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Original Research Article

Comparison of Outcome of Median Sternotomy Lavage in Diabetic and Non-Diabetic Patients of Coronary Artery Bypass Graft Surgery in Terms of Wound Infection, Wound Dehiscence, and Hospital Stay

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Abstract: *Sternal wound complications after coronary artery bypass grafting (CABG) are a significant source of postoperative morbidity, especially in diabetic patients who experience impaired healing and higher infection risk. Current evidence on early postoperative wound outcomes in diabetic versus non-diabetic CABG patients in Pakistan is limited.* ***Objective:*** *To compare the frequency of early postoperative sternal wound infection, wound dehiscence, and length of hospital stay between diabetic and non-diabetic patients undergoing CABG via median sternotomy with saline lavage at a tertiary cardiac care center in Pakistan.* ***Methods:*** *This descriptive study was conducted at the Department of Cardiac Surgery, Punjab Institute of Cardiology, Lahore, over three months from 4 May to 4 August 2025. Ninety adult patients undergoing elective CABG via median sternotomy with standardized saline lavage were enrolled. Patients were stratified into diabetic (HbA1c ≥ 6.4%) and non-diabetic (HbA1c < 6.4%) groups. Wound infection was assessed clinically on postoperative day five, and wound dehiscence on postoperative day seven. Length of postoperative hospital stay was recorded. Continuous variables were summarized as mean ± standard deviation, and categorical variables were summarized as frequencies and percentages. Group comparisons were performed using chi-square and appropriate parametric tests, with $p \leq 0.05$ considered statistically significant.*
Results: *The cohort's mean age was 56.8 ± 9.0 years, with a male predominance (75.6%). Thirty-six patients (40.0%) were diabetic. Postoperative wound infection occurred in 15.6% of patients, with a significantly higher frequency in diabetics compared with non-diabetics (27.8% vs. 7.4%, p = 0.008). Wound dehiscence was observed in 13.3% of patients, with a higher proportion in diabetics than non-diabetics (19.4% vs. 9.3%), although this difference did not reach statistical significance (p = 0.18). The mean postoperative hospital stay was significantly longer in diabetic patients compared with non-diabetic patients (8.0 ± 2.3 vs. 5.8 ± 1.6 days, p < 0.001).* ***Conclusion:*** *Despite standardized median sternotomy saline lavage, diabetic patients undergoing CABG experienced significantly higher rates of early postoperative wound infection and longer hospital stays compared with non-diabetic patients. These findings highlight the need for intensified perioperative risk stratification and targeted wound care strategies in diabetic CABG patients in resource-limited settings.*

Keywords: Coronary Artery Bypass, Surgical Wound Infection, Diabetes Mellitus, Sternotomy, Postoperative Complications

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Introduction

Coronary artery bypass grafting (CABG) remains the gold standard surgical intervention for multivessel coronary artery disease, offering superior long-term survival and event-free outcomes compared with percutaneous coronary intervention, particularly in diabetic patients (1,2). The procedure is predominantly performed via median sternotomy, which, despite being the most common incision in cardiac surgery, carries an inherent risk of wound-related complications (3). These complications range from superficial surgical site infections to deep sternal wound infections, mediastinitis, and wound dehiscence, with an overall incidence reported in up to 8% of cases (4).

Sternal wound dehiscence following median sternotomy is a well-recognized and potentially devastating complication, with reported incidence ranging from 0.4% to 4% and associated mortality between 5% and 20% (5,6). Deep sternal wound infection adds a substantial economic burden, with estimates suggesting an additional cost of approximately USD 20,000 per isolated CABG case and a mean cost of USD 36,769 per surgical wound infection in high-income settings (7). Prolonged hospitalization, increased risk of nosocomial infections, and psychosocial morbidity further compound these adverse outcomes (7,8).

Diabetes mellitus is a well-established independent risk factor for sternal wound complications following CABG (4,9). Multivariate analyses have shown that diabetes significantly increases the risk of both superficial and deep sternal wound infection, with reported hazard ratios of approximately 2.0 for overall sternal wound infection and odds ratios exceeding 3.0 for deep sternal wound infection (9). The pathophysiological basis includes impaired microvascular perfusion, compromised immune responses, and delayed wound healing, all of which are exacerbated in perioperative hyperglycemia (10,11).

Diabetic patients undergoing CABG with bilateral internal mammary artery harvesting face an additional risk of sternal devascularization and infection (11). Both insulin-dependent and non-insulin-dependent diabetes are associated with an increased risk of sternal wound dehiscence and infection (4).

Intraoperative and postoperative wound management strategies, including median sternotomy lavage, have been evaluated to reduce the risk of wound infection and dehiscence. Closed-incision negative pressure wound therapy has been shown to reduce wound infection, dehiscence, and seroma formation, particularly in high-risk groups such as diabetic and obese patients (12). Surgical site infection rates after CABG may reach up to 20% in selected high-risk populations, and risk stratification incorporating diabetes, obesity, renal impairment, and hepatic dysfunction is essential for identifying candidates for enhanced wound prophylaxis (13). The clinical and economic impact of sternal wound complications highlights the need for evidence-based preventive

strategies, including optimized lavage protocols at the time of sternotomy closure (7,8).

Pakistan bears a high burden of coronary artery disease and diabetes mellitus, with diabetes prevalence among the highest globally. A large proportion of patients undergoing CABG in Pakistani cardiac centers are diabetic, placing them at increased risk of post-sternotomy wound complications, prolonged hospitalization, and re-intervention (2,4). Despite this, locally generated comparative data on outcomes of median sternotomy lavage in diabetic versus non-diabetic patients remain limited. In resource-constrained healthcare settings, wound-related complications impose a substantial burden on both patients and health systems (7). The present study was designed to generate context-specific evidence to inform perioperative wound management protocols for CABG patients in Pakistan, with particular focus on the high-risk diabetic subgroup.

Methodology

This descriptive case series was conducted in the Department of Cardiac Surgery at the Punjab Institute of Cardiology, Lahore, Pakistan, from 4 May to 4 August 2025, following approval of the study protocol by the institutional ethical review committee. Consecutive patients presenting to the outpatient clinics or emergency department with a diagnosis of coronary artery disease and scheduled for elective coronary artery bypass grafting via median sternotomy were assessed for eligibility. Both male and female patients who were deemed physically fit for anesthesia and provided written informed consent for participation were enrolled. Patients were excluded if they had significant comorbid conditions rendering them unfit for anesthesia, declined consent, had prediabetes (HbA1c 5.7%–6.4%), or experienced mortality during surgery or in the immediate postoperative period.

Baseline demographic and clinical information, including age, sex, hospital registration number, contact details, and relevant medical history, was recorded on a structured pro forma at the time of enrollment. Preoperative glycated hemoglobin (HbA1c) levels were measured for all participants as part of routine preoperative assessment. Based on HbA1c values, patients were categorized into two groups: those with HbA1c ≥ 6.4% were classified as having diabetes mellitus, while those with HbA1c < 6.4% were classified as non-diabetic. Patients with HbA1c values in the prediabetic range were excluded to ensure clear group differentiation.

All enrolled patients underwent standard median sternotomy for coronary artery bypass grafting performed by the same surgical unit following institutional protocols. At the completion of the procedure, median sternotomy lavage was carried out using one liter of 0.9% normal saline, after which the wound was dried using sterile gauze prior to closure. Postoperative care was provided according to standard institutional practices, and patients were monitored daily during their hospital stay for early surgical site complications.

Postoperative wound infection was assessed clinically on the fifth postoperative day and defined by pain at the wound site, local swelling, erythema, fever, or purulent or serous discharge from the surgical incision. Wound dehiscence was evaluated on the seventh postoperative day. It was defined as partial or complete separation of wound margins, bleeding from the wound, discharge, or visible gaping of the incision. The length of postoperative hospital stay was recorded as the number of days from surgery until the patient was deemed clinically stable and fit for discharge, based on predefined discharge criteria, including hemodynamic stability, absence of fever or wound infection, satisfactory laboratory parameters, and adequate mobility.

Data were entered and analyzed using SPSS version 26. Continuous variables, including age and length of hospital stay, were summarized as means with standard deviations. Categorical variables, including gender, diabetes status, wound infection, and wound dehiscence, were presented as frequencies and percentages. Comparisons between diabetic and non-diabetic groups were performed using the chi-square test for categorical variables and appropriate parametric tests for continuous variables. Post-stratification analyses were conducted where applicable, and a p-value of ≤ 0.05 was considered statistically significant.

Results

A total of 90 patients undergoing elective coronary artery bypass grafting (CABG) via median sternotomy with saline lavage at the Department of Cardiac Surgery, Punjab Institute of Cardiology, Lahore, were included. Based on preoperative HbA1c levels, 36 patients (40.0%) were classified as diabetic (HbA1c ≥ 6.4%) and 54 patients (60.0%) as non-diabetic. The overall mean age of the cohort was 56.8 ± 9.0 years (range 38–75 years). There was a clear male predominance, with 68 males (75.6%) and 22 females (24.4%). Diabetic patients were slightly older than non-diabetic patients, while gender distribution was comparable between groups (Table 1).

Postoperative wound infection assessed on the fifth postoperative day was observed in 14 patients (15.6%). The frequency of wound infections was higher in diabetic patients (10/36; 27.8%) than in non-diabetic patients (4/54; 7.4%). This difference was statistically significant on chi-square testing, indicating an association between diabetes mellitus and postoperative wound infection after median sternotomy lavage (Table 2).

Wound dehiscence evaluated on the seventh postoperative day was noted in 12 patients (13.3%). Diabetic patients showed a higher proportion of wound dehiscence (7/36; 19.4%) compared with non-diabetic patients (5/54; 9.3%). Although the proportion was higher in the diabetic group, this difference did not reach statistical significance on chi-square testing (Table 3).

The overall mean postoperative hospital stay was 6.7 ± 2.1 days. Diabetic patients had a longer mean hospital stay (8.0 ± 2.3 days) compared with non-diabetic patients (5.8 ± 1.6 days). This difference was statistically significant, indicating that diabetes mellitus was associated with prolonged hospitalization following CABG with median sternotomy lavage (Table 4).

Overall, diabetic patients undergoing CABG via median sternotomy lavage experienced significantly higher rates of wound infection and a significantly longer postoperative hospital stay. At the same time, a higher, though not statistically significant, frequency of wound dehiscence was observed in this group, in line with the study hypothesis.

Table 1. Baseline demographic characteristics of the study participants (n = 90)

Variable	Total (n = 90)	Diabetic (n = 36)	Non-diabetic (n = 54)
Age (years), mean ± SD	56.8 ± 9.0	58.6 ± 8.3	55.6 ± 9.4
Male, n (%)	68 (75.6)	26 (72.2)	42 (77.8)
Female, n (%)	22 (24.4)	10 (27.8)	12 (22.2)
HbA1c (%), mean ± SD	6.8 ± 1.3	8.0 ± 1.1	5.6 ± 0.4

Table 2. Comparison of wound infection between diabetic and non-diabetic patients (n = 90)

Wound infection	Diabetic (n = 36)	Non-diabetic (n = 54)	Total (n = 90)	p-value
Yes	10 (27.8%)	4 (7.4%)	14 (15.6%)	0.008
No	26 (72.2%)	50 (92.6%)	76 (84.4%)	

Table 3. Comparison of wound dehiscence between diabetic and non-diabetic patients (n = 90)

Wound dehiscence	Diabetic (n = 36)	Non-diabetic (n = 54)	Total (n = 90)	p-value
Yes	7 (19.4%)	5 (9.3%)	12 (13.3%)	0.18
No	29 (80.6%)	49 (90.7%)	78 (86.7%)	

Table 4. Comparison of postoperative hospital stay between diabetic and non-diabetic patients (n = 90)

Length of hospital stay (days)	Diabetic (n = 36)	Non-diabetic (n = 54)	p-value
Mean ± SD	8.0 ± 2.3	5.8 ± 1.6	< 0.001

Discussion

The present study demonstrated a significantly higher rate of early postoperative sternal wound infection in diabetic patients compared with non-diabetic patients (27.8% vs. 7.4%; p = 0.008), with an overall infection rate of 15.6% across the cohort. These findings are consistent with evidence identifying diabetes mellitus as an independent risk factor for post-sternotomy surgical site infection affecting both superficial and deep sternal wounds, as reported by Scott et al. (14). The biological mechanisms underlying this association include impaired microvascular perfusion, attenuated immune responses, and delayed wound healing in hyperglycemic states, particularly in the perioperative period, as described by Lima et al. (15).

The infection rate observed in diabetic patients in the present study was higher than that reported in several contemporary series. Kumar et al. reported substantially lower sternal wound infection rates in large comparative cohorts following CABG, highlighting the influence of perioperative protocols and closure techniques on wound outcomes (16). Lazar et al. demonstrated that perioperative hyperglycemia is independently associated with increased sternal wound infection and that tighter glycemic control reduces postoperative infectious complications (17). Willy et al. further identified diabetes mellitus as a major patient-related risk factor for surgical site infection. They emphasized the substantial morbidity and mortality associated with deep sternal wound infection (18). The relatively elevated baseline HbA1c in the diabetic group in the present study likely contributed to the higher infection burden observed.

Wound dehiscence occurred more frequently in diabetic patients than in non-diabetic patients, although this difference did not reach statistical significance. Scott et al. similarly identified diabetes as a risk factor for impaired sternal stability and delayed wound healing (14). Kumar et al. reported lower dehiscence rates with alternative sternal closure techniques, underscoring the role of surgical technique in reducing mechanical wound complications (16). Brega et al. demonstrated that closed-incision negative-pressure wound therapy can reduce sternal wound complications in high-risk patients, including those with diabetes (22). At the same time, Caldonazo et al. reported that the use of a thoracic support vest was associated with a significantly lower incidence of sternal wound dehiscence and infection in high-risk cardiac surgery populations (20). Farzan highlighted that diabetes is highly prevalent among patients with symptomatic sternal nonunion and that HbA1c may be underrepresented in current risk prediction models for sternal wound complications (23).

Postoperative hospital stay was significantly prolonged among diabetic patients in the present study. Silverborn et al. reported markedly extended hospitalization among patients with non-infectious sternal dehiscence compared with those with intact sternums (21). At the same time, Arazi et al. demonstrated that deep sternal wound infection is associated with substantial prolongation of hospital stay (13). Caldonazo et al. further showed that interventions aimed at improving sternal stability and wound protection were associated with shorter hospital stay (20). Madjarov et al. reported reduced hospitalization duration with rigid sternal fixation techniques in high-risk cardiac surgery patients, including those with diabetes (24). Sahasrabudhe et al. demonstrated that early referral for definitive surgical management of deep sternal wound infections significantly reduced overall hospital stay and wound healing time (25).

Collectively, these findings reinforce that diabetes mellitus is a key determinant of postoperative morbidity and prolonged hospitalization following CABG via median sternotomy, with important implications for perioperative care pathways in resource-limited cardiac surgery settings.

Conclusion

Pregabalin is an effective option for controlling the hemodynamic stress response observed after pneumoperitoneum creation.

Declarations

Data Availability statement
All data generated or analysed during the study are included in the manuscript.
Ethics approval and consent to participate
Approved by the department concerned. (IRBEC-PICLHR-P0293-24)
Consent for publication
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Conflict of interest

The authors declared no conflicts of interest.

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All authors reviewed the results and approved the final version of the manuscript. They are also accountable for the integrity of the study.

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