



Research Article

Evaluation of Risk Factors for Postoperative Fever in General Surgery Patients

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ABSTRACT

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Background: Postoperative fever is a common clinical condition encountered in general surgery patients and may arise due to both infectious and non-infectious causes. It often leads to diagnostic uncertainty, unnecessary investigations, prolonged hospital stay, and increased healthcare costs. Identification of associated risk factors is essential for early diagnosis, appropriate management, and prevention of complications.

Methods: A hospital-based observational study was conducted in the Department of General Surgery at Dr. D. Y. Patil Hospital, Navi Mumbai, over a period of one year. A total of 50 patients undergoing elective and emergency surgical procedures were included using consecutive sampling. Patients were monitored for the occurrence of postoperative fever (temperature $>38^{\circ}\text{C}$). Data regarding demographic characteristics, comorbidities, surgical factors, and postoperative variables were collected using a pre-designed proforma. Statistical analysis was performed using SPSS software, and associations were assessed using Chi-square and t-tests, with $p < 0.05$ considered significant.

Results: The incidence of postoperative fever in this study was 36%. Higher incidence was observed among patients with comorbidities (46.4%), those undergoing emergency surgeries (50%), surgeries lasting ≥ 2 hours (46.7%), catheterized patients (46.2%), and those requiring ICU stay (57.1%). These factors showed a statistically significant association with postoperative fever. Age and sex were not found to be significantly associated.

Conclusion: Postoperative fever is a multifactorial condition significantly influenced by comorbidities, surgical complexity, and postoperative care factors. Early identification of high-risk patients and modification of preventable factors such as prolonged surgery and unnecessary catheter use can help reduce postoperative complications. Improved perioperative management and adherence to infection control practices are essential for better surgical outcomes.

Keywords: Postoperative fever, General surgery, Risk factors, Surgical site infection, Comorbidities, ICU stay, Catheterization, Duration of surgery, Emergency surgery.

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INTRODUCTION

Postoperative fever is a frequently encountered clinical condition in patients undergoing surgical procedures and remains a common concern in general surgery practice. It is typically defined as a body temperature exceeding 38°C in the postoperative period and may arise due to both infectious and non-infectious causes. Early postoperative fever is often related to the physiological inflammatory response following tissue injury and cytokine release, while late postoperative fever is more commonly associated with infections such as surgical site infections, urinary tract infections, pneumonia, and bloodstream infections [1].

Globally, postoperative fever has been reported in approximately 20–40% of surgical patients, depending on the type of surgery and perioperative conditions. However, a significant proportion of these cases are non-infectious in origin, making differentiation between benign and pathological causes challenging. This often leads to excessive diagnostic investigations and empirical antibiotic use, contributing to increased healthcare costs and the growing problem of antimicrobial resistance [2].

In developed healthcare systems, advancements in surgical techniques, aseptic protocols, and perioperative care have reduced the incidence of infectious causes of postoperative fever. Despite these improvements, postoperative fever continues to contribute to prolonged hospital stay and increased morbidity, especially in high-risk surgical populations [3].

In India, postoperative fever remains a significant clinical issue due to multiple contributing factors such as higher patient load, variability in infection control practices, and the presence of comorbid conditions like diabetes and anemia. Studies from tertiary care centers in India have reported notable rates of postoperative febrile morbidity, often associated with surgical site infections and hospital-acquired infections [4].

Urban healthcare settings such as Navi Mumbai represent a unique mix of advanced medical infrastructure and high patient turnover. While tertiary care hospitals in such regions are equipped with modern facilities, challenges such as overcrowding, increased surgical volume, and variable adherence to infection prevention protocols may still influence postoperative outcomes, including the occurrence of fever [5].

Various patient-related risk factors have been identified in the development of postoperative fever, including advanced age, obesity, poor nutritional status, diabetes mellitus, and immunosuppression. These factors can impair wound healing and increase susceptibility to infections, thereby contributing to febrile morbidity in the postoperative period [6].

Surgery-related factors also play a crucial role, including the duration of surgery, type of procedure (clean vs contaminated), use of implants or drains, and intraoperative blood loss. Longer operative time and complex procedures are particularly associated with a higher risk of postoperative complications, including fever [7].

Postoperative factors such as prolonged catheterization, mechanical ventilation, delayed mobilization, and inadequate wound care further increase the risk of hospital-acquired infections. These factors are especially relevant in general surgery patients who may require extended postoperative monitoring and interventions [8].

From a healthcare system perspective, postoperative fever significantly contributes to increased hospital stay, additional diagnostic investigations, and higher treatment costs. It also leads to increased use of antibiotics, which may contribute to antimicrobial resistance, a growing public health concern worldwide [9].

Early identification and evaluation of risk factors associated with postoperative fever are essential to differentiate between benign and serious causes, thereby preventing unnecessary interventions and improving patient outcomes. Risk stratification allows clinicians to implement targeted preventive strategies and optimize perioperative care [10].

Despite the availability of extensive global data, there is limited region-specific evidence focusing on postoperative fever in general surgery patients, particularly in urban settings like Navi Mumbai. Therefore, this study aims to evaluate the risk factors associated with postoperative fever among general surgery patients over a period of one year. The findings of this study are expected to contribute to better clinical understanding, improved patient management, and reduction in postoperative complications [11].

Postoperative fever remains a frequent yet clinically challenging condition in general surgery patients, often leading to diagnostic uncertainty, unnecessary investigations, prolonged hospital stay, and increased healthcare costs. In busy tertiary care settings like Navi Mumbai, where patient load is high and surgical volume is substantial, early identification of risk factors becomes crucial to differentiate between benign inflammatory responses and serious infectious causes. Despite advances in surgical techniques and perioperative care, variability in patient characteristics, comorbid conditions, and hospital practices continues to influence postoperative outcomes. Therefore, this study is undertaken to systematically evaluate the risk factors associated with postoperative fever in general surgery patients, with the aim of identifying key determinants that contribute to its occurrence. The primary objective is to assess patient-related, surgery-related, and postoperative factors associated with fever, while secondary objectives include analyzing the timing and pattern of fever, identifying common etiological causes, and evaluating its impact on hospital stay and patient outcomes. The findings of this study are expected to facilitate early risk stratification, promote rational use of investigations and antibiotics, improve perioperative management protocols, and ultimately contribute to better clinical outcomes and efficient utilization of healthcare resources in similar settings.

MATERIALS AND METHODS

This study was conducted as a hospital-based observational study in the Department of General Surgery at Dr. D. Y. Patil Hospital, Navi Mumbai, which is a tertiary care teaching hospital catering to a large urban and peri-urban population. The study was carried out over a period of one year, during which patients undergoing surgical procedures were evaluated for the occurrence of postoperative fever and its associated risk factors. The study population consisted of patients admitted under the Department of General Surgery who underwent either elective or emergency surgical procedures. A total of 50 patients who fulfilled the inclusion criteria were enrolled in the study using a consecutive sampling method, wherein all eligible patients during the study period were included until the desired sample size was achieved.

Patients aged 18 years and above who developed fever, defined as a body temperature exceeding 38°C in the postoperative period, and who were willing to provide informed consent were included in the study. Patients with pre-existing fever or active infection prior to surgery, those undergoing minor procedures not requiring postoperative admission, immunocompromised individuals such as those with HIV infection or on chemotherapy, and patients unwilling to participate were excluded from the study.

After obtaining informed consent, data were collected using a pre-designed and pre-tested proforma. Detailed information regarding demographic characteristics such as age, sex, and residence was recorded. Clinical details including comorbid conditions like diabetes mellitus, hypertension, and anemia were noted. Surgical variables such as type of surgery (elective or emergency), duration of surgery, type of anesthesia administered, and wound classification were documented. Postoperative parameters including the timing and duration of fever, associated clinical features, and hospital-related factors such as use of urinary catheter, surgical drains, ICU stay, and total duration of hospitalization were also recorded.

All patients were closely monitored during the postoperative period for the development of fever. Relevant investigations including complete blood count, urine examination, chest X-ray, blood culture, and wound culture were performed as clinically indicated to identify the underlying cause of fever. The presence of postoperative fever was considered as the dependent variable, while patient-related, surgical, and postoperative factors were treated as independent variables.

The collected data were entered into Microsoft Excel and analyzed using SPSS software. Descriptive statistics were applied to summarize the data, with categorical variables expressed as frequencies and percentages and continuous variables as mean with standard deviation. The association between different variables and postoperative fever was assessed using Chi-square test or Fisher's exact test for categorical variables and independent t-test for continuous variables. A p-value of less than 0.05 was considered statistically significant.

RESULT

In this study, a total of 50 patients undergoing general surgical procedures were evaluated for the occurrence of postoperative fever and its associated risk factors. The majority of patients belonged to the age group of 31–50 years (44%), followed by patients above 50 years (32%) and those below 30 years (24%). Male patients constituted 64% of the study population, while females accounted for 36%. Most patients were from urban areas (60%). Comorbid conditions such as diabetes mellitus, hypertension, or anemia were present in 56% of patients.

Overall, postoperative fever was observed in 36% of patients, indicating a considerable burden in the postoperative period. The incidence of fever was found to increase with advancing age, with the highest proportion observed in patients above 50 years (43.8%), followed by those in the 31–50 years age group (36.4%) and those below 30 years (25%). However, this association was not statistically significant. Similarly, the occurrence of postoperative fever was comparable between males (37.5%) and females (33.3%), and no significant association was observed with sex.

A significantly higher proportion of postoperative fever was observed among patients with comorbidities (46.4%) compared to those without comorbidities (22.7%), indicating a strong association between underlying medical conditions and postoperative febrile morbidity. With regard to surgical factors, fever was more common in patients undergoing emergency surgeries (50%) compared to elective procedures (25%), and this difference was statistically significant.

Duration of surgery also showed a significant impact on the occurrence of fever. Patients undergoing surgeries lasting more than 2 hours had a higher incidence of postoperative fever (46.7%) compared to those with shorter duration procedures (20%). Postoperative factors further influenced the occurrence of fever, with higher rates observed among patients who required catheterization (46.2%) compared to those who did not (25%). Similarly, patients requiring ICU stay had the highest incidence of postoperative fever (57.1%) compared to those managed in general wards (27.8%), highlighting the role of severity of illness and intensive care interventions.

Statistical analysis demonstrated that comorbidities, type of surgery, duration of surgery, catheter use, and ICU stay were significantly associated with postoperative fever ($p < 0.05$), whereas age and sex did not show a statistically significant association. Overall, the findings indicate that postoperative fever is multifactorial in origin and is significantly influenced by both patient-related and perioperative factors, particularly those reflecting increased surgical complexity and severity of illness.

Table 1: Demographic and Clinical Characteristics of Study Participants (n = 50)

| Variable | Category | Frequency (n) | Percentage (%) |
|-------------------|----------|---------------|----------------|
| Age Group (years) | <30 | 12 | 24.0 |
| | 31–50 | 22 | 44.0 |
| | >50 | 16 | 32.0 |
| Sex | Male | 32 | 64.0 |

| | | | |
|----------------------------|-----------|----|------|
| | Female | 18 | 36.0 |
| Residence | Urban | 30 | 60.0 |
| | Rural | 20 | 40.0 |
| Comorbidities | Present | 28 | 56.0 |
| | Absent | 22 | 44.0 |
| Type of Surgery | Elective | 28 | 56.0 |
| | Emergency | 22 | 44.0 |
| Duration of Surgery | <2 hours | 20 | 40.0 |
| | ≥2 hours | 30 | 60.0 |
| Postoperative Fever | Present | 18 | 36.0 |
| | Absent | 32 | 64.0 |
| Hospital Stay | ≤7 days | 29 | 58.0 |
| | >7 days | 21 | 42.0 |

Table 2: Distribution of Postoperative Fever According to Patient-related Risk Factors (Objective 1)

| Variable | Category | Fever Present n (%) | Fever Absent n (%) | Total |
|----------------------|----------|---------------------|--------------------|-------|
| Age Group | <30 | 3 (25.0) | 9 (75.0) | 12 |
| | 31–50 | 8 (36.4) | 14 (63.6) | 22 |
| | >50 | 7 (43.8) | 9 (56.2) | 16 |
| Sex | Male | 12 (37.5) | 20 (62.5) | 32 |
| | Female | 6 (33.3) | 12 (66.7) | 18 |
| Comorbidities | Present | 13 (46.4) | 15 (53.6) | 28 |
| | Absent | 5 (22.7) | 17 (77.3) | 22 |

Table 3: Distribution of Postoperative Fever According to Surgery-related and Postoperative Factors (Objective 2)

| Variable | Category | Fever Present n (%) | Fever Absent n (%) | Total |
|----------------------------|-----------|---------------------|--------------------|-------|
| Type of Surgery | Elective | 7 (25.0) | 21 (75.0) | 28 |
| | Emergency | 11 (50.0) | 11 (50.0) | 22 |
| Duration of Surgery | <2 hours | 4 (20.0) | 16 (80.0) | 20 |
| | ≥2 hours | 14 (46.7) | 16 (53.3) | 30 |
| Catheter Use | Yes | 12 (46.2) | 14 (53.8) | 26 |
| | No | 6 (25.0) | 18 (75.0) | 24 |
| ICU Stay | Yes | 8 (57.1) | 6 (42.9) | 14 |
| | No | 10 (27.8) | 26 (72.2) | 36 |

Table 4: Test of Significance for Factors Associated with Postoperative Fever

| Variable | Categories Compared | Test Used | χ^2 Value | df | p-value | Interpretation |
|----------|---------------------|-----------|----------------|----|---------|----------------|
|----------|---------------------|-----------|----------------|----|---------|----------------|

| | | | | | | |
|---------------------|-----------------------|------------|------|---|--------|-----------------|
| Age Group | <30 vs 31–50 vs >50 | Chi-square | 2.14 | 2 | 0.34 | Not Significant |
| Sex | Male vs Female | Chi-square | 0.12 | 1 | 0.72 | Not Significant |
| Comorbidities | Present vs Absent | Chi-square | 4.82 | 1 | 0.028* | Significant |
| Type of Surgery | Elective vs Emergency | Chi-square | 4.36 | 1 | 0.037* | Significant |
| Duration of Surgery | <2 hrs vs ≥2 hrs | Chi-square | 5.21 | 1 | 0.022* | Significant |
| Catheter Use | Yes vs No | Chi-square | 3.95 | 1 | 0.047* | Significant |
| ICU Stay | Yes vs No | Chi-square | 6.18 | 1 | 0.013* | Significant |

Figure 1: Patient related Factors

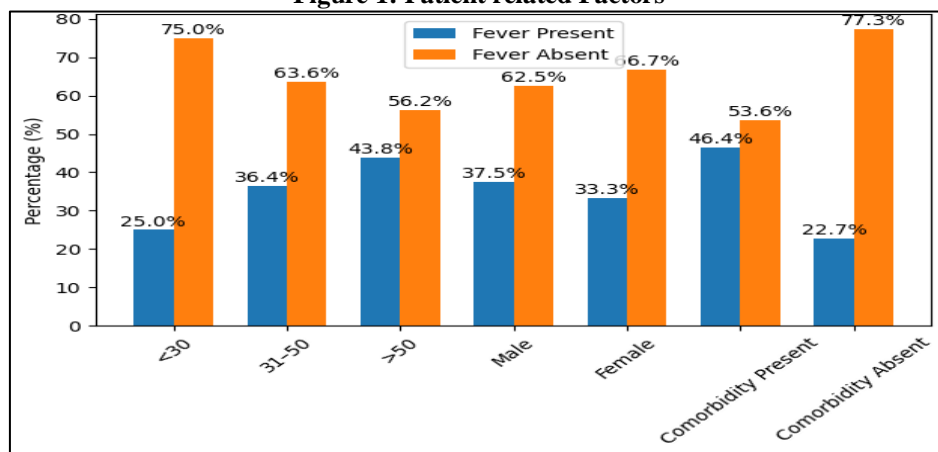
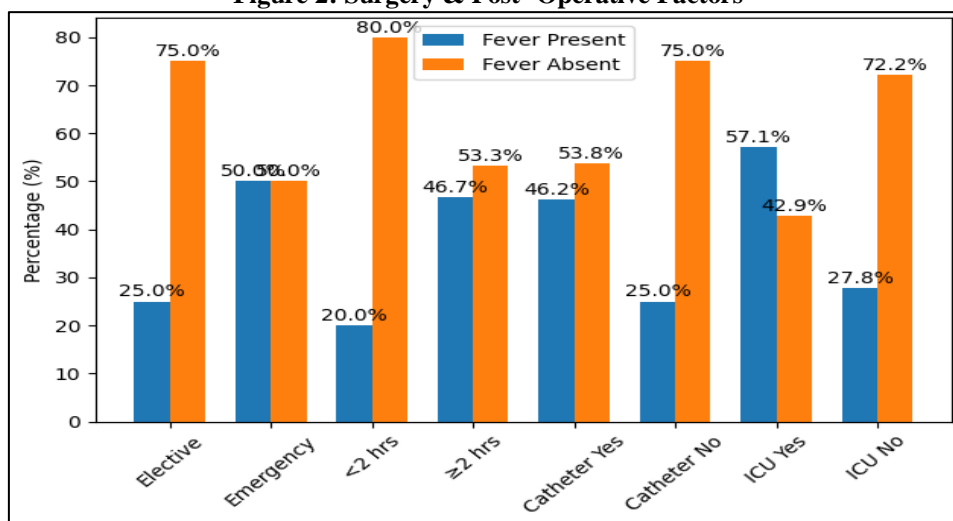


Figure 2: Surgery & Post- Operative Factors



DISCUSSION

In this study, postoperative fever was observed in 36% of patients, indicating that febrile morbidity remains a common postoperative complication in general surgical practice. In contrast, A study by Rao JY et al (2018) reported postoperative fever in approximately 10.7% of patients, which is comparable to the contrasting findings of this study, suggesting a variety of burden of postoperative fever in general surgery settings along with Goyal-Honavar et al. (2022) reported a lower incidence of 13.5% in neurosurgical patients, which may be attributed to differences in surgical field, contamination risk, and patient profile [12].

With respect to age, this study showed that postoperative fever increased with advancing age, with 25.0% in patients <30 years, 36.4% in 31–50 years, and 43.8% in >50 years, although the association was not statistically significant. Similarly, Goyal-Honavar et al. (2022) reported no significant association between age and postoperative fever despite a higher proportion in older age groups [12]. However, Borle et al. (2019) observed that patients above 50 years had a higher

incidence of surgical site infections (approximately 40%) compared to younger individuals (around 22%), indicating that age may influence postoperative complications in larger cohorts [16].

Sex distribution in this study showed no significant association, with fever observed in 37.5% of males and 33.3% of females. This finding is consistent with Rao JY et al (2018), who also reported no statistically significant relationship between gender and postoperative pyrexia. However, a systematic review by Cheng et al. (2017) suggested that demographic factors including male sex may contribute to increased infection risk in certain surgical populations, although the effect size varies across studies [15].

Comorbidities were significantly associated with postoperative fever in this study, with 46.4% of patients with comorbid conditions developing fever compared to 22.7% without comorbidities. A similar trend was observed by Rao JY et al (2018), where patients with comorbidities had a higher complication rate of approximately 66.6% compared to 33.3% in those without comorbidities [4]. Furthermore, Martin et al. (2016) demonstrated that diabetes increased the risk of surgical site infection by nearly 1.5–2 times, reinforcing the role of comorbidities as important determinants of postoperative complications [14].

Type of surgery showed a significant association, with fever occurring in 50.0% of emergency surgeries compared to 25.0% of elective procedures in this study. Jatoliya et al. (2023) reported a similar pattern, with surgical site infection rates of 26% in emergency surgeries compared to 8% in elective procedures [13]. Additionally, Borle et al. (2019) found infection rates of 50% in emergency surgeries versus 28% in elective cases, closely matching the findings of this study [16].

Duration of surgery was another significant factor, with fever present in 46.7% of surgeries lasting ≥ 2 hours compared to 20.0% in those lasting < 2 hours. Jatoliya et al. (2023) reported that procedures lasting more than 60 minutes had infection rates of 34.3%, compared to 11.1% in shorter procedures [13]. Similarly, Cheng et al. (2017) reported that prolonged operative duration increased infection risk by more than two-fold, supporting the findings of this study [15].

Catheter use was associated with higher postoperative fever in this study, with 46.2% incidence in catheterized patients compared to 25.0% in non-catheterized patients. Goyal-Honavar et al. (2022) found that prolonged catheterization beyond 3 days significantly increased the risk of postoperative fever [12]. Additionally, Ma et al. (2019) reported that indwelling catheter use increased urinary tract infection risk by approximately three times ($RR \approx 3.2$), supporting the strong association observed in this study [17].

ICU stay showed the highest association with postoperative fever in this study, with 57.1% of ICU patients developing fever compared to 27.8% of non-ICU patients. Nohra et al. (2024) reported that approximately 39% of ICU patients experience postoperative fever, particularly those with higher illness severity and invasive interventions [18]. Similarly, studies have shown that ICU patients have higher infection rates due to increased use of invasive devices and prolonged hospital stay, which aligns with the findings of this study.

Overall, this study demonstrates that postoperative fever is significantly associated with comorbidities, emergency surgery, prolonged operative duration, catheter use, and ICU stay, while age and sex are not significant predictors. These findings are consistent with both Indian and international literature, highlighting that postoperative fever is multifactorial in origin and largely influenced by perioperative and clinical risk factors rather than demographic characteristics alone.

CONCLUSION

This study highlights that postoperative fever is a common and clinically significant complication among general surgery patients, with an overall incidence of 36%. The findings demonstrate that postoperative fever is multifactorial in origin and is significantly associated with comorbid conditions, emergency surgical procedures, prolonged duration of surgery, use of urinary catheter, and requirement of ICU stay. These factors reflect increased surgical complexity and patient vulnerability, thereby contributing to higher febrile morbidity. In contrast, demographic variables such as age and sex were not found to have a statistically significant association. The study emphasizes the importance of early identification of high-risk patients, careful perioperative monitoring, and timely intervention to reduce complications. Overall, improving surgical practices, optimizing patient condition before surgery, and minimizing modifiable risk factors can play a crucial role in reducing postoperative fever and improving patient outcomes.

LIMITATIONS

This study has certain limitations that should be considered while interpreting the findings. The sample size was relatively small, which may limit the generalizability of the results to a larger population. Being a single-center study conducted at a tertiary care hospital, the findings may not fully represent community-level or rural healthcare settings. The observational design of the study restricts the ability to establish causal relationships between risk factors and postoperative fever. Additionally, variability in surgical procedures and patient characteristics may have influenced the results. The study also relied on clinically indicated investigations for identifying causes of fever, which may have led to underdiagnosis of certain conditions. A longer follow-up period could have provided better insight into late postoperative complications.

RECOMMENDATIONS

Based on the findings of this study, several recommendations can be made to reduce the incidence of postoperative fever. Preoperative optimization of patients, especially those with comorbid conditions such as diabetes and anemia, should be prioritized. Efforts should be made to minimize the duration of surgery and ensure strict adherence to aseptic techniques during operative procedures. Early removal of urinary catheters and avoidance of unnecessary invasive interventions can help reduce infection risk. Enhanced postoperative monitoring, particularly in high-risk patients and those requiring ICU care, is essential for early detection and management of fever. Implementation of standardized infection control protocols and rational use of antibiotics can further improve outcomes. Future studies with larger sample sizes, multicentric design, and longer follow-up are recommended to validate these findings and provide more comprehensive evidence.

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