

Surgical Site Infection Prevention Practice and Associated Factors among Nurses Working in Public Hospitals in Eastern Ethiopia: A Multi-center Cross-sectional Study

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Abstract

Background: Surgical site infections are the most prevalent type of healthcare-associated infections that have a detrimental effect on surgical patients and healthcare systems. If evidence-based strategies are applied throughout the management of surgical wounds, these infections can be mainly avoided. The safe practice of infection prevention by nurses, who serve as front-line caregivers, is essential to preventing these illnesses. However, there are few studies on this subject among nurses directly involved in providing care in Ethiopia.

Purpose: This study aimed to examine the surgical site infection prevention practice and associated factors among nurses working in public hospitals in Eastern Ethiopia.

Methods: A facility-based cross-sectional study was conducted among 478 randomly selected nurses working in public hospitals in eastern Ethiopia from July 15 to August 20, 2022. Data were collected through self-administered structured questionnaires and observations. Descriptive statistics was done using frequency, percentage, mean and standard deviation to summarize the study variables. Bivariate and multivariable logistic regression analysis was done to determine factors associated with the practice of surgical site infection prevention and a p-value <0.05 was used to declare a statistically significant association.

Results: The nurses' good practice of surgical site infection prevention was 56.4%. Taking infection prevention training (AOR=1.69, 95%CI:1.11-2.58), using infection prevention guidelines (AOR=2.45, 95%CI:1.34-4.47), having an adequate supply of wound care materials (AOR=1.81, 95%CI:1.21-2.71), having good knowledge (AOR=1.81, 95%CI:1.21-2.71) and having a good attitude (AOR=1.83, 95%CI:1.21-2.77) were significantly and positively associated with good practice of surgical site infection prevention.

Conclusion: Nurses' surgical site infection prevention practice was poor and several modifiable factors were identified. Continuous in-service training on and consistent utilization of infection prevention guidelines, provision of adequate wound care supplies and close supervision are recommended to improve the practice of preventing surgical site infections.

Keywords: Nurses • Practice • Prevention • Surgical site infection

Introduction

Background

Surgical Site Infections (SSIs) are infections that occur in a surgical patient at or around the incision site within 30 days after surgery if there is no implant or within one year if there is an implant [1,2]. SSIs are a significant global health issue, causing significant morbidity and mortality rates and are recorded as the leading cause of Healthcare-Associated Infections (HAIs) in developed and Low- and Middle-Income Countries (LMIC) [3]. The burden of SSIs was disproportionately higher in Africa, with an incidence of 14.8% in sub-Saharan Africa [4], 16.4% in Uganda [5] and 13.0–22.05% in Nigeria [6]. Moreover, meta-analyses done in Ethiopia showed that the prevalence of SSIs was high, with a pooled prevalence of 12.3%–25.22% (95%CI: 17.30 to 33.14%) [7,8].

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SSIs significantly impact surgical patients and healthcare systems, leading to increased hospital stay, spending time in an intensive care unit, readmissions, additional surgical procedures, high mortality, high medical costs for patients and families, significant financial burden to healthcare systems and increased workload for providers [9-11].

It's indicated that evidence-based surgical site wound care practice is the most effective preventive measure for SSI [12-14]. Several studies have demonstrated a potential reduction of up to 55% in SSI with evidence-based intervention strategies [15,16]. World Health Organization (WHO) and Centers for Disease Control and Prevention (CDC) have developed updated guidelines for preventing SSIs to ensure high-quality care for every patient, irrespective of the available resources [1,17]. Despite the widespread availability of evidence-based guidelines, there is a significant gap between recommended and observed practices regarding the prevention of SSI [18], particularly among nurses that can play a crucial role in initiatives that aim to reduce the risk of SSI [19]. Moreover, previous studies indicated that a considerable number of nurses had an unsatisfactory level of practice regarding SSI prevention [20-23]. Merely 2.3% of the nurses in Tanzania, [24] 44.5% in Bangladesh, [25] 59.7% in Indonesia, [26] and 66.6% in Uganda [27] had demonstrated a safe practice regarding SSI prevention. Likewise, in Ethiopia, less than half of the nurses demonstrated good practice of SSI prevention [28-30].

Available literature revealed that nurses' SSI prevention practice is significantly affected by personal factors like nurses' educational level, work experience, usage of available infection prevention guidelines, knowledge and attitude towards evidence-based SSIs prevention activities [20,23,31-33].

Additionally, the availability of infection prevention guidelines in working units, managerial support, adequate supply of water, personal protective equipment and wound care materials, continuous in-service training on infection prevention and orientation programs during unit rotation were institutional-related factors that significantly affect the nurses' SSIs prevention practice [21,28,29]. These factors may vary from site to site.

In Ethiopia, the SSI rate is currently recognized as a key performance indicator of medical and nursing care received by surgical patients and an indirect measure of infection prevention practices in hospitals [34]. Thus, it's imperative to determine the level of SSI prevention practice and associated factors to provide scientific evidence for action to improve the quality of care for surgical patients. The nurses' role is vital in this initiative as they cover most of the SSI prevention activities [7]. Despite this, there is a paucity of studies among nurses who are directly involved in surgical site wound care practice in Ethiopia.

Materials and Methods

Study setting and period

The study was conducted in public hospitals in Eastern Ethiopia from July 15 to August 20, 2022. The study area includes four administrative units in the eastern part of the country: Dire Dawa City Administration, East Hararghe Zone of Oromia Regional State, Harari Regional State and Somali Regional State. The study was conducted in four public hospitals, one from each administrative unit: Dilchora Referral Hospital (DRH) from Dire Dawa City Administration, Haramaya General Hospital (HGH) from East Hararghe Zone of Oromia Regional State, Hiwot Fana Comprehensive Specialized Hospital (HFCSH) from Harari Regional State and Sheik Hassan Yabere Referral University Hospital (SHRUH) from Somali Regional State. All four hospitals provide a wide range of elective and emergency surgical procedures for patients and there were a total of 1090 nurses providing healthcare services; DRH has 243 nurses, HGH has 82 nurses, HFSUH, a Haramaya University teaching hospital, has 395 nurses and SHRUH, Jigjiga University teaching hospital, has 370 nurses.

Study design and population

A facility-based cross-sectional study design was employed. The source population was all nurses working in public hospitals in eastern Ethiopia. The study population consisted of randomly selected nurses working in selected public hospitals in eastern Ethiopia. Those staff nurses who were working in the surgical ward, gynecology/obstetrics ward, orthopedic ward, operation room, surgical referral clinic, intensive care unit and emergency units were included in the study. Those who were on annual, maternity and educational leave, those who were on training, those who were seriously ill and head nurses who were working at the administrative functions during the data collection period were excluded from the study.

Sample size determination and sampling techniques

The sample size was determined by using Epi-Info version 7 software. For objective one, the sample size was calculated by the assumptions of 48.9% good practice in SSI prevention, 95%CI and 5% margin of error. After adding a 10% non-response rate, the calculated final sample size was 423.

For objective two, the sample size was determined by using Epi-Info version 7 software for individual factors at 80% power, 95% CI and 1:1 ratio of exposed to unexposed; by considering factors like nurses' work experience (≤ 5 years vs. > 5 years; 42.6% vs 56.5%) [31] Yielded the largest sample size. After adding a 10% non-response rate, the final sample size identified was 478 of the associated considered for the sample size determination. Comparing the two calculated sample sizes, the sample size calculated for the second objective (478) was taken into the study since it is the larger sample size.

A simple random sampling technique was used to select the study subjects. First, four representative hospitals were identified based on their importance: Hiwot Fana Comprehensive Specialized Hospital, Sheik Hassen Yabere University Hospital, Dilchora Referral Hospital and Haramaya General

Hospital. These hospitals are considered the largest hospitals that provide surgical services to a quite large segment of the population in the study area. The sample size was proportionally allocated to each hospital based on the total number of nurses and the study subjects were selected using a simple random sampling technique.

Data collection instruments and procedures

Data were collected using a structured self-administered questionnaire and an observational checklist. The questionnaire has five sections; section one consists of socio-demographic characteristics (age, sex, marital status, educational level and work experience) and institutional-related questions (training on infection prevention, the presence of infection prevention protocols and guidelines in their department, the presence of management support and wound care materials), which were adopted from previous similar studies.

Section two consists of questions about the nurses' knowledge of SSIs prevention and is measured by 25 multiple-choice questions that were adopted from previous similar studies [33,35,36]. Each of the correct responses received 1 and an incorrect response received 0. The total score was obtained by adding up all items, with possible scores ranging from 0 to 25. The nurses' knowledge of SSIs prevention was classified into two categories: good knowledge for those who scored mean and above value and poor knowledge for those who scored below the mean value.

Section three includes questions regarding nurses' attitudes towards SSIs prevention and measured with 10 questions constructed along a 4-point Likert scale (strongly disagree to strongly agree). Since the questions were negatively worded, strongly disagree attracted 4 points, disagree attracted 3 points, agree attracted 2 points and strongly agree attracted 1 point. The total scores were obtained by adding up all items, with possible scores ranging from 10 to 40. The nurses' attitude towards SSIs prevention was categorized as a good attitude for those participants who scored mean and above values and poor attitude for those who scored below the mean value.

Section four consists of questions concerning nurses' self-reported practice of SSI prevention and measured by 25 questions using a 4-point Likert scale (never practice=0, seldom practice=1, sometimes practice=2 and always practice=3) that was adopted from previous similar studies. The total scores were obtained by adding up all items, with possible scores ranging from 0 to 75. The mean score was used to classify the nurse's practice of SSI prevention into two categories: good practice for those who scored mean and above value and poor practice for those who scored below the mean value.

Section five consists of an observational checklist used to measure the nurses' actual SSI prevention practices that were adopted from previous similar studies and international guidelines. Four trained BSc nurses and two MSc nurses were recruited as data collectors and supervisors, respectively, to facilitate the data collection process.

Data quality control

To ensure the quality of the data, a pretested and structured questionnaire was utilized for data collection. The questionnaire was pretested on 5% (24 nurses) of the study population at two public hospitals (Jogul Hospital and Bisidimo Hospital) that were not included in the final study and all necessary amendments were made accordingly. Besides, the internal consistency (reliability) of the outcome variable (practice of SSI prevention) measuring questions was checked and a Cronbach's alpha coefficient of 0.89 was obtained. Before actual data collection, both data collectors and supervisors were trained in the data collection process. Supervisors and investigators supervised the data collection process and provided feedback throughout the data collection period. Double data entry was done and validated for inconsistencies and mismatches.

Data processing and analysis

The data were coded and entered into Epi Data version 4.6 and exported to Statistical Package for Social Science (SPSS) version 22 for analysis. Study variables were described using graphical and statistical methods; categorical variables were described using frequency and percentages and continuous

variables were described using the mean and standard deviation. A binary logistic regression model was fitted to identify factors associated with the practice of SSI prevention. Multicollinearity was checked using the variance inflation factor and tolerance. All variables with a P-value <0.25 were entered into a multivariable regression analysis to determine the independent predictors of the outcome variable. Model fitness was checked using the Hosmer-Lemeshow goodness of fit test. An adjusted odds ratio (AOR) with 95%CI was computed to determine the strength and direction of the association between explanatory and outcome variables and the level of statistical significance was declared at a p-value <0.05.

Ethical consideration

Ethical approval was obtained from the Institutional Health Research Ethics Review Committee (IHRERC) of the College of Health and Medical Sciences, Haramaya University, with the reference number HURG-2021-02-01-62. The ethical clearance and support letter were submitted to the administrative offices of each hospital to obtain permission and cooperation during the data collection process. A written informed consent was obtained from each study participant before data collection. All study participants were informed about the purpose of the study and about their right to participate or to terminate at any time if they wanted. Confidentiality of the information was guaranteed by using an anonymous questionnaire and maintaining the privacy of the respondents.

Results

Socio-demographic characteristics of study participants

A total of 478 nurses were included in the study, of whom 468 returned a complete questionnaire, with a response rate of 98%. The mean (±SD) age of the study participants was 29.30± 6.38 years old. The majority of the study participants, 357 (54.9%), were within the age group of 20-29 years, 286 (61.9%) were male and 248 (53.0%) were married. A higher proportion of the participants, 171 (36.5%), were Oromo by ethnicity and more than half, 247 (52.8%), were Muslims by religion. Regarding educational status, most study participants, 391 (83.5%), had a bachelor's degree and nearly half, 213 (45.5%), of the study participants had work experience <5 years in healthcare facilities and the majority, 335 (70%), were from teaching hospitals. Concerning the infection prevention-related training, only less than half, 206 (44%), of the participants were ever trained in infection prevention (Table 1).

Health facility related factors

In this study, 367 (78.4%) of the participants reported that there is an adequate supply of wound care materials (dressing packs like kidney dish, artery forceps, scissors, gauze and cotton swabs; dressing solutions like normal saline, povidone/iodine and hydrogen peroxide; and dressing or personal protective equipment like mask, gloves, apron, bandage and plaster); and more than half, 267 (57.1%), of them reported that there is a continuous supply of water in their working units.

Moreover, three-fourths, 351 (75%), of the participants reported having managerial support for SSI prevention practices. About three-fourths, 356 (76.1%), of the participants reported the presence of infection prevention guidelines in their working units and of them, 398 (85%), reported that they were using the guideline to update their knowledge.

Personal related factors

In this study, about 232 (49.6%) (95% CI: 45.0%-54.2%) and 249 (53.2%) (95% CI: 48.6%-57.8%) of the participants had good knowledge and attitudes towards SSI prevention strategies, respectively. The mean (±SD) knowledge score was 13.17 (±3.91) with a minimum score of 2 and a maximum score of 23 and the mean (±SD) attitude score was 26.93 (±7.55) with a minimum score of 10 and a maximum score of 40 (Figure 1).

Nurses' self-reported overall practice of SSI prevention

Table 1. Socio-demographic characteristics of nurses working in public hospitals, Eastern Ethiopia, 2022.

Variable	Category	Frequency	Percent
Age	20-29 years	257	54.9
	30-39 years	138	29.5
	40-49 years	54	11.5
	≥50 years	19	4.1
Sex	Male	286	61.9
	Female	182	38.1
Marital status	Single	205	43.8
	Married	248	53
	Widowed/divorced/separated	15	3.2
Educational level	Diploma	30	6.4
	Degree and above	438	93.6
Learning institution	Government	411	87.8
	Private	57	12.2
Work experience	<5 years	213	45.5
	5-10 years	180	38.5
	>10 years	75	16
Type of current working hospital	Teaching hospital	335	70.1
	Referral hospital	107	22.4
	General Hospital	36	7.5
Ever took IP training	Yes	206	44
	No	262	56



Figure 1. Knowledge and attitude towards SSI prevention practice among nurses working in public hospitals, Eastern Ethiopia, 2022.

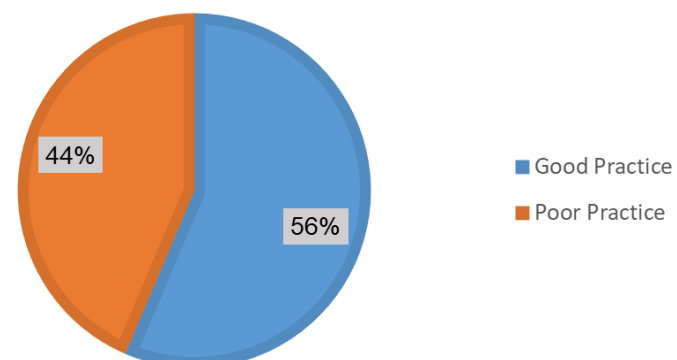


Figure 2. Overall self-reported practice of SSI prevention among nurses working in public hospitals, Eastern Ethiopia, 2022.

The mean (\pm SD) practice score was 55.6 (\pm 8.75) with a minimum score of 23 and a maximum score of 75. The overall nurses' level of good practice regarding the prevention of SSIs was 364 (56.4%) (95% CI: 51.8-61.0%) in the study area (Figure 2).

Nurses' actual practice of SSI prevention

In this study, 143 episodes of wound care were observed to determine the nurses' actual practice of SSI prevention and support their self-reported practice. The observations were made in surgical and obstetrics/gynecology wards. The mean (\pm SD) age of the participants was 28.37 (\pm 4.36), the majority, 107 (74.68%), were BSc nurses and more than half, 78 (54.73%), were males. Of the total 143 observed participants, 79 (55%), washed their hands before and after dressing changes using soap and water or alcohol gel, respectively. Around half, 73 (51%), of the participants observed, used sterile wound dressing materials and 82 (57%) of them used aseptic techniques when dressing wounds. All participants observed (143) used direct visual observation to check the wounds and look for signs of infection (redness, pain, heat, swelling and fever), but less than half, 66 (46.3%), of the wound assessment findings were recorded. The overall actual good practice of SSI prevention score was 70 (49.0%) (95% CI: 40.5-57.4%) (Figure 3).

Factors associated with SSI prevention practices

In bivariate analysis, variables like training on infection prevention, usage of infection prevention guidelines, availability of adequate wound care materials, continuous supply of water, management support, knowledge and attitude were significantly associated with SSI prevention practices. However, infection prevention training, usage of infection prevention guidelines, availability of adequate wound care materials, knowledge and attitude remained statistically significant predictors of good practice of SSI prevention in multivariable analysis.

Those nurses who had taken infection prevention training were about two times more likely to practice SSI prevention activities than their counterparts (AOR=2.17, 95% CI: 1.46-3.23). Those nurses who reported the usage of infection prevention guidelines in their routine wound care practice were about 2 times more likely to practice SSI prevention activities than their counterparts (AOR=1.92, 95% CI: 1.16-3.20). Furthermore, nurses who reported the availability of adequate wound care materials in their working units were 1.64 times more likely to practice SSI prevention activities than their counterparts (AOR=1.64, 95% CI: 1.01-2.66).

Concerning the knowledge and attitude of nurses towards SSIs prevention, nurses who had good knowledge and a good attitude were 1.81 and 2.09 times more likely to practice SSI prevention activities than those who had poor knowledge (AOR=1.81, 95% CI: 1.21-2.71) and poor attitude (AOR=2.09, 95%CI: 1.42-3.07), respectively (Table 2).

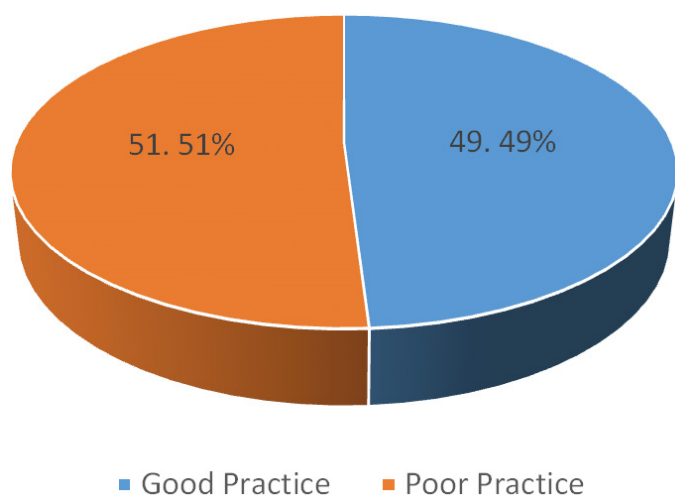


Figure 3. Actual practice of SSI prevention among nurses working in public hospitals, Eastern Ethiopia, 2022.

Table 2. Multivariable analysis of factors associated with SSI prevention practice among nurses working in public hospitals, Eastern Ethiopia, 2022.

Variables	Category	Practice Status		COR (95%CI)	AOR (95%CI)
		Good	Poor		
Sex	Male	170 (59.4)	116 (40.6)	1.37 (0.94,1.99)	1.30 (0.86,1.98)
	Female	94 (51.6)	88 (48.4)	1	1
Age	<30 years	155 (60.3)	102 (39.7)	1.42 (0.98,2.05)	1.48 (0.94,2.34)
	≥ 30 years	109 (51.7)	102 (48.3)	1	1
Educational status	Diploma	12 (40.0)	18 (60.0)	1	1
	Degree and above	152 (57.5)	186 (42.5)	2.03 (0.96,4.32)	1.37 (0.61,3.09)
Learning institutions	Government	237 (57.7)	174 (42.3)	1.51 (0.87,2.64)	1.54 (0.87,2.77)
	Private	27 (47.4)	30 (52.6)	1	1
Work experience	<5 years	113 (53.1)	100 (46.9)	1	1
	≥ 5 years	151 (59.2)	104 (40.8)	1.29 (0.89,2.86)	1.13 (0.75,2.69)
Knowledge	Good	148 (63.8)	84 (36.2)	1.82 (1.26,2.64)	1.81 (1.21,2.71)
	Poor	116 (49.2)	120 (50.8)	1	1
Attitude	Good	164 (65.9)	85 (34.1)	2.30 (1.58,3.34)	2.09 (1.42,3.07)
	Poor	100 (45.7)	119 (54.3)	1	1
Trained on IP	Yes	144 (69.2)	64 (30.8)	2.63 (1.47,3.13)	2.17 (1.46,3.23)
	No	120 (46.2)	140 (53.8)	1	1
Usage of IP guideline	Yes	201 (64.0)	113 (36.0)	2.57 (1.73,3.83)	1.92 (1.16,3.20)
	No	63 (40.9)	91 (59.1)	1	1
Availability of wound care materials	Yes	221 (60.2)	146 (39.8)	2.04 (1.31,3.19)	1.64 (1.01,2.66)
	No	43 (42.6)	58 (57.4)	1	1
Availability of water supply	Yes	165 (61.8)	102 (38.2)	1.67 (1.15,2.42)	1.48 (0.96,2.27)
	No	99 (49.3)	102 (50.7)	1	1
Managerial support	Yes	208 (59.0)	143 (41.0)	1.58 (0.99,2.30)	1.27 (0.75,2.14)
	No	56 (48.7)	61 (51.3)	1	1

Discussion

In this study, the overall nurses' self-reported good practice of SSIs prevention was 56.4%. This is supported by the actual findings of the observational study, in which about 49% of the observed study participants performed safe practices of SSI prevention activities. These findings imply that in most areas, nurses' self-reported practices and actual observational results are comparable to each other. The study revealed that taking IP training, usage of IP guidelines, availability of wound care materials and having good knowledge and a good attitude towards SSI prevention were significantly and positively associated with good practice of SSI prevention. The finding of this study is comparable with the results of other studies from Ethiopia [37] and Indonesia [26] in which about 52.8% and 59.7% of the nurses had good practice of SSI prevention, respectively.

However, this finding is lower than the results of other studies from Malaysia (97.7%) [36] (Sham, et al.), India (64.51%) [38], Uganda (66.6%) [27] and Palestine (91.1%). It's also lower than a study from Cameroon [39], which concluded that most of the nurses had good practice concerning the prevention of SSIs. This disparity might be attributed to the differences in sample size,

sampling techniques, types of facilities, study setting, operational definition of SSIs prevention practice, sociodemographic characteristics, participant-related factors and availability of training related to SSIs prevention. For instance, in Cameroon, only 40 nurses were included in the study by convenient sampling from a single district hospital. Moreover, the majority (62.5%) of the participants reported taking refresher courses and most of them were found knowledgeable on SSI prevention. In India, subgroup analysis among a small sample (only 31 nurses and 107 other health professionals) was done only in one tertiary hospital and in Uganda, a small sample of study participants (only 43 nurses and 17 other health professionals) were included from one referral and one teaching hospital and most nurses (96.3%) were found knowledgeable on the prevention of SSIs. The other reason for the discrepancy could be the differences in the operational definition used to assess nurses' practice of SSI prevention, which was measured by using only a 3 Likert scale and 10 or 12 practice-related questions in these two studies. The discrepancy in findings from a study in Malaysia could be attributed to three things: one, the country's institutional policy on SSIs prevention, which was a priority in every healthcare institution to keep a safe environment; two, good governance that oversees and coordinates at different levels; and three, continuous educational programs and professional training related to SSIs prevention that would update their nurses' knowledge. It might also be related to differences in the developmental level of the countries and the resulting shortage of wound care materials, as the availability of wound care materials was one of the significant factors affecting nurses' practice regarding SSI prevention.

On the other hand, the finding of this study is higher than studies done in Bangladesh [25] and Tanzania [24], which reported that only less than half of the nurses had good postoperative wound care practice. It is also higher than a study done in Egypt [22], which concluded that most nurses had poor practice and only 7.3% performed a high level of practice regarding SSI prevention. Moreover, this finding is higher than the results of other studies conducted in different parts of Ethiopia, in which only less than half of the nurses had good practice of SSI prevention. The observed discrepancy could be related to the differences in the operational definition of SSI prevention practice, sociodemographic characteristics, participants' related factors, type of facility, study setting, study period, sample size and sampling techniques. The disparity might also be attributed to differences in the availability and/or adequacy of resources required to implement SSI prevention activities, continuous educational programs, professional training related to SSI prevention and hospital policy on SSI prevention protocols and guidelines. Besides, the incident of COVID-19 pandemic and its recommended standard prevention activities can have a positive effect during this study. For instance, SSI prevention activities like wearing a face mask and handwashing practices could be mainly affected by COVID-19 prevention practices.

This study revealed that the availability of in-service training on infection prevention techniques was significantly associated with good practice of SSI prevention. Those nurses who had taken IP training were more likely to practice SSI prevention activities than those who had not. This supports the findings of other previous studies that indicated that training of nurses on IP was significantly and positively associated with good practice of SSI prevention. This can be explained by the fact that training on current national and global guidelines could upgrade nurses' knowledge and skills on SSI prevention and thus increase their compliance with the recommended practices.

Likewise, IP guideline usage was another factor that was significantly associated with good practice of SSI prevention. Those nurses who reported the usage of the available IP guideline in their routine practice were more likely to practice SSI prevention activities than those who did not. This is consistent with the findings of previous studies from Addis Ababa city and West Showa, Ethiopia. This can be explained by the fact that those nurses who utilize evidence-based guidelines during their routine practice could upgrade their knowledge and skills, which in turn improves their practice of SSI prevention.

This study also revealed that the availability of wound care materials in the practice area was identified as one of the institutional-related factors that significantly associated with the safe practice of SSIs prevention. Those nurses who had access to wound care materials in their practice area were more likely to practice SSI prevention activities than those who had not. This corroborates the findings of a study conducted in West Showa, Ethiopia, that

identified that the availability of wound care materials was significantly and positively associated with good practice of postoperative wound care. This is also in agreement with research conducted in Australia that concluded that the availability of adequate wound care materials is essential in managing surgical site wounds to reduce a complication of SSIs and improve patients' quality of life [40].

Furthermore, nurses' knowledge about SSI prevention was significantly associated with their practice of SSI prevention activities in this study. Those nurses who had good knowledge were more likely to practice SSI prevention activities than those who had poor knowledge. This is consistent with the findings of similar previous studies. This is true because knowledge is an essential factor in nursing decision-making and an important element in forming positive attitudes. It is also in line with the Knowledge, Attitude and Practice (KAP) model, which states that knowledge and attitude are often linked to practice [41]; thus, the more knowledge they acquire, the higher the practice of SSIs prevention.

This study also indicated that nurses' attitude was another personal factor significantly associated with the practice of SSI prevention. Nurses who had good attitudes towards SSI prevention were more likely to practice SSI prevention activities than those who had poor attitude. This supports several previous studies that demonstrated a positive and significant association between nurses' good attitude and practice of SSI prevention [42]. This could be explained by the fact that since attitude can influence an individual's choice of action; it can lead to a better practice of SSI prevention activities. This also goes with the KAP model which states that knowledge and attitude can be mutually influential and linked to practice [41]. A higher level of knowledge can improve the attitude of nurses regarding SSIs prevention. Thus, improved nurses' attitudes can improve nurses' SSI prevention practice. On the other hand, consistent with learning theory [43], a positive attitude can motivate learning and bring about a better practice of SSI prevention.

Despite the above merits, the current study should be interpreted with the following limitations. Because of the cross-sectional nature of the study design, temporal relationships cannot be established between the explanatory and outcome variables. Since the study assessed the nurses' self-reported practice, there might be social desirability and recall bias. This was minimized by assessing the nurses' actual practice using an observational checklist to support their self-reported results and by including in the study only those nurses who directly participated in surgical site wound care practice to minimize recall bias. The Hawthorne effect may be introduced (nurses may change their usual practice) when they feel that they are under study during observation. This was minimized by explaining the purpose of the research and avoiding a detailed explanation of what was to be observed.

Conclusion

The study revealed that nurses' practice of SSI prevention was low in our study area. Taking IP training, using available IP guidelines in their routine practice, having adequate wound care materials in their practice area and having good knowledge and a good attitude towards SSI prevention were significantly and positively associated with good practice of SSI prevention. Therefore, the availability and accessibility of standard IP guidelines in nurses' working units, especially for those nurses providing services for surgical patients, is essential to improving the practice of SSI prevention. Nurses in our study area should upgrade their knowledge and skills by using IP guidelines if available in their working units or by reading the newly developed global and national guidelines to improve SSI prevention practices. Hospital administration should provide continuous in-service training related to SSI prevention, focusing on the current evidence-based guidelines to improve the quality of care and patient safety. It is recommended that all necessary dressing equipment and solutions be made available and accessible to provide high-quality surgical site wound care practices. Future studies are recommended to include other diverse healthcare professionals (surgeons and anesthesia) providing care for surgical patients and factors like job satisfaction to identify barriers to SSI prevention.

Data Availability

The raw data supporting the findings of this study are available from the authors upon reasonable request.

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Conflicts of Interest

None.

Ethics Approval and Consent to Participate

Ethical approval was obtained from the Institutional Health Research Ethics Review Committee (IHRERC) of the College of Health and Medical Sciences, Haramaya University, with the reference number HURG-2021-02-01-62. The ethical clearance and support letter were submitted to the administrative offices of each hospital to obtain permission and cooperation during the data collection process. A written informed consent was obtained from each study participant. Confidentiality of the information was guaranteed by using an anonymous questionnaire and maintaining the privacy of the respondents.

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