidelines recommend administering an appropriate prophylactic antibiotic within 60 minutes before surgical incision to ensure adequate tissue concentrations during surgery, thereby minimizing bacterial contamination of the operative field.[3,4] In abdominal hysterectomy, where contamination from endogenous vaginal flora is unavoidable, timely prophylactic antibiotic administration has consistently been shown to reduce the incidence of surgical site infection and other postoperative infectious complications without requiring prolonged postoperative antibiotic use.[2,5]

Although evidence-based guidelines strongly advocate single-dose or short-course prophylactic antibiotics, empirical postoperative antibiotic therapy continues to be widely practiced in many low- and middle-income countries. This practice is often influenced by concerns regarding inadequate infection control measures, delayed presentation of patients, institutional prescribing habits and fear of postoperative infection rather than by established clinical evidence.[6,7] Such unnecessary antibiotic exposure may contribute to antimicrobial resistance, adverse drug reactions and disruption of antimicrobial stewardship programmes while offering limited additional protection against postoperative infection.[3,6]

Previous studies have demonstrated that appropriate prophylactic antibiotic selection is associated with lower rates of postoperative infection following hysterectomy, emphasizing the importance of adherence to standardized perioperative antibiotic protocols.[8,5] However, evidence from Bangladesh comparing prophylactic antibiotic administration with empirical postoperative therapy in routine abdominal hysterectomy remains limited. Given the increasing global concern regarding antimicrobial resistance and the need for rational antibiotic use, evaluating these two treatment strategies in the local clinical setting is highly relevant. Therefore, this study aimed to compare antibiotic prophylaxis with empirical therapy in women undergoing routine abdominal hysterectomy and to assess their impact on postoperative clinical outcomes in a tertiary care hospital.

METHODS

This comparative observational study was conducted in the Department of Obstetrics and Gynaecology, Chittagong Medical College Hospital, Chattogram, Bangladesh, from 19 January 2020 to 30 June 2020. Women admitted for routine abdominal hysterectomy due to benign gynaecological conditions were included in the study after obtaining informed written consent. Patients with pre-existing infection, immunosuppression, malignancy, emergency surgery or incomplete records were excluded. Participants were divided into two groups according to the antibiotic regimen received: Group A received antibiotic prophylaxis before surgery, while Group B received empirical antibiotic therapy after surgery according to institutional practice. Relevant perioperative and postoperative clinical data were collected using a structured data collection sheet. The main outcome variables included postoperative fever, surgical site infection, wound discharge, urinary tract infection, pelvic infection and duration of hospital stay. All patients were followed during the postoperative period to assess infective morbidity and recovery outcomes.

Inclusion criteria

Women admitted for routine abdominal hysterectomy for benign gynaecological conditions who provided informed written consent to participate.

Exclusion criteria

Patients with pre-existing infection, immunosuppression, malignancy, emergency (non-elective) hysterectomy, or incomplete medical records were excluded from the study.

Operational definitions

Antibiotic prophylaxis: Administration of an appropriate antibiotic before surgical incision to prevent postoperative infection.

Empirical therapy: Antibiotic treatment given after surgery based on clinical judgment, without confirmed microbiological evidence of infection.

Routine abdominal hysterectomy: Planned removal of the uterus through an abdominal incision for benign gynaecological indications.

Surgical site infection: Infection occurring at the surgical wound site during the postoperative period, indicated by redness, pain, discharge, swelling or wound gaping.

Postoperative febrile morbidity: Body temperature of 38°C or more occurring after surgery, excluding the first 24 hours, with or without clinical evidence of infection.

Data analysis

Data were checked, cleaned and analyzed using SPSS software, version 27.0. Categorical variables were expressed as frequency and percentage, while continuous variables were presented as mean ± standard deviation. The Chi-square test or Fisher's exact test was used to compare categorical variables between groups. The independent sample t-test was used for normally distributed continuous variables. A p-value of less than 0.05 was considered statistically significant.

RESULTS

Table 1 shows the socio-demographic characteristics of the study participants. The mean age was comparable between Group-A and Group-B, with no statistically significant difference in age distribution (p=0.382). Educational status was also similar between the two groups (p=0.375). However, monthly family income differed significantly between groups, with a higher proportion of lower-middle-income patients in the empirical therapy group (p=0.007).

Table 1: Socio-demographic characteristics of the patients.

Characteristics	Group A-Prophylaxis, N (%)	Group B-Empirical, N (%)	Total, N (%)
Age group 36-45 years	21 (47.7)	19 (43.2)	40 (45.5)
Age group 46-55 years	22 (50.0)	21 (47.7)	43 (48.9)
Age group >55 years	1 (2.3)	4 (9.1)	5 (5.7)
Mean age±SD	46.32 ± 4.523	46.84 ± 5.578	46.58±5.055
Range in years			36-62
Illiterate	17 (38.6)	18 (40.9)	35 (39.8)
Primary	26 (59.1)	24 (54.5)	50 (56.8)
SSC	1 (2.3)	0 (0.0)	1 (1.1)
HSC	0 (0.0)	2 (4.5)	2 (2.3)
Lower middle income	33 (75.0)	42 (95.5)	75 (85.2)
Upper middle income	11 (25.0)	2 (4.5)	13 (14.8)

Chi-square test for age group and income; Fisher's Exact test for educational qualification. p=0.382 (age), p=0.375 (education), p=0.007 (income)

Table 2 summarizes the antibiotic regimens used in both study groups. Both groups received preoperative intravenous ceftriaxone 1 g, administered 30 minutes before surgery. In Group-A, antibiotics were not routinely continued postoperatively, whereas Group-B received intravenous ceftriaxone 12-hourly for 72 hours followed by oral cefixime for 7 days. All patients were followed for 30 days to assess postoperative outcomes.

Table 2: Antibiotic regimen used among the study groups (n=88).

Antibiotic regimen	Group A-Prophylaxis	Group B-Empirical
Preoperative antibiotic	Inj. Ceftriaxone 1 g IV, 30 min before surgery	Inj. Ceftriaxone 1 g IV, 30 min before surgery
Postoperative antibiotic	Not routinely continued	Inj. Ceftriaxone 1 g IV 12-hourly for 72 hours
Oral antibiotic after IV therapy	Not given routinely	Oral Cefixime 400 mg twice daily for 7 days
Follow-up period	30 days	30 days

Figure 1 illustrates the menopausal status of the participants in both groups. Most patients were premenopausal in both Group-A and Group-B, accounting for 97.7% and 90.9%, respectively. Postmenopausal women represented only a small proportion of the study population. There was no statistically significant difference in menopausal status between the two groups (p=0.167).

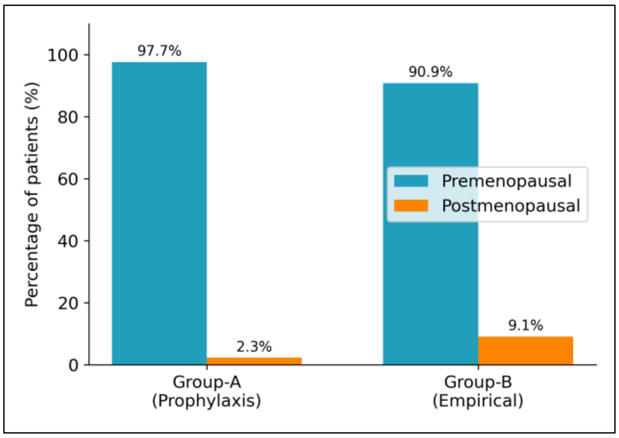

Figure 1: Menopausal status of the study population (n=88).

Table 3 presents the baseline clinical profile according to the indication for surgery. Fibro-adenomyosis was the most common indication overall, followed by fibroid uterus and adenomyosis. The distribution of surgical indications was generally comparable between the antibiotic prophylaxis and empirical therapy groups. No statistically significant difference was observed between the groups regarding indication for surgery (p=0.331).

Table 4 compares superficial surgical site infection between the two antibiotic groups. Superficial SSI occurred in 5 patients (11.4%) in Group-A and 7 patients (15.9%) in Group-B. Although the proportion was slightly higher in the empirical therapy group, the difference was not statistically significant (p=0.534). This indicates that antibiotic prophylaxis had a comparable outcome to empirical therapy in preventing superficial SSI.

Table 3: Baseline clinical profile of the patients.

Indication for Surgery	Group-A, N (%)	Group-B, N (%)	Total, N (%)
Fibroid uterus	10 (22.7)	15 (34.1)	25 (28.4)
Fibro-adenomyosis	16 (36.4)	14 (31.8)	30 (34.1)
Adenomyosis	11 (25.0)	9 (20.5)	20 (22.7)
Endometriosis	2 (4.5)	0 (0.0)	2 (2.3)
Others	1 (2.3)	4 (9.1)	5 (5.7)
Fibroid with endometriosis	1 (2.3)	0 (0.0)	1 (1.1)
Fibroid with others	0 (0.0)	1 (2.3)	1 (1.1)
Fibro-adenomyosis with endometriosis	2 (4.5)	0 (0.0)	2 (2.3)
Adenomyosis with endometriosis	1 (2.3)	1 (2.3)	2 (2.3)

Fisher's Exact test, p=0.331

Table 4: Superficial surgical site infection among the study groups.

Superficial SSI	Group-A, N (%)	Group-B, N (%)	Total, N (%)
Present	5 (11.4)	7 (15.9)	12 (13.6)
Absent	39 (88.6)	37 (84.1)	76 (86.4)
Total	44 (100.0)	44 (100.0)	88 (100.0)

Chi-square test, p=0.534

Figure 2 shows the distribution of postoperative complications between the study groups. Postoperative complications were observed in 43.2% of patients in Group-A and 36.4% in Group-B. The absence of complications was more frequent in both groups than their presence. The difference in postoperative complication rate between the two groups was not statistically significant (p=0.513).

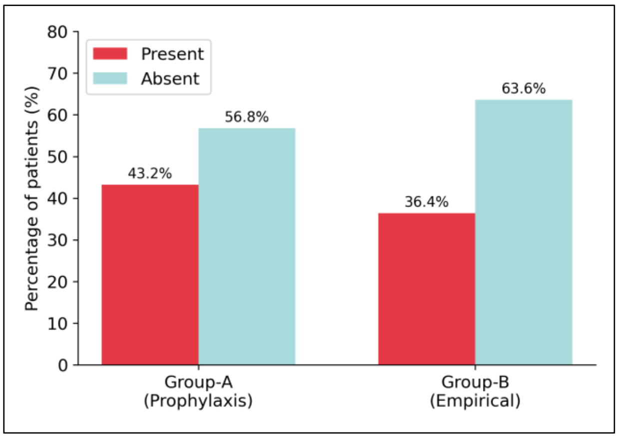

Figure 2. Distribution of postoperative complications among groups.

Table 5 demonstrates the pattern of postoperative complications among patients who developed complications. Febrile morbidity was the most frequent complication in both groups, occurring in 63.2% of complicated cases in Group-A and 43.8% in Group-B. Febrile morbidity with respiratory tract infection was relatively more frequent in Group-B. However, the overall distribution of complication types did not differ significantly between groups (p=0.419).

Table 5: Postoperative complications among the study groups.

Type of complication (among complicated cases)	Group-A, N (%)	Group-B, N (%)	Total, N (%)
Febrile morbidity	12 (63.2)	7 (43.8)	19 (54.3)
Febrile morbidity with UTI	3 (15.8)	2 (12.5)	5 (14.3)
Febrile morbidity with RTI	2 (10.5)	5 (31.3)	7 (20.0)
Febrile morbidity with UTI and RTI	1 (5.3)	2 (12.5)	3 (8.6)
Febrile morbidity, RTI and others	1 (5.3)	0 (0.0)	1 (2.9)

Fisher's Exact test, p=0.419

Table 6 shows the requirement for further antibiotics and wound condition during postoperative follow-up. Further antibiotic therapy was required in 18.2% of patients in both groups, showing no difference between the regimens (p=1.000). Healthy wound status during D1–D7 follow-up was observed in 88.6% of Group-A and 86.4% of Group-B patients. The difference in wound condition was not statistically significant (p=0.747).

Table 6: Further antibiotic requirement and wound condition during follow-up.

Follow-up outcome	Group-A, N (%)	Group-B, N (%)	Total, N (%)
Further antibiotic needed	8 (18.2)	8 (18.2)	16 (18.2)
Further antibiotic not needed	36 (81.8)	36 (81.8)	72 (81.8)
Wound healthy (D1-D7)	39 (88.6)	38 (86.4)	77 (87.5)
Wound unhealthy (D1-D7)	5 (11.4)	6 (13.6)	11 (12.5)

Chi-square test. Further antibiotic use: p=1.000; wound condition: p=0.747

Table 7 presents the duration of hospital stay among the study participants. Most patients stayed in hospital for 5–10 days in both Group-A and Group-B. The mean hospital stay was slightly shorter in the antibiotic prophylaxis group than in the empirical therapy group, 6.75 ± 4.271 days versus 8.18 ± 6.420 days. However, this difference was not statistically significant (p=0.221).

Table 7: Duration of hospital stay among the study groups.

Duration of hospital stay	Group-A, N (%)	Group-B, N (%)	Total, N (%)
5-10 days	39 (88.6)	37 (84.1)	76 (86.4)
11-15 days	3 (6.8)	2 (4.5)	5 (5.7)
16-20 days	1 (2.3)	1 (2.3)	2 (2.3)
21-25 days	1 (2.3)	3 (6.8)	4 (4.5)
>25 days	0 (0.0)	1 (2.3)	1 (1.1)
Mean±SD (days)	6.75±4.271	8.18±6.420	7.47±5.469
Range in days	5-30	5-30	5-30

Fisher's exact test for stay-duration categories (p=0.221); independent sample t-test for mean stay (p=0.221)

DISCUSSION

The present study compared antibiotic prophylaxis with empirical postoperative antibiotic therapy among women undergoing routine abdominal hysterectomy in a tertiary care hospital. The principal finding was that single-dose preoperative prophylaxis produced clinical outcomes comparable to empirical therapy. Superficial surgical site infection occurred in 11.4% of patients in the prophylaxis group and 15.9% in the empirical therapy group, and this difference was not statistically significant. Similarly, postoperative complications, further antibiotic requirement, wound condition during follow-up and duration of hospital stay did not differ significantly between the two groups. These findings suggest that routine continuation of postoperative antibiotics may not provide additional clinical benefit when appropriate preoperative prophylaxis is administered.

This finding is consistent with current infection prevention principles. International guidelines recommend administration of an appropriate prophylactic antibiotic before surgical incision to ensure adequate tissue concentration during the period of contamination, rather than routine prolonged postoperative antibiotic use.[3,1,4] ACOG also emphasizes antibiotic prophylaxis as a key intervention for preventing infection after gynaecological procedures, while enhanced recovery guidance recommends intravenous antibiotics within 60 minutes before skin incision.[9,2] Recent reviews also support prophylaxis for hysterectomy, particularly because the genital tract is entered and endogenous flora may contaminate the operative field.[5,10]

The superficial SSI rate in the present study was slightly lower in the prophylaxis group than in the empirical therapy group, although the difference was not significant. This aligns with Cochrane evidence showing that antibiotic prophylaxis reduces postoperative infection after elective abdominal and vaginal hysterectomy, but that available evidence is less definitive regarding superiority of one dose regimen over another.[10] Uppal et al also reported that the choice and appropriateness of prophylactic antibiotics are associated with SSI risk after hysterectomy, while Till et al showed that antibiotic selection, particularly coverage of expected organisms, can influence post-hysterectomy SSI rates.[8,11] Therefore, the timing, appropriateness and adequacy of prophylaxis may be more important than prolonged empirical therapy.

In this study, febrile morbidity was the most frequent postoperative complication, but its distribution did not differ significantly between groups. Similar observations have been reported in gynaecological SSI prevention literature, where postoperative fever and wound infection are recognized outcomes but are influenced by several perioperative factors including surgical technique, asepsis, patient comorbidity, catheterization, operative duration and institutional infection control practices.[12-14] The absence of a significant difference in further antibiotic requirement and early wound condition also supports the view that empirical postoperative therapy should not be routinely continued in uncomplicated cases.

These findings have important implications for antimicrobial stewardship in Bangladesh and similar low-resource settings. Prolonged or unnecessary surgical antibiotic use is common in many LMICs and may contribute to antimicrobial resistance, adverse drug reactions and increased healthcare burden.[6,15] A recent Bangladeshi study also highlighted misuse and overuse of surgical antibiotic prophylaxis in tertiary care settings, recommending institutional antibiotic guidelines and stewardship programmes.[7] The Bangladesh National Strategy and Action Plan for Antimicrobial Resistance similarly identifies high hospital antibiotic use, including prophylactic and empirical prescribing, as an important concern.[16] Therefore, adopting evidence-based prophylactic regimens may reduce unnecessary antibiotic exposure without compromising patient safety.

Overall, this study supports the clinical adequacy of antibiotic prophylaxis compared with empirical therapy in routine abdominal hysterectomy. However, the findings should be interpreted considering the single-centre design and modest sample size. Larger multicentre trials with microbiological surveillance, standardized SSI assessment and longer follow-up are recommended to strengthen evidence and guide national perioperative antibiotic protocols.

CONCLUSION

This study found that single-dose preoperative antibiotic prophylaxis was comparable to empirical postoperative antibiotic therapy in preventing superficial surgical site infection and postoperative morbidity following routine abdominal hysterectomy. No significant difference was observed between the groups regarding SSI, postoperative complications, further antibiotic requirement, wound condition or duration of hospital stay. These findings suggest that routine prolonged empirical antibiotic therapy may not provide additional clinical benefit in uncomplicated abdominal hysterectomy. Therefore, appropriate antibiotic prophylaxis may be considered a safe and rational strategy to support antimicrobial stewardship in tertiary care settings.

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Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethical Review Board of Chittagong Medical College, Chattogram, Bangladesh

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