



Risk Factors for the Occurrence of Surgical Wound Infection in Post-Caesarean Section Patients

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ABSTRACT

Surgical wound infection (SWI) is one of the most common complications that occur after surgical procedures, including in post-Caesarean section (CS) patients. The purpose of this study is to identify the risk factors associated with the incidence of surgical wound infections in post-Caesarean section patients. The research design used is analytic with a cross-sectional approach. The population in this study includes all post-Caesarean section patients at RS Dian Husada Mojokerto. The sampling technique used is accidental sampling. The sample consists of all post-Caesarean section mothers who experienced post-Caesarean section wound infections and meet the criteria. The independent variable in this study is the risk factors for post-Caesarean section wound infections. The dependent variable in this study is post-Caesarean section wound infections. Data analysis was conducted using the Chi-Square statistical test. The research results show that all risk factors causing post-C-section wound infection have a significant relationship. Factors such as age, Hb levels, nutritional status, obesity, delivery history, immunity, and comorbidities all pose a risk of causing post-C-section wound infection. It is expected that healthcare workers or hospital authorities improve the standard operating procedures (SOP) related to the prevention of surgical wounds, especially in post-C-section patients. Patients are also expected to pay attention to the cleanliness of post-C-section wounds and follow the advice of healthcare professionals.

Keywords: Risk Factors for Post-Cesarean Wound Infection, Post-Cesarean Wound Infection

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INTRODUCTION

Surgical site infection (SSI) is one of the most common complications that occurs after surgical procedures, including in post-Caesarean section (CS) patients. This infection not only prolongs the length of hospital stay and increases the burden of medical costs, but it can also raise maternal morbidity and mortality rates, as well as hinder the postoperative recovery process. Many factors can influence the occurrence of surgical site infections, including age, obstetric history, nutritional status, obesity, comorbidities, immune system, and hemoglobin levels¹.

Cesarean section is a major surgical procedure performed to save the mother and/or fetus in delivery conditions that do not allow vaginal birth. Along with the increasing rates of cesarean sections in various healthcare facilities, the risk of complications such as surgical wound infections also rises. The increase in the number of deliveries by cesarean section is directly proportional to the increase in postoperative surgical wound infections. Another study in an Australian hospital found 40 cases (6.9%) of surgical wound infections out of 583 cesarean surgeries². The World Health Organization (WHO) estimates that around 3% to 15% of post-cesarean patients may experience surgical wound infections, depending on medical conditions and the quality of healthcare provided. The danger of infection after delivery surgery remains a threat, so postoperative care requires attention specifically to reduce maternal mortality due to infection. Although the number is not very significant, it is still an issue that deserves to be studied in order to prevent recurrent infections. The most feared postoperative complication is surgical wound infection. Nationally, the prevalence of post-CS surgical wound infections in Indonesia is reported to range from 2% to 18%, with an average of around 15%. This figure shows significant variation between healthcare facilities and regions³. According to primary data available at RSUD Kudungga Kutai Timur, the incidence of post-CS wound infections since 2021 was 1.97% in 2021, 2.03% in 2022, and 1.85% in 2023. From this data, there appears to be slight fluctuation, but overall there may be a small decrease from 2022 to 2023 (2.03 to 1.85%). Although showed a decrease, however, the hope of healthcare workers is that the incidence of post-Caesarean wound infections can truly be reduced further, even down to 0 (zero). From the preliminary study conducted by the researchers over the last 3 months at Dian Husada Hospital, it was found that 5 (2%) mothers experienced post-Caesarean wound infections out of a total of 245 mothers who underwent C-section operations⁴.

Various risk factors can contribute to the occurrence of surgical wound infections in post-Cesarean section patients, which can be classified into several main categories including maternal

factors, obstetric and perioperative factors, and media and environmental factors. To reduce the incidence of surgical wound infections, antibiotics are administered to prevent the development of infection in the surgical area. From the administration of antibiotics 30 minutes before surgery, most patients do not experience surgical wound infections. Surgical wound infection is not only an important indicator of the quality of surgical services but also reflects the effectiveness of the infection control system in healthcare facilities⁵.

To reduce the rate of post-CS wound infections, various preventive and promotive efforts are carried out at different stages. Before the operation, the following can be done: 1) screening and stabilization of the mother's condition by controlling blood sugar levels in diabetic patients, treating anemia, and addressing any existing infections before surgery, 2) preoperative education: providing explanations about the importance of personal hygiene, especially the abdominal and genital areas before surgery, 3) antibiotic prophylaxis, which includes administering antibiotics (for example, cefazolin 1–2 g IV) 30–60 minutes before the incision is made, in accordance with WHO guidelines. During the surgery, several measures can be implemented, including: 1) strict application of aseptic and antiseptic principles in the operating room, 2) selection of atraumatic incision and suturing techniques, using sterile instruments and according to standard protocols, 3) reducing the duration of surgery and minimizing bleeding to lower the risk of contamination, 4) maintaining the mother's body temperature within the normal range during surgery because hypothermia increases the risk of infection. In the postoperative period, efforts that can be made to prevent the risk of infection in post-Cesarean section wounds are 1) wound care according to standards: changing dressings according to schedule, washing hands before and after procedures, and maintaining cleanliness of the wound area, 2) administering further antibiotics if needed according to clinical indications, 3) educating the patient about signs of infection and the importance of follow-up at a healthcare facility, 4) closely monitoring vital signs and wound condition for at least the first 48–72 hours post-Cesarean section⁶.

To comprehensively address and prevent post-CS wound infections, a multidisciplinary and continuous approach is required, which includes: 1) Implementation of an SSI prevention care bundle in healthcare facilities, covering four main components, namely antibiotic prophylaxis, skin preparation, aseptic technique, and wound care management, 2) Enhancing the competence of healthcare workers through training in instrument sterilization, clean operation management, and strict supervision of aseptic procedures, 3) Provision of adequate sterile facilities and infrastructure, including operating

room ventilation systems, sterilization equipment, and disposable medical devices, 4) Regular audit and monitoring of surgical wound infection rates for evaluation and quality improvement, 5) Empowering patients and families through education on personal hygiene, proper nutrition for wound healing, and adherence to postoperative follow-up⁷.

With the consistent implementation of the efforts and solutions mentioned above, various positive results can be achieved, including: 1) A significant reduction in post-Cesarean wound infection rates to below 5% in accordance with WHO standards, 2) Faster wound healing, reduced length of hospital stay, and decreased need for continued antibiotics, 3) Improved quality of life and comfort for mothers post-Cesarean, positively impacting breastfeeding success and mother-baby bonding, 4) Enhanced quality of obstetric services and increased patient satisfaction with hospital or health center services⁸.

METHOD

The design of this study is analytical with a Cross-Sectional approach. The independent variable in this study is the risk factors for post-cesarean wound infection. The dependent variable is post-cesarean wound infection. The population in this study is all post-cesarean patients at RSUD Kudungga Kutai Timur. The sampling technique used is Accidental Sampling. Data collection was conducted using a questionnaire. Data analysis was carried out using the Chi-Square statistical test.

RESULTS

Based on the research, the results obtained :

Table 1. Cross-Distribution of Respondents' Delivery History with the Incidence of Post-Cesarean Wound Infection

Obstetric History	Post-Cesarean Section Wound Infection		Total
	Post-CS wound infection occurred	No Post-CS wound infection occurred	
Labor is too close (<2 years)	8	11	19
Labor is not very close (>2 years)	8	40	48
Total	16	51	67

Table 1 presents the distribution of post-cesarean section wound infection according to birth interval. Of the 67 respondents, 16 experienced post-CS wound infection, while 51 did not. Among respondents with a birth interval of less than two years, 8 experienced wound infection and 11 did not.

Among respondents with a birth interval of more than two years, 8 experienced wound infection and 40 did not. These findings show that post-CS wound infection occurred more frequently among respondents with a birth interval of less than two years. However, statistical testing is required to determine whether this difference is statistically significant. The research results show that the Asymp. Sig. (2-sided) value in the Pearson Chi-Square test is 0.031, which means it is smaller than the significance level of 0.05.

Table 2. Cross-Distribution of Respondents' Nutritional Status with the Incidence of Post-Cesarean Wound Infection

Nutritional Status	Post-Cesarean Section Wound Infection		Total
	Post-CS wound infection occurred	No Post-CS wound infection occurred	
Underweight nutritional status (IMT<18,5)	9	3	12
Normal nutritional status (IMT 18,5-25,0)	0	46	46
Overnutrition status (IMT > 25,0)	7	2	9
Total	16	51	67

The table 2 presents the relationship between nutritional status and the occurrence of post-cesarean section (CS) wound infection among 67 patients. The results show that 16 patients experienced post-CS wound infections, while 51 patients did not develop wound infections. Among patients with underweight nutritional status (BMI <18.5), 9 patients experienced post-CS wound infection and 3 patients did not. In the normal nutritional status group (BMI 18.5–25.0), none of the patients experienced post-CS wound infection, while 46 patients did not develop infection. Meanwhile, among patients with overnutrition status (BMI >25.0), 7 patients experienced post-CS wound infection and 2 patients did not. The results of this study indicate that based on statistical tests using the Pearson Chi-Square, the Asymp. Sig. (2-sided) value obtained was 0.000. This value is smaller than the significance threshold of 0.05 ($p < 0.05$).

Table 3. Cross Distribution of Respondents' Hb Levels with the Incidence of Post-Cesarean Wound Infection

Hb level	Post-Cesarean Section Wound Infection		Total
	Post-CS wound infection occurred	No Post-CS wound infection occurred	
Abnormal Hb Level (<12 gr/dl)	9	3	12
Normal Hb Level (12-16 gr/dl)	7	48	55
Total	16	51	67

The table 3 presents the relationship between hemoglobin (Hb) level and the occurrence of post-cesarean section (CS) wound infection among 67 patients. The results show that 16 patients experienced post-CS wound infection, while 51 patients did not develop wound infection. Among patients with abnormal Hb levels (<12 g/dL), 9 patients experienced post-CS wound infection and 3 patients did not. Meanwhile, in the normal Hb level group (12–16 g/dL), 7 patients experienced post-CS wound infection, while 48 patients did not develop infection. The results of this study shows that based on statistical tests using the Pearson Chi-Square, an Asymp. Sig. (2-sided) value of 0.000 was obtained. This value is smaller than the significance level of 0.05 ($p < 0.05$).

Table 4. Cross Distribution of Respondents' Obesity with the Incidence of Post-Cesarean Wound Infection

Obesitas	Post-Cesarean Section Wound Infection		Total
	Post-CS wound infection occurred	No Post-CS wound infection occurred	
obesitas	12	2	14
no obesitas	4	49	53
Total	16	51	67

The table 4 presents the relationship between hemoglobin (Hb) level and the occurrence of post-cesarean section (CS) wound infection among 67 patients. The results show that 16 patients experienced post-CS wound infection, while 51 patients did not develop wound infection. The results of this study shows that based on statistical tests using the Pearson Chi-Square, an Asymp. Sig. (2-sided) value of 0.000 was obtained. This value is smaller than the significance level of 0.05 ($p < 0.05$).

Table 5. Cross-Distribution of Diseases Accompanying Respondents with the Occurrence of Post-Cesarean Wound Infection

Accompanying disease	Post-Cesarean Section Wound Infection		Total
	Post-CS wound infection occurred	No Post-CS wound infection occurred	
There is a comorbid disease	9	0	9
No a comorbid disease	7	51	58
Total	16	51	67

The table 5 presents the relationship between the presence of accompanying diseases (comorbidities) and the occurrence of post-cesarean section (CS) wound infection among 67 patients.

The results show that 16 patients experienced post-CS wound infection, while 51 patients did not develop wound infection. Among patients who had comorbid diseases, 9 patients experienced post-CS wound infection, and none of the patients were reported without infection. Meanwhile, among patients with no comorbid diseases, 7 patients experienced post-CS wound infection, while 51 patients did not develop infection. The results shows that based on the statistical test using Pearson Chi-Square, an Asymp. Sig. (2-sided) value of 0.000 was obtained.

Table 6. Cross Distribution of Respondents' Immunity With the Incidence of Post-CS Wound Infection

Body immunity	Post-Cesarean Section Wound Infection		Total
	Post-CS wound infection occurred	No post-CS wound infection occurred	
There is an infection (leuko >11.000/mm ³)	14	0	14
No infection (leuko < 11.000/mm ³)	2	51	53
Total	16	51	67

The table 6 presents the relationship between the presence of accompanying diseases (comorbidities) and the occurrence of post-cesarean section (CS) wound infection among 67 patients. The results show that 16 patients experienced post-CS wound infection, while 51 patients did not develop wound infection. Among patients who had comorbid diseases, 9 patients experienced post-CS wound infection, and none of the patients were reported without infection. Meanwhile, among patients with no comorbid diseases, 7 patients experienced post-CS wound infection, while 51 patients did not develop infection. The results of this study shows that based on statistical tests using the Pearson Chi-Square, an Asymp. Sig. (2-sided) value of 0.000 was obtained. This value is smaller than the significance level of 0.05 ($p < 0.05$).

DISCUSSION

1. Factors of Delivery History on Post-Cesarean Wound Infection

The research results show that the Asymp. Sig. (2-sided) value in the Pearson Chi-Square test is 0.031, which means it is smaller than the significance level of 0.05. Statistically, this indicates that there is a significant relationship between the history of childbirth and the occurrence of wound infections in post-cesarean section (SC) patients. This fact suggests that previous childbirth experiences, both the number and type of deliveries experienced, can influence the condition of the surgical wound as well as the risk of infection during the postpartum period.

The history of childbirth is closely related to the anatomical and physiological condition of the uterus and surrounding tissues. Mothers with a history of repeated childbirth (multipara or grand multipara) tend to experience changes in tissue elasticity and the possibility of scar tissue due to previous surgical procedures, such as repeated cesarean sections. This scar tissue can affect the wound healing process because of suboptimal blood supply in the area, thereby increasing the risk of infection. In addition, mothers with a previous cesarean section have a greater likelihood of experiencing tissue adhesions and intraoperative complications, which can also impact the wound healing process⁹.

In maternity nursing theory, obstetric history is an important factor that must be reviewed because it can affect labor outcomes and recovery periods, including the risk of surgical wound infection. In primiparous mothers, even though they do not have a previous delivery history, the risk of infection can still occur, especially if there are other factors such as lack of experience in wound care, anxiety, and limited knowledge about postoperative self-care¹⁰. Meanwhile, in multiparous mothers, despite having experience, physical fatigue from repeated pregnancies as well as the possibility of comorbidities can be factors that worsen wound healing conditions. Thus, both primiparous and multiparous mothers have their respective risk factors that can contribute to the occurrence of post-CS wound infections¹¹.

When related to research results, this finding is in line with the theory that states that the history of childbirth is one of the important determinants in the post-operative recovery process. A complex childbirth history, such as repeated cesarean sections or deliveries with previous complications, can increase susceptibility to infection. In addition, other supporting factors such as nutritional status, wound hygiene, early mobilization, and adherence to health workers' recommendations also play a role in determining whether a wound infection will occur or not¹².

Based on the researchers' opinion, the relationship between childbirth history and the occurrence of post-CS wound infection is influenced not only by medical conditions but also by aspects of education and maternal health behavior. Mothers with a previous childbirth history do not necessarily have adequate knowledge about proper wound care, especially if they have never received optimal education. Therefore, healthcare workers need to provide an individual and continuous educational approach, taking the patient's childbirth history into account as a basis for developing interventions. Education on wound care techniques, signs of infection, the importance of nutrition, and routine check-ups is very necessary to reduce the risk of infection¹³.

2. Nutritional Status Factors on Post-Cesarean Wound Infection

The results of this study indicate that based on statistical tests using the Pearson Chi-Square, the Asymp. Sig. (2-sided) value obtained was 0.000. This value is smaller than the significance threshold of 0.05 ($p < 0.05$), so it can be statistically concluded that there is a significant relationship between nutritional status and the occurrence of wound infections in post-cesarean section (SC) patients. These findings indicate that the patient's nutritional status plays an important role in the surgical wound healing process, where patients with poor nutritional status tend to have a higher risk of wound infection compared to patients with good nutritional status.

Nutritional status is one of the main factors that affect the wound healing process. In nursing and medical science, wound healing consists of several phases, namely the inflammatory phase, proliferation phase, and maturation phase. In each of these phases, the body requires adequate nutrient intake, especially protein, vitamins (such as vitamin C and A), and minerals (such as zinc) which play a role in collagen synthesis, new tissue formation, and enhancing the immune system. Nutrient deficiency, especially protein-energy deficiency, can impair immune cell function, reduce antibody production, and slow down tissue regeneration. This will increase vulnerability to infections, including surgical wound infections in post-CS patients. In addition, another theory also states that patients with poor nutritional status experience decreased body immunity, both humoral and cellular immunity. This condition causes the body to be unable to fight pathogenic microorganisms that enter through the surgical wound. In post-CS patients, incisional wounds on the abdominal wall and uterus become an entry point for bacteria. If not supported by good nutritional status, the body's defense process becomes suboptimal, thereby increasing the risk of wound infection. On the contrary, patients with good nutritional status have sufficient energy and nutrient reserves to accelerate wound healing and prevent infection. The results of

this study are in line with various previous studies that state that there is a relationship between nutritional status and the incidence of surgical wound infections¹⁴. Patients with malnutrition are reported to have a higher risk of experiencing postoperative complications, including wound infections, compared to patients with normal nutritional status. This strengthens the idea that nutritional status not only plays a role in maintaining general health but also significantly determines the success of medical procedures and the patient recovery process¹⁵.

According to the researchers' opinion, the significant relationship between nutritional status and the occurrence of wound infections in post-CS patients indicates the importance of healthcare personnel's attention to fulfilling patients' nutritional needs, both before and after surgery. Education on a balanced diet, monitoring of nutritional status, and appropriate nutritional interventions need to be an integral part of nursing and midwifery care. In addition, collaboration between medical personnel, nutritionists, and nurses is necessary in developing care plans for post-CS patients to minimize the risk of wound infection.

3. The Factor of Hb Levels on Post-CS Wound Infection

The discussion of the results of this study shows that based on statistical tests using the Pearson Chi-Square, an Asymp. Sig. (2-sided) value of 0.000 was obtained. This value is smaller than the significance level of 0.05 ($p < 0.05$), so it can be concluded that there is a significant relationship between hemoglobin (Hb) levels and the occurrence of wound infection in post-cesarean section (SC) patients. This result confirms that Hb levels are an important factor influencing the condition of surgical wounds, where patients with low Hb levels (anemia) tend to experience wound infection more than patients with normal Hb levels.

Hemoglobin has a primary role in the transportation of oxygen throughout the body's tissues, including wound tissues. The wound healing process heavily depends on an adequate supply of oxygen because oxygen is needed in the inflammatory phase for immune cell activities such as neutrophils and macrophages in fighting bacteria, as well as in the proliferative phase for the formation of collagen and new tissue. Low Hb levels will lead to a decrease in the oxygen transport capacity to tissues, thereby hindering the phagocytosis process and slowing down cell regeneration. As a result, wounds become more susceptible to infection. In addition, anemia is also associated with a decreased immune response of the body. Physiologically, a low Hb condition causes tissue hypoxia, which affects the function of immune cells and reduces the body's resistance to pathogenic microorganisms. In post-Cesarean section

patients, the incision wound becomes an entry point for bacteria, so if it is not supported by optimal Hb levels, the body cannot provide a maximal defense response. This aligns with previous research stating that Hb levels are one of the determinants of surgical wound infections, in addition to other factors such as wound care and comorbidities¹³.

According to the researcher's opinion, the existence of a significant relationship between Hb levels and the occurrence of wound infections in post-Cesarean patients indicates that monitoring and checking Hb levels should be an important part of midwifery and nursing care, especially for patients who are about to undergo or have undergone surgery. Interventions such as providing iron supplementation, blood transfusions if necessary, as well as education on meeting iron-rich nutritional needs should be carried out optimally to improve the patient's Hb levels. In addition, healthcare workers also need to conduct early detection of anemia in pregnant and postpartum mothers to minimize the risk of post-operative complications. Thus, it can be concluded that hemoglobin levels have a significant relationship with the occurrence of wound infections in post C-section patients. Efforts to increase Hb levels become an important strategy in preventing surgical wound infections and in supporting the optimal wound healing process in patients¹⁶.

4. The Factor of Obesity on Post-Cesarean Section Wound Infection

The discussion of the research results shows that based on statistical tests using Pearson Chi-Square, an Asymp. Sig. (2-sided) value of 0.000 was obtained. This value is smaller than the significance level of 0.05 ($p < 0.05$), so it can be concluded that there is a significant relationship between obesity and the occurrence of wound infection in post-cesarean section (SC) patients. These results confirm that obesity is an important risk factor that can influence the occurrence of surgical wound infections, where patients with obesity have a higher tendency to experience wound infections compared to patients with normal weight.

Obesity is closely related to various physiological changes that can hinder the wound healing process. The fat tissue (adipose) in obese individuals has lower vascularization compared to other tissues, making the supply of oxygen and nutrients to the wound area suboptimal. This condition causes the wound healing process to be slower. In addition, adipose tissue also tends to exert higher pressure on surgical wounds, especially in post-Cesarean section patients with abdominal incisions, thereby increasing the risk of wound dehiscence and facilitating the entry of microorganisms that cause infection. Obesity is also associated with a condition of chronic low-grade inflammation⁶. In obese

individuals, there is an increase in proinflammatory cytokines such as TNF- α and IL-6, which can disrupt the normal inflammatory process in wound healing. As a result, the inflammatory phase becomes prolonged and ineffective in fighting infection. In addition, obesity is often accompanied by insulin resistance, which can interfere with glucose metabolism and worsen the body's immune function. This causes the body's ability to fight bacteria to decrease, thereby increasing the risk of surgical wound infection. In post-Cesarean patients, obesity also poses challenges in wound care. Fat folds in the abdominal area can create a humid and warm environment, which is an ideal condition for bacterial growth. In addition, wound care becomes more difficult to perform optimally due to limited access to the wound area. These factors further increase the risk of wound infection in obese patients¹⁶.

According to the researchers' opinion, the significant relationship between obesity and the occurrence of wound infections in post-C-section patients highlights the importance of paying attention to the patient's weight status from pregnancy through postpartum. Efforts to prevent obesity through education on a balanced diet, sufficient physical activity, and monitoring weight gain during pregnancy need to be enhanced. In addition, for obese patients undergoing a C-section, more intensive wound care, strict aseptic techniques, and early monitoring of signs of infection are required to prevent further complications.

5. Disease Factors Associated with Post-Cesarean Section Wound Infections

The discussion of the research results shows that based on the statistical test using Pearson Chi-Square, an Asymp. Sig. (2-sided) value of 0.000 was obtained. This value is smaller than the significance level of 0.05 ($p < 0.05$), so it can be concluded that there is a significant relationship between comorbid diseases and the occurrence of wound infections in post-cesarean section (CS) patients. These results indicate that the presence of comorbid diseases is a risk factor that plays an important role in increasing the likelihood of surgical wound infection in post-CS patients.

Comorbidities such as diabetes mellitus, hypertension, anemia, and other chronic diseases can affect the wound healing process through various physiological mechanisms. In patients with diabetes mellitus, for example, there is impaired microcirculation and neuropathy that lead to reduced blood flow to the wound tissue. In addition, high blood glucose levels can inhibit leukocyte function, particularly in the processes of phagocytosis and chemotaxis, thereby reducing the body's ability to fight infection. This condition makes surgical wounds more susceptible to infection and slower healing¹⁷.

In hypertension, changes occur in the blood vessels that can cause impaired tissue perfusion. Suboptimal blood flow to the wound area will hinder the distribution of oxygen and nutrients needed in the tissue regeneration process. Meanwhile, in patients with anemia, low hemoglobin levels result in reduced oxygen supply to the wound tissue, thereby inhibiting collagen synthesis and slowing down the healing process. Overall, these comorbid diseases can reduce the body's immunity and disrupt the normal wound healing mechanism. Selain itu, teori imunologi modern juga menjelaskan bahwa pasien dengan penyakit kronis umumnya mengalami penurunan respon imun baik secara seluler maupun humoral. Kondisi ini menyebabkan tubuh tidak mampu merespon secara optimal terhadap invasi mikroorganisme pada luka operasi. Pada pasien post SC, luka insisi pada dinding abdomen menjadi pintu masuk potensial bagi bakteri. Jika disertai dengan penyakit penyerta, maka risiko infeksi luka akan meningkat secara signifikan karena sistem pertahanan tubuh tidak bekerja secara maksimal. The results of this study are in line with various previous studies that show that patients with comorbidities have a higher risk of surgical wound infections compared to patients without underlying diseases. This confirms that internal patient factors, particularly accompanying health conditions, have a significant influence on the success of the post-operative wound healing process¹⁸.

According to researchers' opinions, the significant relationship between comorbidities and the occurrence of wound infection in post-Cesarean section patients highlights the importance of a holistic approach in nursing and midwifery care. It is not only necessary to focus on surgical procedures and wound care, but also on optimal management of comorbidities before and after surgery. Efforts such as blood sugar control, blood pressure monitoring, increasing hemoglobin levels, and patient adherence to medication are important factors in preventing wound infections. In addition, healthcare professionals need to conduct comprehensive screening of the patient's condition before the Cesarean procedure so that complication risks can be identified earlier. Patient education on the importance of managing comorbidities also needs to be enhanced so that patients are more active in maintaining their health¹⁹.

6. Immune System Factors

The discussion of the results of this study shows that based on statistical tests using the Pearson Chi-Square, an Asymp. Sig. (2-sided) value of 0.000 was obtained. This value is smaller than the significance level of 0.05 ($p < 0.05$), so it can be concluded that there is a significant relationship between immunity and the incidence of wound infection in post-cesarean section (CS) patients. These results indicate that the condition of the patient's immune system plays a very important role in determining the

occurrence of surgical wound infections, where patients with low immunity are at greater risk of infection compared to patients with a good immune system.

The immune system is the main defense mechanism in protecting the body from the invasion of pathogenic microorganisms, including bacteria that cause wound infections. The immune system consists of innate immunity and adaptive immunity. In the early phase of wound healing, innate immunity plays a role through the activity of cells such as neutrophils and macrophages that perform phagocytosis of bacteria. Subsequently, adaptive immunity works through the activation of lymphocytes to produce a more specific immune response. This process is highly dependent on optimal body conditions, including nutritional status, hormonal balance, and the absence of certain diseases. In the context of wound healing, the immune system plays a role in the inflammatory phase, which is the initial and very crucial stage²⁰. In this phase, an inflammatory response occurs aimed at clearing the tissue of germs and debris. If the patient's immune system is good, this process proceeds effectively and in a controlled manner, thereby preventing the development of infections. Conversely, in patients with low immunity, immune cell activity becomes suboptimal, making it easier for bacteria to multiply in the wound area and cause infection. This can also prolong the inflammatory phase and inhibit the entry of the proliferative phase, thus making wound healing longer. In addition, modern immunology theory explains that a decrease in the immune system can be caused by various factors such as malnutrition, stress, fatigue, chronic diseases, as well as the post-operative condition itself. In post-Cesarean patients, the body experiences physiological stress due to the surgical procedure, which can temporarily reduce immune response. If this condition is not supported by optimal recovery, the risk of wound infection will increase¹⁸.

According to researchers' opinions, the significant relationship between immunity and the occurrence of wound infections in post-cesarean section patients indicates the importance of efforts to improve patients' immune resilience as part of nursing and midwifery care. Interventions that can be carried out include fulfilling a balanced diet, getting adequate rest, stress management, as well as prevention and control of comorbid diseases. In addition, healthcare workers need to educate patients about the importance of maintaining the immune system during the post-operative recovery period.

CONCLUSION

Risk factors that can cause postoperative wound infection after a C-section include: a. Immune or body immunity status of the patient, where patients with low immunity are more susceptible to infection. b. Nutritional status, where patients with poor nutrition have a slower wound healing process. c. Obstetric factors and delivery history, including comorbid medical conditions that can affect the wound healing process. d. Obesity factors, some people with obesity experience delayed wound healing and have a chance of postoperative wound infection after a C-section. e. Hb levels, patients with low Hb levels have a chance of postoperative wound infection after a C-section. f. Comorbid diseases, patients with certain comorbid conditions can experience postoperative wound infection after a C-section.

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