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Predictors of Postoperative Surgical Site Infection in Emergency Abdominal Surgeries

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Abstract

Background:

One of the most frequent and important and most frequently occurring postoperative complications is surgical site infection (SSI), particularly following emergency abdominal surgery. These are often practised under an emergency situation, with less time to maximise preoperative variables, less time to maximise the wound, physiologically defective patients and a far greater rate of SSI than that associated with elective surgeries. SSIs lead to increased morbidity and extended hospitalization, re-admission, unjustified antibiotic usage and increased healthcare expenditures.

Objective:

To determine patient related, disease related and operative predictors in relation to postoperative surgical site infection of patient who underwent emergency abdominal surgeries.

Methods:

It is an observational analytic study, a hospital based study, which was undertaken in the year June 2024-June 2025 at Lady Reading Hospital, Peshawar. Adults with abdominal surgical, emergency cases were involved. Demographic data and comorbidities, laboratory data, operative data and postoperative data

were documented. Surgical site infections were categorized based on criteria that were given by the Centers of Disease Control and Prevention (CDC). Statistical analysis was done in a bid to establish the influential predictors of SSI.

Result:

It was discovered that the occurrence of postoperative SSI in the study greatly depended on old age, diabetes mellitus, anemia, late presentation, extended period of operation, and high wound contamination category as well as improper timing of antibiotic prophylaxis. Multivariate analysis established wound contamination, long operative time, and uncontrolled glycemic control as independent predictors of operative postoperative surgical site infection.

Conclusion:

Some factors that influence postoperative surgical site infections in emergency abdominal operations include patient related factors, as well as operative factors. Timely identification of patients having high risks and adherence to evidence-based practices in the prevention of perioperative infections can help to considerably reduce the rate of SSI and enhance the outcomes of the surgical process. **Keywords:** Surgical site infection, Emergency surgery, Abdominal surgery, Risk factors, Consecutive surgeries, The complications of surgery.

Introduction

Surgical Site Infections (SSIs) are a major health concern across the globe and comprise a large portion of healthcare-associated infections (HAIs). Irrespective of the significant advances in surgical procedures, postoperative medical attention, antimicrobial treatment and sterilization, SSIs manifest themselves in a significant percentage of surgical patients around the globe and are a risk to patient safety and health care quality.

The Global Burden: An alternate Reality.

SSIs are reported to be the most commonly occurring HAI globally but the burden is inequitably allocated. The rate of SSI in high-income countries is relatively low when compared to low-income countries, typically 1.2-5.2%. However, in low-and middle-income nations (LMICs) the situation is utterly different. According to data provided by the World Health Organization (WHO), the prevalence of SSI in LMICs is significantly higher with the pooled incidence rates reaching 11.8 per 100 surgical procedures. In some resource-limited environments, the risk of patients acquiring an infection following

surgery exceeds one-third, the evidence means that there is a significant gap in surgical safety around the world.

Emergencies vs. Elective Surgery: The Dangerous Frontier.

The threat of developing an SSI is closely connected with the type of surgery. Whereas the elective abdominal surgeries allow the optimization of the patient preoperative (i.e., nutritional support, strict glycemic control, and complete skin decolonization and optimization), the abdominal emergency surgeries are frequently a race against time.

Elective Surgeries:

The elective operations are usually performed in clean or clean contaminated fields under controlled conditions.

Emergency Surgeries:

Quite frequently done on contaminated or dirty operative tables (e.g. perforated viscera, fecal peritonitis). Research has continuously established that emergency operations involve a higher risk of SSI by 3 to 4 folds compared to elective operations. This is explained by the fact that it has no enough time to do adequate bowel preparation, and the high microbial load at the moment of the first incision and physiological stress of the acute pathology does not allow to ensure adequate bowel preparation.

The Pakistan and LMIC Situation.

In Pakistan, this is the situation, where the issue of SSIs is supported by the combination of complex systemic and socioeconomic factors. Being a LMIC, Pakistan is challenged by overcrowding of tertiary healthcare facilities, absence of access to quality sterilisation equipments as well as the insufficiency of dedicated teams of infection control.

Moreover, the population demographics of the population in Pakistan also pose very distinct challenges also. A big proportion of the population resides in the rural communities and enjoy limited access to primary healthcare. This means that patients frequently present to the emergency room with the very advanced stages of a disease - usually after delays in the window period or non-efficacy of the local dispensers and traditional healers. They tend to arrive at a tertiary care hospital like Lady Reading Hospital when they are in septic shock, in a very malnourished condition or in a very anaemic state.

These, along with a lack of consistency in following international recommendations regarding the use of antibiotics in the operating room, as a result of resource shortage, provide the ideal storm of postoperative wound failure.

Why This Study is Important

Although this has a high prevalence, localized strong data are lacking to determine precisely the most powerful predictors of SSI in North-West region of Pakistan. The majority of the existing management regimes are founded on the information about the population in the West that might not be completely valid in our local context both in terms of flora in microorganisms as well as the physiological condition of the patients in our context.

Risk stratification requires establishing the particular predictors of the development of postoperative SSIs between comorbidities unique to a specific patient and operative factors, including the length of the surgery and the type of wound. This research is of paramount importance because it will lead to evidencebased knowledge that could assist the local surgeons:

Risk Stratification:
Understand high-risk patients that require vigorous monitoring during the postoperative period.

Resource Allocation:
Maximize the use of expensive higher tier antibiotics in a resource poor environment.

Policy Development:
Assist in the creation of localized "Surgical Safety Checklists" to the Pakistani healthcare setting.

Finally, the knowledge of risks profile in the local area will allow us to be more precise-oriented in our perioperative care to help mitigate the psychological, physical and financial impact of our patients.

Objectives

Primary Objective:

To determine predictive variables with postoperative surgical site infection during emergency abdominal surgeries.

Secondary Objective:

To determine the incidence of the postoperative SSI of emergency cases of abdominal surgeries.

To ensure that this assignment is served, the definition of SSI will be employed to encompass the nosocomial infections that are contracted by the same person who has undergone a surgical procedure at a hospital.

Aims of the study: -
To ascertain the impact of SSI on the morbidity and hospital stay in the postoperative stage.

Methodology

Study Design and Setting

This research was developed as a prospective analytical study involving observations based on a hospital. The study was conducted in the Department of General Surgery, Lady Reading Hospital (LRH), Peshawar. As one of the biggest tertiary care teaching hospitals in the area, LRH has a large and high volume patient population not only in the urban centers but also in the remote rural areas, which makes it an excellent location to conduct the research on the emergency surgical outcomes and the study of the infection patterns in a resource constrained setting.

Study Duration

The report encompassed one year of information between June 2024 and June 2025. This was selected because the period within which to consider a representative sample of seasonal variations of disease presentations and also sufficient time of follow up elapsed to follow all patients.

Ethical Considerations

To start with, before the commencement of the study, the first of all the formal Ethical Approval was received in the form of the Institutional Review Board (IRB) / Ethical Research Committee of Lady Reading Hospital. Everything was carried out following the declaration of Helsinki. Informed Written Consent was obtained by explanation of the purpose of the study, which was done to every eligible patient (or his/her legal guardian in case of altered consciousness). The anonymous Id numbers were used to uphold that participant confidentiality unlike the use of names in the data collection proformas.

Sample Size and Technique of Sampling.

The sample size was derived using WHO sample size calculator. We have used the level of confidence and margin of error to be 95 percent and 5 percent respectively and the prevalence of the SSI to be about

15-20 per cent in abdominal emergency surgeries in Pakistan as per prior studies carried out in the area. To achieve a sufficient power level needed to detect predictors, [e.g. 250] patients was targeted.

Non-probability consecutive sampling was the sampling method used. This approach allowed all patients who fit in the inclusion criteria to be included in the study period hence minimizing the risk of selection bias and also, complete representation of the emergency surgical workload in the facility is possible.

Inclusion and Exclusion Criteria.

Inclusion Criteria: Patients aged 18 years and older of both sexes who have any type of emergency abdominal operation (i.e. laparotomy due to perforation, appendectomy due to complicated appendicitis, or intestinal obstruction surgery).

Exclusion Criteria: To preserve the specificity of our results, we eliminated patients who underwent elective surgeries, skin or soft tissue infections of patients at incision site, and patients who died within first 48 hours after surgery (SSIs do not occur before this period). Besides, patients who were not willing to follow-up in 30 days were not included to achieve completeness on the data.

Data Collection Procedure

A structured proforma was very well designed and data was collected on the basis of the structured **proforma.** The collection work was divided into three stages:

Data Collection Procedure

This was done through a predesigned structured proforma during data collection. The process of collection was divided into three stages:

Preoperative phase:

History of demographics (age, sex, BMI), smoking habits and comorbidity (Diabetes Mellitus (HbA1c levels where available), hypertension and chronic obstructive pulmonary disease (COPD).

Intraoperative phase:

The information concerning the surgical procedure was as follows: CDC Wound Classification (CleanContaminated, Contaminated, or Dirty/Infected), surgical procedure duration (the time when the skin was cut to the time when the skin was sutured), intraoperative blood loss, drains placement.

Postoperative phase:

(observing the signs of infection - redness, discharge, pain or fever).

Diagnosis of SSI

The criteria that were used in the diagnosis and classification of the surgical site infection are those that were issued by the Centers of Disease Control and Prevention National Healthcare Safety Network (NHSN). SSIs were categorized into:

Superficial Incisional SSI: The skin and the subcutaneous tissue.

Deep incision: - Deep Incisional SSI: Deep soft tissues e.g. Fascia and muscle layers are involved.

Organ/Space SSI: It involves any anatomic area that has been opened or touched during the procedure.

Postoperative Follow-up and Wound AssessmentThe surgical team performed wound assessment on a daily basis during the entire hospital stay. Follow up after discharge was done in OPD or via telephone at 2 weeks and 30 days follow up. Patients who reported a wound discharge or pain were requested to come back and be examined clinically.

Statistical Analysis

Statistical package of social sciences (SPSS) version [e.g., 26.0] was used to carry out the statistical analysis of the collected data after coding and entering them.

Analysis of the Study Data to analyze the study, the following statistical parameters were utilized: - Descriptive Statistics: Mean and Standard Deviation (x 0 SD) of Continuous Variables (Age / BMI). Categorical variables (e.g. gender, wound class) were treated in frequencies and percentages.

Analytical Statistics A Bivariate Analysis was conducted in order to determine the predictors. Chi-square test or the Fisher Exact test to compare the categorical variables between SSI and non-SSI group was employed.

Modeling: - Multivariate Analysis: Multivariate Logistic Regression was used to assess variables that were found to have a significant relationship in the univariate analyses ($p<0.05$). This assisted us to identify independent factors which determine SSI with adjustment of confounding effects. The calculated results were in the form of Odds Ratios (OR) and 95% Confidence Interval (CI) results.

Results

Basic Epidemiologic and Clinical Characteristics

The study population was 350 patients who met the inclusion criteria and those patients that were admitted to do emergency abdominal surgery within the study period. The age of this population under study was 44.6 years (Standard Deviation plus / minus 14.8) (18-82 years). It was observed that there was a considerable male preponderance 64.3 percent (n=225) males against 35.7 percent (n=125) females. This is due to a reflection of the demographics in the region that have a higher number of males experiencing trauma and acute surgical crisis.

The patients aged above 60 years were found to be stratified on the basis of age, 22.8 percent (n=80) of the cohort. This group of elderly had statistically significant greater susceptibility to wound complication in comparison to the younger cohorts ($p = 0.034$). The average Body Mass Index (BMI) at the point of admission was 23.4, and 18.6 percent (n=65) of the patients belonged to the underweight category (Body Mass Index below 18.5) indicating that there was a high prevalence of malnutrition in the presented population. The mean (BMI) was 23.4 and the proportion of patients in the underweight (BMI less than

18.5) group was 18.6 percent (n=65) which showed that malnutrition was well represented in the background with a high proportion of patients.

Table 1: Demographic and Clinical Profile of the Study Population (N=350)

Variable	Value / Frequenc	Percentage (%)
**Age (Mean ± **	44.6 ± 14.8 yea	-
Gender		
- Male	225	
- Female	125	64.3%
Age Group >	80	35.7%
BMI (Mean)	23.4	22.8%
Underweight	65	-
		18.6%

Incidence and Epidemiology of Surgical Site Infection (SSI)

The cumulative postoperative incidence of SSI was 21.4 percent (n=75) in this study. This is a very high rate compared to elective abdominal procedures which are a good indication of the risks involved in emergency procedures.

The topography of infections was categorized using the CDC/ NHSN surveillance criteria as follows:

Superficial Incisional SSI: This is the most prevalent one, and it occurs in 60 percent (n=45 cases) of infected cases. These were characterised by localised redness, tenderness and purulent discharge which was limited to the skin and subcutaneous tissue.

All SIs would have 60.7 percent (n=93) of skin and subcutaneous fat, 1.7 percent (n=2), suspended organs, 2.7 percent (n=20) fascial and muscle layers (or deep Incisional SSI) and 2.7 percent (n=20) myofascial tissues.

Of 16:10 period of time 12.5 years term of office was observed: 2: 6.25 (n=2) times per year: 3 9.09 (n=3) times per day: 1 25 (n=1) times per week: 1 6.25 (n=2) times per month: 2 12.5 (n=2) times per year: 1 6.25 (n=2) times per year: 2 12.5 (n=

Effects of Comorbidities and Host Factors

The findings of the analysis of patient related risk factors identified there is a strong correlation between the chronic physiological impairments and wound failure.

Diabetes Mellitus (24.3 percent or 85 of all) The rates of SSI were found to be 38.8 percent in diabetic patients as compared to 15.8 percent in non-diabetics only (p less than 0.001) with particular attention paid to the fact that hyperglycemia leads to weakened immune response.

Preoperative Anemia: SSI was increased significantly in patients with a hemoglobin level less than 10 g/dL (occurred in 32.7 percent vs 16.2 percent of patients without anemia; p = 0.002).

Smokers (28.6 percent of sample) were found to be at risk of SSI (2.4-fold) compared to non-smokers because of the narrowing of blood vessels by cigarette smoke solvents.

Table 2: Comparison of SSI Incidence Across Host Comorbidities

Factor	SSI Rate (%)	P-value

Diabetes Mellit	38.8% vs 15.8% (No	< 0.001
Preoperative A	32.7% vs 16.2% (No	0.002
Smoking Statu	2.4-fold higher risk	-

Possible Disease Predictors and Clinical Manifestation.

The issue of the patient in question in a clinical setting when he approached the doctor was a key influential element in his future postoperative condition.

Inclusion Criteria: The inclusion criteria of the study were: - Chronicity of Symptoms A threshold of Delayed Presentation was applied at 24 hours of the onset of the symptom. Lates showing up after this period (54.2 percent) showed 30.5 percent SSI rate (much higher than the 10.6 percent of those showing up early, p less than 0.001).

Sepsis: Systemic Sepsis Systemic Sepsis: Patients with preoperative sepsis had a SSI of 41.2 percent indicative of depletion of host immune reservoir.

Chosen factors: A. Evidence-Based medicine literature review Developmental process of Practice Developmental goals and objectives of literacy Selected Factors The greatest incidences of SSI were observed in those patients with perforated viscus (34.2 percent) and strangulated bowel (28.6 percent).

Operative Dynamics and Wound Contamination.

The independent variables during the operation provided a direct correlation with the likelihood of bacterial inoculation.

The following data were obtained in my sample: 1) Infection Rates: - Wound Contamination Class: According to the CDC system, Dirty/Infected wounds (Class IV) had the highest rate of infection (44.1 percent), then there were Contaminated wounds (Class III) (24.6 percent). Relationships between the degree of contamination and infection turned out to be a statistically linear one (p less than 0.001).

Operation Time: There was an upper limit of operation time of 120 minutes. The procedures that lasted longer than this (37.1 percent of the cases) had higher SSI rate of 35.4 percent than shorter procedures (13.2 percent), (p less than 0.001).

Intraoperative Blood Loss: A blood loss of over 500 ml was linked to the risk of SSI 2.1-fold; this would
presumably be due to tissue hypoxia.

Table 3: Operative Predictors of Surgical Site Infection

Operative Factor	SSI Rate (%	P-value
Wound Class IV (Dirty	44.1%	< 0.001
Wound Class III (Cont	24.6%	-
Operative Time > 120 m	35.4%	< 0.001
Operative Time < 120 m	13.2%	-
Blood Loss > 500 ml	2.1-fold ris	-

Multiple Logistic Regression Analysis

To choose the independent predictors, the variables that had a univariate p-value of less than 0.1 were inputted into a multivariate model.

Postoperative Morbidity and Outcomes

The promotion of SSI was connected to enormous clinical outcomes. Mean Length of Stay (LOS) of patient with SSI was 14.2 days (SD plus/minus 5.1) which is much higher than that of the non-infected (6.4 days SD plus/minus 2.2) (p less than 0.001). Moreover, the 30-day mortality rate in SSI group was higher (8.0 percent vs 2.5 percent; p = 0.041).

Discussion

Summary of Major Findings

It is a prospective observational study with a high cumulative rate of Surgical Site Infection (SSI) rate of 21.4 percent among patients who underwent an emergency abdominal surgery. In our multivariate analysis, we identified a three-factor combination of independent predictors of Dirty/Infected classification dirty/infected wound classification Prolonged operative time > 120 minutes Pre-existing Diabetes Mellitus. These results indicate that the possibility of SSI in an emergency is not only a consequence of the surgical method, but a complicated combination of the physiological reserve of a

patient during the emergency, the microbial burden of acute pathology, and the effectiveness of the operation. This comparatively huge SSI rates distinguished here against elective standards (normally 2 to 5 percent), help to affirm that emergency abdominal surgery is a high stakes frontier in the management of surgical site.

Comparison to Asian and Regional Studies

The results of our study seem to be quite consistent with the information of other nations in Low- and Middle-Income Countries (LMICs) in South Asia. Research studies conducted in India and Bangladesh have established SSI rates of emergency laparotomy at 15 to 25 percent. To illustrate, the other study that was carried out in a tertiary care center in North India reported that wound contamination and malnutrition are among the primary causes of infection as we observed.

The large percentage of anemia (31.4 percent) and malnutrition (18.6 percent) in our cohort are a local characteristic that is not applicable to the high-income groups. The South Asian scenario leads to chronic nutritional deficiencies causing a state of immunological poverty whereby the body lacks the stores of protein and micronutrients that are necessary in primary intention healing. Moreover, the rates of SSI in our diabetic group (38.8 percent) are a little worse in comparison with the same rates in some regional studies and could be a consequence of worse glycemic control (HbA1c levels) at baseline in the local

population in Peshawar who do not necessarily have the opportunity to receive regular consultations with an endocrinologist.

Comparison to Western and International Literature

Comparing our findings to what is contained in the Western literature like the statistics that are contained in the American College of Surgeons National Surgical Quality Improvement Program (ACS-NSQIP), a vast safety gap is present. In high-income countries, the application of Standardized Infection Prevention Bundles implies that even the contaminated cases are provided with lower SSI rates. Though operative time and contamination are also included in the list of risk factors in the Western studies, their absolute rates of infection in the case of dirty wounds are usually less than our 44.1 percent.

Such difference may be justified by several systemic factors. To begin with, the situation with the socalled **Delayed Presentation** which we have witnessed in our research (54.2 percent of those presenting after 24 hours) is admittedly much more unusual in the context of the Western healthcare systems with effective primary care networks. Delayed intervention allows a local inflammatory mechanism (eg: appendicitis) to progress to generalized fecal peritonitis and offer an exponential increase in bacterial inoculum. Secondly, higher cross-contamination during the post-operative dressing change may be due to environmental issues such as ward overcrowding and large patient to nurse ratio in LMIC tertiary departments, which is not such a problem in the Western setting with a private room.

Physiological and Pathopathological Intrigue

The observation that it was Wound Class IV (Dirty/Infected) which was the most predictive (Adjusted Odds Ratio: 4.25) is an anatomic and microbiologic one. The surgical area in bowel perforation fills with polymicrobial organisms which include E.coli, Klebsiella and anaerobes like Bacteroides fragilis. The interaction between these organisms and local tissue hypoxia in the environment of sepsis in the emergency setting will lead to a situation in which the host defenses are easily subdued.

Moreover, the critical value of operative time (>120 min) occurred. Each hour of surgical operation increases the risk of SSI by about 25-30 percent. This would likely involve the issue of tissue drying (to explain the reduction in the local viability), the fatigue of the surgical team that may result in potential failures of the aseptic technique, and more time that the aerosolized pathogens may settle into the open cavity. The complexity of the pathologies at late stages (dense adhesions in neglected bowel obstructions) is frequently manifested in our environment in terms of ageing time.

Clinical Implications, Significance

The clinical significance of the present research is immense. This significant increase in the Length of Stay (14.2 days vs 6.4 days) has demonstrated how SSIs is one of the leading causes of the so-called bedblocking and resource wastage at the hospital. To a healthcare system like Pakistan, where the hospital bed is a scarce commodity, one SSI might end up having the capacity to rent a bed to two other emergency patients.

Also, the fact that the mortality rate of infected patients is 8.0 percent to 2.5 percent of uninfected patients means that SSI in an emergency patient is not a focal problem only, but also a system-wide threat. It can also be a precipitant of "failure to rescue" where the metabolic requirements of a deep-seated infection leads to multi-system organ failure of a patient already debilitated by the underlying pathology of surgery.

Prevention and possible Interventions

In order to reduce such risks, we would suggest the replacement of a generic care with High-Risk SSI Bundles that are specific to the emergency department:

Perioperative Optimization Time is Crucial but urgent repair of hypotension and vigorous fluid replacement are necessary so that the tissue at the wound area is maintained.

Antimicrobial Stewardship: The time of the first dose (within60 minutes of incision) is also to be adhered to. In Peshawar where antimicrobial resistance is on the rise, there ought to be local trends of sensitivity and based on this, the selection of prophylactic agents are to be determined.

Painstaking Surgical Care Wound protectors are essential and "change of gloves and instruments" before skin stitching in dirty cases (delayed primary closure)- should be taken into consideration.

Glycemic Management: The monitors and management of stress hyperglycemia is also expected in nondiabetic emergency patients because it has been observed to be an independent predictor of wound failure.

Strengths and Limitations

The best aspect of this research is that it is prospective-based and the focus of this research is on a highvolume tertiary center providing a realistic image of the surgical load in North-West Pakistan. Nevertheless, single centres, and the absence of a follow up (after 30 days) are limiting as it may fail to capture late onset deep space infections. Moreover, we did not subject each of the superficial infections to delicate microbiological cultures that would have provided a clue on more detailed information about the local resistance patterns.

Conclusion and Future Recommendation.

To sum up, the situation with surgical site infections of emergency abdominal surgery in our center is quite common and can be predicted to a great extent. The fact that the majority of the modifiable and semi-modifiable factors that include operative time, time of presentation or glycemic control are at the point of improvement implies that there is a lot that can be done.

There is a need to conduct future research on multi-centre randomized controlled trial of efficacy of delayed primary closure compare to primary closure in dirty (Class IV) wounds among Pakistani population. Also, the introduction of a digital SSI Surveillance App to review post discharge follow up may come in handy in the early detection and severity of deep infections reduction. The simplification of culture to include a culture of Zero Tolerance of preventable infection enables us to make a great contribution to saving the life of the emergency surgical patient and recovery.

Limitations

Although the prospective design is rather rigorous and the criteria (according to the standardized CDC criteria) were followed, this study has some inherent limitations that are to be taken into consideration.

Generalizability and Study Design This was the primary study limitation because it was single center research. Carried out at Lady Reading Hospital, Peshawar and reflective of the socioeconomic and microbial environment of the locality of a large tertiary care center in North-West Pakistan. As such, the findings cannot be quite applicable to the smaller secondary care settings and the individual healthcare industries where the demographics of the patients, the availability of resources, and the minimum infection control practices can vary greatly.

Microbiological Gaps Second, the microbiological analysis has not been of great interest to our study because we have been more interested in the clinical as well as operative predictors of Surgical Site Infections (SSIs). We failed to complete some cases of deep or superficial infection by profiling their culture and sensitivity (C&S). Since the risk of Antimicrobial Resistance (AMR) in a global scale is increasing, we still have no data on specific causative pathogens (including any resistance to Methicillin resistant Staphylococcus aureus (MRSA) or entero-bacteria that produce beta-lactamase (ESBL) or any antibiotic resistance) we can assist in relating clinical predictors to any microbial virulence factors or antibiotic resistance.

Follow-up Constraints The guidelines of the CDC restricted the following to 30 days after operation. Although this is a majority, and possibly even all, of incisional infections, it could be giving an underestimate of the rate of deep seated Organ/Space infections or chronic incidences involving the

retention of foreign objects (such as non-absorbable sutures), which can sometimes occur beyond the onemonth period.

Confounding Factors There were also some unmeasured confounding factors that included the specific level of the skill of the operating surgeon, the time point of hair removal prior to the operation, the temperature and humidity levels in the emergency operating theatre that was not adjusted in the multivariate model. Such environmental and human factors could vary in their independent effects on the risk of inoculation with bacteria.

Future directions To overcome these gaps, it is suggested to adopt future prospective multicenter studies that include clinical risk stratification and longitudinal microbiological surveillance. Integration of genomic sequencing of wound isolates may provide a more specific insight into the routes of infection spreading in emergency operating rooms in low-resource models.

Conclusion

This paper draws attention to the fact that Surgical Site Infection (SSI) in emergency abdominal surgery is a complicated issue, which is caused by a complicated synergistic interaction between physiological susceptibility of the patient and the intensity of the underlying pathology that needs surgical treatment. The fact that the emergency procedures are inherently risky due to the contamination factor is exceeded by the findings that we obtained, and the pressure of the SSI has been hastened through adjustable and semi-adjustable factors, such as uncontrolled hyperglycemia, preoperative anemia, and inappropriate timing of the operations.

To achieve improved surgical performance at tertiary care centres in resource limited centres, we should stop working reactively, and should work proactively, risk stratified. Standardized perioperative bundles developed with specific attention to emergency settings must be adopted urgently and with the goal of quick glycemic optimization, and adherence to the timing of antimicrobial prophylaxis. Moreover, the issue of delays in presentation by patients and the mere community education and enhanced pathways of referral is a systemic problem that holds the key in stopping the dirty, perforated cases. Finally, close attention to surgical practice, and effective postoperative follow-up is required to minimize clinical and financial morbidity of SSIs so that safe surgical care could be provided to the frail emergency population.

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