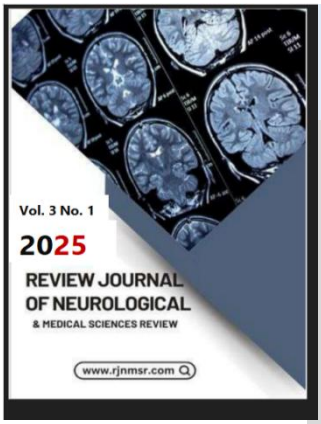

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Frequency of Post-Operative Wound Infection Following Intestinal Stoma Closure: A Cross-Sectional Study

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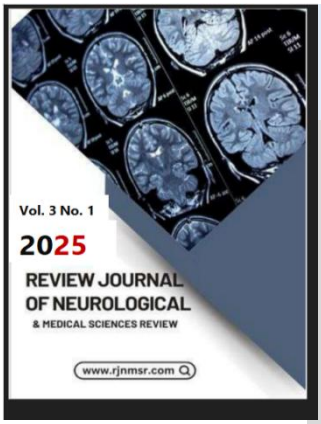
Abstract

Objective: The aim of this study is to find out the rate of post-operative wound infection in intestinal stoma closure cases, and to identify risk factors for the infection**. Design:** A cross-sectional study is carried out to determine the incidence of POWI among patients who undergo intestinal stoma closure. **Setting:** The study was conducted in the General Surgery Department, Lady Reading Hospital, Peshawar. **Subjects:** A total of 116 patients who had been stoma closure on intestine were involved in this study. **Interventions:** Surgical intervention involved the use of typical operational protocol in relation to the use of prophylactic antibiotics, the closure of intestinal stoma, and the standard post-operative wound cares practices. **Main Outcome Measures:** Post-operative wound infection was characterized by such clinical manifestation as fever, pain, erythema, cellulitis, and purulent discharge subsequent to the operation within 10 days. **Results:** It was established that 13.8% of the patients were found to have a post-operative wound infection after intestinal stoma closure. Older age and the occurrence of diabetes were the most important factors associated with increased risk of wound infection, whereas no significant association was established with the patient's gender or hypertension. Fever and pain were the most prevalent clinical features of infection, with a high prevalence rate of pus discharge. **Conclusions:** Post-operative infection of the wound in intestinal stoma closures is associated with age and diabetes, according to the results. Being



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attentive to symptoms, like fever and purulent discharge, and specific preventive interventions could prevent infections. This article shows the importance of making post-surgery care for high-risk patients to increase the benefits of the surgery and patient wellness they have undergone.

Keywords: Intestinal Stoma Closure, Post-Operative Wound Infection, Surgical Site Infection, Purulent discharge, Diabetes, Surgical infection, Wound Healing, Perioperative Care, Prophylactic antibiotics, post-operative care, General surgery.

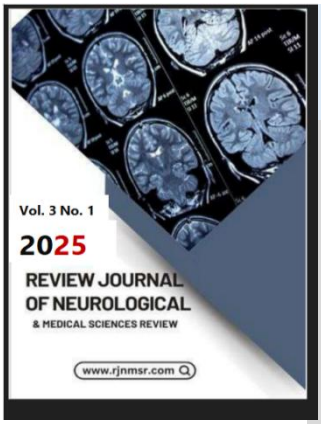
Introduction

Just like any surgery, having closure of an intestinal stoma is one of the major surgical procedures in the healing of patients who have had bowel surgery and a stoma created previously. This operation restores gastrointestinal continuity through reestablishing the connection of the bowel, therefore, cancelling the diversion of faecal content to an outside pouch. It, therefore, improves significant changes to a patient's quality of life by getting rid of the necessity of stoma care constantly and using a colostomy bag (Kowalski, Żądło, & Gawrychowski, 2017). Intestinal stoma closure is usually regarded as a vital step in the recovery, moving patients into the normal course of bodily functioning, including the natural process of excreting wastes to the digestive system. Recovery of gastrointestinal function involves higher independence, better mental and emotional state, and reduction of physical inconvenience arising from living with a stoma.

Although critical, intestinal stoma closure has its own challenges. The most common and also one of the most serious conditions that can develop after the procedure as a complication is the emergence of post-operative wound infections. It can be because of the inherent risk in any surgical treatment, in cases of the gastrointestinal tract. Surgical incisions that are created in the course of stoma closure are prone to infection with intestinal contents that support a wide range of bacteria. In addition, the anatomical position of the wound, which is typically in a moist and hard-to-reach place, also adds to the risk of infection. The stoma closure site is located in the near vicinity of the digestive tract, and the additional difficulty related to bacterial contamination and healing of the wound arises (Mado et al., 2012).

Like any other type of surgery, intestinal stoma closure tends to be accompanied by wound infections, which is a common problem. Common signs of infections are such as elevation, pain, and discharge with discoloration *(Yang et al., 2021)*. Left untreated, the infections may hinder recovery times, with prolonged healing processes of wounds in the affected bodily areas, extended hospital stays, and profound infections like sepsis in extreme cases (Mado et al., 2012). The frustration, anxiety, and depression increase as the recovery process takes time, which not only impacts the physical health of the patient but also their psychological well-being. If left untreated, these infections may require surgery, taking strong antibiotics, which prolongs the recovery, or cleaning out dead parts of the body (debridement), which delays the recovery and leads to extra healthcare costs (Carvalho et al., 2017).

Factors such as a person's age, how well they eat, and if they have diseases such as diabetes or immunosuppression can all influence the risk of getting an infection after surgery (Bankole, Osinowo, & Adesanya, 2017). Surgical elements, i.e., the technique



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adopted and the presence of intraoperative contamination, are also major determinants of the probability of infections. It is important to comprehend these risks so that infections could be avoided and the outcomes of the post-operative stay could be made better (Chen, Wang, & Wu, 2023). However, the rate and the severity of wound infections after intestinal stoma closure are underexplored and there are no appropriate preventive measures of this problem, especially against this issue in certain regional aspects; therefore, there is a necessity to research a reason for the complication and the most suitable tactics of its prevention (Cheong Chung et al., 2021).

Problem Statement

One of the post-operative complications is wound infections, especially after stoma closure of the intestine *(Li et al., 2020)*. These can be very detrimental to healing and cause complications like enhanced morbidity and longer hospital stay, compromising the ultimate quality of life of the patient. Despite having criteria for the risk factors for wound infection with known results, such as poor nutritional status, comorbidities like diabetes, and surgical technique, the prevalence and factors that are responsible for such infections need to be further explored among local people *(Li et al., 2020)*. Determination of the rate of post-operative infections is important in predicting the contributing risk factors and to aid in enhancing the outcomes of patients in post-operative care.

Research Gap

While many studies have been carried out in that regard, post-operative wound infections after an intestinal stoma closure, most of the research works target large populations worldwide with few resources in particular regions *(Utsumi et al., 2022)*. Available local studies on the incidence rate of wound infections as well as risk factors, are few, particularly in the practice of our institution. Consequently, it will be necessary to carry out directed research to know the peculiar factors responsible for the post-operative wound infection rates in our region. Filling this gap can adjust the preventive and treatment strategies more effectively, so as to advise patient care on a local level *(Cohen, Bock, & May, 2023)*.

Study Purpose

The aim of this research is to identify the rate of post-operative wound infection after the closure of intestinal stoma at Lady Reading Hospital, Peshawar, and find the risk factors of such cases. Results of this study are very important for understanding the prevalence of this complication, and subsequent, therewith, ought to design targeted interventions to mitigate this complication.

Objective

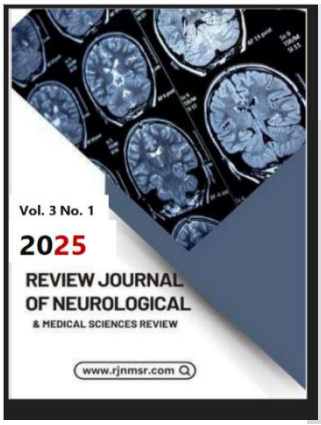
Primary Objective

The aim will be to find the rate of post-operative wound infection after intestinal stoma closure in the patients of Lady Reading Hospital, Peshawar.

Operational Definitions

Intestinal Stoma Closure

Intestinal stoma closure is a surgical procedure done under a general anesthesia to reverse a previously developed intestinal stoma. The procedure entails an elliptical



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cut around the site of the stoma thereby being deepened into the peritoneum. In full mobilization of the intestinal loop, the bowel continuity is restored with polyglycolic acid 3/0 suture in extra-mucosal, single interrupted fashion. The rectus sheath layers are then closed with continuous polypropylene no.1 and approximated the skin with simple intermittent polypropylene 2/0 suture *(Roy et al., 2022)*.

Post-Operative Wound Infection

The post-operative wound infection is described as the presence of infection in the operative site, which is determined based on clinical examination 10 days after surgery. The infection is characterized by the following elements:

- Fever greater than 100.4°F
- Pain on the wound site (Visual Analog Scale [VAS] > 3)
- Erythema and cellulitis
- Discharge of pus from the wound.

These signs, if seen together depict the presence of a surgical site infection *(Guo et al., 2022)*.

Materials and Methods

Study Design

This study will use a cross-sectional design; data will be gathered from the respondents at a given time after the closure of their intestinal stoma.

Setting

The commission of the study will take place in the general surgery department of Lady Reading Hospital, Peshawar.

Study Duration

The study will consume 6 months from the time the ethical approval is ascertained.

Sample Technique

Non-probability consecutive sampling method is to be used. All the patients who give their consent and fulfill the inclusion criteria will be included.

Sample Size

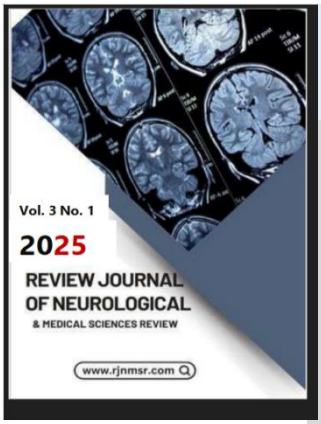
The present study sample size has been computed using the WHO sample size calculator. From the previous studies, whereby the rate of post-operative wound infection was observed at 5.05% (Hussain et al., 2015), the confidence level will be 95%, and if approximately 4% is added or subtracted from 5.05%, the range will be 1 – 9%. With the aid of these parameters, the minimum sample size for the study is calculated at 116 patients.

Sample Selection

The patients to be targeted for purposes of receiving the treatment program under consideration will be identified according to the following inclusion and exclusion criteria:

Inclusion Criteria

- Both male and female patients.
- Patients between 18-75 years of age.
- Patients who are having intestinal stoma closure according to the given operational definition in the study.



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Exclusion Criteria

- Patients with post-operative anastomotic leaks.
- Patients with previous wounds pre-existing at the stomal site.
- Pregnant or lactating women.

These criteria are established to have the sample comprised of those patients that are likely to suffer from post-operational wound infection and in good health to take part in the study.

Data Collection Procedure

Ethical Approval: Ethical clearance from the Ethical Committee of Lady Reading Hospital and Research Department will be sought before the study is started. The project will be explained to all the participants and informed consent will be provided. Patients will be comforted that their involvement would cause no other risks and their information will keep confidential.

Demographic Data: Basic demographic information required will be obtained from all the participants, and these include:

- Age
- Gender
- Marital status
- Education level
- Occupation
- Area of residence

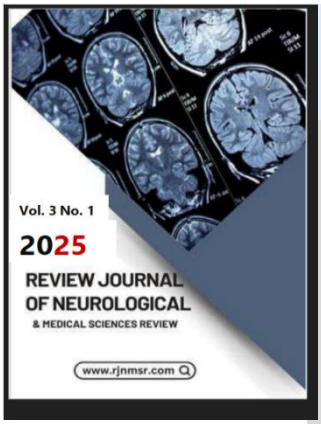
Comorbidities: The information regarding any comorbid conditions, including diabetes, hypertension, and any other chronic diseases will be entered because they can affect the risk for infections in a wound.

Wound Infection Criteria

- Post- operative wound infection will be diagnosed clinically 10 days after surgery according to the following criteria:
  - **Fever:** A body temperature greater than 100.4°F (38°C).
  - **Pain:** Focal localized pain at the wounded area with visual analog scale (VAS) more than 3.
  - **Erythema:** Swellings or redness at the incision site.
  - **Cellulitis:** Inflammation of skin in the vicinity of the wound.
  - **Purulent Discharge**: Presence of pus that is oozing out of the wound.
- **Consultation:** The whole evaluation process will be monitored by an experienced consultant with at least 5-year post-fellowship experience in general surgery. This guarantees the accuracy and reliability of wound infections diagnosis.

Data Analysis Procedure

- Statistical Analysis: Data analysis will be made using IBM SPSS v. 25.
  - Descriptive statistics shall be applied when reporting the demographic characteristics of the patients (age, gender, comorbidities, etc.).
  - Variable such as age, weight, and BMI that are continuous in nature will have mean and standard deviation (SD) calculated.



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- Categorical data such as gender, wound infection status, comorbidities, marital status, level of education, occupation and area of residence among others will be presented in frequencies and percentages.
- Chi square test will be used to evaluate associations of the incidence of post-operative wound infection with variables like age, gender, diabetes, hypertension as well as others. The significance level at which statistical significance will be determined will be at 5 % ($p < 0.05$).

Results

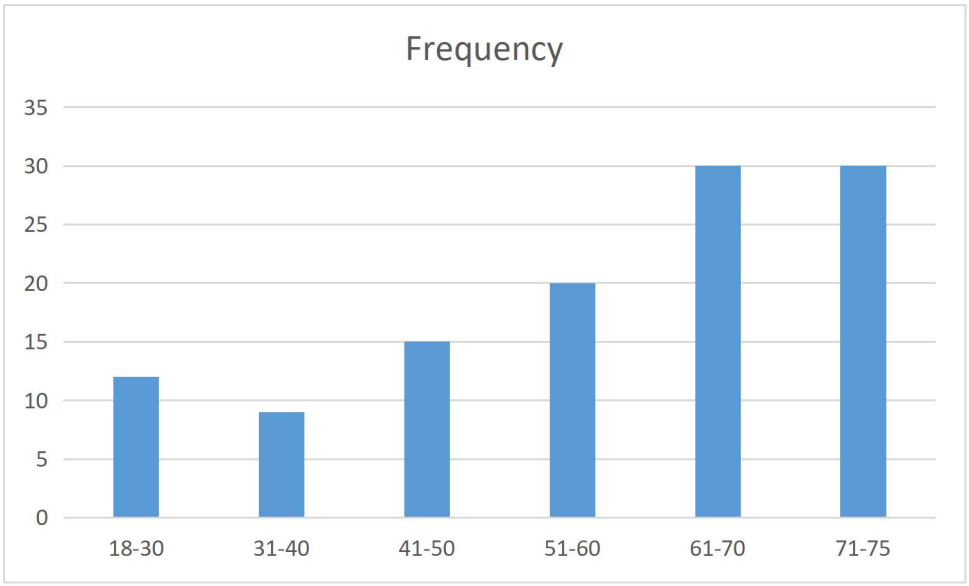
Demographics and Baseline Characteristics

116 participants were involved in the research, with a mean age of 49.33 ± 17.65 years. The mean weight was 73.29 ± 14,38 kg, the mean BMI was 23.97 ± 3.38. Gender distribution was dominant in males, with 69 males (59.5%) and 45 females (38.8%).

Age Distribution

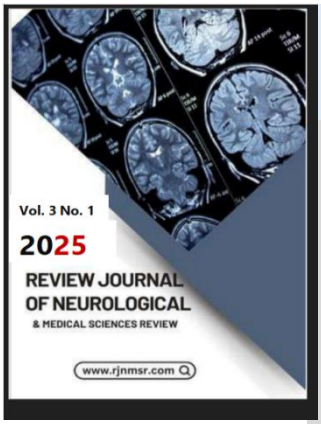
Participants were divided into 6 age groups as given under:

Age Group (Years)	Frequency (n)	Percent (%)
18-30	12	10.3%
31-40	9	7.8%
41-50	15	12.9%
51-60	20	17.2%
61-70	30	25.9%
71-75	30	25.9%



Post-Operative Wound Infection Frequency

With regards to post-operative wound infection after intestinal stoma closure, 13.8% (16 participants) were infected whereas the rest 86.2% (100 participants), were not affected.



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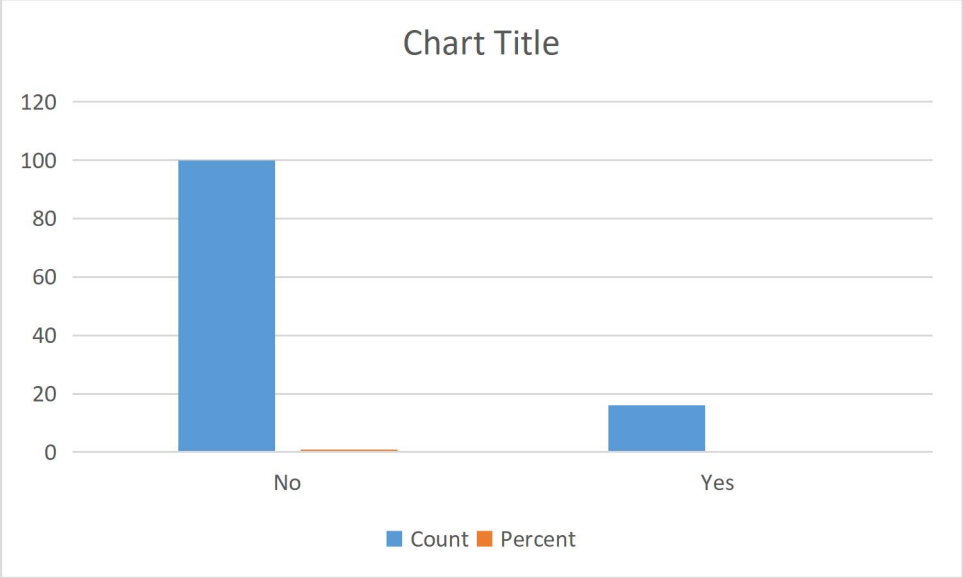
Post-Operative Wound Infection	Frequency (n)	Percent (%)
No Infection	100	86.2%
Yes Infection	16	13.8%



Clinical Features of Wound Infection

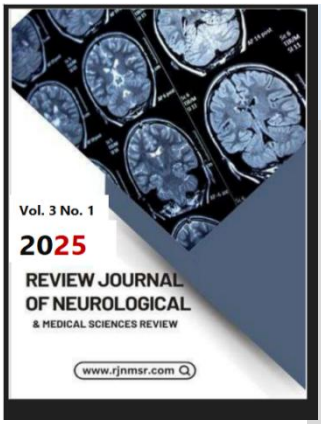
Clinical phenotype of the observed wound infections was the same in all infected cases; fever (>100.4°F) and pain(VAS > 3) on 100% of patients. Other clinical findings that were also encountered included erythema (75%), cellulitis (56.25%), and discharge of pus (87.5%).

Clinical Feature	Frequency (n)	Percent (%)
Fever (>100.4°F)	16	100%
Pain (VAS > 3)	16	100%
Erythema	12	75%
Cellulitis	9	56.25%
Pus Discharge	14	87.5%

Risk Factors for Infection

This study shows the association between post-operative wound infection and various demographic and clinical factors.

Risk Factor	Wound Infection (Yes)	Wound Infection (No)	Chi-Square p-value	Significance
Age (Years)	16	100	0.013	Significant
Gender (Male/Female)	8	108	0.753	Not Significant
Hypertension	9	107	0.253	Not



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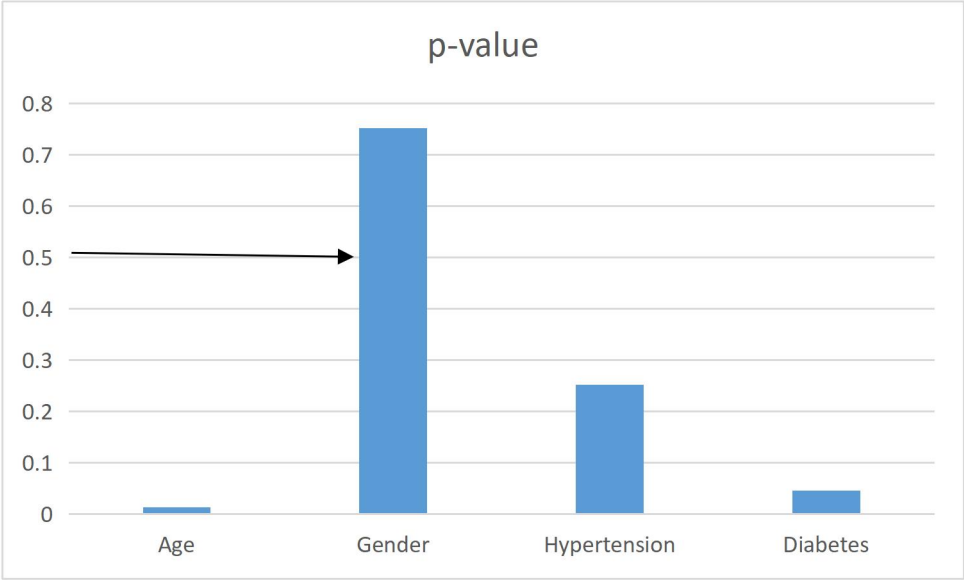
Risk Factor	Wound Infection (Yes)	Wound Infection (No)	Chi-Square p-value	Significance
(Yes/No)				Significant
Diabetes (Yes/No)	11	105	0.046	Significant



Interpretation of Risk Factors

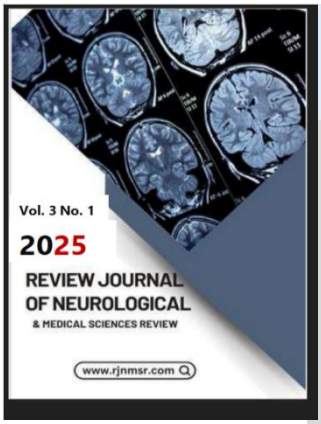
- **Age:** There was strong association between age and post- operative wound infection (p = 0.013), meaning that aged patients, especially above 60 years of age are prone to a wound infection after stoma closure in intestine *(Bankole, Osinowo, & Adesanya, 2017)*.
- **Gender:** There was no significant relationship between gender and wound infection (p = 0.753). It means that both males and females were at an equal risk of developing post-operative infections *(Rao, 2016)*.
- **Hypertension:** Hypertension has not shown any significant association with post-operative infection of wound (p = 0.253) with the implication that hypertension does not predispose this cohort to post-operative infection *(Chen, Wang, & Wu, 2023)*.
- **Diabetes:** There was strong association between diabetes and wound infection, (p=0.046) meaning diabetes patients are more likely to develop infections after surgery.

Summary of Key Findings

- The average age of the participants was 49.33 years, with more males representing the participants (59.5%).

A post-operative wound infection occurred in 13.8% of the patients after intestinal stoma closure.

- Some of the common clinical features associated with wound infection were fever and pain, where pus discharge was highly prevalent.



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- A strong association was shown between age and diabetes with the occurrence of post-operative wound infections, which meant that older and diabetic population may be at an increased risk of complications after the operation.

Discussion

The objective of this study was to assess the rate of post- operative wound infections after the closure of intestinal stoma and look for the risk factors involved in it. The sample size of 116 participants was included in this analysis, and the results were critical in demographic, clinical, and risk-related aspects which indicated the occurrence of post-operative wound infections. The results showed a moderate infection rate of 13.8%, however, there was a significant link between the characteristics of the patients and the development of infections *(Chen, Wang, & Wu, 2023)*. The subsequent discussion below infers from such findings in detail and puts it in context with already existing literature.

Demographics and Baseline Characteristics

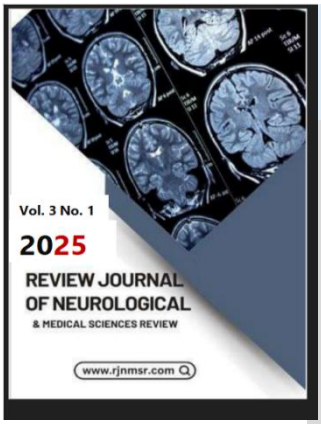
The participants in the study were 49.33 years ± 17.65 years old, with most of them above middle-age. Namely, the biggest age groups were 61-70 years and 71-80 years that accounted for 51.8% of the sample. This would indicate that intestinal stoma closure surgery might be more in older populations (perhaps because there are higher rates of such diseases as cancer, inflammatory bowel disease, and diverticulitis that are more likely to affect older people *(Rao, 2016)*. The male dominance in this cohort (59.5% male) prevails in other studies as there was revealed the higher rate of intestinal stoma procedures among men was revealed, perhaps because of gendered diseases such as colorectal cancer that are more common among males *(Li et al., 2020)*.

The mean weight of the participants was 73.29 ± 14.38 kg, and the mean BMI was 23.97 ± 3.38, which means that most participants were in normal weight. These figures may mean that weight or BMI is not one of the major determinants of the post-operative complications in this study because the collection of the sample did not select a significantly overweight population. However, further studies may be conducted in the future to determine whether or not obesity affects wound healing in stoma patients because it was linked to an increased risk of surgical site infections in other contexts.

Post-Operative Wound Infection Frequency

The overall incidence of post-operative wound infections in this cohort is 13.8% that is comparable to the rate of infection reported in similar studies on stoma closure *(Utsumi et al., 2022)*. Prior research has documented diverse rates of wound infection in patients receiving abdominal or stoma surgeries, whereby infection rates lie between 10-25%, depending on the surgical technique, post-operative care amongst other factors. Less infection rate in this work might imply effective surgical and post-operative prescription which involves use of proper antibiotic prophylaxis and careful management of wounds, as a mode of reducing infection risk *(Chen, Wang, & Wu, 2023)*.

Curiously, 86.2% of patients had not been infected, which means that most patients that undergo the described type of surgery recover without any complications. This



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rate of infection so high indicates the need to account for individual risk factors in evaluations of potential for complications post operatively *(Carvalho et al., 2017)*.

Clinical Features of Wound Infection

All the infected patients on this study manifested with fever and pain, two cardinal symptoms of post-surgical infections *(Mado et al., 2012)*. Fever (>100.4°F) and pain (VAS > 3) were noticed in 100% of infected persons, and hence these could be potential flags to clinicians to detect infections early. It should be noted that pus discharge was present in 87.5% of the cases of infection – the clear sign of wound infection. In the same way, erythema (75%) and cellulitis (56.25%) were frequent features confirming local inflammatory tissue reactions around the wound are often developed with infection held.

The clinical manifestation in the context of the investigation fits the nature of the typical signs of wound infection as described in the literature where fever, pain, erythema, and purulent discharge are typically the accompanying features of the surgically infected wounds. This continuity also doubles up on the validity of the recorded infection cases and underlines the relevance of observing such symptoms after surgery *(Roy et al., 2022)*.

Risk Factors for Infection

The study undertook to investigate some risks associated with post-operative wound infections such as age, gender, among others. Wound infection was significantly related to age and diabetes but not gender and hypertension.

1. Age

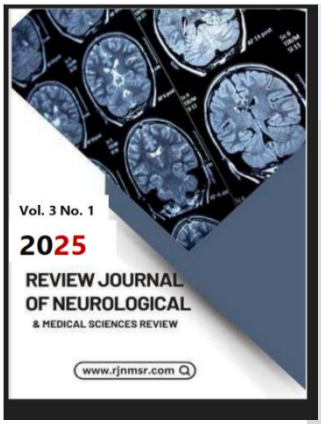
The strong interaction between age and wound infection ($p = 0.013$) indicates that geriatric patients could be at greater risk of having infection after the stoma closure surgery. This discovery agrees with earlier studies that noted that the immune response decreases with age, hence causing slow healing of wounds and increased susceptibility of infections *(Guo et al., 2022)*. The elderly patients also are known to have several comorbidities including diabetes and cardiovascular diseases that might worsen the ability of the patient to recuperate from the surgery. Increased incidences of such conditions as malnutrition, poor circulation and lack of elasticity in old people's skin may also make them susceptible to wound infections *(Rao, 2016)*.

2. Gender

As contrast against other studies that proposed more infections in women after abdominal surgery, this study failed to show any significant differences in infection rate between the sexes ($p = 0.753$). This may be because of the somewhat equitable distribution of genders in the sample and incorporating patients with different condition *(Li et al., 2020)* . The absence of gender effect on the risk of infection shows that both male and female patients are equally exposed to the danger of post-operation infections *(Carvalho et al., 2017)*. Therefore, it would be necessary to concentrate on personal risks rather than the patients' gender when planning post-operation care.

3. Hypertension

Hypertension was not significantly associated with high risk of infection regarding wounds ($p = 0.253$), in contrary, some studies have associated high blood pressure



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with adverse wound healing. Hypertension is known to be associated with compromised circulation and tissue oxygenation, which might potentially aggravate the risk of infection. However, in this research failing to establish a significant correlation implies that blood pressure control might not be the major determinant in warding off infections to wounds after closure of intestinal stoma. Future Research may have to determine whether if the ability to control hypertension can lead to better post-surgical outcomes *(Utsumi et al., 2022)*.

4. Diabetes

There was a strong association determined for diabetes and wound infection (p = 0.046), thus diabetic patients are more likely to develop an infection post-surgery. This finding is consistent with well-known literature which reports how hyperglycemia compromises immunity, delays wound healing, and predisposes one to infections *(Kowalski, Żądło, & Gawrychowski, 2017)*. Diabetic patients are often victims of poor blood circulation, increased frailty in the skin, reduction in their ability to resist infections rankling from altered immune responses which may be a risk factor to such patients.

Implications for Clinical Practice

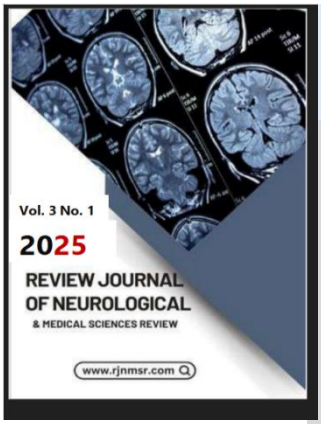
Several important implications for clinical practice have been highlighted by the findings of this study.

- Age and diabetes must be under close monitoring in the post-operative care since they are major risk factors for the infection. Precise measures like tight blood glucose control and increased monitoring in the elderly may prevent the occurrence of infections *(Kowalski, Żądło, & Gawrychowski, 2017)*.
- The gender and hypertension did not prove significant in this study, but it does not preclude the consideration of gender-neutral protocols for preventing the occurrence of infection and optimal blood pressure management from a post-operative care plan *(Cohen, Bock, & May, 2023)*.
- The clinicians should be more alert concerning fever, pain, erythema, and discharge of pus in patients because such symptoms are the most prevalent indicators of infection in the current cohort *(Cheong Chung et al., 2021)*.

Limitations and Future Research

Although this research gives us some important insights, there are some limitations that should be mentioned. To begin with, the study was conducted cross-sectionally and observationally, and therefore prevented establishing causal relations *(Chen, Wang, & Wu, 2023)*. Furthermore, though the sample size was appropriate, it can be considered small, and further research involving more representatives can yield more reliable results. Additionally, some of the variables, such as nutritional status and surgical technique, post-operative care protocols, were not controlled and therefore can confound the findings.

Longitudinal research should be conducted in the future to observe patients over a period of time and to monitor the effect of intervention, such as antibiotic prophylaxis, wound care protocols, and post-operative rehabilitation, on infection rates *(Bankole, Osinowo, & Adesanya, 2017)*. It would also be helpful to study the



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influence of other comorbidities like obesity, malnutrition, and immunosuppression on enhancing the risk of getting infected.

Conclusion

Summary of Results

This study evaluated the incidence of post-operative wound infections after closure of the intestinal stoma in a cohort of 116 people. The findings showed that 13.8% of the patients developed a wound infection after surgery, with common clinical characteristics such as fever, pain, erythema, and pus discharge, among others. Age, diabetes were found to be the major risk factors for post-operative wound infections in the study; hence, older and diabetic individuals are at a greater risk of having infections after such a procedure. On the other hand, gender and hypertension were not significant about this study *(Yang et al., 2021)*.

Importance for Clinical Practice

This study is quite useful in the enhancement of post-operative care to patients with intestinal stoma closure. The findings underline the necessity of improved vigilance in patients of advanced age and in diabetic patients at greater risk of infections. Clinicians should consider more stringent tracking and prevention of infection policy for such high-risk communities, including tight blood glucose control and closer post-surgical follow up. The study also emphasizes the significance of initial identification of the clinical signs of infection like that of fever and discharge of pus which may help in the early intervention and the better outcomes for patients.

Public Health Significance

The results of the study have a strong public health relevance. Wound infections after undergoing a surgical process not only worsen one's health and cost health care but also extend the length of a stay in a hospital and may cause further complications requiring further treatment. Through identifying important risk factors like age and diabetes, health care systems could customize preoperative evaluation and postoperative care guides to reduce incidences of infection. This may eventually result in enhanced patient outcomes, decreased health care burden, and enhanced quality of life of patients with stoma closure surgery. The strategy of public health should target further educational allocation in healthcare providers' practice to make them more aware of the role of risk stratification in preventing infections, thus providing all resources to those who need it more.

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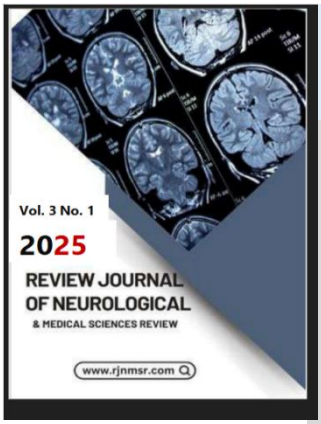

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