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Rate of Post-Operative Wound Infection and Mortality Related with Surgery among Patients presented with Spinal Cord Lesions in Bangladeshi Population: A Retrospective Study

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Abstract

Background: Spinal cord lesions are operated for the excision as well as for treatment purpose. **Objective:** The purpose of the present study was to post-operative infection and mortality related with surgery among patients presented with spinal cord lesions. **Methodology:** This retrospective cross-sectional study was conducted in the Department of Neurosurgical spine at National Institute of Neurosciences and Hospital, Dhaka, Bangladesh from January 2022 to December 2022 for a period of one year. All the patients with any age presented with spinal complain like pain, movement restriction or bony destruction were selected for this study. The patients with traumatic injury to the spine were excluded from this study. The details of the patients were recorded for this study. The management of the patients were performed according to the treatment protocol of this institute. **Results:** A total number of 463 patients were admitted in the Department of Neurosurgery Spine during the study period. The mean age group of this study population was 35.2±15.3 years with the age range of 21 to 71 years. The male and female ratio was 6.6:1. PLID & Lumber Canal Stenosis was the most common disease among all surgical procedure which was 143(40.1%) cases. The rate of post-operative infection was 18(5.0%) cases among the 357 surgical cases of spinal lesion. The most common isolated bacteria from wound infection were *Pseudomonas species* which was 10(55.6%) cases followed by *Klebsiella pneumoniae* and *Staphylococcus aureus* which were 5(27.8%) cases and 2(11.1%) cases respectively. **Conclusion:** In conclusion post-operative infection is not uncommon among the spinal surgery with the predominant of *Pseudomonas species*.

Keywords: Spinal Pathologies; spinal surgery; spinal cord lesion; post-operative infection

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Introduction

Bangladesh is developing country with densely populated in the world. Approximately hundred and seventeen million people live in this country. Near about 10.0% of total population are disable in Bangladesh where 43% are physically disable[1]. According to disability in Bangladesh the total figure of disability is increasing with population growth and aging[2]. With such a large number of disables people it is quite possible to achieve national development. However, it is real phenomenon of our society that disable people are very often deprived of their social opportunity and their rights.

Spinal cord lesions (SCL) are a significant public health concern, often resulting from traumatic injuries, infections, tumors, or degenerative diseases[3-4]. These lesions can severely impact motor, sensory, and autonomic functions, necessitating surgical intervention in many cases. However, surgery for spinal cord lesions is inherently complex, involving

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prolonged operative times, the use of surgical implants, and extensive tissue dissection, which predispose patients to post-operative complications, including infections[5]. Post-operative infections are a leading cause of morbidity and mortality worldwide, and their impact is particularly profound in low- and middle-income countries like Bangladesh, where healthcare resources and infection control practices are often suboptimal[5-6].

The burden of spinal cord lesions in Bangladesh is exacerbated by socio-economic and infrastructural challenges. The prevalence of traumatic spinal cord injuries is high, largely driven by road traffic accidents, falls from heights, and workplace injuries[7]. Infectious causes, including tuberculosis, remain a significant contributor to spinal pathologies, especially in rural areas[8]. Moreover, delayed diagnosis and inadequate access to advanced healthcare often lead to worsened disease progression, complicating surgical outcomes. Against this backdrop, post-operative infections represent a critical barrier to improving surgical success rates and reducing mortality.

Post-operative infections, particularly surgical site infections (SSI), are among the most common complications following spinal surgery. Globally, the incidence of SSIs in spinal surgeries ranges from 1% to 20%, depending on the type of procedure and patient-specific factors[9]. These infections can lead to prolonged hospital stays, increased healthcare costs, and significant physical and psychological burden on patients. In resource-limited settings like Bangladesh, the prevalence is likely higher due to systemic deficiencies in infection prevention practices, limited availability of sterile surgical environments, and overburdened healthcare facilities[10].

In addition to SSIs, complications such as pneumonia, urinary tract infections, and bloodstream infections are common in patients undergoing spinal surgery, particularly those with spinal cord injuries[9]. These patients often have impaired immune responses, prolonged immobility, and underlying comorbidities, further increasing their susceptibility to infections[11]. In the Bangladeshi healthcare context, the lack of robust post-operative monitoring systems and critical care resources compounds these risks, contributing to higher morbidity and mortality rates[12].

Post-operative infections are a significant contributor to surgical mortality, particularly in high-risk populations such as those with SCL. Sepsis, a severe systemic response to infection, is the leading cause of death among patients with surgical complications[13]. In spinal surgeries, infections can spread rapidly due to the extensive vascularity of spinal tissues, leading to multi-organ failure and death if not promptly addressed. Studies from resource-constrained settings suggest that limited access to timely diagnostics and treatment intensifies the risk of fatal outcomes[14].

In Bangladesh, the mortality rate associated with post-operative infections is influenced by systemic healthcare challenges, including delayed recognition of sepsis, suboptimal antibiotic use, and poor access to advanced critical care facilities[15]. Understanding these factors is essential to developing targeted strategies to improve surgical outcomes and reduce infection-related mortality.

Despite the high prevalence of SCL and its associated complications in Bangladesh, there is limited research on post-operative infections and their impact on mortality in this population. Addressing this gap is crucial to improving patient outcomes and guiding policy interventions. This study was aimed to evaluate the prevalence of post-operative infections and their association with mortality among Bangladeshi patients undergoing surgery for spinal cord lesions, providing insights into the challenges and opportunities for enhancing surgical care in resource-limited settings.

Methodology

Study Settings and Population: This retrospective cross-sectional study was conducted in the Department of Neurosurgical spine at National Institute of Neurosciences and Hospital, Dhaka, Bangladesh from January 2022 to December 2022 for a period of one year. All the patients with any age presented with spinal complain like pain, movement restriction or bony destruction were selected for this study. The patients with traumatic injury to the spine were excluded from this study.

Study Procedure: The details of the patients were recorded for this study. The management of the patients were performed according to the treatment protocol of this institute. After surgery the specimens were sent to the Department of Neuropathology at National Institute of Neurosciences and Hospital, Dhaka, Bangladesh and were tested for histopathological examination. The findings of the histopathological test were recorded. The morbidity and mortality were assessed among the patients. The study included patients with non-traumatic spinal cord lesion as well as those with cauda equina syndrome while excluding those who could not communicate or had SCI attributable to congenital causes such as spina

bifida, motor neuron disease, multiple sclerosis, or peripheral nerve damage like Guillain-Barre syndrome or poliomyelitis. Basic demographic and clinical information, including address and cell phone number, was collected from the medical records using a semistructured questionnaire. The wound swabs were collected from the study population and were sent to the microbiology laboratory for the isolation and identification of causative bacteria.

Statistical Analysis: Statistical analysis was performed by Windows based software named as Statistical Package for Social Science (SPSS), versions 22.0 (IBM SPSS Statistics for Windows, Version 22.0. Armonk, NY: IBM Corp.). Continuous data were expressed as mean, standard deviation, minimum and maximum. Categorical data were summarized in terms of frequency counts and percentages. Every effort was made to obtain missing data.

Ethical Clearance: This study was approved by the institute. The patients were not required to provide consent for participation in this study. All methods in this study were carried out in accordance with relevant guidelines and regulations of studies involving human beings. Because the data were extracted from the data base registry system, we did not consent the study participants, but the dataset was kept in confidential folder and was de-identified (no names extracted).

Results

A total number of 463 patients were admitted in the Department of Neurosurgery Spine during the study period. The most common age group were 18 to 40 years which was 273(58.9%) cases followed by 40 to 60 years and more than 60 years which were 138(29.8%) cases and 52(11.3%) cases respectively. The mean age group of this study population was 35.2±15.3 years with the age range of 21 to 71 years (Table 1).

Table 1: Age Group Distribution of the Study Population (n=463)

Age Group	Frequency	Percent
18 to 40 Years	273	58.9
40 to 60 Years	138	29.8
More than 60 Years	52	11.3
Total	**463**	**100.0**
Mean±SD (Years)	35.2±15.3 (21 to 71)	

Male was predominant than female in respect of spinal cord lesion surgeries which was 402(87.0%) cases and 61(13.0%) cases respectively. The male and female ratio was 6.6:1 (Figure I)

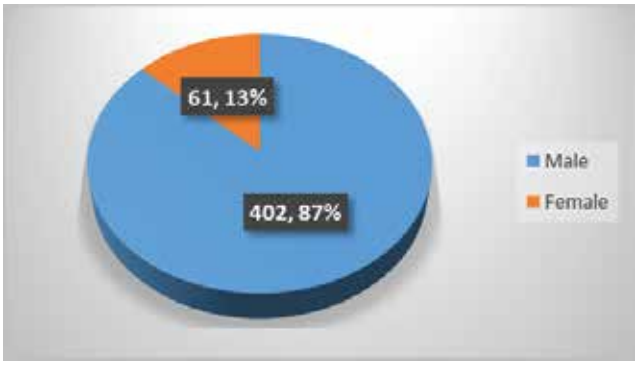

Figure I: Showing Gender Distribution among Study Population (n=463)

Among 463 cases, surgical intervention was performed among 357(77.1%) cases and the rest of the 106(22.9%) patients were got the conservative treatment (Figure II).

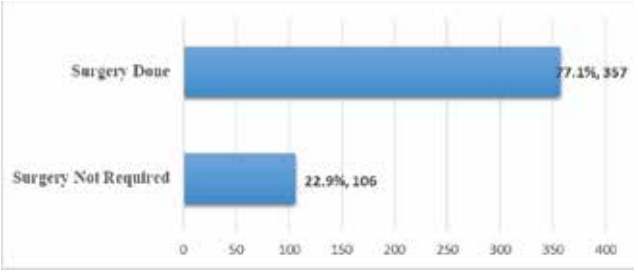

Figure II: Showing Surgery among Study Population (n=463)

PLID & Lumber Canal Stenosis was the most common disease among all surgical procedure which was 143(40.1%) cases followed by Spinal Tumor, Cervical & Fixation (ACDF), Lumber Spondylolisthesis & Fixation, AAD and CV Junction/ Chiari Malformation which were 62(17.4%) cases, 53(14.8%) cases, 30(8.4%) cases, 16(4.5%) cases and 16(4.5%) cases respectively (Table 2).

Table 2: Distribution of Surgeries with Different Disease Profiles among Study Population (n=357)

Disease	Frequency	Percent
PLID & Lumber Canal Stenosis	143	40.1
Spinal Tumor	62	17.4
Cervical & Fixation (ACDF)	53	14.8
Lumber Spondylolisthesis & Fixation	30	8.4
AAD	16	4.5
Pott's Spine	8	2.2
CV Junction/ Chiari Malformation	16	4.5
Dorsal Fixation	3	0.8
Scoliosis/Kyphosis	8	2.2
Other	18	5.0
Total	**357**	**100.0**

The rate of post-operative infection was 18(5.0%) cases among the 357 surgical cases of spinal lesion (Table 3).

Table 3: Rate of Post-Operative Infection among the Study Population (n=357)

Post-Operative Infection	Frequency	Percent
Present	18	5.0
Absent	339	95.0
Total	**357**	**100.0**

The most common isolated bacteria from wound infection were Pseudomonas species which was 10(55.6%) cases followed by Klebsiella pneumoniae and Staphylococcus aureus which were 5(27.8%) cases and 2(11.1%) cases respectively. No mortality was reported among the cases (Table 4).

Table 4: Distribution of Isolated Bacteria from Post-Operative Wound Infection (n=18)

Isolated Bactria	Frequency	Percent
Pseudomonas species	10	55.6
Klebsiella pneumoniae	5	27.8
Staphylococcus aureus	2	11.1
Others	1	5.5
Total	**18**	**100.0**

Discussion

Post-operative infections are a significant concern in surgeries, particularly in patients with spinal cord lesions (SCL), as these patients often have compromised immune systems and require complex surgical interventions[7]. The current study sheds light on the relationship between post-operative infections and mortality among patients with SCL in the Bangladeshi population, highlighting the critical challenges in surgical management and infection control.

Post-operative infections were found to be a common complication, consistent with previous studies. Research indicates that spinal surgeries are particularly prone to infections due to prolonged operative time, use of implants, and extensive tissue dissection12. In the Bangladeshi context, factors like inadequate sterilization, limited resources, and delayed hospital admission may exacerbate the risk. Studies from similar low-resource settings have reported surgical site infection (SSI) rates ranging from 5.0% to 20.0% for spinal surgeries[13]. This underscores the importance of strict adherence to infection control protocols, including pre-operative antibiotic prophylaxis and enhanced surgical techniques.

The findings also confirm that post-operative infections significantly increase mortality rates. The pathophysiology of infections, particularly sepsis, plays a pivotal role in adverse outcomes. Sepsis and multi-organ failure remain leading causes of death in patients with SCL undergoing surgery[14]. In Bangladeshi hospitals, limited availability of critical care resources, delayed recognition of sepsis, and lack of advanced microbiological diagnostics likely contribute to higher mortality. This aligns with global evidence suggesting that timely intervention can reduce sepsis-related deaths[15].

Several factors associated with an increased risk of infection and mortality were identified. These include the patient's pre-operative nutritional status, presence of comorbidities like diabetes mellitus, and the type and duration of surgery. Nutritional deficiencies, particularly anemia and hypoalbuminemia, are prevalent in Bangladeshi patients and compromise immune function, predisposing them to infections[16]. Additionally, prolonged operative time and the use of surgical implants are well-documented risk factors for SSIs, as implants can serve as a nidus for bacterial colonization[17].

To mitigate the burden of post-operative infections, targeted strategies are imperative. First, improving pre-operative patient optimization is essential, including addressing nutritional deficiencies and controlling blood sugar levels. Second, hospitals should enforce rigorous infection control measures, including proper sterilization techniques and adherence to WHO surgical safety checklists. Third, antibiotic stewardship programs must be implemented to prevent the emergence of multi-drug-resistant organisms, which are increasingly prevalent in Bangladesh[18]. Lastly, post-operative monitoring and early recognition of infections are critical. This can be achieved by training healthcare staff and employing low-cost technologies for early detection.

This study is limited by its observational design and the lack of advanced microbiological data to identify specific pathogens. Future research should focus on multicenter studies to capture diverse hospital settings and evaluate the impact of targeted interventions. Furthermore, integrating cost-effective innovations, such as telemedicine and artificial intelligence, could enhance monitoring and early intervention in resource-constrained environments.

Conclusion

The findings highlight the high prevalence of post-operative infections and their significant contribution to mortality among Bangladeshi patients with spinal cord lesions. Addressing this challenge requires a multi-pronged approach, focusing on infection prevention, patient optimization, and timely management of complications. Policymakers must prioritize investments in healthcare infrastructure and training to reduce the burden of post-operative infections and improve surgical outcomes.

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Conflict of Interest
All authors declared no conflict of interests.

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Authors' contributions
Khan YF, Khan MSK conceived and designed the study, analyzed the data, interpreted the results, and wrote up the draft manuscript, contributed to the analysis of the data. Alam MS, Saad SA helped in data collection. Khan YF, Khan MSK critically reviewed and edited the manuscript. Moureen A, Islam MR involved in the manuscript review. All authors read and approved the final manuscript.

Data Availability
Any inquiries regarding supporting data availability of this study should be directed to the corresponding author and are available from the corresponding author on reasonable request.

Ethics Approval and Consent to Participate
Ethical approval for the study was obtained from local ethics committee. All methods were performed in accordance with the relevant guidelines and regulations.

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