Biological and Clinical Sciences Research Journal
eISSN: 2708-2261; pISSN: 2958-4728
www.bcsrj.com
DOI: https://doi.org/10.54112/bcsrj.v6i2.1560
*Biol. Clin. Sci. Res. J., Volume 6(2), **2025**: 1560*
Original Research Article

Pre-Operative Serum Albumin As A Predictor of Abdominal Wound Related Complications in Patients Undergoing Emergency Exploratory Laparotomy

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(Received, 14th January 2025, Accepted 8th February 2025, Published 28th Feburary2025)

Abstract: *Hypoalbuminemia is recognized as a key indicator of poor surgical outcomes, particularly in emergency settings. In patients undergoing emergency exploratory laparotomy, preoperative serum albumin levels may serve as a predictive marker for postoperative wound-related complications such as surgical site infections (SSI) and wound dehiscence. Early identification of at-risk patients can help guide perioperative nutritional and wound management strategies.* ***Objective:*** *This study aims to evaluate the predictive value of preoperative serum albumin levels for postoperative wound-related complications in patients undergoing emergency exploratory laparotomy, including surgical site infections and wound dehiscence.* ***Methods:*** *After the ethical approval from the institutional review board, this prospective observational study was conducted at the Department of General Surgery in Dr Ruth KM PFAO Civil Hospital Karachi, from 1st October 2024 to 30th December 2024.Through non probability consecutive sampling, 100 patients aged 18-75 years, both gender, undergoing Emergency exploratory laparotomy, and whose preoperative serum albumin screen results become available within 24 hours preceding their operation* ***Results:*** *The comparison of serum albumin levels between patients with and without postoperative wound infections and wound dehiscence revealed significant findings. Patients with serum albumin levels below 3.5 g/dL had a higher occurrence of wound infections (12 vs. 32 patients, p = 0.107), though the association was not statistically significant. However, for wound dehiscence, the relationship with serum albumin was highly significant (p = 0.001), as 12 patients with albumin levels below 3.5 g/dL developed wound dehiscence compared to only two patients with levels above 3.5 g/dL. Additionally, the presence of comorbidities did not show a statistically significant association with postoperative wound infection (p = 0.509).* ***Conclusion:*** *Patients with low preoperative serum albumin levels face higher risks of developing postoperative wound problems which mainly include surgical site infections and wound dehiscence.*

Keywords: hypoalbuminemia, exploratory laparotomy, SSI, wound dehiscence

[***How to Cite:*** Jokhio SN, Zulfiqar I, Jamal A, Sheikh K, Tahir S, Khan BS. Pre-operative serum albumin as a predictor of abdominal wound related complications in patients undergoing emergency exploratory laparotomy. *Biol. Clin. Sci. Res. J.*, **2025;** 6(2): 44-47. doi: https://doi.org/10.54112/bcsrj.v6i2.1560

Introduction

Emergency exploratory laparotomy stands as a vital surgical procedure which treats acute abdominal problems including perforations with obstructions and traumatic injuries (1). Patients who have emergency exploratory laparotomy face increased complications after surgery because of wound healing problems despite modern surgical methods and postoperative treatment advances. Such complications require reliable preoperative identifiers to enhance patient results and better direct surgical resources (2).

The most abundant protein in plasma functions as a vital factor that sustains oncotic pressure and carries different substances while managing inflammatory processes (3). The measurement of hypoalbuminemia as serum albumin below 3.5 g/dL has received extensive research attention as a nutritional indicator and systemic inflammation marker (4). Studies indicate that low levels of albumin before surgery serve as a significant risk factor for patients to experience adverse postoperative effects, which include surgical site infections (SSIs) and wound dehiscence, along with more extended hospital stays (1).

The research by Rohith et al. (2022) studied 60 emergency exploratory laparotomy patients and determined that hypoalbuminemia affected 65% of the patient group. The study revealed among patients undergoing emergency exploratory laparotomy that SSIs occurred in 56.4% of cases. In comparison, wound dehiscence developed in 87.2% of cases and both complications directly correlated statistically with low preoperative serum albumin levels ($p<0.001$). Patients who entered the hospital with hypoalbuminemia needed double the length of time for recovery compared to patients who were normoalbuminemic (5).

Singh et al. (2024) conducted a prospective observational study of 150 patients who needed emergency abdominal surgery. The researchers discovered that 66% of surgical patients presented with hypoalbuminemia before surgery. Postoperative complications among these patients became more frequent, leading to SSIs and wound dehiscence. Findings from the research showed that patients with low preoperative serum albumin had a greater risk of adverse wound effects (6).

Different physiological processes explain how hypoalbuminemia creates poor surgical results. Patients with albumin deficiency exhibit poor tissue repair and diminished immune function because their collagen synthesis decreases and fibroblast proliferation rates decline, compromising successful wound healing and making them prone to infections (7). Hypoalbuminemia signals the presence of both catabolic states and persistent illnesses which heighten operative risks (8).

Preoperative determination of serum albumin enables healthcare providers to perform simple cost-effective evaluation for risk classifying emergency exploratory laparotomy patients. Early identification of hypoalbuminemic patients permits medical professionals to develop specific perioperative strategies that combine nutritional support and heightened surveillance, thus decreasing the risk of surgical complications and strengthening surgical results (9). Serum albumin testing as part of regular preoperative assessments boosts patient care delivery during urgent surgical operations (10). This study aims to evaluate the predictive value of preoperative serum albumin levels for postoperative wound-related complications in patients undergoing

emergency exploratory laparotomy, including surgical site infections and wound dehiscence.

Methodology

After the ethical approval from the institutional review board, this prospective observational study was conducted at the Department of General Surgery in Dr Rukh KM PFAO Civil Hospital Karachi, from 1st October 2024 to 30th December 2024.Through nonprobability consecutive sampling, 100 patients aged 18-75 years, both gender, undergoing Emergency exploratory laparotomy, and whose preoperative serum albumin screen results become available within 24 hours preceding their operation. The study excluded all patients who have chronic liver disease or nephrotic syndrome or plan to have a planned elective laparotomy. After the informed consent from the recruited patients, data collection starts with a prospective design that includes measurements taken before, during, and after surgery. The preoperative assessment included recording patient demographics, which include age and gender, alongside a notation of existing medical conditions. The patient's nutritional condition was measured using BMI and the bromocresol green method to analyze serum albumin in the hospital laboratory. The laparotomy indication among the intraoperative data included perforation or trauma or ischemia or obstruction while also recording operative duration in minutes along with estimated blood loss in milliliters. The important postoperative results include surgical site infection development (SSI), wound dehiscence occurrence, total hospital stay duration in days, and mortality observed within thirty days after surgery. FDA standards determine SSI cases, and doctors diagnose wound dehiscence through clinical assessments of wound separation. The data was analysed using SPSS version 26. The study presented continuous variables through mean and standard deviation and categorical variables through frequencies and percentages. The Chi-square test was used to analyse categorical variables whereas continuous variables underwent independent t-test or Mann-Whitney U test based on normality criteria. The preoperative serum albumin level diagnostic ability was assessed to predict postoperative wound complications through Receiver Operating Characteristic (ROC) curve analysis. P value <0.05 was considered significant.

Results

The study included 100 patients undergoing emergency exploratory laparotomy. The mean age of the participants was 50.8 ± 21.0 years. Regarding gender distribution, 52% (n=52) of the patients were male, while 48% (n=48) were female. The mean preoperative serum albumin level was 3.16 ± 0.82 g/dL, and 68% (n=68) of the patients had one or more comorbidities.

Regarding the postoperative parameters, the most common indication for laparotomy was trauma (22%), followed by ischemia (21%), perforation (20%), obstruction (17%), and other causes (20%). The mean operative time was 163.06 ± 52.5 minutes, while the mean intraoperative blood loss was 1049 ± 494.0 mL. Postoperative wound infection occurred in 36% (n=36) of patients, and wound dehiscence was observed in 14% (n=14) of cases. The mean length of hospital stay was 15.18 ± 7.01 days, and the overall mortality rate was 12% (n=12).

The comparison of serum albumin levels between patients with and without postoperative wound infections and wound dehiscence revealed significant findings. Patients with serum albumin levels below 3.5 g/dL had a higher occurrence of wound infections (12 vs. 32 patients, p = 0.107), though the association was not statistically significant. However, for wound dehiscence, the relationship with serum albumin was highly significant (p = 0.001), as 12 patients with albumin levels below 3.0 g/dL developed wound dehiscence compared to only two patients with levels above 3.0 g/dL. Additionally, the presence of comorbidities did not show a statistically significant association with postoperative wound infection (p = 0.509).

The operative time and blood loss were also compared between patients with and without wound complications. Patients with wound complications had a slightly longer operative time (170.8 ± 48.7 minutes vs. 158.6 ± 54.3 minutes, p = 0.777) and lower blood loss (940 ± 517.2 mL vs. 1110.7 ± 473.7 mL, p = 0.188), though these differences were not statistically significant.

Finally, Figure 1 presents the ROC curve analysis of serum albumin levels in predicting postoperative wound infection, demonstrating its potential predictive value in identifying patients at higher risk for surgical site complications. The AUC value is 0.599.

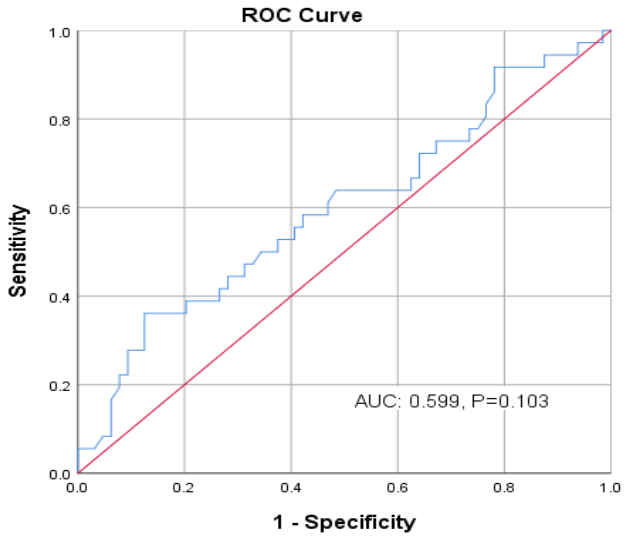

Figure 1: ROC curve analysis of serum albumin level in predicting post-operative wound infection

Table 1: Demographic and Clinical parameters of the study participants

Variables	Mean and Frequency (n=100)
Age (years)	50.8±21.0
Gender	
Male	5 2 (52%)
Female	48 (48%)
Pre-operative Serum Albumin (g/dL)	3.16±0.82
Comorbidities	68 (68%)

Table 2: Post-operative parameters

Variables	Mean and Frequency (n=100)
Type of Surgery	
Perforation	20 (20%)
Obstruction	17 (17%)
Ischemia	21 (21%)
Trauma	22 (22%)
Other	20 (20%)
Operative Time (minutes)	163.06±52.5
Blood Loss (mL)	1049±494.0
Postoperative Wound Infection	36 (36%)
Wound Dehiscence	14 (14%)
Length of Hospital Stay (days)	15.18±7.01
Mortality	12 (12%)

Table 3: Comparison of serum albumin between patients with and without postoperative wound infections/wound dehiscence, and comorbidity with wound infection

Variables	Wound Complications		P Value
	Yes	No	
Serum Albumin			0.107
<3.5	12	32	
>3.5	24	32	
Wound Dehiscence			0.001
<3.5	12	32	
>3.5	2	54	
Comorbidity			0.509
Yes	23	45	
No	13	19	

Table 4: Comparison of operative time and blood loss between patients with and without wound complications.

Variables	With Wound complications (n=36)	Without wound Complications (n=64)	P Value
Operative time	170.8±48.7	158.6±54.3	0.777
Blood loss	940±517.2	1110.7±473.70	0.188

Discussion

This research examined how preoperative albumin levels in blood affect the development of wound complications following emergency exploratory laparotomy surgeries. Our research revealed that wound dehiscence and surgical site infections (SSIs) occurred more frequently in patients with low serum albumin levels. This finding confirms previously published literature on this topic.

The examined patient group included 65% cases of hypoalbuminemia (serum albumin concentration below 3.5 g/dL). Patients with low preoperative albumin showed a higher probability of developing both SSIs and wound dehiscence than patients with normal albumin levels. The findings match He et al.'s research results showing hypoalbuminemia in 65% of patients who developed SSIs at 56.4% and wound dehiscence at 87.2% rates (11). Their research data showed strong evidence of preoperative low serum albumin levels connecting to negative surgical wound results with $p<0.001$ as the statistical significance value.

Ahmed et al. performed a prospective observational research study to assess patients undergoing emergency abdominal surgery as part of their investigation. Preoperative hypoalbuminemia existed in 66% of patients, and their results demonstrated that this condition produced higher rates of SSIs and wound dehiscence during the postoperative period. The results reinforce the forecasting ability of low serum albumin levels regarding surgical wound complications (12).

The study found that patients having serum albumin levels under 3.5 g/dL showed spectacularly elevated wound dehiscence rates ($p=0.001$). The study data indicate that as serum albumin levels decline progressively, complications become more frequent. Sim et al.'s research analysis through the National VA Surgical Risk Study revealed that serum albumin testing exceeds other preoperative patient variables as a surgical outcome predictor, thus reinforcing the fundamental role of nutrient status in surgical patient forecasts (13).

According to this research, hypoalbuminemia correlated with higher wound complications, but we detected no significant statistical connection between comorbidities and postoperative wound infections ($p=0.509$). The assessment of serum albumin demonstrates better accuracy than comorbid conditions for predicting postoperative wound complications.

Several physiological processes cause hypoalbuminemia in patients, causing delayed wound healing and higher infection risks. These include changes to collagen synthesis rates and fibroblast proliferation decline, together with weakened immune system function (14). Evaluating preoperative serum albumin offers a beneficial method to identify patients who face elevated postoperative wound complications potential at an economical assessment cost. Surgical outcomes and morbidity reduction could become possible by implementing specific nutritional interventions and improved perioperative care for this patient group (15).

Conclusion

The research shows that patients with low preoperative serum albumin levels face higher risks of developing postoperative wound problems, which mainly include surgical site infections and wound dehiscence. Serum albumin plays a crucial role in predicting the surgical results of emergency exploratory laparotomy surgery. The optimization of preoperative nutritional status assessment helps decrease surgical complications and improves the rehabilitation of patients after surgery.

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-PFKMMS-0344-24)

Consent for publication
Approved

Funding
Not applicable

Conflict of interest

The authors declared the absence of a conflict of interest.

Author Contribution

SNJ (Post Graduate Trainee**),**
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AJ (Post Graduate Trainee**),**
Conception of Study, Development of Research Methodology Design,
KS (Resident**)**
Study Design, manuscript review, critical input.
ST (Resident**),**
Manuscript drafting, Study Design,
BSK (Resident**)**

Review of Literature, Data entry, Data analysis, and drafting article.

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

References

1. Smyth L, Bendinelli C, Lee N, Reeds MG, Loh EJ, Amico F, et al. WSES guidelines on blunt and penetrating bowel injury: diagnosis, investigations, and treatment. World Journal of Emergency Surgery. 2022; 17(1):13.
2. Ylimartimo AT, Nurkkala J, Koskela M, Lahtinen S, Kaakinen T, Vakkala M, et al. Postoperative Complications and Outcome After Emergency Laparotomy: A Retrospective Study. World journal of surgery. 2023; 47(1):119-29.
3. Aguilar-Cazares D, Chavez-Dominguez R, Marroquin-Muciño M, Perez-Medina M, Benito-Lopez JJ, Camarena A, et al. The systemic-level repercussions of cancer-associated inflammation mediators produced in the tumor microenvironment. Frontiers in endocrinology. 2022; 13:929572.
4. Gremese E, Bruno D, Varriano V, Perniola S, Petricca L, Ferraccioli G. Serum Albumin Levels: A Biomarker to Be Repurposed in Different Disease Settings in Clinical Practice. Journal of clinical medicine. 2023; 12(18):6017.
5. Naga Rohith V, Arya SV, Rani A, Chejara RK, Sharma A, Arora JK, et al. Preoperative Serum Albumin Level as a Predictor of Abdominal Wound-Related Complications After Emergency Exploratory Laparotomy. Cureus. 2022; 14(11):e31980.
6. Singh RK, Shakya P, Bhutani S. ROLE OF SERUM CHOLESTEROL AND ALBUMIN LEVELS AS A RISK FACTOR FOR DEVELOPING SURGICAL SITE INFECTION. Int J Acad Med Pharm. 2023;5(2):1271-8.
7. Sun J, Yang G, Yang C. Influence of postoperative hypoalbuminemia and human serum albumin supplementation on incision healing following total knee arthroplasty for knee osteoarthritis: a retrospective study. Scientific Reports. 2024; 14(1):17354.
8. Wiedermann CJ. Hypoalbuminemia as surrogate and culprit of infections. International journal of molecular sciences. 2021; 22(9):4496.
9. Ananda BB, Kumar PS, Gowda VSS, Bharathiraja T. Evaluation of pre-operative albumin in the prediction of outcomes of emergency laparotomy. International journal of health sciences. 2022; 6(S6):1380-5.
10. Lee CC, Wang TT, Hunter WP, Peacock ZS. Is Preoperative Serum Albumin Predictive of Adverse Surgical Outcomes in Maxillofacial Fracture Repair? Journal of Oral and Maxillofacial Surgery. 2022; 80(2):286-95.
11. He Z, Zhou K, Tang K, Quan Z, Liu S, and Su B. Perioperative hypoalbuminemia is a risk factor for wound complications following posterior lumbar interbody fusion. Journal of Orthopaedic Surgery and Research. 2020; 15(1):538.
12. Ahmed J, Sarma NM. Preoperative serum albumin as predictor of adverse outcome in emergency abdominal surgery. International Surgery Journal. 2022; 9(5):1034-7.
13. Sim J-H, Bang J-Y, Kim S-H, Kang S-J, Song J-G. Association of Preoperative Prognostic Nutritional Index and Postoperative Acute Kidney Injury in Patients with Colorectal Cancer Surgery. Nutrients. 2021; 13(5):1604.
14. Utariani A, Rahardjo E, Perdanakusuma DS. Effects of Albumin Infusion on Serum Levels of Albumin, Proinflammatory Cytokines (TNF-α, IL-1, and IL-6), CRP, and MMP-8; Tissue Expression of EGRF, ERK1, ERK2, TGF-β, Collagen, and MMP-8; and Wound Healing in Sprague Dawley Rats. International journal of inflammation. 2020; 2020:3254017.
15. Gushiken LFS, Beserra FP, Bastos JK, Jackson CJ, Pellizzon CH. Cutaneous Wound Healing: An Update from Physiopathology to Current Therapies. Life. 2021; 11(7):665.