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Validation and reliability of the Turkish version of the surgical site infection assessment scale: a methodological study

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Abstract

Background Although the incidence of healthcare-associated infections has decreased over the past decade, surgical site infections (SSIs) have continued to constitute a significant proportion of these infections. Therefore, early identification and management of high-risk patients has been crucial in reducing the incidence of SSIs.

Objectives In this study, we aimed to evaluate the validity and reliability of the Turkish version of the Surgical Site Infection Assessment Scale (SSIAS), which was developed to identify patients at risk of superficial incisional SSI.

Methods In this methodological study, we evaluated the Turkish validity and reliability of the SSIAS in a prospective cross-sectional sample of 170 patients who underwent elective abdominal surgery at a tertiary healthcare center. The scale was adapted in accordance with international guidelines through a forward-backward translation process performed by three professional translators and content validation by a panel of 20 experts. We assessed the psychometric properties using univariate logistic regression and ROC analysis for construct validity (AUC calculation). Diagnostic accuracy was evaluated based on sensitivity, specificity, and predictive values at the optimal cutoff point (> 14), determined using the Youden index.

Results The adaptation process was carried out based on Beaton et al.'s guidelines, and the content validity ratio (CVR) was calculated between 0.78 and 1.00. ROC analysis revealed an AUC of 0.935 (95% CI: 0.897–0.972), and at the > 14 cutoff point, we observed 91.8% sensitivity and 79.3% specificity. The scale demonstrated superior predictive performance compared to previously developed tools. Surgical site infections occurred in 49 patients. The mean scale score of infected patients was 16.76 ± 1.85 . For each one-point increase in the scale score, the risk of infection increased by 3.52 times. Smoking, comorbidities, abnormal laboratory findings, length of preoperative hospitalization, wound classification, body temperature, and prolonged presence of drains were identified as factors influencing the risk of infection.

Conclusion The Turkish version of the *Surgical Site Infection Assessment Scale (SSIAS)*, originally developed by Anwar et al., was found to be a valid and reliable tool for predicting SSI risk in Türkiye. Due to its high predictive power, it offers practical potential for early risk identification and preventive action in clinical settings.

Trial registration Not applicable.

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Keywords Surgical site infection, Wound infection, General surgery, Validation study, Methodological study

Introduction

Surgical site infection (SSI) is the second most common healthcare-associated infection in patients undergoing surgical procedures [1]. SSI usually occurs within 30 days after surgery and may present with a wide range of clinical features. The Centers for Disease Control and Prevention (CDC) subdivide SSIs into superficial, deep, and organ/space [2].

Active infection control can prevent up to 60% of SSIs, and identifying infection risk factors is crucial for this purpose [3]. Age, body mass index, surgical risk index (also known as the National Nosocomial Infections Surveillance (NNIS) score), underlying disease, albumin, duration of surgery, whether a drainage tube was inserted, and the type of drainage are common risk factors for SSI [3–7]. The evaluation of patients' risk status is crucial. To make assessment easier, a variety of tools are employed. Scoring systems are efficient tools for identifying patients at high risk of surgical site infections [8, 9].

Research has indicated that assessing risk factors separately before, during, and after surgery effectively predicts factors affecting the risk of SSI [10]. The Surgical Site Infection Assessment Scale (SSIAS) was developed by Anwar et al. for general surgery patients, and the final score is determined on the second postoperative day. The higher the total score is, the greater the risk of SSI. Surgical risk assessment tools vary in complexity and predictive focus. Unlike the NNIS index (which relies solely on wound class, ASA score, and surgery duration) or the ACS-NSQIP calculator (which requires 20+ variables), the SSIAS integrates pre-, intra, and postoperative factors into a 17 item rapid screening tool. This makes it particularly suitable for clinical settings where immediate risk stratification is needed. In addition, anyone can use the tool, and it can be scored quickly and easily, so it has the advantage of quickly identifying high-risk groups for SSI [9].

This study aimed to determine the SSI risk prediction score with the SSIAS, which was developed by Anwar et al. [9] to identify patients at risk of superficial incisional SSI, which helps to determine the relationship between preoperative-intraoperative-postoperative risk factors and the occurrence of superficial incisional SSI, to verify the predictive validity of the tool by analyzing its relationship with SSI occurrence, and to evaluate its validity and reliability in our country.

Methods

This methodological study was conducted in the Department of General Surgery at a University Training and Research Hospital between March 2021 and March 2022.

The study population consisted of patients who underwent elective surgery in the General Surgery Service and met the inclusion criteria. As a result of the sample size analysis, 170 patients—ten times the number of items in the scale—were included in the study with 80% power and a 0.05 significance level (95% confidence interval). A post-hoc power analysis (G*Power 3.1) confirmed that the study had 80% power to detect an AUC difference of ≥ 0.1 ($\alpha = 0.05$, two-tailed).

Patients aged between 20 and 60 years who underwent elective surgery, had blood glucose levels below 200 mg/dl or were regulated, and voluntarily agreed to participate were included. Patients had a prior infection, morbid obesity (BMI > 40 kg/m²), neurological and/or psychiatric disorders (due to potential impaired compliance with postoperative care protocols, which may indirectly increase SSI risk), peripheral vascular disease, were pregnant, or received perioperative blood transfusions were excluded.

Scale adaptation process

The Turkish adaptation of the Surgical Site Infection Assessment Scale (SSIAS) used in this study was performed in accordance with the guidelines of Beaton et al. [11]. The forward-backward translation process was carried out by three independent professional translators and 20 clinical experts (5 general surgeons, 5 surgical nurses, and 10 academic nurse-physicians). Content validity was evaluated using Lawshe's Content Validity Ratio (CVR) method, and the CVR values of all items ranged from 0.78 to 1.00 (critical threshold: 0.42) [12]. The average agreement rate at the scale level was calculated as 90%. Additionally, the item-level Content Validity Index (CVI) ranged from 0.80 to 1.00. As the SSIAS evaluates dynamic clinical parameters that change over time (e.g., postoperative temperature, drain duration), test-retest reliability is not applicable to this scale. Therefore, no temporal stability analysis was performed.

Data collection

Data were collected using a standardized form consisting of a biosociodemographic form, the SSIAS, and a postoperative evaluation form. The biosociodemographic form which was created by the researchers as a result of literature review [9], consists of a total of nine questions related to age, gender and laboratory parameters (HGB (hemoglobin), WBC (white blood cell), albumin, PTZ (prothrombin time), APTT (activated partial thromboplastin time), CRP (C-reactive protein) and glucose).

The "Superficial Incisional Surgical Site Infection Assessment Scale" developed by Anwar et al. [9] was

used as a risk assessment tool for superficial SSIs. The SSIAS included 17 items: 10 preoperative, 2 intraoperative, and 5 postoperative factors. The total score ranged from 0 to 30, with higher scores indicating a higher risk of SSI.

Preoperative factors (age, smoking status, body weight, corticosteroid use, antibiotic prophylaxis, site of surgical intervention, comorbidities, laboratory results, length of hospital stay, shaving time), intraoperative factors (type of anesthesia, wound classification), and postoperative factors (body temperature, presence of a drain, day of drain removal, suture type, length of hospital stay) were scored, and a total risk score was calculated. As all abdominal surgeries during the data collection period were performed under general anesthesia at the participating institution, no patients receiving regional (e.g., spinal) anesthesia were included in the sample.

Postoperative evaluations included assessment of antibiotics used, laboratory values (WBC, CRP), local and systemic signs of SSI, and the occurrence of infection.

Study process

Before and during the operation, the biosociodemographic form and relevant sections of the SSIAS were completed. After surgery, patients' vital signs were monitored. They were assessed for signs of infection on postoperative days 1, 3, and 10. The relevant parts of the scale and the postoperative evaluation form were completed again by the investigator. The diagnosis of SSI was made according to the 2017 CDC diagnostic guidelines [2]. To minimize the risk of observer bias, data collection and SSI diagnosis were performed by different researchers. A member of the research team collected the data, while a different researcher (a participating surgeon) made the SSI diagnoses. Additionally, to enhance objectivity, an independent infectious disease specialist—who was not involved in the study—reviewed the clinical data and confirmed the diagnoses. Although full blinding was not applied due to practical limitations, this process ensured a certain degree of independence in outcome assessment.

Statistical analysis

The collected data were analyzed using IBM SPSS Statistics version 27 (IBM Corp., Armonk, NY, USA):

- Descriptive statistics for general characteristics were presented as frequencies and percentages. The chi-square test was employed to evaluate the association between categorical variables and the occurrence of surgical site infection (SSI).
- Logistic regression analysis was performed to identify independent predictors of surgical site infection (SSI) and to estimate the corresponding odds ratios.

- The validity of the scale was analyzed in terms of sensitivity, specificity, positive predictive value, and negative predictive value.
- The accuracy and discriminative ability of the SSI risk assessment were evaluated using the area under the receiver operating characteristic (ROC) curve (AUC).
- The optimal cutoff point to distinguish between high and low risk for SSI was identified as the score where the sum of sensitivity and specificity was the highest across all possible thresholds.
- No variable elimination techniques such as LASSO regression were used, as our aim was not to reduce dimensionality but to evaluate the individual predictive power of each item.

Results

SSI risk and risk-related factors

SSI was identified in 49 (28.8%) of the 170 patients included in the study. The SSIAS was used to predict the presence of SSIs. The SSIAS results for the three periods are analyzed in detail in Tables 1, 2, and 3.

Preoperative risk factors

Smoking more than 20 cigarettes per day [OR: 4.21 (95% CI: 1.51–11.73); $p=0.006$], presence of a chronic disease [OR: 5.35 (95% CI: 2.45–11.71); $p<0.001$], preoperative hospital stay of ≥ 3 days [OR: 5.87 (95% CI: 2.51–13.76); $p<0.001$], abnormal lab values [OR: 6.59 (95% CI: 3.00–14.46); $p<0.001$], and shaving the surgical site the night before surgery [OR: 8.95 (95% CI: 3.57–22.42); $p<0.001$] were all significantly associated with increased SSI risk.

The mean preoperative SSI risk score was 7.22 ± 1.96 points. Patients with SSI had a significantly higher preoperative risk score (9.02 ± 1.31) compared to those without SSI (6.49 ± 1.68 ; $p<0.001$). Each 1-point increase in the preoperative risk score was associated with a 3.5-fold increase in SSI risk (95% CI: 2.3–5.3), explaining 53% of the variance in SSI (R^2N (Nagelkerke's pseudo- R^2) = 0.53) (Table 3).

Intraoperative risk factors

The intraoperative risk score was significantly associated with SSI [OR: 7.0 (95% CI: 1.11–44.06); $p=0.038$]. The mean intraoperative SSI risk score was 1.89 ± 0.42 points. Patients with SSI had a significantly higher intraoperative risk score (2.00 ± 0.41) compared to those without (1.85 ± 0.42 ; $p=0.036$). Each 1-point increase in intraoperative risk was associated with a 2.5 fold increase in SSI risk (95% CI: 1.03–6.2), explaining 3.8% of the variance in SSI ($R^2N=0.038$). These findings indicate that the predictive power of intraoperative factors alone was limited (Table 3).

Table 1 Descriptive statistics of patient characteristics and risk factors related to superficial incisional surgical site infection

			All (n = 170)	SSI (+) (n = 49; 28.8%)
		Score	n(%)	n(%)
A-) Preoperative risk factors				
Age	20–29	0	4(2.4)	2(50)
	30–39	1	11(6.5)	1(9.1)
	40–49	2	41(24.1)	5(12.2)
	≥ 50	3	114(67.1)	41(36)
Smoking status	No smoke	0	118(69.4)	27(22.9)
	Smoker (≤ 20 pcs/day)	1	34(20)	12(35.3)
	Smoker (> 20 pcs/day)	2	18(10.6)	10(55.6)
Body mass index	Ideal weight (18,5–24,9 kg/m)	0	42(24.7)	7(16.7)
	Underweight(18,5 kg/m)	1	2(1.2)	1(50)
	Overweight (25 kg/m and over)	2	126(74.1)	41(32.5)
Use of corticosteroids	No	0	160(94.1)	46(28.7)
	Yes	1	10(5.9)	3(30)
Antibiotic prophylaxis	Yes	0	169(99.4)	48(28.4)
	No	1	1(0.6)	1(100)
Site of surgical operation	Nonabdominal	0	2(1.2)	1(50)
	Abdominal	1	168(98.8)	48(28.6)
Associated diseases	No	0	80(47.1)	10(12.5)
	Yes	1	90(52.9)	39(43.3)
Results of laboratory investigations	Normal value	0	86(50.6)	10(11.6)
	Abnormal value	1	84(49.4)	39(46.4)
Preoperative length of hospital stay (days)	1	0	113(66.5)	24(21.2)
	2	1	26(15.3)	6(23.1)
	3 or more	2	31(18.2)	19(61.3)
Shaving time	Immediate preoperative	0	143(84.1)	30(21)
	At the night before operation	1	27(15.9)	19(70.4)
B-)Intraoperative risk factors				
Type of anesthesia	Spinal	0	0(0)	N/A
	General	1	170(100)	49(28.8)
Classification of surgical wound	Clean	0	25(14.7)	4(16)
	Clean-contaminated	1	138(81.2)	41(29.7)
	Contaminated	2	7(4.1)	4(57.1)
	Infected	3	0(0)	N/A
C-)Postoperative risk factors				
Body temperature	Normal (36–37,40 C)	0	142(83.5)	23(16.2)
	Hypothermia (< 360 C)	1	3(1.8)	3(100)
	Hyperthermia (≥ 37.5°C)	2	22(12.9)	20(90.9)
	Both	3	3(1.8)	3(100)
Presence of drain	Absent	0	21(12.4)	5(23.8)
	Closed	1	138(81.2)	41(29.7)
	Open	2	9(5.3)	1(11.1)
	Both	3	2(1.2)	2(100)
Day of drain removal	1 st day	0	28(16.5)	4(14.3)
	2nd day	1	37(21.8)	6(16.2)
	3rd day and over	2	105(61.8)	39(37.1)
Suturing technique	Nonabsorbable	0	170(100)	49(28.8)
	Absorbable	1	0(0)	N/A
Postoperative length of hospital stay (days)	1	0	0(0)	N/A
	2	1	20(11.8)	2(10)
	3 and over	2	150(88.2)	47(31.3)

N/A = not available, SSI = surgical site infection criterion

Table 2 Univariate logistic regression analysis of risk factors associated with superficial incisional surgical site infection

Factors	Categories	Reference	Univariate Logistic Regression Analysis	
			OR(95% CI)	p-value
A-) Preoperative risk factors				
Age	30–39	20–29	0.10(0.01–1.71)	0.112
	40–49	20–29	0.14(0.02–1.22)	0.075
	≥ 50	20–29	0.56(0.08–4.14)	0.571
Smoking status	Smoker (≤ 20 pcs/day)	No smoke	1.84(0.81–4.19)	0.148
	Smoker(> 20 pcs/day)		4.21(1.51–11.73)	0.006*
Body mass index	Underweight(18,5 kg/m)	Ideal weight (18,5–24,9 kg/m)	5(0.28–89.80)	0.275
	Overweight (25 kg/m and over)	Ideal weight (18,5–24,9 kg/m)	2.41(0.99–5.89)	0.053
Use of corticosteroids	Yes	No	1.06(0.26–4.29)	0.933
Antibiotic prophylaxis	Yes		N/A	
	No		N/A	N/A
Site of surgical operation	Abdominal	Nonabdominal	0.40(0.03–6.53)	0.520
Associated diseases	Yes	No	5.35(2.45–11.71)	<0.001*
Results of laboratory investigations	Abnormal value	Normal value	6.59(3.00–14.46)	<0.001*
Preoperative length of hospital stay (days)	2	1	1.11(0.40–3.08)	0.837
	3 or more	1	5.87(2.51–13.76)	<0.001*
Shaving time	At the night before operation	Immediate preoperative	8.95(3.57–22.42)	<0.001*
B-)Intraoperative risk factors				
Type of anesthesia	Spinal		N/A	
	General		N/A	N/A
Classification of surgical wound	Clean-contaminated	Clean	2.22(0.72–6.87)	0.167
	Contaminated	Clean	7.00(1.11–44.06)	0.038*
	infected	Clean	N/A	N/A
C-)Postoperative risk factors				
Body temperature	Hypothermia (< 36 ⁰ C)	Normal (36–37,4 ⁰ C)	N/A	N/A
	Hyperthermia (≥ 37.5 ⁰ C)	Normal (36–37,4 ⁰ C)	51.74(11.31–236.70)	<0.001*
	Both	Normal (36–37,4 ⁰ C)	N/A	N/A
Presence of drain	Closed	Absent	1.35(0.47–3.94)	0.580
	Open	Absent	0.40(0.04–4.02)	0.437
	Both	Absent	N/A	N/A
Day of drain removal	2nd day	1 st day	1.16(0.29–4.58)	0.831
	3rd day and over	1 st day	3.55(1.15–10.98)	0.028*
Suturing technique	Nonabsorbable		N/A	
	Absorbable		N/A	N/A
Postoperative length of hospital stay (days)	1	2	N/A	
	3 and over	2	4.11(0.92–18.43)	0.065

ORodds ratio, CI confidence interval, N/A not available, Ref reference value, SSI surgical site criterion, *p < 0.05

Table 3 Mean SSIAS scores of preoperative, intraoperative and postoperative patients

SSIAS Score	SSI			P-value ^a	β(SE.)	OR(95%CI)	P-value ^b	R ² _N
	All	Yes	No					
Preoperative	7.22±1.96	9.02±1.31	6.49±1.68	<0.001*	1.26(0.21)	3.52(2.33–5.31)	<0.001*	0.53
Intraoperative	1.89±0.42	2.00±0.41	1.85±0.42	0.036*	0.92(0.45)	2.52(1.03–6.17)	0.042*	0.038
Postoperative	4.62±1.56	5.73±1.51	4.17±1.34	<0.001*	1.04(0.20)	2.81(1.89–4.21)	<0.001*	0.33
Total	13.73±2.90	16.76±1.85	12.50±2.29	<0.001*	1.26(0.21)	3.52(2.30–5.38)	<0.001*	0.68

*p<0.05, a=p value for independent sample t test, b= p value for logistic regression analysis, SDStandard deviation, SE Standard error, SSSI Superficial incisional surgical site infection, R²_N Nagelkerke's pseudo-R² (R²_N) values indicated variance explained by the model.

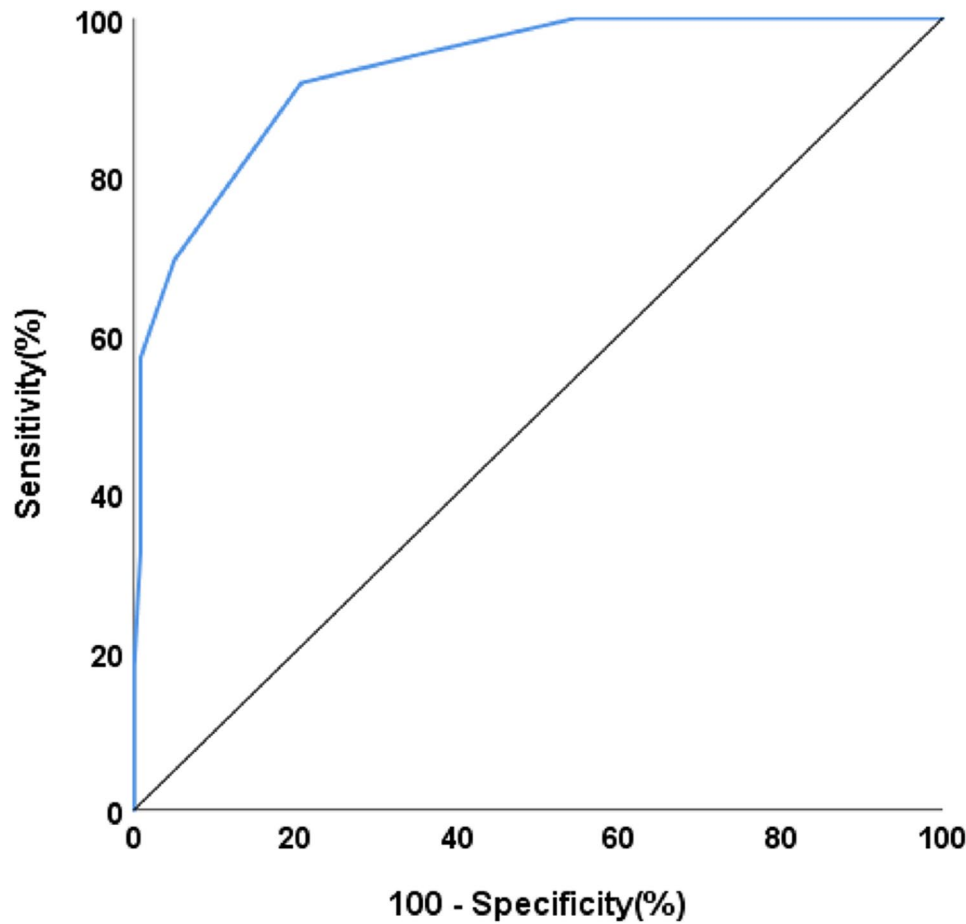


Fig. 1 ROC curve analysis for total score screening of SSIAS

Postoperative risk factors

Postoperative hyperthermia (≥ 37.5 °C) [OR: 51.74 (95% CI: 11.31–236.70); $p < 0.001$] and presence of a drain for ≥ 3 days [OR: 3.55 (95% CI: 1.15–10.98); $p = 0.028$] were significantly associated with higher SSI risk. The mean postoperative SSI risk score was 4.62 ± 1.56 . Patients with SSI had a significantly higher score (5.73 ± 1.51) than those without (4.17 ± 1.34 ; $p < 0.001$). Each 1-point increase in the postoperative risk score was associated with a 2.8-fold increase in SSI risk (95% CI: 1.9–4.2), explaining 33% of the variance in SSI ($R^2N = 0.33$) (Table 3).

Total SSIAS risk level

The mean total SSIAS score was 13.61 ± 3.07 points. Patients with SSI had significantly higher total scores (16.76 ± 1.85) compared to those without (12.50 ± 2.29 ; $p < 0.001$). Each 1-point increase in the total SSIAS score was associated with a 3.5-fold increase in the risk of SSI (95% CI: 2.3–5.4), explaining 68% of the variance in SSI ($R^2N = 0.68$) (Tables 1 and 2). ROC analysis showed that the optimal cut-off for predicting SSI was 14 points (AUC: 0.935; 95% CI: 0.897–0.972). The cut-off point was

Table 4 The area under the curve and predictive validity

	Statistics
Area Under the Curve (95% CI)	0.935(0.897–0.972)
P value	< 0.001
Cutoff point	> 14
Sensitivity	91.8% (45/49)
Specificity	79.3% (96/121)
Positive predictive value	64.2% (45/70)
Negative predictive value	96% (96/100)
Accuracy	82.9% (141/170)
Youden Index: 0.711; AUC: 0.935 (95% CI: 0.897–0.972), Sensitivity 91.8%, Specificity 79.3% for cut-off point > 14	

determined according to Youden index. Using this cutoff, the sensitivity was 91.8%, specificity 79.3%, and overall accuracy 82.9% (Fig. 1; Table 4). These results indicate that the SSIAS has high diagnostic performance in identifying patients at risk for SSI. The Youden index for the optimal cutoff point of > 14 was calculated as 0.711, indicating excellent diagnostic utility.

Discussion

The surgical site infection (SSI) rate observed in this study was 28.8%, which is relatively high. This elevated rate may be attributed to several factors, including the specific characteristics of our study population—namely patients undergoing abdominal surgeries—as well as the limited sample size and potential institutional variations in infection control practices. Additionally, factors such as the complexity of surgical procedures, the presence of comorbidities, and perioperative care standards may have further contributed to the increased incidence of SSIs. These findings underscore the importance of contextualizing infection rates within the clinical, institutional, and procedural frameworks in which they occur.

In this study, 44.89% of patients with SSI were smokers, and the risk of infection was significantly higher among those smoking more than 20 cigarettes per day. Smoking has been shown to impair capillary perfusion, delay cellular responses in wound healing, and disrupt the inflammatory process, thereby increasing the risk of complications like SSI [13–15]. Studies by Legesse et al. [16] and Kamarajah et al. [15] similarly found that smoking significantly elevated SSI risk, with Legesse et al. reporting a 3.7-fold increase in smokers. Our findings align with these results and confirm that smoking is an independent risk factor for SSI.

Chronic diseases that impair circulation and reduce mobility may also increase susceptibility to SSI. Therefore, assessing comorbidities before surgery is crucial for preventive planning [6]. Previous studies have identified diabetes [1, 17, 18] and hypertension [19–21] as significant risk factors. In this study, comorbidities were scored as a single item on the SSIAS, and chronic disease was confirmed as a significant risk factor for SSI. However, due to the aggregation of multiple diseases into a single scoring item, it was not possible to determine the individual contribution of each condition to the overall risk.

In this study, abnormal laboratory findings were significantly associated with an increased risk of SSI. Recent studies have confirmed that low serum albumin levels (<3.5 g/dL) are a strong predictor of SSI. One study found that hypoalbuminemia increased the risk of both superficial and deep SSI following abdominal surgery [8, 22]. Similarly, hypoalbuminemia was linked to higher complication rates, including SSI, in colorectal surgery patients [23]. Albumin plays a critical role in tissue healing and immune function, and low levels indicate poor nutritional status, which can impair wound healing. In line with this, another study showed that preoperative hypoalbuminemia was a significant risk factor for SSI in abdominal surgery patients [6]. These findings highlight the critical role of serum albumin as a marker for predicting postoperative infection risk. In our study, since four laboratory parameters (WBC, Hb, albumin, PT/aPTT,

INR) were collectively evaluated by assigning one point for any abnormality, it was not possible to determine which specific abnormality most strongly affected the risk of SSI.

Longer hospital stays before surgery were also associated with higher SSI risk. Previous studies support this, showing that prolonged preoperative hospitalization increases the chance of nosocomial infection [16, 24, 25]. In particular, Carvalho et al. [26] found that hospitalization beyond 24 h doubled the risk of SSI. In our findings, 38% of patients hospitalized for over three days developed SSI, and the association was statistically significant.

Although shaving is often recommended just before surgery, there is no strict consensus regarding timing. Our study found that epilation performed the night before surgery led to higher SSI rates compared to epilation done immediately before. While the literature is mixed on this issue [21, 27], the results of Jung and Lee [8] support our findings. These data suggest that performing epilation immediately before surgery may be more effective in reducing the risk of infection.

As in previous studies, we observed that patients with contaminated surgical wounds (Class 3) had a significantly higher incidence of SSI compared to those with clean-contaminated wounds (Class 2) [3, 5, 6]. Particularly in abdominal surgeries, where contamination is more likely due to gastrointestinal involvement, careful wound assessment and infection control measures are essential.

While no patients in this study had open drainage tubes, we evaluated drain usage based on presence or absence and duration. It is known that the presence of a drain increases the risk of infection, so the use of closed drains and early removal are recommended [28]. In our study, all drains were closed systems; nonetheless, longer duration of drain retention was associated with higher SSI rates. Therefore, in line with current guidelines, we suggest that if a drain is used, it should be removed as early as clinically feasible. Although previous research reported inconsistent results regarding drain usage and duration [29–31], a meta-analysis by Coletta et al. [32] concluded that drains do not prevent SSI. Our findings support clinical guidelines suggesting that drains should be avoided unless necessary and removed promptly if used.

The SSIAS demonstrated strong performance in detecting patients at risk for SSI. The AUC was 0.935 (0.897–0.972), with a cutoff score of 14. Sensitivity was 91.8%, specificity 79.3%, positive predictive value 64.2%, negative predictive value 96%, and overall accuracy 82.9%. In comparison, the original tool had a cutoff of 11.5, sensitivity of 71.7%, specificity of 51%, and accuracy of 66%. Additionally, SSI incidence was approximately 6.14 times higher in the high-risk group. These values are superior

to those of widely used scales such as NNIS (AUC: 0.82) and ACS-NSQIP (AUC: 0.85), with statistically significant differences ($p < 0.01$). This underscores the scale's ability to identify high-risk patients more effectively.

Sensitivity and specificity are critical for evaluating prediction tools, as they remain stable across varying disease prevalence rates. For early detection and prevention, high sensitivity is crucial, whereas high specificity helps minimize false positives and overtreatment in low-risk groups [8]. With high values in both, the SSIAS is a promising tool for clinical use. In line with the results obtained, it is thought that SSIAS can be used in clinical practice to reduce the incidence of SSI, effective infection monitoring and preventive management.

The SSIAS is also a practical tool, requiring approximately five minutes to complete and suitable for use by both physicians and nurses. Its straightforward scoring system enhances its applicability in clinical practice by enabling seamless integration into preoperative screening protocols and facilitating the rapid identification of high-risk patients—particularly in high-volume or resource-constrained healthcare settings.

Limitations

This study has several limitations. First, only four preoperative blood parameters (WBC, HGB, albumin, PTZ, and aPTT) were analyzed, which may not fully reflect all relevant predictors of surgical site infections (SSIs). The single-center design and inclusion of only abdominal surgery patients limit the generalizability of the findings.

To reduce observer bias, data collection and SSI assessment were conducted independently by separate researchers, and diagnoses were reviewed by an external infectious disease specialist. However, full blinding was not feasible.

The cross-sectional nature of the study precludes long-term outcome evaluation, and the timing of infection assessment (postoperative days 1, 3, and 10) may not fully align with standard criteria for superficial SSIs.

The sample size may not have been sufficient for detailed subgroup analyses. Further multicenter studies with larger, more diverse populations are needed to confirm and expand upon these findings.

Lastly, another limitation is the absence of external validation, which could not be conducted due to the lack of an equivalent SSI risk scale in Turkish. Future multicenter studies are planned to address this need.

Conclusion

The present study corroborates the findings of Anwar et al. [9], confirming that the “Surgical Site Infection Assessment Scale” is a valid and appropriate tool for predicting the risk of SSI in the Turkish clinical setting, demonstrating a high predictive performance.

This scale offers a practical method for identifying high-risk and low-risk patients in clinical practice, thereby supporting early preventive interventions. Its integration into preoperative screening protocols may enhance surgical site infection control strategies by enabling targeted monitoring and management of patients at elevated risk.

The findings lay the groundwork for the scale's future use as a decision-support tool in clinical workflows and its potential role in improving the efficiency of infection surveillance systems.

Given its simplicity, rapid administration, and adaptability to routine workflows, the SSIAS may be integrated into preoperative screening protocols by both physicians and nurses to facilitate early identification and management of patients at high risk for SSIs.

Abbreviations

SSI	Surgical site infection
CDC	Centers for Disease Control and Prevention
NNIS	National Nosocomial Infections Surveillance
SSIAS	Surgical Site Infection Assessment Scale
HGB	Hemoglobin
WBC	White blood cell
PTZ	Prothrombin time
APTT	Activated partial thromboplastin time
CRP	C-reactive protein
SPSS	Statistical Package for the Social Sciences
AUC	Area under the curve
ROC	Receiver operating coefficient
OR	Odds ratio
CI	Confidence interval
N/A	not available
Ref	reference value

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Authors' contributions

C.C. and I.C. contributed to all stages of the study, including the conception and design of the work, literature review, data collection, data analysis, manuscript writing, and critical review. M.U. contributed to the conception and design, literature review, data analysis, manuscript writing, and critical review, but was not involved in data collection. All authors read and approved the final manuscript.

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Data availability

Data is provided within the manuscript.

Declarations

Ethics approval and consent to participate

Based on the Declaration of Helsinki, permission was obtained from Mugla Sitki Kocman University Clinical Research Ethics Committee (14.04.2021-8/I) and the institution where the study would be conducted. Patients were informed about the study, and their verbal and written consents were obtained before starting the study.

Consent for publication

Not applicable.

Competing interests

The authors declare no competing interests.

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