Research Article

The Antibiotic Prescribing Practices of Gynecologists in Abdominal Hysterectomy

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Abstract

Objective: To evaluate the pattern of antibiotics used for abdominal hysterectomy by gynecologists in infected and non-infected cases.

Methods: Data was collected through an online survey of gynecologists in Surabaya, Indonesia.

Results: A total of 200 gynecologists were involved in this study. All of them used prophylactic antibiotics in all cases of abdominal hysterectomy, and the most commonly used was cefazoline (70.5%), followed by ceftriaxone (15.5%) and cefotaxime (9%). Most gynecologists (68%) gave 2 grams of prophylactic antibiotic, and 79,5% of antibiotics were administered within 30 minutes before surgery. Additional antibiotics during surgery were given in prolonged surgery (79.01%) and intraoperative bleeding > 1500 mL (48.14%). The most common additional dosage used was 1 gram (72.9%), and most gynecologists (37.2%) continued antibiotics for one day ahead. The type of therapeutic antibiotics used for infected cases was varied, consisting of ceftriaxone (50.5%), metronidazole (42%), cefotaxime (17%), cefazoline (15.5%), gentamicin (12%), ampicillin-sulbactam (4%), and amoxicillin-clavulanic acid (3.5%). Most gynecologists (43.7%) gave these antibiotics for three days.

Conclusion: The majority of gynecologists in Surabaya already use prophylactic antibiotics for abdominal hysterectomy and therapeutic antibiotics for infected cases following the existing guidelines

Keywords: antibiotics, gynecologist, hysterectomy, infection.

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INTRODUCTION

Hysterectomy has become the second most commonly performed surgical procedure for reproductive-age women and is widely used for treating various gynecologic problems. In the United States, 90% of hysterectomy procedures are performed for benign gynecological reasons such as fibroid, abnormal uterine bleeding, endometriosis, and uterine prolapse[1]. The hysterectomy rate in the United States is relatively high: 510 per 100.000 women[2], while in some European countries like Denmark, the incidence is generally lower, as low as 173 per 100.000 women[3]. Hysterectomy rates in Asian countries are lower, ranging from 1.7-9.8% of all women in India, Yordania, and El Salvador[4].

The prophylactic antibiotic is strongly suggested in gynecology surgery[5–10]. The prophylactic antibiotic has been shown to reduce maternal morbidity, healthcare costs, and antibiotic use[11,12]. Prophylactic antibiotics also help prevent postoperative and surgical wound infections[5,10,13–16].

According to the Scottish Intercollegiate Guidelines Network's 2014 guidelines on surgical antibiotic prophylaxis, these antibiotics must be used appropriately, backed up by evidence

of efficacy, and their effect on the patient's normal bacterial flora and immune system must be minimized[17]. Several meta-analysis studies suggest that prophylactic antibiotics (of various types, durations, and routes) effectively reduced the risk of severe infection following surgery, including abdominal hysterectomy[18–22].

Antibiotic misuse can result in serious health consequences, mainly antibiotic resistance[23–27]. Bacteria, viruses, fungi, and parasites can acquire antibiotic resistance, lowering their efficacy[26–28]. Antibiotic resistance affects around 2.8 million individuals in the United States, and over 35,000 people die yearly due to antibiotic resistance[29]. Antibiotic resistance develops when bacteria and fungi acquire the ability to resist medications that are intended to kill them. As a result of the bacteria surviving and growing, physicians must be cautious about this happening. As a result, antibiotics must be provided appropriately and at the appropriate time to avoid infection[30]. Regarding drug selection and administration timing, dose, and duration, inappropriate antibiotic use is a critical factor in the emergence of antibiotic resistance.

Although recommendations for antibiotic use have been established, in practice, antibiotic use in abdominal hysterectomy varies according to the attending doctor's discretion. Along with adherence to rules, gynecologists' personal experiences influence how antibiotics are administered for hysterectomy surgery. There is a wide variation in the prophylactic antibiotic use, antibiotic type selection, administration timing, and the addition of antibiotics during and after surgery in the hospital setting. This study aimed to identify the type, dosage, timing of administration, reasons, dan duration of antibiotic use for abdominal hysterectomy in infected and non-infected cases performed by gynecologists in Surabaya, Indonesia's second-largest city. This study is important to determine the characteristics of antibiotic use in infected and non-infected cases by gynecologist.

METHODS

This study was conducted in Surabaya, Indonesia, from July to August 2021. All Gynecologists from hospitals were included in the study. Ethical clearance was approved by the Ethical Committee of Universitas Airlangga Hospital No. 138/KEP/2021), Surabaya, Indonesia. The research participants were gynecologists working in all hospitals in Surabaya based on the inclusion and exclusion criteria (total sampling size). Gynecologists still performing a hysterectomy in treating gynecologic cases meet the inclusion criteria. Participants are automatically excluded if they choose not to respond to the survey.

The study aims to evaluate the pattern of antibiotic use for abdominal hysterectomy in infected and non-infected cases. Infected cases were defined as any infection in the mother that occurred during surgery, including systemic or local (reproductive tract infections). We excluded any hysterectomy performed for malignancy indication. Non-infected cases were benign gynecological cases requiring abdominal hysterectomies, such as uterine fibroid and ovarian cysts. The primary outcome of this study was the pattern of antibiotic use, including prophylactic antibiotic use, antibiotic type selection, administration timing, and the addition of antibiotics during and after surgery.

Based on the respondents' age, work history, and place of employment, the clinical characteristics of each were evaluated. The medical facility is separated into primary, secondary, tertiary, and exceptional hospitals for mothers and child. The completeness of the range of medical services that can be offered, the number of beds, the kind of medical services (specialist or subspecialist), and the availability of medical staff are the factors that differentiate types of hospitals. Electronic form were used to conduct online interviews that provided the research data. Then, the research team made contact with potential study participanst, informed them about the study, and got their informed consent. Following their completion of the questionnaire, study participants provided the research with the data. The information was shown as descriptive statistcs.

RESULTS

Two hundred gynecologists agreed to participate in this study (50% response rate of the population). Due to the pandemic, the remaining gynecologists did not respond. Most participants were aged 30–60 (93.5%) and had less than ten years of work experience (53.5%). Participants worked in various types of hospitals, with the majority in secondary (39%) and primary hospitals (33%) (Table 1).

Table 1. Characteristics of Participant

Characteristics	N (%)
Ages (years old)	
30 – 39	67 (33.5)
40 – 49	65 (32.5)
50 – 59	55 (27.5)
60 – 69	11 (5.5)
70 - 79	2 (1)
Working Experience (years)	
>20	14 (7)
10 – 20	79 (39.5)
< 10	107 (53.5)
Hospital Type	
Tertiary care hospital	30 (15)
Secondary care hospital	78 (39)
Primary care hospital	66 (33)
Mother and Child hospital	24 (12)
Others	2 (1)

Table 2 shows the pattern of antibiotics used for abdominal hysterectomy in non-infected gynecology cases. All gynecologists used prophylactic antibiotics in these cases. The type of antibiotics used were varied, but the most commonly used were cefazoline (70.5%), ceftriaxone (15.5%), and cefotaxime (9%). The most used dosage of prophylactic (iv) antibiotic was 2000 mg (68%), with the majority administered 30 minutes before surgery (79.5%). During surgery, interestingly, 2.5% of the patients received additional iv antibiotics routinely, whereas 40.5% received additional antibiotics based on specific situations such as prolonged operation (79%), bleeding > 1.5 Liters (48.1%), and cases with a risk of infection (27.2%). Even though in non-infected cases, 28.5% of the participants continued IV antibiotics after surgery for the most common one day (37.2%). The most common antibiotics iv used after surgery were cefazoline (43%), ceftriaxone (30.2%), and metronidazole (15.1%). In addition, several gynecologists continued to give antibiotics orally (35%). Cefadroxil and ciprofloxacin were the most common oral antibiotics after surgery and the most common oral antibiotics for five days (64.2%) (Table 2).

Table 2. Antibiotics Used in Non-Infected Abdominal Hysterectomy Surgery

Antibiotics Use Profile	N (%)
Prophylactic antibiotic use	
Yes	200 (100)
No	0
Type of prophylactic antibiotic Used (iv)	
Cefazoline	141 (70.5)
Ceftriaxone	31 (15.5)
Cefotaxime	18 (9)
Cefoperazone	2 (1)
Cefuroxime	5 (2.5)
Amoxicillin Clavulanic Acid	4 (2)
Ampicillin Sulbactam	3 (1.5)
Gentamycin	3 (1.5)
Phosphomycin	1 (0.5)
Antibiotic dosage (mg)	
500	1 (0.5)
1000	51 (25.5)
1000-2000	9 (4.5)
2000	136 (68)
2000-3000	2 (1.1)
Timing of antibiotic administration	
>30 minutes before surgery	36 (18)
<30 minutes before surgery	159 (79.5)
After abdominal incision	5 (2.5)
Addition of antibiotics during surgery	
Yes	5 (2.5)
No	114 (57)
Depend on condition	81 (40.5)
What condition necessitates the addition of antibiotic	
Prolong surgery	64 (79)
Bleeding > 1.5 L	39 (48.1)
Infection risk	22 (27.2)
Others	6 (7.4)
Antibiotics (iv) continued after surgery	
Yes	57 (28.5)
No	143 (71.5)
Type of Antibiotics (iv)	
Cefazolin	37 (43)
Cefotaxime	8 (9.3)
Ceftriaxone	26 (30.2)
Metronidazole	13 (15.1)
Ampicillin Sulbactam	3 (3.5)
Amoxicillin Sulbactam	2 (2.3)
Cefuroxime	3 (3.5)
Gentamycin	2 (2.3)
Duration of antibiotics (iv) continued after surgery (days)	
1	32 (37.2)
2	11 (12.8)
3	21 (24.4)
5	10 (11.6)
7	1 (1.2)
Antibiotics oral continued after surgery without infection risk or complications	
Yes	70 (35)
No	130 (65)
Type of oral antibiotics given after surgery	
Cefadroxil	36 (51.4)
Ciprofloxacin	12 (17.1)
Amoxicillin	13 (18.6)
Cefixime	6 (8.6)
Azithromycin	1 (1.4)
Amoxicillin Clavulanic Acid	3 (4.3)
Levofloxacine	1 (1.4)
Duration of oral antibiotics continued after surgery (days)	
2	1 (1.4)
3	3 (22.8)
4	1 (1.4)
5	45 (64.2)
7	7 (10)

We also evaluated antibiotics used for hysterectomy in infected gynecology cases. Every patient received therapeutic antibiotics before and after surgery, except for 4% of gynecologists who did not continue giving antibiotics. The type of antibiotics commonly used were ceftriaxone (51.6%), metronidazole 50%), cefotaxime (14.1%), Gentamycin (12.5%), Amoxicillin clavulanic acid (9.9%) and Ampicillin Sulbactam (6.3%). These antibiotics can be used as a single regimen or combined with two or more drugs. Most gynecologists administered therapeutic antibiotics (iv) for three days (43.7%) and five days (32.3%). Reference of their prophylactic and therapeutic antibiotic use was from their operational hospital guidelines (46.5%) as the most commonly used, followed by guidelines given when they were obstetric gynecology trainees (18.5%) (Table 3).

Table 3. Antibiotics Used in Infected Abdominal Hysterectomy Surgery

Infected Cases Surgery	n %
Type of Antibiotics (iv)	
Ceftriaxone	101 (50.5)
Cefazoline	31 (15.5)
Cefotaxime	34 (17)
Metronidazole	84 (42)
Meropenem	2 (1)
Amoxicillin Clavulanic Acid	7 (3.5)
Ampicillin Sulbactam	8 (4)
Cefuroxime	1 (0.5)
Gentamicin	24 (12)
Amikacin	2 (1)
Antibiotics continued after surgery	
Yes	192 (96)
No	8 (4)
Type of antibiotics administrated after surgery	
Cefriaxone	99 (51.6)
Metronidazole	96 (50)
Cefazoline	5 (2.6)
Amoxicillin Clavulanic acid	19 (9.9)
Cefotaxime	27 (14.1)
Gentamycin	24 (12.5)
Ampicillin Sulbactam	12 (6.3)
Cefadroxil	2 (1)
Amikacin	1 (0.5)
Cefuroxime	1 (0.5)
Meropenem	1 (0.5)
Ciprofloxacine	1 (0.5)
Duration of antibiotics administrated after surgery (days)	
1	14 (7.3)
2	2 (9.4)
3	84 (43.7)
4	3 (1.6)
5	62 (32.3)
7	7 (3.6)
14	1 (0.5)
Until normal temperature	1 (0.5)
Consideration of Antibiotics choices	
Based on the protocol in the specialist program	37 (18.5)
Based on the protocol in the hospital where the doctors work	93 (46.5)
Based on the recent seminar attended	19 (9.5)
Based on the recent evidence from a medical journal	33 (16.5)
Others	18 (9)

DISCUSSION

This study showed that all gynecologists administered prophylactic antibiotics for hysterectomy. This is the following recommendation that all women who will have a hysterectomy procedure should receive prophylactic antibiotics[21,31–34]. Prophylactic antibiotics aim to lower antimicrobial colonization pressure to a level where the women's immune system can overcome it when surgery is performed[35]. Prophylactic antibiotics have been shown to minimize the incidence of all types of infection following surgery, including abdominal wound infection, urinary tract infection, pelvic infection, and fever[21].

The Cephalosporine group was this study's most commonly utilized antibiotics (cefazoline, ceftriaxone, and cefotaxime). First-generation cephalosporine is the first drug of choice as a prophylactic antibiotic for hysterectomy, according to the Society of Obstetricians and Gynecologists of Canada (SOGC) and American College of Obstetrician and Gynecology (ACOG). If the patient is allergic to cephalosporin, an alternate regimen such as clindamycin, erythromycin, or metronidazole might be used instead[31,33]. Because of its broad antibacterial spectrum (most gram-positive and harmful bacteria) and low incidence of allergies and adverse events, cephalosporine has become the preferred prophylactic antibiotic for most surgical procedures[32,36].

Most antibiotics were given before surgery (less or more than 30 minutes). This method corresponds with the SOGC's recommendation that antibiotics be administered 15-60 minutes before skin incision[31]. The timing of antibiotic administration should be adjusted to the antibiotic type, such as fluoroquinolone and vancomycin, which should be infused over a prolonged period (>60 minutes) before incision to avoid drug toxicity[37]. However, using other antibiotics increases the risk of surgical site infections in parallel with the time between the drug administration and the skin incision[38].

Fifty percent of postoperative febrile morbidity was suffered by patients who did not receive prophylactic antibiotics[39].

2.5% of gynecologists routinely used prophylactic antibiotics after abdominal incisions, contrary to current recommendations. This routine was ineffective in preventing infection after hysterectomy because intraoperative antibiotics were inadequate to reduce microbial burden in the incision site during surgery[21,31,32,34,37,38]. This finding suggests that a minority of our study participants did not comply with the updated prophylactic antibiotics protocol guidelines. Most additional antibiotics within surgery after the prophylactic antibiotic was administered for specific cases like prolonged surgery (1-2 times the drug's half-life) and massive bleeding (blood loss> 1500 mL). If cefazoline is used, an extra dose should be given if the surgery lasts more than 3 hours[21,31,32,34,37].

Inappropriate use of antibiotics was also found after surgery. 28.5% of participants were given antibiotics routinely after surgery, respectively, without appropriate justification (infection). Antibiotics after surgery are generally administered orally. Following surgery, oral antibiotics such as cephalosporin, fluoroquinolones, and penicillin are commonly used. Prophylactic antibiotics should not be continued after surgery unless there is a medical indication. Patients given additional antibiotics during surgery should stop administration within 24 hours of the procedure[34,39,40]. Continued antibiotics after surgery are not increasing the effectiveness of preventing surgical site infection. On the other hand, administering prophylactic antibiotics in a single dosage can save up to 75-80% of the cost[41]. Even a study revealed that prolonging antibiotics more than 24 hours after surgery increases the risk of surgical site infection both in the hospital and after discharge[42].

The pattern of antibiotics used in infected gynecology cases is more varied, defined by the type of infection. The therapeutic antibiotic is often given before surgery, so prophylactic antibiotics are unnecessary. Broad-spectrum antibiotics such as ceftriaxone, metronidazole, and cefotaxime are the most commonly used. Furthermore, second-line antibiotics are also used in infected cases, such as amoxicillin-clavulanic acid, ampicillin-sulbactam, cefuroxime, amikacin, and meropenem. After surgery, 96% of therapeutic antibiotics are continued, but some are replaced with different types based on the results of blood or tissue cultures and antibiotic sensitivity tests.

Most of the prophylactic and therapeutic antibiotics chosen by gynecologists are based on their working hospital protocols and antibiotic guidelines, which were given when they were still obstetrics and gynecology trainee. A few gynecologists have updated their knowledge about antibiotic use based on the latest evidence-based from scientific journals.

The prophylactic antibiotic must be administered before incision to minimize incision site and postoperative infection. Antibiotics can be continued if there is an indication. The therapeutic antibiotic type is given based on the specific type of infection. To standardize the use of antibiotics by all gynecologists for hysterectomy surgery, the hospital must periodically update and socialize the appropriate established antibiotics protocol.

Limitation of this study is the study design by online questionnaire. The fact that the case details were not examined may also have an impact on the antibiotics chosen by gynecologist. Additionally, just one major Indonesian city's gynecologist were included in this study.

CONCLUSION

Most gynecologists have already employed prophylactic antibiotics for hysterectomies according to the guidelines.This study concluded that all gynecologist in Surabaya has provided prophylactic antibiotic in accordance with recommendations for hysterectomy procedurs. Continued medical education update is required to keep up withfollow the recent guidelines, especially in antibiotics use. Moreover, establishing an antibiotics protocol in the hospital can reduce the risk of inappropriate antibiotics used by medical personnel. More trials with a prospective cohort design should be conducted to verify this preliminary findings.

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