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General Surgery

CLINICAL PROFILE AND INCIDENCE OF SURGICAL SITE INFECTIONS IN A TERTIARY CARE HOSPITAL IN SOUTH-WEST INDIA: A PROSPECTIVE OBSERVATIONAL STUDY

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ABSTRACT **Background:** Surgical site infections (SSIs) continue to represent a formidable challenge in surgical practice, often culminating in significant morbidity, increased healthcare costs and extended hospitalization. A nuanced understanding of their epidemiological and clinical patterns is crucial for the implementation of effective preventive strategies. **Objective:** This study aimed to ascertain the incidence of SSIs among postoperative patients in a tertiary care teaching hospital, to elucidate their demographic and clinical determinants and to classify them based on the Southampton wound grading system. **Methods:** A prospective observational analytical study was undertaken involving 1000 consecutive elective surgical patients at a tertiary care center. Detailed demographic data, body mass index (BMI), comorbidities and the postoperative course were documented. The onset and severity of SSIs were categorized using the Southampton wound grading system. **Results:** The mean age of the study cohort was 43.34 ± 18.28 years, with males comprising 63.5%. A total of 12.5% (n=125) developed SSIs. Most infections manifested on postoperative day (POD) 7. Grade I infections were the most prevalent, comprising 36% of all SSIs. Comorbidities such as obesity (10.6%) and diabetes mellitus (8%) were found to be significantly associated with increased SSI risk. **Conclusion:** The study underscores the continued prevalence of SSIs, particularly in high-risk subgroups. Vigilant perioperative surveillance and individualized preventive strategies remain vital in mitigating the burden of SSIs.

KEYWORDS : Surgical Site Infection, Southampton Grading, Postoperative Morbidity, Wound Healing, Prospective Cohort

INTRODUCTION

Surgical site infections (SSIs) persist as one of the most prevalent healthcare-associated infections, second only to urinary tract infections in incidence. Globally, SSIs account for an estimated 20% of all nosocomial infections among hospitalized surgical patients.[1,2] These infections are not merely superficial disruptions of skin integrity; rather, they reflect a complex interplay of host and procedural factors that can significantly compromise surgical outcomes.

The global epidemiological burden of SSIs varies substantially between high-income and low- and middle-income countries (LMICs).[3] In LMICs, the incidence is estimated to be disproportionately high, attributable to limited resources, inconsistent adherence to aseptic techniques and challenges in implementing evidence-based perioperative care protocols.[4,5] In India, a broad range of SSI rates have been reported, reflecting heterogeneity in practice and patient populations.[6]

Multiple host-related and environmental factors modulate the risk of developing an SSI. These include patient age, gender, nutritional status, BMI, glycemic control and co-existing systemic illnesses.[7,8] Among procedural variables, the duration of surgery, emergency status, type of wound and antibiotic prophylaxis play decisive roles.[9] Importantly, the Southampton wound grading system offers a structured clinical approach to stratify SSIs based on severity, facilitating uniformity in surveillance and reporting.[10]

Against this backdrop, we undertook a comprehensive hospital-based prospective observational study with the aim of quantifying the incidence of SSIs, analysing their demographic & clinical correlates and categorizing them using the Southampton grading system.

METHODS

Study Design And Setting

A prospective, hospital-based observational analytical study was conducted in the Department of General Surgery at a tertiary care teaching hospital in South-West India. The study was approved by the Institutional Ethics Committee and informed consent was obtained from all participants.

Participants

A total of 1000 consecutive patients irrespective of age and gender undergoing clean elective surgical procedures were included. Those with primarily infected cases, pre-existing wound infections or systemic sepsis, those who refused consent and those who underwent emergency surgery were excluded.

Data Collection And Definitions

Patient demographics (age, sex), anthropometric measures (height, weight, BMI) and relevant clinical history including comorbidities (obesity, diabetes mellitus, hypertension, ischemic heart disease, chronic kidney disease) were recorded. Surgical parameters such as type of procedure, duration and postoperative wound assessment were documented meticulously.

Postoperative wounds were examined daily until POD10 on outpatient or inpatient basis. SSIs were defined based on clinical criteria including erythema, induration, purulent discharge and wound dehiscence. Grading was performed as per the Southampton wound grading system.[11]

Statistical Analysis

Data were analysed using descriptive statistics. Continuous variables were presented as mean ± standard deviation (SD), while categorical variables were expressed as frequencies and percentages.

The association of SSIs with demographic and clinical variables was explored using chi-square and t-tests, with a p-value <0.05 considered statistically significant.

RESULTS

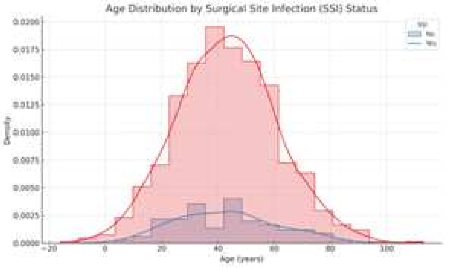
Demographic Profile

Among the 1000 patients included, the largest subset (19.3%) was aged 21-30 years, followed by 31-40 years (17.8%).

The age distribution spanned from 1 to 90 years, with a mean of 43.34 ± 18.28 years. Males comprised a substantial proportion (63.5%), underscoring a gender disparity likely reflective of healthcare-seeking behaviour and surgical epidemiology in the region.

Table 1: Distribution Of Patients According To Age

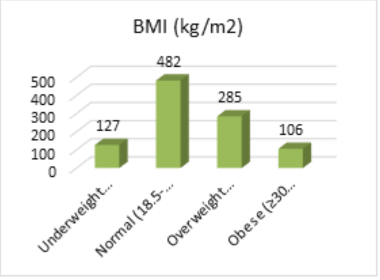
Age (years)	N	%
1-10 years	29	2.9%
11-20 years	67	6.7%
21-30 years	193	19.3%
31-40 years	178	17.8%
41-50 years	149	14.9%
51-60 years	169	16.9%
61-70 years	154	15.4%
71-80 years	52	5.2%
81-90 years	9	0.9%
Total	1000	100%
Mean ± SD	43.34 ± 18.28	



Graph 1: Distribution of patients according to Age

BMI And Nutritional Status

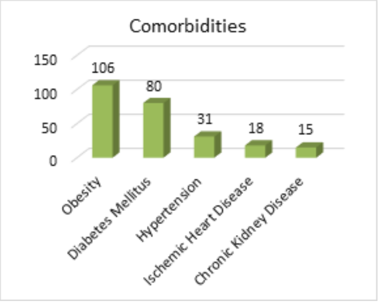
The mean BMI was 23.82 ± 4.53 kg/m². Nearly half (48.2%) of the cohort had a normal BMI, while 28.5% were overweight and 10.6% were classified as obese. Notably, underweight individuals (12.7%) represented a significant subgroup, often overlooked in surgical risk assessments.



Graph 2: Distribution Of Patients According To BMI

Comorbidities

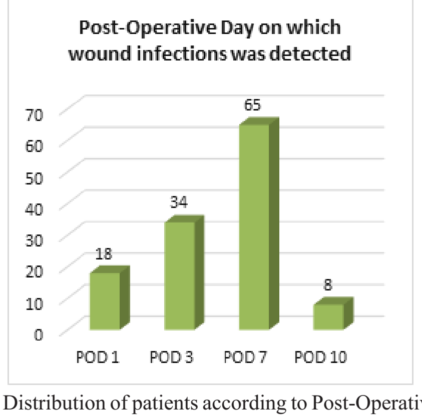
Obesity (10.6%) and diabetes mellitus (8%) were the most prevalent comorbidities. Hypertension was observed in 3.1%, ischemic heart disease in 1.8%, and chronic kidney disease in 1.5% of patients. These conditions are well-recognized to impair wound healing and immune function, thus predisposing to infections.



Graph 3: Distribution of patients according to Comorbidities

Incidence And Timing Of SSIs

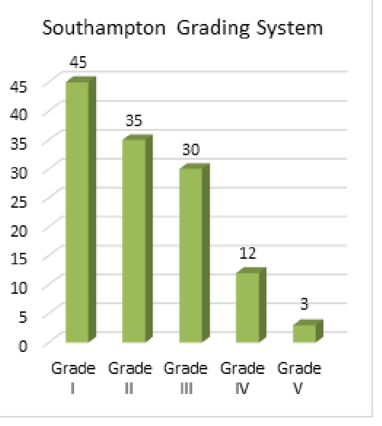
SSIs were detected in 125 patients, yielding an incidence rate of 12.5%. The temporal distribution revealed that a majority (52%) were identified on POD7, followed by POD3 (27.2%) and POD1 (14.4%). Late-onset infections, noted on POD10, comprised only 6.4% of cases.



Graph 4: Distribution of patients according to Post-Operative Day on which wound infections was detected

Southampton Grading Of SSIs

The severity grading revealed that Grade I SSIs were predominant (36%), indicating minimal inflammation without discharge. Grades II and III, denoting increased serous or purulent discharge and more marked local signs, accounted for 28% and 24% respectively. Grade IV (9.6%) and Grade V (2.4%) cases represented deep infections and systemic involvement, necessitating intensive management.



Graph 5: Distribution of patients according to Southampton Wound Grading System

Statistical Analysis

Correlation Of Patient Characteristics With SSIs

Univariate Analysis:

- **Age**: Mean age was slightly higher in the SSI group (45.2 ± 19.1 years) than in the non-SSI group (43.1 ± 18.1 years), but this difference was **not statistically significant** (p=0.12).
- **Gender**: SSI incidence was 13.4% in males and 10.9% in females ($\chi^2 = 1.51$; p = 0.22).
- **BMI**: Incidence of SSI in obese patients was significantly higher (18.9%) compared to non-obese patients (11.5%) ($\chi^2 = 5.76$; **p = 0.016**).
- **Diabetes Mellitus**: 21.3% of diabetic patients developed SSI vs. 11.5% of non-diabetic patients ($\chi^2 = 7.01$; **p = 0.008**).
- **Hypertension, IHD, CKD**: These were not significantly associated with increased SSI risk (p > 0.05).

Table 2: Association Of Variables With Surgical Site Infection (Univariate Analysis)

Variable	SSI (%)	No SSI (%)	p-value
Age (mean ± SD)	45.2 ± 19.1	43.1 ± 18.1	0.12
Male	13.4	86.6	0.22
Female	10.9	89.1	
Obese (BMI ≥30)	18.9	81.1	**0.016**
Non-obese	11.5	88.5	
Diabetic	21.3	78.7	**0.008**
Non-diabetic	11.5	88.5	
Hypertension	12.9	87.1	0.33
IHD	13.3	86.7	0.45
CKD	13.3	86.7	0.48

Multivariate Logistic Regression:

- **Obesity** (OR: 1.82; 95% CI: 1.11–2.99; **p = 0.017**)
- **Diabetes Mellitus** (OR: 2.04; 95% CI: 1.17–3.57; **p = 0.012**)

Table 3: Multivariate Logistic Regression For Predictors Of SSI

Variable	Odds Ratio (OR)	95% CI	p-value
Obesity	1.82	1.11 – 2.99	**0.017**
Diabetes Mellitus	2.04	1.17 – 3.57	**0.012**
Age	1.01	0.99 – 1.02	0.18
Gender (Male)	1.22	0.79 – 1.89	0.36

These results underscore the importance of targeted SSI surveillance and prophylaxis in patients with **obesity and diabetes**, who represent high-risk subpopulations.

DISCUSSION

This study elucidates a 12.5% incidence of SSIs among postoperative patients in a tertiary care Indian hospital, aligning with the upper spectrum of reported rates globally.[12,13,14] Such variability reflects underlying differences in patient profiles, surgical complexity, institutional practices and infection control policies.

The age distribution of the study cohort revealed a predominance of younger adults, diverging from western data where elderly surgical patients dominate.[15] This demographic skew may be attributed to population structure and healthcare accessibility patterns in LMICs.

Gender disparities noted herein, with a male preponderance, echo findings from other Indian and regional studies. This may reflect socio-cultural determinants influencing hospital attendance and surgical decision-making.[16]

The statistical findings of this study reinforce the clinical observation that **obesity and diabetes mellitus are significantly associated with increased risk of SSIs**. The logistic regression model confirmed both variables as **independent predictors**, corroborating existing literature on impaired host immune responses and suboptimal tissue perfusion in these conditions.[14,17,18,19] The role of under-nutrition, as indicated by underweight BMI in 12.7%, is an area warranting further scrutiny, particularly in resource-constrained settings where preoperative nutritional optimization remains suboptimal.

The observation that over half of the SSIs manifested by POD7 underscores the critical window for infection surveillance. This also supports the need for structured outpatient follow-up post-discharge, especially in day-care or short-stay surgeries.[20]

Southampton grading provided a clinically intuitive framework to stratify SSIs. The predominance of Grade I and II infections suggests that a significant proportion of cases were amenable to conservative management. However, the presence of Grades IV and V in 12% of infections necessitates robust infection control and early escalation protocols.

Comparative studies have reported SSI rates ranging from 3% to 15%, influenced by procedure type, operating room environment and antibiotic stewardship.[21,22,23] The relatively higher rate in our cohort may reflect the inclusion of a broad surgical spectrum, including emergency procedures often performed under suboptimal asepsis.

Recommendations

Based on the findings of this study, several practical recommendations can be implemented in tertiary care surgical settings to reduce the incidence of surgical site infections (SSIs) and enhance postoperative outcomes.

Firstly, it is essential to incorporate mandatory preoperative risk stratification protocols that assess patients for modifiable risk factors such as obesity and diabetes mellitus. Patients identified as high-risk should undergo a prehabilitation regimen involving nutritional counselling, glycemic optimization, and targeted weight reduction strategies, where feasible.

Secondly, all surgical units should adopt standardized wound surveillance protocols with emphasis on the first postoperative week, particularly around postoperative day 7, which this study identified as the most frequent day for SSI detection. Incorporating digital wound monitoring tools and encouraging early return visits for wound assessment may improve early detection and timely intervention.

Third, hospitals should revise their perioperative antibiotic prophylaxis guidelines, emphasizing patient-specific tailoring based on comorbidities and local antibiogram data. A multidisciplinary approach involving surgeons, anesthetists, endocrinologists, and infection control teams can facilitate more effective perioperative management especially in high-risk individuals.

Fourth, operating room protocols should be re-evaluated to ensure compliance with infection prevention bundles, including preoperative bathing, appropriate hair removal techniques, normothermia maintenance and stringent aseptic handling. Establishing a SSI audit system and feedback mechanism at the departmental level can also foster accountability and continuous improvement.

Finally, hospitals must invest in staff education and simulation-based training programs focused on wound classification, SSI grading (e.g., Southampton system) and evidence-based dressing techniques. Empowering nursing staff and residents with the knowledge and tools to identify and address early signs of wound infection will close the loop in infection prevention.

Implementing these structured, evidence-based recommendations can lead to meaningful reductions in SSI rates and enhance the overall quality of surgical care in high-volume tertiary centers.

CONCLUSION

Our study affirms the enduring challenge posed by SSIs in surgical practice, with an incidence of 12.5% and varied clinical presentation. The demographic and clinical determinants identified herein—particularly obesity, diabetes and younger age—offer actionable targets for preoperative risk stratification. The application of the Southampton grading system facilitated objective assessment and triaging of infection severity. Implementation of stringent perioperative protocols, coupled with targeted surveillance, can significantly mitigate this preventable complication.

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