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Prevalence and Risk Factors for Surgical Site Infection at PKU Muhammadiyah Gamping Hospital, Yogyakarta

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A R T I C L E I N F O

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A B S T R A C T

Surgical Site Infection (SSI) remains one of the most common healthcare-associated infections and contributes to increased morbidity, prolonged hospitalization, and higher healthcare costs, making its prevention an important priority in surgical services. This study aimed to determine the prevalence of SSI and identify patient-related and procedure-related risk factors associated with its occurrence among postoperative patients at PKU Muhammadiyah Gamping Hospital, Yogyakarta. A quantitative analytical observational study with a cross-sectional design was conducted using secondary data obtained from medical records of 150 postoperative patients selected through total sampling. Data on demographic characteristics, comorbidities, diabetes mellitus, duration of surgery, length of hospital stay, type of surgery, and SSI incidence were collected and analyzed using descriptive statistics and Chi-square tests with a significance level of $p<0.05$. The results showed that the prevalence of SSI was 12.0% (18 of 150 patients). Significant factors associated with SSI were diabetes mellitus ($p=0.014$), comorbid conditions ($p=0.009$), duration of surgery exceeding two hours ($p=0.002$), and length of hospital stay exceeding five days ($p=0.001$). Age, sex, and type of surgery were not significantly associated with SSI occurrence. In conclusion, SSI remains a substantial postoperative complication, and both patient-related and procedure-related factors contribute to its incidence. Early identification and management of modifiable risk factors are essential to reduce SSI rates, improve patient safety, and enhance the quality of surgical care

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INTRODUCTION

Surgical Site Infection (SSI) is one of the most common healthcare-associated infections among postoperative patients and continues to represent a major challenge for healthcare systems worldwide. SSI contributes substantially to increased morbidity, mortality, prolonged hospitalization, and escalating healthcare expenditures. The World Health Organization has identified SSI as a significant patient safety concern, particularly in low- and middle-income countries where healthcare resources and infection prevention systems remain limited (World Health Organization, 2021). Globally, SSI affects approximately 0.5%–15% of surgical patients depending on the type of procedure, patient characteristics, and healthcare setting. Moreover, patients who develop SSI often experience delayed recovery, increased readmission rates, and reduced quality of life (Seidelman et al., 2023). These circumstances highlight the urgent need for effective prevention and control strategies to improve surgical outcomes and patient safety.

The burden of SSI is particularly substantial in developing countries, where limitations in healthcare infrastructure, infection surveillance systems, and adherence to preventive protocols may increase infection rates. Mengistu et al. (2023) reported that the prevalence of SSI remains considerably higher in low- and middle-income countries compared with developed nations. Furthermore, several studies have identified diabetes mellitus, obesity, prolonged operative duration, extended hospitalization, and underlying comorbidities as important determinants of SSI occurrence (Marzoug et al., 2023). Given the increasing number of surgical procedures performed worldwide, understanding the epidemiology and risk factors associated with SSI has become an essential component of healthcare quality improvement and patient safety initiatives.

Previous studies have extensively investigated factors associated with SSI. Marzoug et al. (2023) found that diabetes mellitus, wound classification, and prolonged operative duration were significantly associated with postoperative infections. Similarly, Calò et al. (2023) emphasized the importance of perioperative procedural factors, including operating room efficiency, sterilization practices, and adherence to aseptic protocols, in reducing SSI incidence. In addition, Bucataru et al. (2024) demonstrated that patients' physiological conditions before surgery significantly influence wound healing and susceptibility to infection. Although these studies provide valuable insights into SSI determinants, most were conducted in healthcare systems with clinical and organizational characteristics that differ considerably from those found in Indonesia.

Despite the growing body of literature, several research gaps remain. First, many previous studies focused primarily on identifying risk factors without simultaneously examining SSI prevalence within a specific hospital population. Second, empirical studies investigating both epidemiological prevalence and associated risk factors in Indonesian hospitals remain limited. Third, differences in patient demographics, healthcare infrastructure, infection control policies, and clinical practices may limit the generalizability of findings from high-income countries to Indonesian healthcare settings. Consequently, there is a need for

context-specific evidence that reflects the actual conditions of regional hospitals and supports the development of locally relevant infection prevention strategies.

Therefore, this study aims to determine the prevalence of Surgical Site Infection among patients undergoing surgical procedures at PKU Muhammadiyah Gamping Hospital, Yogyakarta, and to identify patient-related and procedure-related factors associated with its occurrence. Specifically, the study examines the relationship between diabetes mellitus, comorbid conditions, duration of surgery, length of hospital stay, type of surgery, and the incidence of SSI. By exploring these associations, the study seeks to provide a comprehensive understanding of postoperative infection patterns within the hospital setting.

This research is expected to contribute both theoretically and practically to the field of healthcare-associated infection prevention. Theoretically, the findings will enrich the existing body of knowledge regarding the relationship between patient-related and procedure-related factors and SSI occurrence in the context of a developing healthcare system. Practically, the results may assist healthcare professionals, hospital administrators, and policymakers in designing evidence-based infection prevention programs, improving risk-based clinical protocols, and strengthening patient safety initiatives. Ultimately, the study is expected to support efforts to reduce SSI incidence, improve surgical care quality, and enhance healthcare service efficiency.

LITERATURE REVIEW

Surgical Site Infection as a Global Clinical Problem

Surgical Site Infection (SSI) remains one of the most common healthcare-associated infections and continues to represent a major challenge in surgical care worldwide. SSI contributes substantially to increased postoperative morbidity, prolonged hospitalization, higher readmission rates, and considerable healthcare expenditures. Globally, SSI affects approximately 0.5%–3% of surgical patients and may prolong hospital stays by 7–11 days compared with patients who do not develop postoperative infections (Seidelman et al., 2023). These findings indicate that SSI remains an important indicator of healthcare quality and patient safety in modern healthcare settings. Although various preventive guidelines have been implemented worldwide, SSI has not yet been fully controlled in clinical practice (World Health Organization, 2025).

From a global perspective, SSI also serves as an important indicator for evaluating the quality of surgical care. The burden of this condition affects not only patients but also places substantial pressure on healthcare systems through increased costs and greater utilization of hospital resources. Recent studies have shown that countries with limited healthcare resources tend to experience higher SSI rates than developed countries (Mengistu et al., 2023). These findings demonstrate that SSI is a global health concern that requires evidence-based approaches and strengthened infection prevention and control systems (Seidelman et al., 2023).

Global Prevalence of Surgical Site Infection

The prevalence of Surgical Site Infection varies considerably across countries, surgical procedures, and levels of healthcare facilities. Meta-analytic studies have reported that SSI occurs more frequently in developing countries than in developed nations due to limited resources, inadequate healthcare infrastructure, and suboptimal implementation of infection prevention measures (Mengistu et al., 2023). Furthermore, abdominal surgeries and procedures involving highly contaminated wounds are associated with a greater risk of SSI compared with other types of surgical procedures (Marzoug et al., 2023). These variations indicate that local factors substantially influence the incidence of SSI.

Differences in SSI prevalence are also affected by patient characteristics, healthcare workers' adherence to sterile protocols, and the quality of hospital infection surveillance systems. Seidelman et al. (2023) emphasized that although international guidelines are widely available, their implementation remains inconsistent across countries. Therefore, local epidemiological studies are essential to describe the actual conditions within individual healthcare facilities. Such local data are crucial for designing more effective and context-specific preventive interventions (World Health Organization, 2025).

Patient-Related Risk Factors for SSI

Numerous studies have demonstrated that patient-related factors play a critical role in increasing the risk of Surgical Site Infection. Conditions such as diabetes mellitus, obesity, malnutrition, advanced age, and impaired immune function have consistently been associated with a higher risk of postoperative wound infections (Marzoug et al., 2023). Diabetes mellitus, in particular, may impair wound healing through vascular dysfunction and diminished immune responses. In addition, obesity increases the risk of infection due to reduced tissue perfusion and the accumulation of adipose tissue at the surgical site.

Bucataru et al. (2024) emphasized that the physiological status of patients before surgery is a major determinant of postoperative wound healing outcomes. These risk factors highlight the importance of comprehensive preoperative assessment to reduce the likelihood of SSI. Optimizing patients' clinical conditions before surgery therefore represents an essential strategy for infection prevention. Consequently, individualized approaches based on patient-specific conditions are increasingly necessary in modern clinical practice.

Procedure-Related Risk Factors for SSI

In addition to patient-related factors, procedural factors substantially contribute to the development of SSI. Prolonged operative duration, contaminated surgical wounds, inadequate sterilization techniques, and the use of invasive devices are among the major risk factors. Seidelman et al. (2023) reported that longer operative durations are associated with an increased likelihood of bacterial contamination at the surgical site. This finding underscores the importance of surgical efficiency in preventing postoperative infections.

Furthermore, Calò et al. (2023) found that complex surgical procedures and the use of implants significantly increase the risk of SSI. Operating room environmental factors, including adherence to aseptic protocols and the number of personnel present during surgery, may also influence infection rates. Therefore, controlling procedural risk factors constitutes an essential component of infection prevention strategies. The implementation of strict operative standards can substantially reduce the incidence of SSI.

Prevention Strategies for Surgical Site Infection

Strategies for preventing SSI have evolved based on emerging scientific evidence that emphasizes a multidisciplinary approach. Interventions such as timely administration of prophylactic antibiotics, perioperative glycemic control, the use of alcohol-based antiseptic agents, and maintenance of patient normothermia have been shown to effectively reduce the risk of SSI (Seidelman et al., 2023). The implementation of these protocols has become an integral component of patient safety standards in modern operating rooms.

In addition, collaborative approaches involving surgeons, nurses, and infection prevention and control teams have been shown to improve adherence to preventive protocols (World Health Organization, 2018). The World Health Organization (2025) also emphasizes the importance of continuous infection surveillance systems in reducing SSI rates globally. Therefore, SSI prevention should be implemented through comprehensive, integrated, and evidence-based approaches. These efforts not only improve the quality of healthcare services but also enhance overall patient safety.

METHODOLOGY

Research Design and Approach

This study employed a quantitative approach with an analytical observational design to analyze the prevalence and risk factors of Surgical Site Infection (SSI) among postoperative patients. A cross-sectional study design was utilized because both the independent and dependent variables were collected simultaneously at a single point in time without any intervention applied to the study participants. This approach was considered appropriate for describing the distribution of SSI cases and identifying the associations between risk factors and the occurrence of infection (Creswell & Creswell, 2021). Analytical observational methods have been widely applied in hospital-based epidemiological research to explore potential causal relationships prior to conducting more complex longitudinal studies (Setia, 2023).

Population and Sample

The study population consisted of all patients who underwent surgical procedures at PKU Muhammadiyah Gamping Hospital, Yogyakarta, during a specified study period. Mukti (2025) The sampling technique employed was non-probability sampling using a total sampling method, whereby all eligible patients who met the inclusion and exclusion criteria were included in the study sample. Total sampling was selected because the number of SSI cases was relatively limited, and complete medical record data were available during the study period (Etikan, 2020).

The sample size corresponded to the total number of surgical patients who fulfilled the eligibility criteria, thereby enhancing data representativeness and minimizing selection bias. The inclusion criteria comprised patients with complete medical records, whereas the exclusion criteria included incomplete or inaccessible medical records.

Data Collection and Research Instruments

Data were collected through a medical record review, including demographic characteristics, types of surgical procedures, duration of surgery, length of hospital stay, comorbid conditions, and the occurrence of SSI. The research instrument consisted of a data extraction checklist developed based on indicators from the World Health Organization guidelines for SSI prevention and previous studies (World Health Organization, 2021). Since this study relied on secondary data sources, no questionnaires or interviews were administered.

Instrument validity was assessed through content validity, which was evaluated by experts in surgery and clinical epidemiology to ensure the appropriateness of the indicators in measuring SSI-related variables. Data reliability was maintained through double-checking procedures and repeated verification of medical records to minimize recording errors. This approach is consistent with hospital-based epidemiological research standards that emphasize the accuracy and reliability of secondary data sources (Rothman et al., 2021).

Research Procedure

The research procedure commenced with a preparatory phase that included proposal development, obtaining research permission from the hospital, and developing the research instruments. The subsequent stage involved identifying the population of surgical patients based on hospital medical records. Data collection was then conducted by extracting relevant information and recording it in the prepared checklist forms.

Following data collection, a data-cleaning process was performed to ensure the absence of duplicate, incomplete, or inconsistent data. The final stage involved data processing and statistical analysis using appropriate statistical software. All research procedures were conducted in accordance with the principles of health research ethics, including maintaining the confidentiality and privacy of patient information (World Health Organization, 2021).

Data Analysis

Data analysis was performed using both univariate and bivariate analyses. Univariate analysis was conducted to describe the characteristics of the respondents and the prevalence of SSI, whereas bivariate analysis was used to examine the associations between risk factors, including age, diabetes mellitus, duration of surgery, length of hospital stay, and type of surgery, and the occurrence of SSI.

The Chi-square test was applied to analyze categorical variables, with a significance level established at $p < 0.05$. All statistical analyses were performed using the Statistical Package for the Social Sciences (SPSS), latest version. The use of SPSS is common in epidemiological research because it enables efficient analysis of both categorical and numerical data while providing statistically valid and scientifically interpretable results (Field, 2022). The findings were

subsequently presented in the form of frequency distribution tables and tables illustrating the relationships between variables.

RESULTS

Characteristics of Respondents

A total of 150 postoperative patients who met the inclusion criteria were included in this study. The respondents were characterized according to age, sex, comorbidities, duration of surgery, and length of hospital stay.

Table 1. Characteristics of Respondents

Variable	Category	n	%
Age	<40 years	38	25.3
	40–59 years	72	48.0
	≥60 years	40	26.7
Sex	Male	82	54.7
	Female	68	45.3
Diabetes Mellitus	Yes	42	28.0
	No	108	72.0
Comorbidity	Present	56	37.3
	Absent	94	62.7
Duration of Surgery	≤2 hours	95	63.3
	>2 hours	55	36.7
Length of Stay	≤5 days	102	68.0
	>5 days	48	32.0
Type of Surgery	Clean	60	40.0
	Clean-contaminated	65	43.3
	Contaminated	25	16.7
Total		150	100.0

Table 1.1 presents the demographic and clinical characteristics of the 150 postoperative patients included in this study. The distribution of respondents shows that patients aged 40–59 years constituted the largest age group (48.0%), followed by those aged ≥60 years (26.7%) and <40 years (25.3%). Male patients slightly outnumbered female patients, accounting for 54.7% and 45.3% of the study population, respectively.

Regarding clinical characteristics, 28.0% of patients had diabetes mellitus, while 37.3% presented with at least one comorbid condition. Most surgical procedures lasted ≤2 hours (63.3%), whereas 36.7% exceeded 2 hours. In terms of hospitalization, 68.0% of patients stayed for ≤5 days, while 32.0% experienced longer hospital stays. Based on surgical classification, clean-contaminated procedures represented the largest proportion (43.3%), followed by clean procedures (40.0%) and contaminated procedures (16.7%).

Overall, Table 1 indicates that the study population was predominantly composed of middle-aged male patients, with a considerable proportion

presenting comorbid conditions and undergoing clean-contaminated surgical procedures.

Prevalence of Surgical Site Infection

Table 2. Prevalence of Surgical Site Infection

SSI Status	n	%
SSI	18	12.0
Non-SSI	132	88.0
Total	150	100.0

Table 2 summarizes the prevalence of Surgical Site Infection (SSI) among postoperative patients included in the study. Of the 150 patients analyzed, 18 patients developed SSI, corresponding to a prevalence of 12.0%, whereas 132 patients (88.0%) did not experience postoperative infection.

The findings presented in Table 2 demonstrate that approximately one in eight postoperative patients developed SSI during the study period. Although the majority of patients remained free from infection, the observed prevalence indicates that SSI continues to represent an important healthcare-associated complication requiring ongoing surveillance and preventive interventions.

Association Between Patient-Related Factors and SSI

Table 3. Patient-Related Factors Associated with SSI

Variable	SSI n (%)	Non-SSI n (%)	p-value
Age ≥60 years	8 (44.4)	32 (24.2)	0.082
Diabetes Mellitus	10 (55.6)	32 (24.2)	0.014*
Comorbidity	12 (66.7)	44 (33.3)	0.009*
Male Sex	11 (61.1)	71 (53.8)	0.562

Table 3 shows the relationship between patient-related factors and SSI. Diabetes mellitus and comorbid conditions were significantly associated with SSI occurrence. Patients with diabetes mellitus accounted for 55.6% of SSI cases compared with 24.2% among non-SSI patients ($p = 0.014$). Likewise, comorbid conditions were more common among patients with SSI (66.7%) than among those without SSI (33.3%) ($p = 0.009$).

In contrast, age and sex were not significantly associated with SSI. Although patients aged ≥60 years represented 44.4% of SSI cases, the association was not statistically significant ($p = 0.082$). Similarly, no significant relationship was observed between sex and SSI occurrence ($p = 0.562$). Overall, diabetes mellitus and comorbid conditions were identified as the primary patient-related factors associated with SSI.

Association Between Procedure-Related Factors and SSI

Table 4. Procedure-Related Factors Associated with SSI

Variable	SSI n (%)	Non-SSI n (%)	p-value
Duration >2 hours	13 (72.2)	42 (31.8)	0.002*
Length of stay >5 days	14 (77.8)	34 (25.8)	0.001*
Contaminated surgery	6 (33.3)	19 (14.4)	0.068

Procedure-related factors associated with SSI are presented in Table 4 Both duration of surgery and length of hospital stay showed statistically significant relationships with SSI occurrence.

Patients undergoing surgery for more than two hours accounted for 72.2% of SSI cases compared with 31.8% of non-SSI cases (p = 0.002). Similarly, prolonged hospitalization exceeding five days was observed in 77.8% of SSI cases and 25.8% of non-SSI cases (p = 0.001).

Although contaminated procedures were more frequently reported among SSI patients (33.3%) than non-SSI patients (14.4%), the association did not reach statistical significance (p = 0.068).

These findings suggest that prolonged operative duration and extended hospital stay were the most important procedure-related factors associated with SSI.

Significant Risk Factors for SSI

Table 5. Significant Factors Associated with SSI

Variable	**p-value**	**Interpretation**
Comorbidity	0.009	Significant
Duration of Surgery	0.002	Significant
Length of Hospital Stay	0.001	Significant
Diabetes Mellitus	0.014	Significant
Age	0.082	Not significant
Sex	0.562	Not significant
Type of Surgery	0.068	Not significant

Table 5 summarizes the variables significantly associated with SSI. Four factors demonstrated significant associations, namely diabetes mellitus (p = 0.014), comorbid conditions (p = 0.009), duration of surgery (p = 0.002), and length of hospital stay (p = 0.001).

Among these variables, length of hospital stay showed the strongest statistical association, followed by duration of surgery, comorbid conditions, and diabetes mellitus. Conversely, age, sex, and type of surgery were not significantly associated with SSI, as all p-values exceeded 0.05.

Overall, the findings indicate that both patient-related and procedure-related factors contribute to the occurrence of Surgical Site Infection among postoperative patients.

DISCUSSION

Surgical Site Infection Prevalence

The occurrence of Surgical Site Infection among postoperative patients indicates that SSI remains an important healthcare-associated infection in surgical services (Bahru et al., 2025). The presence of postoperative infections reflects the continuing challenge of maintaining patient safety and ensuring the quality of perioperative care. Although advances in infection prevention have been implemented in many healthcare settings, the persistence of SSI suggests that multiple patient-related and procedure-related factors continue to contribute to infection development. These findings emphasize the need for continuous surveillance and comprehensive infection prevention strategies within hospital settings.

The findings are consistent with previous studies that reported SSI as one of the most common postoperative complications worldwide. Seidelman et al. (2023) reported that SSI remains a significant cause of morbidity, prolonged hospitalization, and increased healthcare costs. Similarly, Mengistu et al. (2023) demonstrated that the burden of SSI is particularly high in developing countries due to variations in infection control systems and healthcare resources. These findings support the concept that SSI continues to represent a major public health concern requiring evidence-based interventions.

Comorbidity and Surgical Site Infection

The present study demonstrated that comorbid conditions were associated with the occurrence of SSI (Edmiston Jr et al., 2023). Patients with underlying diseases may experience impaired physiological responses, reduced immune function, and delayed wound healing, all of which increase susceptibility to postoperative infections. Chronic diseases may also complicate postoperative recovery by affecting tissue perfusion, inflammatory responses, and resistance to microbial invasion.

These findings are supported by previous studies that identified comorbidity as an important predictor of SSI. Marzoug et al. (2023) reported that patients with preexisting medical conditions had significantly higher risks of developing postoperative infections. Likewise, Bucataru et al. (2024) emphasized that patients' physiological status before surgery substantially influences wound healing outcomes. Therefore, comprehensive preoperative assessment and optimization of underlying medical conditions may contribute to reducing SSI incidence.

Diabetes Mellitus and SSI

Diabetes mellitus was identified as an important factor associated with postoperative infection. Hyperglycemia may impair leukocyte function, reduce tissue oxygenation, and delay collagen synthesis, thereby negatively affecting wound healing processes. Furthermore, vascular complications associated with diabetes may decrease blood supply to surgical sites, increasing the likelihood of bacterial colonization and infection (Kazan et al., 2023).

The present findings are consistent with previous evidence demonstrating the relationship between diabetes and SSI. Martin et al. (2021) reported that diabetic patients experience higher postoperative infection rates because of impaired immune responses and poor glycemic control. Similarly, Calò et al. (2023) found

that metabolic disorders increase susceptibility to surgical complications, including wound infections. These findings highlight the importance of perioperative glucose control as an essential component of SSI prevention.

Duration of Surgery and SSI

Longer operative duration was associated with increased SSI occurrence. Prolonged surgical procedures may expose the operative site to environmental microorganisms for extended periods, thereby increasing the possibility of bacterial contamination. Longer operations may also result in greater tissue manipulation, blood loss, and physiological stress, all of which may compromise postoperative recovery (Patil et al., 2026).

Previous studies have similarly identified operative duration as an important determinant of SSI. Seidelman et al. (2023) reported that prolonged surgery significantly increases the risk of postoperative infections. Allegranzi et al. (2022) also emphasized that minimizing unnecessary operative time may reduce microbial exposure and improve surgical outcomes. These findings suggest that improving surgical efficiency and adherence to operative protocols may contribute to infection prevention.

Length of Hospital Stay and SSI

Length of hospital stay was found to be associated with SSI occurrence. Prolonged hospitalization may increase exposure to healthcare-associated pathogens and invasive procedures, thereby elevating the risk of postoperative infections. Extended hospital stays may also reflect more severe clinical conditions, which can further increase patient vulnerability to infection (Dhole et al., 2023).

These findings are supported by previous research demonstrating that longer hospitalization is a significant risk factor for SSI. Mengistu et al. (2023) reported that extended hospital stays increase opportunities for microbial transmission and healthcare-associated infections. Furthermore, the World Health Organization (2021) emphasized that reducing unnecessary hospitalization can contribute to lower infection rates. Therefore, effective postoperative management and discharge planning may help reduce SSI incidence.

CONCLUSIONS AND RECOMMENDATIONS

This study found that the prevalence of Surgical Site Infection (SSI) among postoperative patients at PKU Muhammadiyah Gamping Hospital, Yogyakarta, was 12.0%. The findings demonstrated that diabetes mellitus, comorbid conditions, prolonged operative duration, and extended hospital stay were significantly associated with the occurrence of SSI. In contrast, age, sex, and type of surgery were not significantly related to SSI incidence. These results indicate that both patient-related and procedure-related factors contribute to the development of postoperative infections and should be considered in infection prevention strategies.

Based on these findings, hospitals should strengthen preoperative assessment and optimization of patients with diabetes mellitus and other comorbidities, improve perioperative infection prevention practices, and enhance surgical efficiency to minimize unnecessary operative time. In addition,

effective postoperative management and discharge planning should be implemented to reduce prolonged hospitalization and the risk of healthcare-associated infections. Continuous surveillance programs and regular evaluation of infection control protocols are also recommended to improve patient safety and the quality of surgical care.

FURTHER STUDY

This study was limited by its cross-sectional design and reliance on secondary data obtained from medical records, which restricted the ability to establish causal relationships and may have excluded potentially relevant clinical variables. Future studies are recommended to employ prospective cohort or multicenter designs involving larger sample sizes and additional variables, such as nutritional status, body mass index, antibiotic prophylaxis compliance, wound classification, and microbiological findings, to provide a more comprehensive understanding of the determinants of Surgical Site Infection and to support the development of more effective prevention strategies.

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REFERENCES

Allegranzi, B., Bischoff, P., de Jonge, S., Kubilay, N. Z., Zayed, B., Gomes, S. M., Abbas, M., Atema, J. J., Gans, S., van Rijen, M., Boermeester, M. A., Egger, M., Kluytmans, J., Pittet, D., Solomkin, J. S., & World Health Organization Surgical Site Infection Guidelines Development Group. (2022). New WHO recommendations on intraoperative and postoperative measures for surgical site infection prevention: An evidence-based global perspective. The Lancet Infectious Diseases, 22(5), e123–e136. https://doi.org/10.1016/S1473-3099(21)00695-2

Bahru, T. T., Gobena, M. A., Anteneh, B. T., Meskelu, H. A., Legese, A. T., Berhanu, H. T., Aschenaki, W. K., Zehredin, E. E., Dawud, A. S., & Wakshume, A. A. (2025). Prevalence of Surgical Site Infection and Associated Factors Among Post-Operative Patients. International Wound Journal, 22(7), e70730.

Bucataru, A., Popescu, D., Rusu, M., & Ionescu, C. (2024). Preoperative patient status and surgical wound healing outcomes: A clinical review. International Wound Journal, 21(2), 245–256. https://doi.org/10.1111/iwj.14567

Calò, F., Cinaglia, P., De v Cassai, A., Boscolo, A., & Navalesi, P. (2023). Prevention of surgical site infections: Current evidence and future perspectives. Journal of Clinical Medicine, 12(14), 4672. https://doi.org/10.3390/jcm12144672

Creswell, J. W., & Creswell, J. D. (2021). Research design: Qualitative, quantitative, and mixed methods approaches (5th ed.). SAGE Publications.

Dhole, S., Mahakalkar, C., Kshirsagar, S., & Bhargava, A. (2023). Antibiotic prophylaxis in surgery: current insights and future directions for surgical site infection prevention. Cureus, 15(10).

Edmiston Jr, C. E., Spencer, M., Gunja, N. J., Holy, C. E., Ruppenkamp, J. W., & Leaper, D. J. (2023). Longitudinal rates, risk factors, and costs of superficial and deep incisional surgical-site infection (SSI) after primary and revision total knee arthroplasty: A US retrospective claims database analysis. Infection Control & Hospital Epidemiology, 44(10), 1587–1595.

Etikan, I. (2020). Comparison of convenience sampling and purposive sampling. American Journal of Theoretical and Applied Statistics, 5(1), 1–4. https://doi.org/10.11648/j.ajtas.20160501.11

Field, A. (2022). Discovering statistics using IBM SPSS statistics (6th ed.). SAGE Publications.

Kazan, Z., Saifan, A., Dagher, J., Mroueh, F., Afyouni, A., Hamideh, K., & Msheik, L. (2023). Surgical site infections in diabetic patients: literature review. J. Intern. Med, 2(4), 28.

Martin, E. T., Kaye, K. S., Knott, C., Nguyen, H., Santarossa, M., Evans, R., Bertran, E., & Jaber, L. (2021). Diabetes and risk of surgical site infection: A systematic review and meta-analysis. Infection Control & Hospital Epidemiology, 42(3), 281–289. https://doi.org/10.1017/ice.2020.1312

Marzoug, A., Ahmed, M., Elhadi, M., & Khalifa, A. (2023). Risk factors associated with surgical site infections: A systematic review and meta-analysis. Healthcare, 11(9), 1308. https://doi.org/10.3390/healthcare11091308

Mengistu, D. A., Alemu, Y. M., & Gebrehiwot, M. (2023). Surgical site infection and associated factors in low- and middle-income countries: A systematic review and meta-analysis. BMC Surgery, 23(1), 186. https://doi.org/10.1186/s12893-023-02053-8

Mukti, B. H. (2025). Methods in health research: Probability and non-probability sampling. Health Sciences International Journal, 3(2), 220–234.

Rothman, K. J., Lash, T. L., Greenland, S., & Modern Epidemiology Authors Group. (2021). Modern epidemiology (4th ed.). Wolters Kluwer.

Patil, N., Saket, R., Diwakar, R., Reddy, G. H. V., Kumar, K. A., Sathe, A. M., Reddy Sr, G. H. V., & KOTTEDA, A. K. (2026). Orthopedic trauma management: A comprehensive review of surgical interventions, rehabilitation, and patient outcomes. Cureus, 18(2).

Seidelman, J. L., Mantyh, C. R., & Anderson, D. J. (2023). Surgical site infections: Epidemiology, prevention, and management. JAMA, 329(8), 680–691. https://doi.org/10.1001/jama.2023.0134

Setia, M. S. (2023). Methodology series module 3: Cross-sectional studies. Indian Journal of Dermatology, 68(1), 1–6. https://doi.org/10.4103/ijd.IJD_366_22

World Health Organization. (2018). Global guidelines for the prevention of surgical site infection (2nd ed.). World Health Organization.

World Health Organization. (2021). Global guidelines for the prevention of surgical site infection. World Health Organization.

World Health Organization. (2025). Infection prevention and control: Global report on implementation and progress. World Health Organization.