

Research Article

KNOWLEDGE, PRACTICE OF HEALTH WORKERS AND SURGICAL SITE INFECTIONS AT LIRA REGIONAL REFERRAL HOSPITAL (LRRH) AND LIRA UNIVERSITY TEACHING HOSPITAL (LUTH)

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Abstract

Purpose: The effect of knowledge and practice of health workers (HWs) on surgical site infection (SSI) has never been documented in our area and such knowledge gaps has made advocating for allocation of resources to tackle the vice of SSI and its menacing outcome challenging hence this study. **Method:** A cross-sectional descriptive study on randomly selected 60 health care workers from Lira regional referral hospital (LRRH) and Lira university teaching hospital (LUTH) was conducted for 1 month. Data was entered and analyzed descriptively and inferentially using SPSS version 23. **Results:** Amongst the 60 respondents enrolled, the study found that practicing infection prevention method is the single most significant predictor of SSI prevention compared to just possession of knowledge by the HWs (*P value 0.003*). Further to that, approximately 7.3% of health workers don't practice measures required to prevent surgical site infections, 12.51% of them lack the requisite knowledge on prevention of SSI of which anesthetic officer and nurses were the most likely category of health employees to have poor practice 33.3% and 27.3% respectively. **Conclusion:** A significant number of HWs have limited knowledge and other do not practice all measure required in prevention of SSI, hence, the need for more practical sessions in training institutions

Keywords: Surgical site infection (SSI), Health worker knowledge on prevention of surgical site infection (SSI), Health worker practice on prevention of surgical site infection.

INTRODUCTION

Surgical site infection (SSI) is infection occurring within thirty (30) days after surgery or after one year in case of an implant due to contamination of the surgical site by microorganism¹. According to CDC, superficial surgical site infection develops within 30 days of the surgery and tends to involve skin and subcutaneous tissue, while deep infection develops after 30 days or within one year if a foreign body was implanted and it involves fascia, muscles and organ/space². Classically, SSI presents with signs of redness (rubor), pain (dolor), swelling (tumor), elevated incision tissue temperature (calor), systemic fever and ultimately, the wound gets filled with necrotic tissue, neutrophils, bacteria and proteinaceous fluid that together constitute pus³. Surgical Site infections (SSI) remain a major cause of morbidity and death among the operated patients. So far, SSI is the second leading cause of nosocomial (hospital acquired infections, HAIs) infections⁴. It causes a marked health burden in terms of patient morbidity and mortality, prolonged hospitalization, increased cost of treatment to patients, increased resistance to antimicrobial agent hence the urgent need to address the vice¹. According to WHO, 7.1 million instances of HAI occur each year leading to 99,000 cases of death every year⁵. Whilst global estimates of surgical site infection (SSI) rate vary from 0.5% to 15%, studies in India have consistently found higher rates ranging from 23% to 38%.⁶ In the developed countries, SSI prevalence range from 5% to 15% amongst hospitalized patients in regular wards and 50% on patients in intensive care units (ICUs), but in developing countries the magnitude of the problem remains largely underestimated and unreported⁷.

A systemic review by Nejad et al (2011) reported a 19% SSI in Tanzania and Kenya and 10% SSI in Uganda⁸. The incidence of SSI in Uganda at Mbarara regional referral hospital (MRRH) by 2015 was found to be 16.4% attributable to poor infection conscious practice and universal precaution in operative procedures¹. Therefore the knowledge and practice of health works (HWs) is an important concern as far as SSI control and prevention is concern. The level of knowledge and practice of health workers (HWs) on SSI at Lira Regional Referral Hospital (LRRH)/Lira University Teaching Hospital (LUTH) has never been studied. Such knowledge gaps make allocation of resources to tackle SSI challenging⁹, hence the need for this study

Objectives

1. To assess knowledge of health workers (HWs) on prevention of surgical site infections
2. To assess the practices of health workers (HWs) on prevention of surgical site infections.

METHODS

A prospective cross-sectional descriptive study design was used to collect quantitative data on knowledge and practice of health care workers on surgical site infection at Lira regional referral hospital (LRRH) and Lira university teaching hospital (LUTH) in Lira city. The sample studied consisted of 60 health workers from the maternity/gynecological ward, surgical ward and operating theatre of two hospitals located in Lira city, Lango sub-region in northern Uganda. The study participants included; theatre assistants, nurses, midwives, intern doctors, ward in-charges, surgeons, anesthetic officers, and medical officers. Nursing aids and nursing assistants, consultants and senior consultants were excluded from the study. The

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following data was collected from the participants using a pretested semi-structured questionnaire of Cronbach's Alpha 0.756 adopted from Sadaf et al, (2018)²¹: socio-demographic characteristics, knowledge, as well as the practice of HWs on Surgical Site Infections (SSI). The results was entered and analysed descriptively and inferentially using SPSS version 23.

RESULTS

There was 100% response rate from all the 60 participants. Their Biodata comprising of age, gender, qualification level and years of work experience was analyzed and described in the table 1. The inferential analysis is provided in the subsequent tables

Table 1. Biodata of Health workers

Variables	Frequency	Percentage	Chi square	Df	P value
Age groups					
25-30yrs	39	65	30.1	2	0.0001
31-35yrs	16	26.7			
36-49yrs	5	8.3			
Gender					
Male	32	53.3	0.267	1	0.606
Female	28	46.7			
Level of qualification					
Nurse	43	71.7			
Doctor	10	16	34.47	4	0.0001
Theatre assistant	3	5			
Anaesthetist	3	5			
Others	1	1.7			
Work experience (Years)					
Up to 1yr	5	8.3			
2-3yrs	19	31.7	38.93	3	0.0001
4-5yrs	3	5			
Over 5yrs	33	55			
Total	60	100%			

From Table 1, the majority of the respondents were within the age group of 25-30yrs (65%) followed by 31-35yrs (26.7%) and lastly those 36-49yrs (8.3%). The age difference was statistically significant (chi-square= 30.1, DF=2, P value=0.0001). Therefore the hospitals (LRRH & LUTH) tend to employ young officers. Furthermore, the majority of respondents were males (53.3% n=32), compared to female (46.7% n=28), however this difference was not statistically significant (chi-square=0.267, d.f=1, P value=0.606).

Table 2. Knowledge of health workers towards Surgical Site Infection

Items	Yes	Not Sure	No
Does sterile hand washing before wound care reduce the risk of surgical site infection	98.30%	0%	1.7%
Does skin preparation before operation reduce the chance of surgical site infections	100%	0%	0.0%
Does observation of aseptic technique during the preparation of sterile instruments prevent surgical site infections	100%	0	0.0%
Does the duration of operations affect developing surgical site infections	55%	25.00%	20.0%
Does the administration of prophylactic antibiotics help in preventing surgical site infections?	93.70%	1.70%	0.0%
Do malnourished patients and relatively healthy persons have an equal chance of developing surgical site infection	35%	15.00%	50.0%
Prolonged preoperative hospitalization is associated with the development of surgical site infections.	50%	20.00%	30.0%
Do you encourage patients to take a shower before operations to prevent surgical site infections	71.70%	16.70%	10.0%
Does maintaining cleanliness of equipment throughout procedure and during wound dressing reduce the risk of surgical site infections	93.30%	5.00%	1.7%
Does minimal movements during operations reduce the surgical site infection	70%	18.30%	11.7%
Average	76.70%	10.17%	12.5%

Table 3. Practice of health workers toward Surgical Site Infection prevention

Item	Yes	Not Sure	No	Total
Do you wash hands before and after changing wound dressing/ touching the surgical site?	96.6%	3.3%	0%	100%
Do you catheterise the patients before surgical procedure	73.3%	16.7%	10.0%	100%
Do you keep the contact of sterile equipment minimal?	90%	6.7%	1.7%	98.3%
Do you administer preoperative prophylactic antibiotics within an hour before surgery	93.3%	5.0%	1.7%	100%
Do you advise patients to take preoperative shower bathing with the antimicrobial agent before operations	36.7%	36.7%	25.0%	98.3%
Do you sterilize dressing materials for cleaning and surgical wound dressing?	90%	0%	8.4%	98.3%
Antiseptic technique to a surgical wound dressing.	85%	5.0%	3.3%	93.3%
Do you minimize movements during operations and wound dressing	85%	8.3%	6.6%	100%
Do you observe haemostasis before skin closure	88.3%	5.0%	5.0%	98.3%
Do you wear a facemask, head cover, and proper attire before and during surgical site wound dressing?	78.4%	10.0%	11.7%	100%
Average	81.7%	9.7%	7.3%	99.2%

Amongst the health workers recruited in the study, the greatest majority were nurses (71.7%), followed by doctors (16.7%), anesthetic officer and theatre assistant, both making of 5%; and this difference was statistically significant (chi-square=34.47, df=4, P value=0.0001). In many hospitals, the nursing cadre tend to be the majority compared to all the other group of HWs. Out of the health workers recruited in the study, 55% had experience of more than 5years and only 8% had experience of less than one year (P value= 0.0001). Experience is a very important factor that influences practice of HWs.

Knowledge of health workers towards Surgical Site Infection

The knowledge of HWs was examine using a 5 points scale and later recalculated into a binary response Table 2.

Much as all HWs are expected to have excellent knowledge on prevention and identification of SSI, on average only 76.7% of them have good knowledge on prevention of SSI, 12.51% of them lack the requisite knowledge on prevention of SSI (table 2). Furthermore as shown in table 2, only 50% of HWs know that prolonged preoperative hospitalization is associated with development of SSI and only 55% know that duration of operation has effect on SSI. Lastly only 70% of HWs know that minimizing movements during operations reduces risk of SSI while 11.7% disagree. All the above knowledge domain determines the ability of health workers to call into action the universal precaution, but to the dismay of the unsuspecting patients, some health workers lack the knowledge which is very important in SSI prevention and control

The Practice of Health Workers and SSI (Table 3)

From table 3, 7.3% of the health workers don't practice measures necessary to prevent surgical site infections during their care of surgical patient, but 81.66% of respondents practiced all required measures in prevention of SSI.

Table 4. Identification of surgical site infections

Items	Yes	Not Sure	No	Total
Does increased pain and discharge from the wound site indicate surgical site infections?	81.7%	15%	3.3%	100%
Does the increased temperature of the incision site indicate SSI	81.7%	13.3%	5.0%	100%
Does redness of incision site indicate surgical site infection	76.7%	15%	6.7%	98.3%
Does swelling of the incision site indicate surgical site infection	78.3%	13.3%	8.3%	100%
Does proteinaceous fluid that constitutes pus indicate surgical site infection	95%	3.3%	0%	98.3%
Does wound dehiscence (reopening) indicates surgical site infection	76.6%	13.3%	10%	100%
Does deep skin infection by microbes (cellulitis) indicate surgical site infection	80%	10.0%	10%	100%
Average	81.4%	11.89	6.2%	85.2%

Approximate 96.6% of health workers do hand washing before and after wound dressing /touching surgical site, more than 90% of them sterilize dressing materials for clean surgical wound dressing, administer preoperative prophylactic antibiotics within an hour before surgery and keep minimal contact with sterile equipment. However only 36.7% advise patients to take preoperative shower bathing with the antimicrobial agent before operations and only 78.4% wear a facemask, head cover, and proper attire before and during surgical wound dressing. Therefore whereas a conglomeration of practice is needed for the HW to prevent SSI, some of them do not practice the recommended universal precaution for control and prevention of SSI

Identification of surgical site infections

From table 4, a greater proportion of HWs (81.4%, on average) can detect the signs and symptoms of SSI and hence may respond early whereas 6.2% of them lacked the ability to identify SSI. Therefore some of the health workers are unable to identify SSI and this makes the patients prone to prolonged morbidity and/or mortality due to SSI. Although >90% health workers believe that SSI is when proteinaceous fluid that constitute pus and cellulitis at site of incision, only a small percentage aver that the following indicate SSI; swelling at incision site (78.3%), wound dehiscence (76.6%), redness of incision site (76.7%)

Rate of poor knowledge and practice amongst health workers

Table 5. Rate of poor knowledge and practice amongst health workers

Category	Practice (%)	Knowledge (%)
Age	25-30	0
	31-35	6.3
	36-45	0
Gender	Male	15.60
	Female	7.10
Level of qualification	Nurse	27.3
	Anesthetist	33.3
	Other cadres	0
Year of experience	<1yr	20
	2-3yr	26
	>5yr	3

As shown in table 5, poor practice was generally more prevalent than poor knowledge amongst health worker within variables like age, gender, level of qualification and years of experience. Within the different age groups, poor practice was more common amongst health workers in the ages ranging from 36-45yrs (20%), followed by 25-30yrs (12.8%) and 31-35yrs (6.3%). Whereas more male than female HWs tended to have poor practice (15.6% vs 7.1%), more female tended to have poor knowledge than the males (0 vs 3.6%).

Furthermore, the anesthetic officer and the nurses were the most likely category of health employees to have poor practice; 33.3% and 27.3% respectively nonetheless, poor practice tended to decrease in those with more than 5yrs' work experience.

Health workers Knowledge, Practice and Surgical Site Infection

Multiple Regression Analysis

Table 6. Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.404 ^a	.163	.134	.57607

a. Predictors: (Constant), knowledge of HW toward SSI, The practice of HW toward SSI

Table 7. Regression Coefficients^a

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	2.534	.813		3.115	.003
1 The practice of HW toward SSI	.356	.116	.392	3.074	.003
knowledge of HW toward SSI	.054	.195	.035	.276	.783

a. Dependent Variable: HW identification of SSI

As depicted in Table 6, the practice and knowledge of health worker (HW) exhibited a coefficient of determination (R Square) of 0.163 in the model summary. Hence variation in SSI attributable to practice and knowledge of health worker is 16.3%. According to table 7, as health workers practice and knowledge increases, SSI identification and prevention also tended to increase. However for a unit increase in the practice, identification and prevention of SSI increases significantly by 0.356 times ($P=$ value 0.003). On the other hand, when health workers knowledge increase by one unit, their ability to identify and prevent SSI increases by only an insignificant 0.035 times (P value = 0.783). Therefore when compared to knowledge, the practice of health workers is the most significant predictor in identification and prevention of SSI

DISCUSSION

Whereas this study found the majority of the respondents to be within the age group of less than 30years with male predominance, and the males tending to have poor practice while females tended to have poor knowledge, similar finding were also obtained in others studies. Freahiywot et al (2015) found that Females were about 2 times more likely to practice good surgical site infection prevention activities compared to male nurses although male nurses were about 3 times more likely to be knowledgeable in SSI prevention¹⁰. This study found nurse predominance and out of the total of 60

participants who took part in the study, 55% had experience of more than 5 years and only 8% had experience of less than one year. A study by Nini (2021)¹¹ found that Nurses who had a work experience of 11–20 years were two times more likely to have good knowledge than nurses with ≤ 10 years of work experience. However another study under a different research setting found that nurses who participated in a survey had inadequate knowledge about the prevention of SSIs and more than half of them were practicing inappropriately¹⁰. Lobo (2019) also found that nurses have inadequate knowledge on infection prevention and control and their practices were average with regard to infection prevention and control.¹² Similarly Woldegioris *et al.* (2019) found that, nurses level of practice related to prevention of SSI is not satisfactory (45.1%)¹³. Kolade *et al.* (2017) also found that, nurses have unsatisfactory level of practice on prevention of SSI with strong correlation between attitude and practice¹⁴. This finding is ominous, because the unsuspecting patients trust health worker and they have a feeling that HWs are quite knowledgeable in the profession they practice.

Whereas this study found that 7.3% of health workers don't practice measures to prevent surgical site infections and 12.5% don't have knowledge for prevention of surgical patient (SSI), there was a positive significant relation between practice of health workers to SSI ($P = \text{value } 0.003$). A unit increase in appropriate practice by health workers leads to a 0.356 times increase in SSI prevent. Knowledge of health workers had no significant effect of SSI prevention ($P \text{ value} = 0.783$). Patil *et al.*, (2018), in their study on knowledge and practice, found that health care professionals have good practices level regarding infection control.¹⁵ Another study found that 50.6% of the respondents were knowledgeable with regard to Infection control and Prevention (IPC) and factors associated with knowledge level were educational level, occupation, marital status and age¹⁶. However in the same study¹⁶ 13.7% of nurses rated their practice as unsatisfactory. A study by Sickder *et al.* (2010) found a weak, negative correlation between knowledge and practice regarding prevention of SSI ($r = -.18, P = .04$)¹⁷. However a strong significant negative correlation was found between Knowledge and practice of nurses regarding prevention of surgical site infection by Sadia *et al.* (2017)¹⁸. A separate study found also no significant difference between the nurses' knowledge and practice towards Prevention SSI ($P\text{-value: } 0.28$)¹⁹. Nonetheless, in comparison to knowledge, actual practice of health workers tend to be a better predictor of SSI

Conclusion

This study found that practicing infection prevention method is the single most significant predictor of SSI prevention compared to just knowledge of the HWs ($P \text{ value } 0.003$). Further to that, approximately 7.3% of health workers don't practice measures to prevent surgical site infections, 12.51% of them lack the requisite knowledge on prevention of SSI of which anesthetic officer and nurses were the most likely category of health employees to have poor practice 33.3% and 27.3% respectively, hence the need for more hands-on practical sessions in training institutions.

REFERENCES

1. Hope, D., Ampaire, L., Oyet, C., Muwanguzi, E., Twizerimana, H. and Apecu, R. O. 2019. Antimicrobial resistance in pathogenic aerobic bacteria causing surgical site infections in Mbarara regional referral hospital, Southwestern Uganda. Scientific reports, 9(1), 1-10.
2. CDC, (2022) Surgical Site Infection Event (SSI), (January 2022 9 – 1 <https://www.cdc.gov/nhsn/pdfs/pscmanual/9pscscscurrent.pdf>)
3. Awoke, N., Arba, A. and Girma, A. 2019. Magnitude of surgical site infection and its associated factors among patients who underwent a surgical procedure at Wolaita Sodo University Teaching and Referral Hospital, South Ethiopia. *Plos one*, 14(12), e0226140.
4. Laloto, T. L., Gemed, D. H. and Abdella, S. H. 2017. Incidence and predictors of surgical site infection in Ethiopia: prospective cohort. *BMC infectious diseases*, 17(1), 1-9.
5. Diana Lobo, Larissa Martha Sams, ShaliniLidwin Fernandez, 2019. Correlation between health professionals' knowledge, attitude and practice about infection control measures, *J Med Allied Sci.* 2019; 9(1):26-31 DOI:10.5455/jmas.17740
6. Vatawati, S.R. and Kampli, M.S. 2020. Surgeries and surgical site infection in India: A analysis of Health Management Information System 2019-2020, *Journal of Surgery and Surgical Research*
7. Lubega, A., Joel, B. and Justina Lucy, N. 2017. Incidence and etiology of surgical site infections among emergency postoperative patients in mbarara regional referral hospital, South Western Uganda. *Surgery research and practice*, 2017.
8. Ariho S. B., Lule H., Agwu, E. and Shaban, S. 2020. Abdominal surgical site infection incidence, risk factors, and antibiotic susceptibility at a university teaching hospital in western Uganda: A cross-sectional study *East and Central African Journal of Surgery* (2020) DOI: 10.4314/ecaajs.v25i4.
9. Bhangu, A., Ademuyiwa, A. O., Aguilera, M. L., Alexander, P., Al-Saqq, S. W., Borda-Luque, G., . . . Fitzgerald, J. E. 2018. Surgical site infection after gastrointestinal surgery in high-income, middle-income, and low-income countries: a prospective, international, multicentre cohort study. *The Lancet Infectious Diseases*, 18(5), 516-525.
10. Freahiywot, A.T., Eshetu, H.E., and Workie, Z.W. 2015. Knowledge, Practice, and Associated Factors towards Prevention of Surgical Site Infection among Nurses Working in Amhara Regional State Referral Hospitals, Northwest Ethiopia *Surg Res Pract.* 2015; 2015: 736175. doi: 10.1155/2015/736175
11. Nini, A. 2021. Knowledge and practice of nurses towards prevention of hospital acquired infections and its associated factors, *International Journal of Africa Nursing Sciences*, Volume 15, 2021, 10033
12. Lobo D, Sams L.M., Fernandez, S. F. 2019. Correlation between health professionals' knowledge, attitude and practice about infection control measures, *J Med Allied Sci.* 2019; 9(1):26-31 DOI:10.5455/jmas.17740.
13. Woldegioris, T., Bantie, G. and Getachew, H. 2019. Nurses' Knowledge and Practice Regarding Prevention of Surgical Site Infection in Bahir Dar, Northwest Ethiopia. *Surg Infect (Larchmt)*, 20(1), 71-77. doi:10.1089/sur.2018.081
14. Kolade, O. A., Abubakar, S., Adejumo, S. R., Funmilayo, H. V. and Tijani, A. 2017. Knowledge, attitude and practice of surgical site infection prevention among post-operative nurses in a tertiary health institution in

- north-central Nigeria. *International Journal of Nursing and Midwifery*, 9(6), 65-69.
15. Patil, V. B., Raval, R. M. and Chavan, G. 2018. Knowledge and practices of health care professionals to prevent surgical site infection in a tertiary health care centre. *International Surgery Journal*, 5(6), 2248-2251.
16. Mengesha A, Nete T, Zeleke A, *et al.* 2020. Practice of and associated factors regarding prevention of surgical site infection among nurses working in the surgical units of public hospitals in Addis Ababa city, Ethiopia: A cross-sectional study PLOS ONE OPEN ACCESS, Published: April 16, 2020, <https://doi.org/10.1371/journal.pone.0231270>
17. Sickder, H.K. 2010. Nurses' Knowledge and Practice Regarding Prevention of Surgical Site Infection in Bangladesh. @inproceedings{Sickder2010NursesKA,
18. Sadia H, Kousar R, Muhammad M, *et al.* 2017. Assessment of Nurses' Knowledge and Practices Regarding Prevention of Surgical Site Infection, Saudi Journal of Medical and Pharmaceutical Sciences DOI: 10.21276/sjmps Available Online: <http://scholarsmepub.com/sjmps/> Saudi J. Med. Pharm. Sci.; Vol-3, Iss-6B (Jun, 2017):585-595
19. Sham, F., Raji, N.A., Omar, M.F., Hasan, Z., Patahorahman, M.K., Sihat, H.M. and Supramaaniam, Y. 2021. Nurses' Knowledge and Practice Towards Prevention of Surgical Site Infection. *International Journal of Service Management and Sustainability*, 6(1), 1-19
20. Abdul Rauf Alhassan, E. D. Kuugbee, and Der, E.M. 2021. Surgical Healthcare Workers Knowledge and Attitude on Infection Prevention and Control: A Case of Tamale Teaching Hospital, Ghana, Research Article | Open Access, Volume 2021 | Article ID 6619768 | <https://doi.org/10.1155/2021/6619768>
21. Sadaf, S., Inayat, S., Afzal M., and Hussain, M. 2018. Nurse's knowledge and practice regarding prevention of surgical site infection at allied hospital Faisalabad, *International Journal of Scientific & Engineering Research Volume 9, Issue 5, May-2018 351, ISSN 2229-5518*
