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Original Research Article

Incidence and Independent Risk Factors for Wound Healing Complications in Diabetic Patients Undergoing Surgery: A Retrospective Study

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Abstract:

Background: Diabetes mellitus is associated with impaired wound healing due to metabolic disturbances, vascular insufficiency, and immune dysfunction. Surgical patients with diabetes are therefore at increased risk of postoperative wound complications, which may lead to prolonged hospitalization and increased healthcare burden.

Aim: To determine the incidence of wound healing complications and identify independent risk factors among diabetic patients undergoing surgery.

Methodology: A retrospective observational study was conducted at Department of General surgery, Patna Medical College and Hospital, Patna, Bihar, India. Medical records of 87 diabetic patients who underwent surgical procedures over 8 month period were reviewed. Demographic, clinical, and surgical data were collected. Univariate analysis was performed to identify associated factors, followed by multivariate logistic regression to determine independent risk factors.

Results: Wound healing complications occurred in 28 patients (32.2%). Surgical site infection was the most common complication (17.2%), followed by wound dehiscence (8%) and delayed wound healing (6.9%). Univariate analysis showed significant associations with age >60 years, diabetes duration >10 years, poor glycemic control (HbA1c ≥9%), emergency surgery, and lack of antibiotic prophylaxis. Multivariate analysis identified poor glycemic control (AOR=3.12), diabetes duration >10 years (AOR=2.47), emergency surgery (AOR=2.15), and absence of antibiotic prophylaxis (AOR=2.68) as independent risk factors.

Conclusion: Wound healing complications are common among diabetic surgical patients. Optimizing glycemic control, ensuring appropriate antibiotic prophylaxis, and careful perioperative management may reduce postoperative complications.

Keywords: Diabetes Mellitus, Wound Healing Complications, Surgical Site Infection, Glycemic Control, Risk Factors, Retrospective Study.

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Introduction

Diabetes mellitus is a long-lasting metabolic disease that is caused by lasting hyperglycemia caused by a malfunction in the secretion or the action of insulin or both. It has become one of the major public health issues of the world, and the prevalence is rapidly spreading in the developed and developing world [1]. The International Diabetes Federation estimates that hundreds of millions of individuals all over the world are being impacted by diabetes nowadays and this figure is ever growing because of sedentary living, improper diet, urbanization and population ageing. India has been called the capital of diabetes in the world, especially due to its high and continuously increasing burden of the disease. Diabetes has long-term complications that involve several organ systems and cause great morbidity and mortality to its victims. Impaired wound healing is one of the most clinically significant complications of diabetes that may result in long hospitalization, higher healthcare expenses and poor patient quality of life [2].

The biological process of normal wound healing is intricate and tightly regulated and consists of many overlapping phases, which are hemostasis, inflammation, proliferation and tissue remodeling. The

interactions of the inflammatory cells, growth factors, cytokines, components of the extracellular matrix and sufficient blood supply all play a role in these processes. These mechanisms are however disturbed by a number of pathophysiological processes in patients with diabetes that slow down wound repairs. Recurrent hyperglycemia causes structural and functional changes of blood vessels, which cause disrupted microcirculation and impaired oxygenation of tissues [3]. Moreover, diabetes is also linked with the dysfunction of the immune system, such as the difficulty in the migration of leukocytes, reduced phagocytic activity, and inflammatory responses. All these abnormalities lead to the problem of delaying wound healing and predisposing to infection.

The diabetic patients provide special challenges to the clinicians due to the presence of high risks in postoperative wounds. The physiological conditions necessary to heal a surgical wound are best, and the metabolic changes that come with diabetes can deteriorate these conditions. It has also been demonstrated that poor glycemic control inhibits collagen synthesis, decreases fibroblast proliferation as well as the epithelialization process, which are critical processes during wound repair. In addition, peripheral neuropathy, peripheral vascular disease, and nephropathy are some examples of complications of diabetes that can also contribute to delayed recovery and heighten the risk of wound deterioration or infection during surgical operations [4].

The surgical site infection delayed wound healing, wound dehiscence, and chronic non-healing ulcers are some of the postoperative wound complications among diabetic patients. These complications can have a large effect on extending hospitalization and can require further surgical intervention or extended antibiotic suppressions. Poor wound healing complications in severe cases can cause limb threatening infections or systemic complications, including sepsis. Medically, these consequences lead to the augmented economic weight to patients and health care structures especially in situations that have resource constraints [5].

Some clinical and demographic issues have been found to be possible causes of poor wound healing among diabetics. Among these factors are glycemic control, diabetes years, obesity, old age, smoking, nutritional deficiency, and the co-occurring comorbid conditions such as hypertension, cardiovascular disease and renal dysfunction. Moreover, the perioperative variables that may also be involved in wound healing outcomes include the type of surgery, duration of surgery, contamination of wound, and practices that are given during the postoperative care. The recognition and comprehension of these risk factors is critical in the process of devising specific preventive measures and enhancing the postoperative care of diabetic patients [6].

The situation is further complicated in developing nations like India where low healthcare resources, late diagnosis, and poor management of the disease in most instances means that the impact of complications of diabetes on human health is increased [7]. Diabetic patients undergoing surgical procedures are characterized by an inadequately regulated level of blood glucose and a variety of conditions, which makes them more susceptible to postoperative complications. Moreover, socioeconomic status, difficulties in receiving special wound care services, and disparities in medical care facilities may affect the process of surgical wound management and prognosis in diabetic patients [8].

Knowledge of the occurrence of wound healing complications among diabetic surgical patients can play a crucial role in enhancing the quality of care provided to patients in perioperative settings and lower the postoperative morbidity. Detection of high-risk patients early will enable clinicians to take preventive measures to the complications including strict glycemic control, optimal nutritional care, attentive surgical practice, and proper wound care postoperative. In addition, the identification of independent risk factors related to wound complications may be helpful in the creation of clinical guidelines and risk stratification models that may assist in enhancing decision-making processes in surgical practice.

Consequently, the current retrospective study was done to assess the incidence of wound healing complications, and the incidence of independent risk factors of wound healing complications on diabetic surgical patients. The research was conducted in Department of Psychiatry of Netaji Subhas Medical College and Hospital, Patna, Bihar, India. Through the examination of the clinical records of diabetic surgical patients, the study will seek to offer an improved insight on the prevalence and determinants of postoperative wound healing complications in the population. The outcomes of this study can be used to develop better perioperative management care, better patient outcomes, and less healthcare burden due to surgical wound complications among diabetic patients.

Methodology

Study Design: This study was conducted as a retrospective observational study aimed at determining the incidence and independent risk factors associated with wound healing complications among diabetic patients undergoing surgical procedures. The retrospective design involved reviewing previously recorded medical data of eligible patients to analyze clinical characteristics, surgical details, and postoperative outcomes related to wound healing. This design was chosen because it allows efficient evaluation of existing clinical records to identify

associations between potential risk factors and postoperative complications in diabetic patients.

Study Area: The study was carried out at the Department of General surgery, Patna Medical College and Hospital, Patna, Bihar, India.

Study Duration: The study was conducted over a period of 8 months from April 2025 to December 2025.

Sample Size: A total of 87 diabetic patients who underwent surgical procedures during the study period and fulfilled the eligibility criteria were included in the study. The sample size was determined based on the number of available and complete patient records meeting the inclusion criteria within the study duration.

Study Population: The study population consisted of patients diagnosed with diabetes mellitus who underwent surgical procedures at the hospital during the study period. Both male and female patients belonging to different age groups were included. These patients represented a range of surgical interventions and varying clinical characteristics, which allowed evaluation of multiple factors potentially associated with postoperative wound healing complications.

Data Collection: Data were collected retrospectively from hospital medical records, surgical registers, and patient case files using a structured data collection format. Information extracted included demographic details such as age and gender, clinical characteristics including duration of diabetes and presence of comorbid conditions, and parameters related to glycemic control such as fasting blood glucose levels and HbA1c where available. Additional information regarding the type of surgery, whether the procedure was elective or emergency, duration of surgery, perioperative glycemic management, and use of antibiotic prophylaxis was also collected. Postoperative wound healing outcomes were assessed based on documented clinical findings in the patient records.

Inclusion Criteria

Patients were included in the study if they met the following criteria:

- Diagnosed with diabetes mellitus prior to surgery
- Underwent any surgical procedure during the study period
- Complete medical records available in the hospital database
- Age 18 years and above

Exclusion Criteria

Patients were excluded from the study if:

- They had incomplete or missing medical records
- Patients without a confirmed diagnosis of diabetes
- Patients who underwent minor procedures not requiring surgical wound closure
- Patients with pre-existing chronic non-healing wounds unrelated to surgery

Study Procedure: The study procedure involved reviewing hospital records of diabetic patients who underwent surgical procedures during the study period. Eligible cases were identified according to the predefined inclusion and exclusion criteria. Relevant clinical and surgical information was extracted and recorded in a structured data collection form. Patients were subsequently categorized into two groups based on postoperative outcomes: those who developed wound healing complications and those who did not. Wound healing complications were identified according to established clinical criteria, including surgical site infections, wound dehiscence, and delayed wound healing. The collected variables were then evaluated to determine potential associations with wound healing outcomes.

Statistical Analysis: All collected data were entered and analyzed using Statistical Package for Social Sciences (SPSS) version 26.0 or a similar statistical software package. Descriptive statistics were used to summarize patient characteristics and clinical variables. Continuous variables were expressed as mean and standard deviation, while categorical variables were presented as frequencies and percentages. Initially, univariate analysis was performed using appropriate statistical tests such as the Chi-square test or Fisher's exact test for categorical variables and the independent t-test for continuous variables to identify potential risk factors associated with wound healing complications. Variables that showed statistical significance in univariate analysis were further included in multivariate logistic regression analysis to identify independent risk factors for postoperative wound healing complications. A p-value of less than 0.05 was considered statistically significant."

Result

Table 1 presents the demographic characteristics of the study population comprising 87 patients. The majority of participants were in the 41–60 years age group (44.8%), followed by those above 60 years (34.5%), while 20.7% were aged 18–40 years. In terms of gender distribution, males constituted 59.8% of the study population, whereas females accounted for 40.2%. Regarding the duration of diabetes, 39.1% of patients had diabetes for 5–10 years, 33.3% for less than 5 years, and 27.6% for more than 10 years. These findings indicate that most participants were middle-aged males with a diabetes duration of 5–10 years.

Table 1: Demographic Characteristics of the Study Population (N = 87)		
Variable	**Frequency (n)**	**Percentage (%)**
Age Group (years)		
18–40	18	20.7
41–60	39	44.8
>60	30	34.5
Gender		
Male	52	59.8
Female	35	40.2
Duration of Diabetes		
<5 years	29	33.3
5–10 years	34	39.1
>10 years	24	27.6

Table 2 presents the clinical and surgical characteristics of the patients included in the study. Most patients underwent elective surgery (64.4%), while 35.6% had emergency surgery. Regarding glycemic control, 37.9% had controlled HbA1c (<7%), 33.3% were moderately controlled (7–8.9%), and 28.7% had poorly controlled diabetes (≥9%). Antibiotic prophylaxis was administered to the majority of patients (82.8%), whereas 17.2% did not receive prophylaxis. In terms of comorbidities, hypertension was the most common, affecting 47.1% of patients, followed by cardiovascular disease in 17.2%, while 35.6% had no comorbid conditions. These findings highlight that most patients underwent elective procedures and a considerable proportion had associated comorbidities, particularly hypertension.

Table 2: Clinical and Surgical Characteristics of Patients		
Variable	**Frequency (n)**	**Percentage (%)**
Type of Surgery		
Elective Surgery	56	64.4
Emergency Surgery	31	35.6
Glycemic Control (HbA1c)		
Controlled (<7%)	33	37.9
Moderately Controlled (7–8.9%)	29	33.3
Poorly Controlled (≥9%)	25	28.7
Antibiotic Prophylaxis		
Given	72	82.8
Not Given	15	17.2
Comorbidities		
Hypertension	41	47.1
Cardiovascular Disease	15	17.2
None	31	35.6

Table 3 shows the incidence of wound healing complications among the study participants. The majority of patients did not experience any complications (59 cases, 67.8%), while 28 patients (32.2%) developed some form of wound healing complication. Among the types of complications observed, surgical site infection was the most common, occurring in 15 cases (17.2%). This was followed by wound dehiscence in 7 cases (8%) and delayed wound healing in 6 cases (6.9%). These findings indicate that although most patients had normal healing, a notable proportion experienced postoperative wound-related complications, with surgical site infection being the most frequent.

Table 3: Incidence of Wound Healing Complications		
Wound Healing Outcome	**Frequency (n)**	**Percentage (%)**
No Complications	59	67.8
Any Wound Complication	28	32.2
Types of Complications		
Surgical Site Infection	15	17.2
Wound Dehiscence	7	8
Delayed Wound Healing	6	6.9

Table 4 presents the univariate analysis of risk factors associated with wound healing complications. Age >60 years was significantly associated with complications, observed in 14 patients with complications compared to 16 without complications (p = 0.041). Diabetes duration >10 years also showed a significant association, with 12 patients in the complication group versus 12 in the non-complication group (p = 0.018). Poor glycemic control (HbA1c ≥9%) was strongly associated with complications, occurring in 15 patients with complications compared to 10 without (p = 0.002). Emergency surgery was another significant factor, present in 14 patients with complications versus 17 without complications (p = 0.031). Additionally, lack of antibiotic prophylaxis was significantly related to complications (8 vs 7, p = 0.015). However, male gender did not show a significant association with wound healing complications (p = 0.623). Overall, older age, longer duration of diabetes, poor glycemic control, emergency surgery, and absence of antibiotic prophylaxis were important risk factors for wound healing complications.

Table 4: Univariate Analysis of Risk Factors for Wound Healing Complications

Variable	Complication (n=28)	No Complication (n=59)	p-value
Age >60 years	14	16	0.041
Male Gender	18	34	0.623
Diabetes Duration >10 years	12	12	0.018
Poor Glycemic Control (HbA1c ≥9%)	15	10	0.002
Emergency Surgery	14	17	0.031
No Antibiotic Prophylaxis	8	7	0.015

Table 5 presents the multivariate logistic regression analysis of independent risk factors. Poor glycemic control (HbA1c ≥9%) was significantly associated with the outcome, with an adjusted odds ratio (AOR) of 3.12 (95% CI: 1.28–7.61, p = 0.011). Diabetes duration greater than 10 years also showed a significant association with an AOR of 2.47 (95% CI: 1.05–5.82, p = 0.037). Additionally, emergency surgery was identified as an independent risk factor with an AOR of 2.15 (95% CI: 1.01–4.58, p = 0.046). Lack of antibiotic prophylaxis was another significant factor, with an AOR of 2.68 (95% CI: 1.09–6.57, p = 0.031). These findings indicate that poor glycemic control, longer duration of diabetes, emergency surgical procedures, and absence of antibiotic prophylaxis significantly increased the risk of complications.

Table 5: Multivariate Logistic Regression Analysis of Independent Risk Factors

Variable	Adjusted Odds Ratio (AOR)	95% CI	p-value
Poor Glycemic Control (HbA1c ≥9%)	3.12	1.28 – 7.61	0.011
Diabetes Duration >10 years	2.47	1.05 – 5.82	0.037
Emergency Surgery	2.15	1.01 – 4.58	0.046
No Antibiotic Prophylaxis	2.68	1.09 – 6.57	0.031

Discussion

The current research examined the occurrence and independent risk factors of wound complications healing in surgical patients with diabetes. We found wound healing complications in 32.2 percent of the patients, with surgical site infection (17.2%), wound dehiscence (8%), and delayed wound healing (6.9 percent) being the most prevalent complication. The results align with existing literature that suggest that diabetic patients are vulnerable to postoperative wound complications as a result of poor immune response, maladaptive microvascular processes, and slower tissue repair processes. Similar results of higher postoperative infection rates in diabetic patients have been reported before, and it is evident that such patients are susceptible to wound-related complications that occur after surgeries (Lipsky & Peters, 2007; Singh et al., 2005) [9,10]. The comparatively high rate recorded in our study further promotes the fact that diabetes is a major patient risk and it must be managed carefully during the operations."

Age is considered a factor that has substantial relations with wound healing complications in our research, especially in patients who are above the age of 60 years. This age group had a high percentage of complications as opposed to younger patients. This has been observed in previous studies that suggest that old age is accompanied by poor physiological functions, poor tissue regeneration and poor immune responses that may lead to delayed healing of wounds in diabetic patients. The article by Sorg et al. (2017) [11] emphasized the fact that aging may result in collagen production decline and angiogenesis worsening, and cell proliferation may deteriorate, making the patient more vulnerable to wound complications. Our results are thus in line with other findings that have indicated that the elderly diabetic patients are a high-risk population that needs to be given extra attention in perioperative care and

special interventions aimed at ensuring that the occurrence of postoperative complications is minimized.

The wound healing complications were also significantly associated with the duration of diabetes in the present study. Diabetics who had over 10-year experience showed a greater prevalence of complications over shorter-duration diabetic patients. The findings of this observation align with the previous reports that chronic microvascular and macrovascular complications are caused by prolonged diabetes and thereby limit the tissue perfusion and wound repair mechanisms. Brodovicz et al. (2010) identify vascular abnormalities as well as peripheral neuropathy [12] in long-term diabetes, both of which have adverse effects on wound healing and exposure to infection. On the same note, Pyšná et al. (2021) [13] found out that endothelial dysfunction and impaired vascular regeneration are prevalent in long-term diabetes patients, which could lead to the propagation of slow postoperative recovery. The results of our study thus support the significance of the issue of the duration of diabetes as a significant clinical variable in the process of deciding the risk of surgery in diabetic patients.

One of the most significant predictors in our analysis was glycemic control, as one of the variables influencing wound healing complications. Patients with inadequately managed diabetes (HbA1c 9 and higher) were much more prone to postoperative complications and the poor glycemic control was established as an independent risk factor with adjusted odds ratio of 3.12. The latter outcome is heavily backed by the existing body of literature proving that chronic hyperglycemia has a detrimental impact on various factors of wound healing. Hyperglycemia compromises the function of the leukocytes, decreases the phagocytic activity and disrupts the collagen deposition and angiogenesis steps and thus slows the healing of tissues. Xiang et al., (2019) [14] stressed that the unregulated level of blood glucose is the cause of prolonged inflammatory reaction and predisposition to infections. On the same note, the American Diabetes Association (2021) [1] guidelines suggest stringent preoperative glycemic regulation and postoperative glycemic regulation to minimize the occurrence of postoperative complications in diabetic patients. Thus, our results also emphasize the clinical significance of the improvement of glycemic control as a component of perioperative care.

The nature and the urgency of surgery also had an impact on wound healing in our study. There was a significant correlation between emergency surgery and complications, and it was also an independent predictor in a multivariate analysis. Emergency patients will not necessarily have sufficient time to optimize well before surgery, such as glycemic control, infection prevention measures, and comorbidity evaluation. There are also other past studies that have confirmed that emergency surgical operations are more susceptible to postoperative complications because of inadequate preparation and a heightened physiological demand on the patient. Ljungqvist et al. (2011) [15] stressed that preoperative assessment and optimization are the essential elements of enhanced recovery after surgery programs and may considerably advance the outcome of the surgery. The conclusions of our results point to such a point of view and indicate that where applicable, in terms of appropriate preoperative care, an elective surgery can contribute to mitigating the occurrence of wound complications in diabetic patients.

The other influential variable that was found in our study was the use of antibiotic prophylaxis. The patients who were not treated with prophylaxis antibiotics were highly susceptible to wound complications and multivariate analysis revealed that antibiotic prophylaxis was not a risk factor by itself. These findings are in agreement with the current clinical recommendations where the prophylactic use of antibiotics is important in lowering chances of developing surgical site infections. The guidelines on the use of antimicrobial prophylaxis during postoperative prevention of infections given by Lipsky et al. (2012) [16] outline how the right antimicrobial prophylaxis is used to prevent postoperative infection, especially in high-risk populations, including diabetic patients. Also, other previous research on diabetic foot infection have indicated the importance of timely and effective antimicrobial therapy in the prevention of infection-related complications (Lipsky & Peters, 2007) [9]. Thus, our results also contribute to the common practice of implementing prophylactic antibiotics in form of normal perioperative care in diabetic surgical patients.

In our study, gender was not statistically significantly related to wound healing complications, but more male patients were found in the general sample. The result of this finding is comparable with some of the earlier works that have indicated that there was no strong association between gender and postoperative wound healing outcomes in diabetic groups (Singh et al., 2005) [10]. Rather, recent research indicates that metabolic control, vascular state, and comorbidity have a greater influence on the outcome of wound healing compared to demographic factors including gender.

In general, the results of the current research are mostly in line with the rest of the literature, which demonstrates that wound healing complications in diabetic individuals are multidimensional and dependent on both personal and procedure related factors. The main predictors of complications were found to be poor glycemic control, extended diabetes, emergency surgeries and absence of antibiotic prophylaxis. These results emphasize the need for comprehensive perioperative management strategies, including strict glycemic control, careful

assessment of long-standing diabetes complications, timely administration of antibiotic prophylaxis, and appropriate surgical planning. Implementing these measures may substantially reduce the incidence of postoperative wound complications and improve overall surgical outcomes among diabetic patients.

Conclusion

The present study highlights the importance of early identification and management of factors influencing postoperative wound healing among patients undergoing surgery. The findings indicate that a considerable proportion of patients experienced wound-related complications, emphasizing the need for careful perioperative assessment and management. Clinical factors such as poor glycemic control, longer duration of diabetes, emergency surgical procedures, and lack of antibiotic prophylaxis were found to be significantly associated with a higher risk of wound healing complications. These results underline the critical role of adequate glycemic management, timely surgical planning, and appropriate preventive measures in improving surgical outcomes. Strengthening preoperative optimization and postoperative monitoring may help reduce complications and enhance recovery among surgical patients.

References

1. Association AD. 1. Improving care and promoting health in populations: Standards of Medical Care in Diabetes—2021. Diabetes Care. 2021 Jan 1;44(Supplement_1):S7-14.
2. Atlas D. International diabetes federation. IDF diabetes atlas. Brussels: International Diabetes Federation. 2015.
3. Saeedi P, Petersohn I, Salpea P, Malanda B, Karuranga S, Unwin N, Colagiuri S, Guariguata L, Motala AA, Ogurtsova K, Shaw JE. Global and regional diabetes prevalence estimates for 2019 and projections for 2030 and 2045: Results from the International Diabetes Federation Diabetes Atlas. Diabetes research and clinical practice. 2019 Nov 1; 157:107843.
4. Guo SA, DiPietro LA. Factors affecting wound healing. Journal of dental research. 2010 Mar;89(3):219-29.
5. Falanga V. Wound healing and its impairment in the diabetic foot. The Lancet. 2005 Nov 12;366(9498):1736-43.
6. Martin ET, Kaye KS, Knott C, Nguyen H, Santarossa M, Evans R, Bertran E, Jaber L. Diabetes and risk of surgical site infection: a systematic review and meta-analysis. Infection Control & Hospital Epidemiology. 2016 Jan;37(1):88-99.
7. Ata A, Lee J, Bestle SL, Desemone J, Stain SC. Postoperative hyperglycemia and surgical site infection in general surgery patients. Archives of surgery. 2010 Sep 1;145(9):858-64.
8. Leaper DJ, Edmiston CE. World Health Organization: global guidelines for the prevention of surgical site infection. Journal of Hospital Infection. 2017 Feb 1;95(2):135-6.
9. Lipsky BA. Diabetic foot infections: current treatment and delaying the 'post-antibiotic era'. Diabetes/metabolism research and reviews. 2016 Jan; 32:246-53.
10. Singh N, Armstrong DG, Lipsky BA. Preventing foot ulcers in patients with diabetes. Jama. 2005 Jan 12;293(2):217-28.
11. Sorg H, Tilkorn DJ, Hager S, Hauser J, Mirastschijski U. Skin wound healing: an update on the current knowledge and concepts. European surgical research. 2017 Feb 1;58(1-2):81-94.
12. Brodovicz KG, McNaughton K, Uemura N, Meininger G, Girman CJ, Yale SH. Reliability and feasibility of methods to quantitatively assess peripheral edema. Clinical medicine & research. 2009 Jul 2;7(1-2):21-31.
13. Pyšná A, Bém R, Němcová A, Fejfarová V, Jirkovská A, Hazdrová J, Jude EB, Dubský M. Endothelial progenitor cells biology in diabetes mellitus and peripheral arterial disease and their therapeutic potential. Stem cell reviews and reports. 2019 Apr 15;15(2):157-65.
14. Xiang J, Wang S, He Y, Xu L, Zhang S, Tang Z. Reasonable glycemic control would help wound healing during the treatment of diabetic foot ulcers. Diabetes Therapy. 2019 Feb;10(1):95-105.
15. Ljungqvist O. Enhanced recovery after surgery. Journal de Chirurgie Viscerale. 2011 Jan 1;148(3):181-3.
16. Lipsky BA, Berendt AR, Cornia PB, Pile JC, Peters EJ, Armstrong DG, Deery HG, Embil JM, Joseph WS, Karchmer AW, Pinzur MS. 2012 Infectious Diseases Society of America clinical practice guideline for the diagnosis and treatment of diabetic foot infections. Clinical infectious diseases. 2012 Jun 15;54(12):e132-73.