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Risk factors for postoperative wound infection in obstetrics and gynecology patients in a low resource setting: a cross-sectional study

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Abstract

Aim: In this study, we aimed to identify common risk factors for postoperative wound infection among patients in Obstetrics and Gynecology.

Methods: This was a descriptive cross-sectional study conducted at AOGTH in Gezira State, Sudan, from February 2017 to July 2017. The study sample consisted of 131 women who developed postoperative wound infection after obstetrics and gynecological operations. Wound swabs and cultures were obtained from all patients, in addition to interviews using a structured questionnaire completed by participants after informed consent was obtained.

Results: The total number of postoperative wound infection cases was 131 out of 1543 (8.5%). 101 cases (77.1%) were obstetrical, and 30 (22.9%) were gynecological. This study revealed that the number of wound infections after emergency operations was 71 (54.2%), compared with 60 (45.8%) after electively performed operations. It also showed 65 cases (49.6%) weighing >80 kg and 64 (48.8%) weighing <60 kg. Forty-eight out of 201 (23.9%) cases were diabetic, and a history of previous operations was found in 78 (59.5%) patients. Wound infection was diagnosed in 125 of 1510 (8.3%) cases that received preoperative antibiotic prophylaxis, compared with 6 of 33 (18.2%) who did not.

Conclusion: The SSI rate increases in both overweight and underweight women, in emergency operations, in diabetic patients, and in the absence of preoperative prophylaxis antibiotic therapy. However, the length of operation does not affect the SSI rate.

Keywords

postoperative, wound infection, obstetrics, gynecology, surgical site infection

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Introduction

Surgical site infection (SSI) is defined as a wound infection occurring within 30 days after a surgical operation (or within 1 year if an implant is left in place after the procedure). These infections can be superficial or deep incisional infections.[1] Postoperative SSI is linked not only to the increased patient morbidity in the form of prolonged hospital stay and its psychological and physical impact, but also to the increase in mortality and economic costs for patient care.[2]

Surgical site infections are the second most common nosocomial infections among hospitalized patients.[3] According to the Centers for Disease Control and Prevention (CDC), it is divided into two categories: (a) an organ/space surgical site infection (SSI), and (b) superficial and deep incisional infection. SSI may occur at the site that was opened or manipulated during a surgical procedure other than the incision itself, such as the infections that may develop after a hysterectomy. It must develop within 30 days of the procedure and be associated with one of the following: diagnosis by a surgeon, abscess, or other clinical signs of infection detected during reoperation or on radiologic or histopathologic examination.[4]

Depending on the degree of wound contamination, surgical wound infections are classified into four groups. The first group is clean wounds, which are made electively, primarily closed, without defects in aseptic technique, and without entering the respiratory, alimentary, or genitourinary tracts. The second group is clean-contaminated wounds, in which the surgical field involves the alimentary, respiratory, or genitourinary tract under controlled conditions and without unusual contamination.[4] The third group is the contaminated wounds, which include open, fresh traumatic wounds, gross spillage from the gastrointestinal tract, the entrance of the genitourinary tract in the presence of infected urine, a major break in technique, and incisions in which acute non-purulent inflammation is present. The fourth group is dirty or infected wounds, which are usually traumatic wounds with retained devitalized tissue, foreign bodies, fecal contamination, delayed treatment, wounds from a dirty source, perforated viscus encountered, or acute bacterial inflammation with pus encountered during operation.[4] The surgical wound infection rate per 100 operations in the United States by wound class is 2.1% for clean, 3.3% for clean-contaminated, 6.4% for contaminated, and 7.1% for dirty or infected cases.4 Postoperative wound infection is a leading cause of prolonged hospital admission and, hence, increases the financial burden on the health system in developing countries.[5-6] To control and reduce the incidence of postoperative wound infection in our environment, we should control its modifiable risk factors, such as those influenced by the surgeon and the operative team, by applying the local infection control protocols. Others cannot be influenced by the surgeon or operative team and must be dealt with at the time they occur. Several other factors may increase the infectious morbidity of postoperative patients, for example, obesity, emergency operations, preoperative anemia, prolonged hospital stay, blood loss during surgery, duration of operation, and prophylactic antibiotics. These can be modified by preoperative optimization of the patient's health conditions as much as possible.[7-8-9] Therefore, this study aimed to identify the common risk factors associated with postoperative wound infection among obstetric and gynecologic patients in a low-resource setting.

Materials and Methods

Study Area, Study Population, and Sample Collection

This was a descriptive cross-sectional study conducted at AOGTH, Gezira State, Sudan, from February 2017 to July 2017. All patients operated on in the hospital (obstetrics and gynecology) who presented with postoperative wound infection during the study period were included, excluding those diagnosed with chorioamnionitis before operative delivery, those who were immunocompromised, and those with a history of wound infection. Wound infection was diagnosed based on the patient's symptoms (fever, increasing wound pain, foul odor at the wound site, and wound discharge) and clinical examination findings (elevated temperature, tenderness and induration around the wound, redness, and serous or purulent discharge from the wound). Microbiological wound swabs were taken for culture to confirm the diagnosis and isolate the causative organism. All patients were then interviewed using a structured questionnaire.

Ethical Approval

This study was approved by the Ethics Committee of the Sudan Medical Specialization Board (Date: 14.01.2017, Decision No: 12/17).

Statistical Analysis

Data were analyzed using the Statistical Package for the Social Sciences (SPSS, ver. 20). The Chi-Square test was used to assess the correlation between the proposed risk factor and the rate of wound infection, and a P value of ≤ .05 was considered significant.

Reporting Guidelines

This study was reported in accordance with the STROBE guideline.

Results

Out of the 131 cases diagnosed with SSI, 101 (77.1%) were obstetric operations and 30 (22.9%) were gynecological ones. As shown in Table 1, 71 (54.2 %) of women with postoperative wound infection were emergency operations, 62 (87.3%) of them were obstetric, and 9 (12.7%) were gynecological (4 cases of ovarian cystectomy, 4 cases of ectopic pregnancy, and 1 case of inclusion cystectomy). At the same time, 60 (45.8%) of women with postoperative wound infection underwent elective operations, 39 (65%) obstetric and 21 (35%) gynecological (13 cases of abdominal hysterectomy, 1 case of vaginal hysterectomy, 4 cases of myomectomy, 2 cases of ovarian cystectomy, and 1 case of anterior and posterior repair), and the result was statistically significant (*P* = .02).

Figure 1 shows the distribution of cases by weight. SSI has been diagnosed in 65 (49.6%) cases with body weight over 80 kg, in 3 (2.3%) cases with body weight between 69 and 80 kg, and in 63 (48.1%) cases with body weight less than 60 kg, with a *P* value of .03.

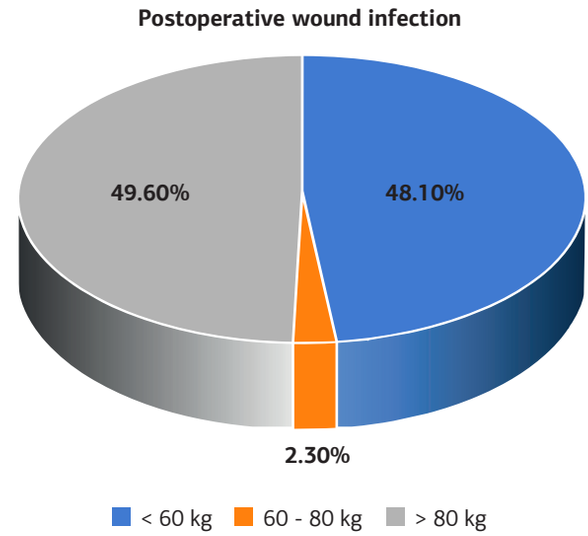

Figure 1. *Distribution of women with postoperative wound infections according to their weight (Kg). P = .03*

With an operation duration of more than 1 hour, 69 (52.7%) cases of SSI were registered, with an operation duration of less than 1 hour, 62 (47.3%) cases were registered, and the result was not statistically significant (*P* = .1) Table 2.

The study revealed wound infection in 78 (59.5%) patients with a history of previous operations and in 53 (40.5%) patients without previous surgery (*P* = .03), as shown in Table 3.

When studying the distribution of women with postoperative wound infection according to their preexisting chronic diseases, the study showed that among diabetic patients, SSI was in 48 out of 201 (23.9%), hypertension was in 5 out of 150 (16.7%), and 57 out of 1192 (4.9%) did not have any chronic diseases, and the *P* value was .03.

Wound infection was diagnosed in 125 of 1510 (8.3%) cases who received preoperative antibiotic prophylaxis, compared with 6 of 33 (18.2%) who did not, with a *P* value of .01.

Discussion

This study showed that the risk of SSI is more common with emergency obstetric or gynecological operations than with elective ones, with an adjusted odds ratio of 1.2. This is consistent with an American study by Erikson et al., who reported an odds ratio of 1.8 for postoperative wound infection in emergency gynecological surgeries compared with elective surgeries.[10] This may be due to failure to follow infection prevention protocols during the emergency or to patient self-care hygiene before the operation.

It was also explored in the study that being underweight or overweight almost equally affected the increased risk of postoperative wound infection. This was also found in Tjeertes EK et al's study on postoperative wound infection in general surgery patients, which concluded that obesity is associated with an increased risk of SSI; moreover, underweight patients have an increased risk for both SSI and long-term mortality.[11]

In contrast to Priti Goyal et al., who found an increased rate of wound infection with increasing duration of operation, this study demonstrated no difference in the rate of SSI between operations lasting less than or more than 1 hour; however, the result was statistically insignificant.[12]

History of a previous operation in this study was associated with increased risk of SSI (odds ratio of 1.5), reversely, Poggio JL found no increase in postoperative complications including SSI when comparing primary cesarean section with a higher number (4-10) repeated ones, this can be explained by the difference in the level of operators (in this study many operations were performed by residents in training) and hence the difference in surgical skills. Moreover, our study was conducted in a secondary hospital, but Poggio JL conducted his study in a tertiary hospital.[13]

Patients with preexisting chronic diseases, especially diabetes and hypertension (odds ratios 4.8 and 3.4, respectively), have a higher risk of SSI compared with preoperatively healthy women. This is even higher than the finding by Mamo et al. in their study on the effect of preexisting diabetes on post-cesarean wound infection, which reported an odds ratio of 3.7. However, they studied only obstetric patients who were young with a short duration of diabetes, and hence, the complications of diabetes were not manifested; nevertheless, preoperative control of diabetes may also influence the risk of postoperative wound infection.[14]

The study showed that the risk of postoperative wound infection is doubled in the group that did not receive preoperative antibiotics, consistent with a study by Azoury S et al., who concluded that preoperative antibiotics not only reduced the SSI rate but also the incidence of postoperative endometritis. Moreover, the WHO recommends administering a single preoperative dose of a first-generation cephalosporin as prophylactic antibiotic treatment to low-risk women undergoing cesarean section, a practice that has been found to significantly reduce postoperative maternal infections.[15]

In conclusion, the rate of postoperative wound infection has been found to increase in both overweight and underweight women, in emergency operations, in patients with chronic diseases like diabetes, and may increase the risk up to fivefold, and the risk is doubled if no preoperative prophylaxis antibiotic was given. However, a minimal effect of previous surgery on the rate of wound infection and no effect of duration of operation on the incidence of SSI have been shown.

Table 1. *Distribution of postoperative wound infection according to the type of operation either emergency or elective (P = .02)*

Type of operation	*n* (%)
Emergency	71 (54.2)
Elective	60 (45.8)
Total	**131 (100)**

Table 2. *Distribution of women with postoperative wound infections according to the duration of operation P = .1*

Duration of operation	*n* (%)
Less than 1 hour	62 (52.7)
More than 1 hour	69 (47.3)
Total	**131 (100)**

Table 3. *Distribution of women with postoperative wound infections according to the history of previous operation P = .03*

History of the previous operation	*n* (%)
One or more past operation	78 (59.5)
No past operation	53 (40.5)
Total	**131 (100)**

Limitations

The limited sample size may limit the generalizability of the findings and reduce the statistical power for subgroup analyses. Because the study was conducted at a single hospital in Sudan, the results may not be representative of other regions or healthcare systems.

Conclusion

The SSI rate is increased in both overweight and underweight women, in emergency operations, in diabetic patients, and in the absence of preoperative prophylaxis antibiotic therapy. However, this study showed minimal effect of previous surgery on the SSI rate, while operation duration had no effect.

Declarations

Animal and Human Rights Statement

All procedures performed in this study were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Declaration of Helsinki and its later amendments, or comparable ethical standards..

Informed Consent

Written informed consent was obtained from all participants before enrollment in the study.

Data Availability

The datasets used and/or analyzed during the current study are not publicly available due to patient privacy reasons but are available from the corresponding author on reasonable request.

Conflict of Interest

The authors declare no conflict of interest.

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Data Curation: H.T.O.A., T.M.A.H.
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Writing – Original Draft: H.T.O.A.
Writing – Review & Editing: A.M., A.E.M., A.A., I.S.
Supervision: I.S.

AI Usage Disclosure

The authors declare that no AI-assisted technologies were used.

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Abbreviations

AOGTH: Academy of obstetrics and gynecology teaching hospital
CDC: Centers for disease control and prevention
SPSS: Statistical package for the social sciences
SSI: Surgical site infection
WHO: World Health Organization

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