

ESTIMATION OF READMISSION RATES AMONG PATIENTS UNDERGOING EMERGENCY GENERAL SURGERY FOR ACUTE ABDOMEN IN A TERTIARY CARE CENTER

Surgery

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ABSTRACT

Background: Acute abdomen is a critical condition requiring emergency general surgery (EGS), often leading to high morbidity and mortality rates. Postoperative readmissions are a key indicator of healthcare quality, reflecting potential gaps in care. Understanding the risk factors associated with readmissions can guide strategies to improve patient outcomes. **Aims & Objectives:** This study aimed to estimate the readmission rates among patients undergoing EGS for acute abdomen in a tertiary care center and to identify specific risk factors contributing to these readmissions. **Methodology:** A prospective observational study was conducted over 18 months, including 61 adult patients who underwent EGS for acute abdomen. Data were collected on demographic characteristics, comorbidities, intra-operative and post-operative variables, and lab parameters. Statistical analysis was performed using SPSS, with significance set at $p < 0.05$. **Results:** Unplanned readmissions were significantly associated with higher BMI, elevated random blood sugar (RBS), and increased bilirubin levels. Although age, surgery duration, and hospital stay were higher in the readmission group, these did not reach statistical significance. Alcohol consumption and comorbidities like diabetes and hypertension were more common among those readmitted. **Conclusions:** Metabolic factors such as BMI, RBS, and bilirubin levels are critical in predicting unplanned readmissions post-EGS. Targeted interventions to manage these variables could reduce readmission rates, enhancing patient outcomes in resource-limited settings.

KEYWORDS

Acute abdomen; emergency general surgery; readmission rates; BMI; random blood sugar.

INTRODUCTION

Acute abdomen is a severe medical condition marked by sudden, intense abdominal pain, often requiring immediate intervention.¹ This condition can stem from various causes, such as infections, inflammation, vascular events, and organ perforations, all necessitating swift diagnosis and treatment.² Emergency general surgery (EGS) is frequently required to address these underlying issues, with emergency laparotomies being a common approach. However, these surgeries carry high mortality and morbidity rates, especially within the first 30 days post-operation, making postoperative complications and readmissions a significant concern.^{3,4,5}

Readmission rates have become a key indicator of healthcare quality, reflecting potential gaps in initial treatment or postoperative care. High rates not only strain healthcare resources but also negatively impact patient outcomes, leading to decreased quality of life, increased morbidity, and higher mortality.^{6,7} The burden of readmissions is particularly heavy for patients undergoing EGS for acute abdomen due to the complex nature of these surgeries.⁸

While much of the existing research focuses on Western populations, there is a significant gap in the literature regarding readmission rates in the Indian healthcare context. This study aims to estimate readmission rates among patients undergoing EGS for acute abdomen in a tertiary care center in India, identifying specific risk factors associated with these readmissions. The insights gained will inform strategies to reduce readmission rates, improve patient outcomes, and enhance the efficiency of healthcare delivery, particularly in resource-limited settings.

MATERIALS & METHODS

This prospective observational study was conducted over 18 months at the Surgery Department of BRD Medical College. The study population included all adult patients aged 18 years and older who presented with acute abdomen and underwent emergency general surgery. The study aimed to estimate the readmission rates among these patients and identify associated risk factors. All eligible and consenting patients were included in the study, with those experiencing intraoperative or postoperative mortality, pregnant women, patients under 18 years of age, those undergoing simultaneous surgical procedures, and those with a diagnosis other than acute abdomen excluded.

Sample Size And Data Collection:

The sample size was determined based on a reported readmission rate of 17.4%, with a 95% confidence interval and a 10% absolute error. Considering a 10% loss to follow-up, the final sample size required was 61 patients. Data collection was carried out over 12 months, during which all eligible patients were consecutively sampled until the required sample size was achieved. A semi-structured, interviewer-administered questionnaire was utilized to gather data on various patient characteristics, including socio-demographic information, pre-existing comorbidities, personal habits, clinical features, and details of the surgical procedure. The questionnaire also captured data on intra-operative and post-operative variables such as vitals, fluid intake, surgery duration, blood requirements, hospital stay, ICU stay, post-operative complications, and readmissions within 60 days.

Statistical Analysis:

Data entry was performed in MS Excel, and the analysis was conducted using SPSS version 26.0. Continuous variables were tested for normality using the Kolmogorov-Smirnov test, and appropriate descriptive statistics (mean with standard deviation or median with interquartile range) were computed. The association between categorical risk factors and readmission rates was analyzed using the Chi-square test, with a p-value of less than 0.05 considered statistically significant. Graphs and tables were created to illustrate the findings.

Ethical Considerations:

Institutional ethics committee approval was obtained before the study commenced. Informed written consent was secured from all participants, who were assured of their right to withdraw from the study at any time without any penalties or loss of benefits. The study followed all ethical guidelines to ensure patient confidentiality and the integrity of the research process.

RESULTS

Table 1 Comparison Of Parameters With Unplanned Readmission Rates

Parameters	Unplanned Readmission Yes	Unplanned Readmission No	Statistics
AGE (Mean $\pm$ SD)	45.7 $\pm$ 12.6	42.3 $\pm$ 16.0	t: 0.91, p: 0.36
WEIGHT (Mean $\pm$ SD)	55.3 $\pm$ 11.3	52.4 $\pm$ 10.2	t: 1.13, p: 0.26
HEIGHT (Mean $\pm$ SD)	1.63 $\pm$ 0.14	1.56 $\pm$ 0.15	t: 1.28, p: 0.24

BMI (Mean ± SD)	26.7 ± 4.0	23.2 ± 4.1	t: 2.14, p: 0.03
MARITAL STATUS			
Married (%)	8	48	χ ² : 0.11, p: 0.73
Unmarried (%)	2	12	χ ² : 0.11, p: 0.73
Separated/Widowed (%)	1	4	χ ² : 0.11, p: 0.73
RESIDENCE			
Rural (%)	10	61	χ ² : 0.24, p: 0.62
Urban (%)	1	3	χ ² : 0.24, p: 0.62
PERSONAL HABITS			
Smoking Yes (%)	2	9	χ ² : 0.13, p: 0.75
Smoking No (%)	9	54	χ ² : 0.13, p: 0.75
Alcohol Yes (%)	3	11	χ ² : 4.17, p: 0.04
Alcohol No (%)	8	53	χ ² : 4.17, p: 0.04
Smokeless Tobacco Yes (%)	3	15	χ ² : 0.14, p: 0.82
Smokeless Tobacco No (%)	8	49	χ ² : 0.14, p: 0.82
COMORBIDITIES			
DM (%)	2	10	χ ² : 4.62, p: 0.03
Hypertension (%)	3	15	χ ² : 4.62, p: 0.03
COPD (%)	1	4	χ ² : 4.62, p: 0.03
None (%)	5	35	χ ² : 4.62, p: 0.03
PAST SURGERIES			
Yes (%)	1	7	χ ² : 0.24, p: 0.62
No (%)	10	57	χ ² : 0.24, p: 0.62

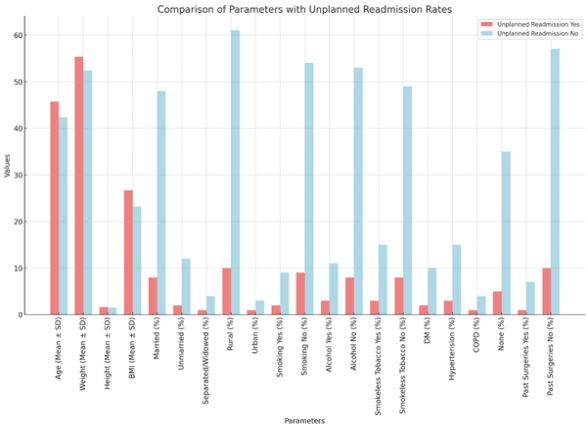


Figure 1 Comparison of Parameters with Unplanned Readmission Rates

Table 2 Comparison Of Lab Parameters With Unplanned Readmission Rates

LAB PARAMETERS	UNPLANNED READMISSION YES	UNPLANNED READMISSION NO	STATISTICS
Hb (Mean ± SD)	11.5 ± 2.7	11.6 ± 2.7	t: 0.12, p: 0.90
Platelet (Mean ± SD)	7.0 ± 0.6	7.1 ± 0.6	t: 0.35, p: 0.72
Blood Urea (Mean ± SD)	32 ± 5	30 ± 10	t: 0.94, p: 0.20

Serum Creatinine (Mean ± SD)	1.1 ± 0.3	0.6 ± 0.3	t: 1.28, p: 0.24
RBS (Mean ± SD)	112 ± 20	96 ± 20	t: 2.16, p: 0.03
Serum Albumin (Mean ± SD)	3.4 ± 0.9	3.2 ± 0.7	t: 0.13, p: 0.92
Bilirubin (Mean ± SD)	1.3 ± 0.5	0.5 ± 0.2	t: 2.21, p: 0.03
AST (Mean ± SD)	65 ± 6	30 ± 8	t: 1.31, p: 0.19
ALT (Mean ± SD)	36 ± 8	25 ± 7	t: 0.47, p: 0.64

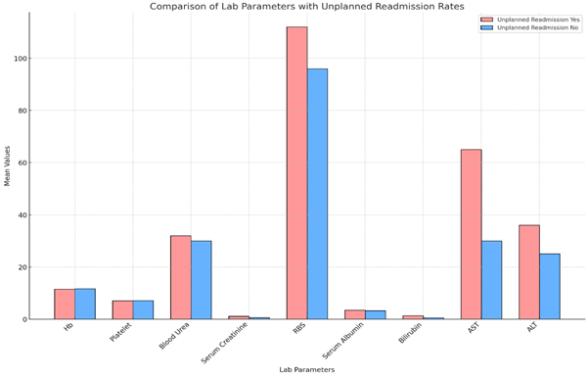


Figure 2 Comparison Of Lab Parameters With Unplanned Readmission Rates

Table 3 Comparison of Intra-Op and Post-Op Variables with Unplanned Readmission Rates

VARIABLES	UNPLANNED READMISSION YES	UNPLANNED READMISSION NO	STATISTICS
Duration of Surgery (Mean ± SD)	2.8 ± 0.5	2.2 ± 0.4	t: 4.62, p: 0.14
Fluid Infusion (Mean ± SD)	2.1 ± 0.5	2.0 ± 0.3	t: 3.64, p: 0.24
Blood Infusion (Mean ± SD)	1.1 ± 0.3	1.0 ± 0.1	t: 0.16, p: 0.12
Length of Hospital Stay (Mean ± SD)	8.2 ± 1.6	7.6 ± 1.2	t: 0.92, p: 0.42
Length of ICU Stay (Mean ± SD)	5.6 ± 0.3	4.8 ± 0.6	t: 0.21, p: 0.36

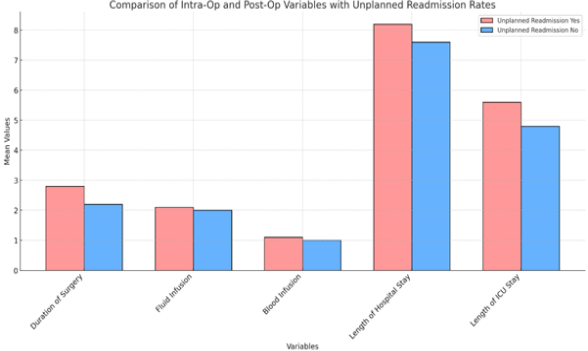


Figure 3 Comparison of Intra-Op and Post-Op Variables with Unplanned Readmission Rates

DISCUSSION

In our study, we found that patients who experienced unplanned readmissions had slightly higher mean age and BMI compared to those who did not. Specifically, the mean age was 45.7 years in the readmission group versus 42.3 years in the non-readmission group, and the mean BMI was 26.7 kg/m² compared to 23.2 kg/m², which was statistically significant (p=0.03). There were no significant differences in weight, height, marital status, residence, or personal habits between the groups. Notably, alcohol consumption showed a significant association with unplanned readmissions (p=0.04), while other personal habits like smoking and smokeless tobacco use did not. A study conducted by Havens et al.⁹, found that older age was associated

with higher readmission rates, with patients aged 65 years and above having a significantly higher risk (RR: 1.5). The study also highlighted that higher BMI was a predictor of readmission, particularly in patients with a BMI ≥ 30 kg/m², which increased the risk by 1.3 times. In contrast, our study's findings regarding marital status and residence were not consistent with the study by **Salimi et al.**¹⁰, which found no significant association between these factors and readmission rates in cardiovascular patients.

In our study, we also found that among the lab parameters, random blood sugar (RBS) and bilirubin levels were significantly higher in patients with unplanned readmissions. The mean RBS was 112 mg/dL in the readmission group compared to 96 mg/dL in the non-readmission group ($p=0.03$). Similarly, bilirubin levels were higher in the readmission group (1.3 mg/dL vs. 0.5 mg/dL, $p=0.03$). Other lab parameters, including hemoglobin, platelet count, blood urea, serum creatinine, serum albumin, AST, and ALT, did not show significant differences between the two groups. A study conducted by **Bioletto et al.**¹¹, observed that patients with severe obesity who had elevated glucose levels had a significantly higher risk of readmission. Specifically, patients with RBS >110 mg/dL had a 30% higher likelihood of readmission within 30 days compared to those with lower glucose levels.

We also found that patients with unplanned readmissions had longer surgeries and hospital stays compared to those without readmissions. The duration of surgery was longer in the readmission group (2.8 hours vs. 2.2 hours), though this difference was not statistically significant ($p=0.14$). Length of hospital stay was also longer in the readmission group (8.2 days vs. 7.6 days), but this was not statistically significant either ($p=0.42$). The study did not find significant differences in fluid or blood infusion during surgery, nor in the length of ICU stay. A study conducted by **Havens et al.**⁹, reported that prolonged surgery duration and extended hospital stays were significant predictors of readmission. They found that surgeries lasting longer than 3 hours were associated with a 20% increased risk of readmission. Similarly, patients with longer hospital stays were at higher risk, with each additional day in the hospital increasing the readmission risk by 5%. Our study's findings regarding the lack of significant differences in fluid and blood infusion are also in line with this study, which did not find these factors to be significant predictors of readmission.

Overall, our study's findings on the predictors of unplanned readmissions are consistent with previous studies, particularly in the context of age, BMI, RBS, and surgery duration. However, differences in other parameters such as marital status, residence, and some lab parameters highlight the need for further research to explore these associations in different patient populations and clinical settings.

CONCLUSION

The analysis revealed that unplanned readmissions were associated with higher BMI, elevated random blood sugar (RBS), and increased bilirubin levels, with these parameters showing statistically significant differences between the groups. Although other factors such as age, weight, duration of surgery, and length of hospital stay were higher in the readmission group, they did not reach statistical significance. Additionally, personal habits like alcohol consumption and comorbidities such as diabetes mellitus (DM), hypertension, and chronic obstructive pulmonary disease (COPD) were more prevalent among patients with unplanned readmissions, further highlighting their potential role as risk factors. Overall, the findings suggest that metabolic and health-related factors play a critical role in the likelihood of readmission following surgery, emphasizing the need for targeted interventions to manage these variables effectively.

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CONSENT:

As per international standards or university standards written participant consent has been collected and preserved by the authors.

Ethical Approval:

As per international standards or university standards written ethical permission has been collected and preserved by the author(s).

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