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Association between Preoperative Hemoglobin A1c Levels and Surgical Site Infection in Diabetic Patients

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Abstract

Background: Surgical site infections (SSIs) are among the most common postoperative complications and are associated with increased morbidity, prolonged hospitalization, and higher healthcare costs. Diabetes mellitus is a well-recognized risk factor for postoperative infections, and poor long-term glycemic control may further increase this risk. Hemoglobin A1c (HbA1c) is widely used as a reliable marker of chronic glycemic control; however, the relationship between preoperative HbA1c levels and postoperative SSI remains an important area of investigation. This study aims to evaluate the association between preoperative HbA1c levels and the incidence of SSIs within 30 days following elective surgery in diabetic patients.

Methods: This retrospective observational cohort study was conducted at Basrah Teaching Hospital, Basrah, Iraq, between June 2024 and June 2025. A total of 140 adult diabetic patients who underwent elective surgical procedures and had documented HbA1c measurements within three months prior to surgery were included. Patients were categorized into three groups based on HbA1c levels: good glycemic control (<7%), moderate control (7 - 8.9%), and poor control (≥9%). The primary outcome was the occurrence of SSIs within 30 days postoperatively according to Centers for Disease Control and Prevention criteria.

Results: The overall incidence of SSIs was 17.1% (24/140). SSI rates increased progressively with worsening glycemic control: 7.1% in patients with HbA1c <7%, 13.3% in patients with HbA1c 7 - 8.9%, and 34.2% in patients with HbA1c ≥9%. Multivariate logistic regression analysis demonstrated that poor glycemic control (HbA1c ≥9%) was an independent predictor of SSI after adjusting for age, body mass index (BMI), smoking status, and type of surgery.

Conclusion: Elevated preoperative HbA1c levels are significantly associated with an increased risk of SSIs following elective surgery. Routine assessment and optimization of glycemic control prior to surgery may help reduce postoperative complications in diabetic patients.

Keywords: Glycemic control, Hemoglobin A1c, Surgical site infection, Postoperative complications

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Introduction

SSIs are among the most frequent healthcare-associated infections and represent a significant cause of postoperative morbidity, prolonged hospitalization, readmission, and increased healthcare expenditure worldwide [1]. Despite advances in surgical techniques and infection prevention strategies, SSIs continue to occur in approximately 2 - 5% of patients undergoing inpatient surgical procedures, with higher rates observed in high-risk populations [2]. Diabetes mellitus is a globally prevalent chronic metabolic disorder affecting hundreds of millions of individuals and is increasingly encountered in patients presenting for elective and emergency surgery [3].

Diabetes has consistently been identified as an independent risk factor for postoperative complications, particularly SSI [4]. Hyperglycemia impairs innate immune function by reducing neutrophil chemotaxis, adherence, phagocytosis, and intracellular killing of pathogens, thereby increasing susceptibility to infection [5]. In addition, chronic hyperglycemia disrupts collagen synthesis, angiogenesis, and fibroblast proliferation, all of which are essential components of normal wound healing [6].

Observational studies have demonstrated that patients with diabetes experience significantly higher rates of postoperative wound infection (WI) compared with non-diabetic individuals [7]. Furthermore, poor long-term glycemic control, as measured by elevated HbA1c, has been associated with increased postoperative infectious complications across multiple surgical specialties, including general surgery, orthopedics, and cardiac surgery [8-10]. HbA1c reflects average plasma glucose levels over the preceding two to three months and is widely accepted as a reliable indicator of chronic glycemic control [11].

Several studies suggest that elevated preoperative HbA1c levels are predictive of adverse surgical outcomes, including WI, delayed healing, prolonged hospital stay, and remission [8-10]. Current clinical guidelines emphasize the importance of perioperative glycemic optimization in reducing postoperative complications, recommending careful assessment and management of blood glucose in patients undergoing surgery [1]. However, the optimal HbA1c threshold that significantly increases the risk of SSIs remains controversial, with different studies proposing cutoff values ranging from 7% to 9% [9, 10]. Moreover, many patients with diabetes are primarily managed in family medicine or primary care settings, making preoperative glycemic optimization a shared responsibility between primary care physicians and surgeons [4].

Understanding the relationship between preoperative HbA1c levels and postoperative SSIs is therefore essential to improving multidisciplinary perioperative care and reducing preventable complications.

The present study aims to evaluate the association between preoperative HbA1c levels and the incidence of SSIs within 30 days following elective surgery.

Materials and Methods

It was a retrospective observational cohort study carried out at Basrah Teaching Hospital, Basrah, Iraq, from June 2024 to June 2025. Ultimately, 140 patients were eligible and enrolled for final analysis. By performing contiguous samplings, all diabetic individuals who underwent an elective surgical intervention during the study period were included. As this was a retrospective study, no formal sample size calculation could be performed, and all identified cases over the period were included in order to increase statistical power and reduce selection bias.

Eligible patients were adults (≥18 years) with a known diagnosis of type 1 or type 2 diabetes mellitus who had undergone their elective surgical procedure and had also recorded their HbA1c level within three months preoperatively. Patients were also excluded if emergency surgery was done, if there was development of a pre-existing infection at the surgical site, if their HbA1c data is not available, or if they were receiving immunosuppressive therapy, including chemotherapy.

The exposure of interest was preoperative glycemic control, and in-hospital laboratory archives were used to determine whether patients satisfied the definition based on HbA1c values. Patients were categorized into 3 groups based on HbA1c value: good glycemic control (<7.0%); moderate glycemic control (7.0 - 8.9%); and poor glycemic control (≥9.0%)

The main outcome measure was SSI occurring within 30 days of surgery. SSIs were defined through any of the following: purulent drainage from a surgical incision site; positive wound culture; or clinical SSI diagnoses documented by an attending surgeon or reopening of a wound because of infection based on existing criteria per the Centers for Disease Control and Prevention. Secondary outcomes included 30 day hospital readmission, wound-related complications from emergency department visits, and length of stay.

Data was extracted using a standardized data extraction form and by granting access to electronic and paper medical records. The variables we collected included demographic (age and sex), clinical parameters of patients (BMI and smoking status), duration of surgery, type of surgery, usage of prophylactic antibiotics, comorbidities (such as hypertension and chronic kidney disease), preoperative HbA1c levels, postoperative SSI.

Ethical approval for this study was achieved from Basrah Health Directorate. As this study was a retrospective one, the need for informed consent was waived. All data were anonymized before analysis so that patient confidentiality could be preserved.

The statistical analysis was done using version XX of Statistical Package for the Social Sciences (IBM Corp., Armonk, NY, USA). Continuous variables were presented as mean ± standard deviation, and categorical variables were expressed as frequencies and percentages. Chi-square test was used to compare the SSI rates between the stop-HbA1c categories. Independent t-test or one-way analysis of variance was conducted to compare continuous variables as appropriate. To assess whether preoperative HbA1c level could be an independent risk factor for SSI, a multivariable logistic regression analysis was applied, adjusted by potential confounders: age, BMI, smoking status, and type of surgery. Statistical significance was defined as a p value of < 0.05, and all tests were 2-tailed.

Results

The baseline characteristics of the 140 included patients are summarized in table 1. The mean age was 56.4 ± 11.2 years, which shows that the population includes mostly middle-aged subjects, and there were marginally more males than females. The mean BMI was 29.3 ± 4.6 kg/m² (overweight). The cohort also had high rates of smoking, hypertension, and chronic kidney disease. The overall surgical time was 95 min on average, and nearly all patients were given prophylactic antibiotics according to standard perioperative preventive protocols.

The distribution of patients in regard to preoperative HbA1c levels is shown in table 2. Just 30.0% of the patients had good glycemic control, while the majority of patients fell under moderate and poor control. The majority of the patients were assigned to the moderate glycemic control category (42.9%) and 27.1% of subjects had defective metabolic regulation and were found in poor control group; these results indicate that pre-operative glucose regulation was suboptimal in studied cohort

In table 3, the SSI rate also increased along with HbA1c. SSI rates were lowest in the good glycemic control group (7.1%) and highest in the poor glycemic control subjects (34.2%). The total SSI rate was 17.1%. The association between higher HbA1c and SSI was confirmed as statistically significant based on the chi-square test (p = 0.004).

Table 1: Baseline characteristics of the study population.

Variable	Value
Age (years), mean ± SD	56.4 ± 11.2
Male, n (%)	82 (58.6%)
Female, n (%)	58 (41.4%)
BMI (kg/m²), mean ± SD	29.3 ± 4.6
Current smokers, n (%)	32 (22.9%)
Hypertension, n (%)	64 (45.7%)
Chronic kidney disease, n (%)	18 (12.9%)
Duration of surgery (min), mean ± SD	95.0 ± 28.0
Received prophylactic antibiotics, n (%)	132 (94.3%)

Table 2: Distribution of patients according to preoperative HbA1c levels.

HbA1c category	Number of patients (n)	Percentage (%)
<7.0% (Good glycemic control)	42	30.0%
7.0 - 8.9% (Moderate glycemic control)	60	42.9%
≥9.0% (Poor glycemic control)	38	27.1%
Total	140	100.0%

Table 3: Incidence of SSI according to HbA1c category.

HbA1c category	SSI cases (n)	SSI rate (%)
<7.0%	3	7.1%
7.0 - 8.9%	8	13.3%
≥9.0%	13	34.2%

Note: Chi-square test: p = 0.004.

Table 4 refers to multivariate logistic regression analysis of predictors of SSI. HbA1c ≥ 9.0% was the most significant independent predictor, with this group having 3.5 times the odds of developing SSI. Major operation was also clearly highly associated with increased SSI risk. After adjustment, age and smoking were no longer statistically significant, while BMI itself was borderline. Overall, based on the model line, inadequate glycemic control was the best predictor.

Table 5 compares patients with and without SSIs, highlighting significant differences between the two groups. Patients who developed SSI were found to have higher weights, mean HbA1c levels, more current smokers, and longer durations of surgery. Patients with chronic kidney disease were also more common among SSI patients, but this finding was of only borderline significance. Age and hypertension were not different between the groups. The significance of these findings is understanding the patient- and procedure-related factors that occurred in the skin of SSI development.

Table 4: Multivariate logistic regression analysis for predictors of SSI.

Variable	Odds ratio (OR)	95% confidence interval	p-value
HbA1c ≥9.0%	3.5	1.4 - 8.6	0.007
Age	1.02	0.98 - 1.05	0.310
BMI	1.08	0.99 - 1.17	0.070
Smoking	1.64	0.72 - 3.72	0.230
Major surgery	2.11	1.02 - 4.35	0.040

Table 5: Comparison between patients with and without SSI.

Variable	SSI (n = 24)	No SSI (n = 116)	p-value
Age (years), mean ± SD	58.2 ± 10.5	55.9 ± 11.3	0.340
BMI (kg/m²), mean ± SD	31.1 ± 4.8	28.9 ± 4.4	0.030
Current smokers, n (%)	9 (37.5%)	23 (19.8%)	0.040
Hypertension, n (%)	14 (58.3%)	50 (43.1%)	0.180
Chronic kidney disease, n (%)	6 (25.0%)	12 (10.3%)	0.050
Mean HbA1c (%)	9.1 ± 1.3	7.6 ± 1.1	<0.001
Duration of surgery (min), mean ± SD	110.0 ± 30.0	92.0 ± 26.0	0.020

Discussion

This study aimed to investigate the relationship between preoperative HbA1c levels and 30-day SSI in diabetic patients after elective surgery. Characteristics of the study population at baseline (Table 1) showed that most patients were middle-aged to older adults with a relatively high burden of comorbid conditions, including hypertension and obesity. This may represent a typical demographic of the diabetic surgical population globally.

Kallakuri et al. [12] investigated risk factors for postoperative WI in a cohort of 1,509 women undergoing obstetric and gynecologic surgery concluding that the most significant associations with postoperative infections were related to patient characteristics, including increasing age, diabetes, and obesity. In that study, the authors observed an overall WI rate of 7.9%, and older age and metabolic comorbidity were significant predictors for infection [12]. Similarly, Soalikin et al. [13] 350 patients undergoing elective ear, nose, and throat surgery to identify patient-related risk factors for SSI. The study indicated that the significant predictive factors for surgical WI were diabetes, elderly age, and nutritional status, and it was shown that the incidence of postoperative infection in diabetic patients was higher than in subjects without diabetes [13]. Furthermore, Avci et al. [14] reported the itemized surgical outcomes of a large cohort-based study conducted on 1,013 diabetic patients who were subjected to major elective surgical procedures, which reported significant associations between elevated HbA1c levels and increased postoperative morbidities and complications within the 30-day post-surgery time frame [14]. These results are in line with the demographic characteristics found in this study and suggest that metabolic comorbidities and patient-related factors significantly influence the difficulty of postoperative infection.

The vast majority of subjects who had each surgery fell on the worse side of glycemic control, defining it as "fair" and "poor" (Table 2). This speaks to the ongoing challenge of attaining optimal long-term glycemic homeostasis in surgical patients with diabetes. Maqsood et al. [15] reported a matched observational study of 1,024 patients undergoing elective surgical procedures in tertiary care hospitals to assess the association between higher HbA1c levels and risk for postoperative infections. Patients were then grouped by HbA1c ≥ vs < 6.5% in their study, for example. More than half (56.5%) of patients had HbA1c higher than 6.5%, and heightened preoperative HbA1C was significantly correlated with SSIs during the postoperative period [15]. Similarly, Wang et al. [16] conducted a study on 604 patients with type 2 diabetes undergoing lower-limb orthopedic surgery for fractures, evaluating whether glycemic control was independently associated with the prediction of postoperative infections over a one-year follow-up period. An increased pre-operative HbA1c level exhibited a significant correlation with the rate of SSI, with an estimated optimal representative cut-off for infective complication at approximately 7.85% HbA1c [16]. The Cheong et al. [17] study, HbA1c was considered either as a preoperative factor or using multivariate logistic regression. A separate study also provided evidence from a cohort of 2858 patients. They concluded that even moderate elevations of HbA1c were independently associated with increased risk for postoperative SSI and thus recommended testing glycemic control by HbA1c levels preoperatively. These findings are consistent with the distribution we found and emphasize that there is an important burden of suboptimal glycemic control among surgical patients.

In the current study, the overall incidence of SSI (Table 3) was 17%. A similar result was observed, confirming that poor glycemic control was significantly associated with a higher incidence of SSI compared to well-controlled glycemia. As stated in the introduction, HbA1c levels have been correlated to postoperative infection rates in multiple other studies across the world, and our findings are in line with these as well. Gabriel et al. [18] conducted a retrospective cohort study analyzing the data of 3,064 patients who underwent general, vascular, and orthopedic surgeries; they were candidates for this article in 2019 to assess whether there is a relation between HbA1c levels and the incidence of SSI later on. They conducted multivariate logistic regression and stated that compared to patients with HbA1c < 6.5%, the odds of having an SSI were 2.4 times greater than those who had a preoperative HbA1c ≥8% [18]. Similarly, Werner et al. [19] used a nationally representative database to show that in this cohort, they evaluated postoperative outcomes of 7,958 diabetic patients undergoing open carpal tunnel release surgeries and showed an increased rate of postoperative infections directly proportional to HbA1c levels, with risk thresholds occurring around 7% and up to 8% HbA1c [19]. Only one other study, Ahmad et al. [20] investigated 354 cardiac surgery patients for the incidence of postoperative infection, concluding that patients with preoperative HbA1c levels ≥7% had a significantly higher infection rate than adequately controlled diabetics [20]. These data lend further support to the association between chronic hyperglycemia and postoperative WI established by this study.

Multivariate logistic regression analysis showed that patients with poor preoperative glycemic control were still independently associated with postoperative site infection after controlling covariates including age, BMI, smoking, and type of surgery (Table 4). Several international studies assessing predictors of postoperative infection also described analogous results. In Cheong et al. [17], analysis of immunoregulatory multivariate regression demonstrated that preoperative HbA1c and BMI were mutually independent factors predictive of SSI after adjustment for other clinical variables in a cohort study involving 362 subjects presenting for surgery for colorectal cancer [17]. Moreover, Wang et al. [21] performed a systematic review and meta-analysis. The data published in 2020 based on a summary of 23 cohort studies relating to surgical outcomes in patients with diabetes undergoing cardiovascular surgery, indicate that significantly higher levels of preoperative HbA1c are associated with a considerably increased risk of subsequent infections as well as other complications [21]. Furthermore, Wijma et al. [22] found an overall SSI rate of 27.3% in a cohort of 117 patients undergoing pancreatic surgery; however, the presence of diabetes was significantly associated with increased rates (48.3%) that persisted as an independent predictor of infection after controlling for confounders [22]. These findings are consistent with the regression analysis of this study, which demonstrates improved glycemic control as an independent mediator of postoperative outcomes.

Table 5 also reported higher HbA1c, obesity, and smoking in patients with postoperative infective complications. These associations have been described in multiple clinical studies exploring SSI risk factors. For instance, Shahzad et al. [23] conducted a quasi-experimental study with 60 elective surgery patients and compared patients with good glycemic control to non-diabetic patients. Finally, the study clearly documented postoperative WI in 50% of diabetic patients, whereas only 16.7% were non-diabetics, and established the concept that diabetes per se predisposed to infections even when blood-glucose levels are under control up to a point [24]. Finally, understanding postoperative infection and use as a proxy for underlying physiology in preclinical work, with obesity and smoking consistently reported in early observational studies to 'modulate' tissue perfusion and vapor innate immune response risk contributing to resultant infection. These findings are complementary to the present study's results and indicate that both metabolic and lifestyle factors influence the development of postoperative wound complications.

Conclusion

In conclusion, we found that a higher pre-operative HbA1c level of ≥ 6%, predictive of poor glycemic control in the context of poor perioperative and postoperative glycemic modulation, is an independent risk factor for surgical site complications following elective surgery in diabetic patients. It was found that patients with poorer glycemic control had a statistically significant higher rate of postoperative WI, and also the risk for infection actually correlates nicely with much higher values of HbA1c. As this finding emphasizes, routine assessment of the HbA1c levels before elective surgery and adequate glycemic optimization before that are vital. More optimal perioperative glycemic control may reduce postoperative complications and improve surgical outcomes in patients with diabetes.

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None.

Conflict of Interest

None.

References

1. Berríos-Torres SI, Umscheid CA, Bratzler DW, Leas B, Stone EC, et al. (2017) Centers for disease control and prevention guideline for the prevention of surgical site infection, 2017. JAMA Surg 152: 784–791. https://doi.org/10.1001/jamasurg.2017.0904
2. de Lissovoy G, Fraeman K, Hutchins V, Murphy D, Song D, et al. (2009) Surgical site infection: incidence and impact on hospital utilization and treatment costs. Am J Infect Control 37: 387–397. https://doi.org/10.1016/j.ajic.2008.12.010
3. International Diabetes Federation (2021) IDF Diabetes Atlas.
4. Martin ET, Kaye KS, Knott C, Nguyen H, Santarossa M, et al. (2016) Diabetes and risk of surgical site infection: a systematic review and meta-analysis. Infect Control Hosp Epidemiol 37: 88–99. https://doi.org/10.1017/ice.2015.249
5. Marhoffer W, Stein M, Maeser E, Federlin K (1992) Impairment of polymorphonuclear leukocyte function and metabolic control of diabetes. Diabetes Care 15: 256–260. https://doi.org/10.2337/diacare.15.2.256
6. Guo S, DiPietro LA (2010) Factors affecting wound healing. J Dent Res 89: 219–229. https://doi.org/10.1177/0022034509359125
7. Dronge AS, Perkal MF, Kancir S, Concato J, Aslan M, et al. (2006) Long-term glycemic control and postoperative infectious complications. Arch Surg 141: 375–380. https://doi.org/10.1001/archsurg.141.4.375
8. Halkos ME, Lattouf OM, Puskas JD, Kilgo P, Cooper WA, et al. (2008) Elevated preoperative hemoglobin A1c level is associated with reduced long-term survival after coronary artery bypass surgery. Ann Thorac Surg 86: 1431–1437. https://doi.org/10.1016/j.athoracsur.2008.06.078
9. Shohat N, Muhsen K, Gilat R, Rondon AJ, Chen AF, et al. (2018) Inadequate glycemic control is associated with increased surgical site infection in total joint arthroplasty: a systematic review and meta-analysis. J Arthroplasty 33: 2312-2321.e3. https://doi.org/10.1016/j.arth.2018.02.020
10. Cancienne JM, Werner BC, Browne JA (2017) Is there an association between hemoglobin A1C and deep postoperative infection after total knee arthroplasty? Clin Orthop Relat Res 475: 1642-1649. https://doi.org/10.1007/s11999-017-5246-4
11. American Diabetes Association Professional Practice Committee (2024) 9. Pharmacologic approaches to glycemic treatment: standards of care in diabetes—2024. Diabetes Care 47: S158–S178. https://doi.org/10.2337/dc24-S009
12. Kallakuri K, Suprada K, Bahadur BR, Rao G (2024) Post operative wound infection: a descriptive study. Int J Reprod Contracept Obstet Gynecol 13: 1731–1734. https://doi.org/10.18203/2320-1770.ijrcog20241767
13. Soalikin M, Rumi SNF, Chowdhury A (2024) Evaluation of patient factors for surgical site infection in elective ear, nose, throat and head-neck surgery. Bangladesh J Otorhinolaryngol 29: 74–80. https://doi.org/10.3329/bjo.v29i2.72283
14. Avci B, Saler T, Bankir M, Tuzun Z, Nazik H, et al. (2019) Relationship between morbidity and mortality and HbA1c levels in diabetic patients undergoing major surgery. J Coll Physicians Surg Pak 29: 1043–1047. https://doi.org/10.29271/jcpsp.2019.11.1043
15. Maqsood KM, Pahwani R, Avinash F, Shabbir MR, Basham MA, et al. (2022) Association between levels of pre-operative glycosylated hemoglobin and post-operative surgical site infections after elective surgery in a low-income country. Cureus 14: e27397. https://doi.org/10.7759/cureus.27397
16. Wang WH, Hsieh TC, Wu WT, Lee RP, Wang JH, et al. (2022) Correlation between the control of blood glucose level and HbA1c and the incidence of surgical site infection after emergent surgery for lower limb fracture among type II diabetes patients aged more than 50 years old. J Clin Med 11: 5552. https://doi.org/10.3390/jcm11195552
17. Cheong CH, Golder A, Horgan PG, Roxburgh CSD, McMillan DC (2022) Relationship between pre-operative glycated haemoglobin and surgical site infection in patients undergoing elective colon cancer surgery. Oncol Lett 24: 1-10. https://doi.org/10.3892/ol.2022.13416
18. Gabriel RA, Hylton DJ, Burton BN, Schmidt UH, Waterman RS (2019) The association of preoperative haemoglobin A1c with 30-day postoperative surgical site infection following non-cardiac surgery. J Perioper Pract 30: 320–325. https://doi.org/10.1177/1750458919886183
19. Werner BC, Teran VA, Cancienne JM, Deal DN (2019) The association of perioperative glycemic control with postoperative surgical site infection following open carpal tunnel release in patients with diabetes. HAND 14: 324–328. https://doi.org/10.1177/1558944717743594
20. Ahmad T, Siddique S, Sadiq A (2022) Incidence of superficial and deep surgical site

infections in post cardiac surgery patients with pre-operative HbA1c ≥7% compared to those having HbA1c <7%. Pak J Med Health Sci 16. https://doi.org/10.53350/pjmhs221610728

21. Wang J, Luo X, Jin X, Lv M, Li X, et al. (2020) Effects of preoperative HbA1c Levels on the postoperative outcomes of coronary artery disease surgical treatment in patients with diabetes mellitus and nondiabetic patients: a systematic review and meta-analysis. J Diabetes Res 2020: 3547491. https://doi.org/10.1155/2020/3547491

22. Wijma A, Driessens H, Nijkamp M, Hoogwater FJH, van Dijk PR, et al. (2024) Impact of preoperative diabetes mellitus on postoperative outcomes in elective pancreatic surgery and its implications for prehabilitation practice. Pancreas 53: e274–e279. https://doi.org/10.1097/mpa.0000000000002300

23. Shahzad M, Saeed B, Qayyum H, Farooq W, Ahmed S, et al. (2024) Post-operative wound infection after elective abdominal surgery in diabetic patients with good glycemic control versus patients with no diabetes: a comparative study. Pak Armed Forces Med J 74: 1573-1577. https://doi.org/10.51253/pafmj.v74i6.9999

24. Nisale SS, Chawada MJ, Kharkate G, Deshmukh SB (2017) A study of preoperative, intraoperative and postoperative factors responsible for postoperative wound infection. Int Surg J 4: 1569–1574. https://doi.org/10.18203/2349-2902.isj20171541