

## Nurses' Knowledge and Practices on Surgical Site Infections in Sub-Saharan Africa: The Case of Buea Regional Hospital, South West Region in Cameroon

Eta Vivian Enow Ayamba<sup>1</sup>, Liwonjo Agnes Namondo<sup>1</sup>,  
Ekongefeyin Sintieh Nchinda Ngek<sup>2</sup>, Eric Ngala<sup>1</sup>,

<sup>1</sup>Department of Nursing, Faculty of Health Sciences, University of Buea, BP63 Buea, Cameroon

<sup>2</sup>Department of Clinical Medicine, Faculty of Health Sciences, University of Buea, BP63 Buea, Cameroon

Corresponding author: Eta Vivian EnowAyamba,

**ABSTRACT:** Surgical site infection is a major cause of mortality and morbidity worldwide, affecting 5.6% of surgical procedures overall in Low and Middle income Countries. This study sought to investigate nurses' knowledge on surgical site infections, determine nurses' practices in the care and prevention of surgical site infections. A cross-sectional study was conducted. Forty nurses working at the Buea Regional Hospital (BRH) in Fako Division the Buea Health District, Cameroon participated in the study. A purposive sampling technique was used to select the study site, while the convenient sampling method was used to enrol eligible participants. A structured questionnaire was used to collect data. Data was entered into Epi Data Version 21.0 and was analysed using SPSS version 21.0. The results revealed that 65.0% knew what surgical site infection is, 100% approved the importance of preoperative counselling in the prevention of SSI and reported that patient hygiene is important in the prevention of SSIs. All nurses (100%) disapproved the use of lotions on surgical wounds. Few respondents (2.5%) had poor knowledge on practices in the care and prevention of SSI

. **KEYWORDS:** Knowledge, practices, prevention, management, Surgical site infection

### I. INTRODUCTION

Surgical site infection (SSI) refers to infections of the skin and subcutaneous tissues which occur following surgery; within 30 days of operation or after a year if implant was done [1]. Surgical site infection is a major cause of mortality and morbidity worldwide, affecting 5.6% of surgical procedures overall in Low and Middle income Countries [2]. It is the third frequently occurring infection which accounts for about 10 to 40% of all nosocomial infections [3]. SSI, are a group of Healthcare associated infections affecting millions of people globally, with an annual rates of 2.5% to 41.9% [4,5]. In Western countries, the prevalence of SSI range from 2 to 5% for patients undergoing clean surgery and up to 20% for patients undergoing intra-abdominal surgery [6,7]. In Africa, surgical site infections were the leading infections in hospitals affecting about 5 persons in every 100 surgical cases, which is quite high compared to recorded cases in developed countries [8]. A study conducted in Africa revealed that cumulative incidence of SSIs ranged from 2.5 to 30.9% [9]. In addition, it was found that the incidence rate of SSIs in Ethiopia ranges from 10.9 to 75% [10, 11].

In Cameroon, the incidence rate was high in the Northern Region (N'gaoundéré Regional Hospital) with 30.7%; with a male to female ratio of 1:4 and a mortality rate of 9.3%. Superficial SSI accounted for 60.9% while deep or organ SSI accounted for 34.8% [12]. Approximately 2-5% of all patients who undergo surgical procedure in the Western world will suffer surgical site infection and these patients are two times likely to die compared to postoperative patients without SSI. Worldwide, SSIs is the cause of longer hospital stays and more health complications, increasing mortality risks and costs for patients, families and healthcare facilities [13]. Hence, preventing this a key component in improving SSI associated morbidity and mortality [14].

The Nurses' role give them a distinctive chance in reducing the propagation of hospital acquired infections by assisting patients in the recovery process, thus reducing complications associated with infections. This is usually achieved by utilising their good knowledge and practice skills in the management and prevention of SSIs [15]. According to Suzanne Gordon [16] nurses use their extensive knowledge working as a rescuers who secure patients from the risk and consequences of disease, disability as well as from the risks and consequences of treatment of diseases.

Labeauet *al.*[17] state that knowledge of the related evidence-based guidelines regarding the prevention of SSIs is necessary for providing high quality nursing care. Mangramet *al.*[18] on their part emphasised that nurses at all levels have a key role in preventing infections. Nurses play a vital role in wound management and their theoretical understanding of basic wound management is expected to influence the quality of wound healing [19]. In this line, Farrelly[20] suggested that to better apply this knowledge, it is essential for nurses to continuously update their knowledge on the prevention of SSIs.

Effective infection prevention measures such as improving surgical techniques, decontamination of operating rooms, giving preoperative bath and enhancing nutrition among others have been implemented in order to prevent and control SSIs[21]. The World Health Organisation (WHO) in its guidelines for safe surgery set a number of recommendations regarding the prevention of surgical site infections. In this guidelines are practices such as routine use of prophylactic antibiotic within 60 minutes prior to skin incision, the use of sterility indicators during sterilization of surgical instruments, pre-surgical skin disinfection and the implementation of surgical safety checklist.

Factors associated with knowledge and practice of nurses towards the prevention of SSIs are not limited to work experiences, level of education, work load, training on infection prevention mechanism and non-adherence in infection prevention and patient safety guidelines [22]. Even though many studies have been conducted in the developed countries on SSI, evidences regarding the level of knowledge and practices towards the prevention of SSIs are very limited in Africa and Cameroon in particular. Thus, nurses being healthcare professionals who are mostly taking care of surgical patients before, during and after surgery need to be studied. Hence, this study is aimed at investigating nurses' knowledge and practices on surgical site infection. Specifically, we sought to assess nurses' knowledge on surgical site infections, determine their role in the care and prevention of surgical site infections. This study will provide information which might go a long way to improve the quality of care nurses render to patients with surgical site infections and hence, reduce long hospital stay, cost and complications.

## II. MATERIALS AND METHODS

This was a hospital-based cross-sectional study conducted to investigate nurses' knowledge and practices in the management and prevention of surgical site infections at the Buea Regional Hospital (BRH) in Fako Division from May 24 to June 14, 2018. The BRH has a surface area of 870 square kilometres with a population of about 19.78 people per square kilometre. It shares its boundaries with Limbe to the Southwest, Tiko to the South East, Idenau to the West and Muyuka to East. The City of Buea is predominated by the Bakweri ethnic group, with English is the main official language used in this area. The BRH was purposely chosen because of the high incidence of patients with Surgical Site Infections. This hospital is made up of an emergency unit, consultation, pediatric, tuberculosis (isolated), HIV/AIDS unit, obstetrics and gynecology, internal medicine, hemodialysis and a surgical/theatre unit.

This survey used both qualitative and quantitative approaches to collect and process data. A questionnaire made up of both open and closed ended questions was used to collect data. The study population included all nurses working at the BRH during the period of this study. Data was collected on the socio-demographic characteristics (age, gender, marital status, number of years on duty etc), knowledge and practices of nurses regarding the management and prevention of SSIs. The knowledge section was scored on 13 points (each question given a point) and those who answered 7 questions and above correctly (53.8-100%) were said to have good knowledge, while those who had 6 and below (00-46.2%) were said to have poor knowledge on SSIs. The practice section was scored on 11 points and those who answered 6 questions and above correctly (54.5-100%) had good practice and those who had 6 points and below (0-45.5%) presented with bad practice.

Face validity was conducted by administering five copies of the questionnaires to five nurses who were not part of the study sample to check for any ambiguity in the questions, Some questions were then rephrased for clarity. Copies of the questionnaire were then administered to the study participants who completed the various sections of the questionnaire. This study was authorised by the Department of Nursing, Faculty of Health Sciences, University of Buea, Cameroon. Administrative authorisation was first obtained from the Regional Delegation of Public Health (No. 329/989) and then from the Director of RHB. Before responding to the questionnaire each respondent gave his/her consent by signing the consent form. Data collected was entered into Epi Data and analysed using SPSS version 21.0. Data was analysed using the quantitative method.

Chi square test and correlation coefficient were conducted to calculate the association between the socio-demographic data, nurses' knowledge and practice on prevention and management of SSIs. Open-ended questions were analysed following the process of thematic analysis whereby viewpoints or ideas were grouped under themes or key words. The confidence interval was fixed at 95% and  $p < 0.05$  was considered statistically significant.

### III. RESULTS

A total of 55 copies of the questionnaire were administered but only 40 copies were returned giving a response rate of 72.7%. Females made up to 67.5% of the participants (Figure 1). The age range 30-40 years was the most represented 47.5%, 50.0% of the nurses were single, 30% of the participants had HND, and 14(35.5%) of the participants had worked for between 5-10 years, Twenty-five (62.5%) of the nurses had taken refresher courses (TABLE 1).

Participants who had not taken refresher courses advanced the following reasons; lack of opportunity, no time, lack of awareness, and negligence (TABLE 2).

Majority of nurses 65.0% (26) knew what surgical site infection is and 28(70%) of the nurses had been involved in the care of patients with surgical site infection. Thirty-eight (95%) of the nurses admitted that there was high occurrence of SSI and all the nurses (100%) agreed that they had a key role to play in the management of patients with SSI, and again, all (100%) of the nurses approved the importance of preoperative counseling in the prevention of SSI (Table 3). Knowledge on SSIs was not dependent on work experience (Table 4). Thus, correlation on nurses' knowledge on SSIs was not dependent on whether they had taken refresher courses or not ( $p < 0.392$ ) (Table 5).

With regards to nurses' practices in the management and prevention of SSIs, all nurses (100%) approved the importance of preoperative counselling in the prevention of SSI. The responses of nurses on the early signs of SSI were odour 80%, fever 65%, muscle pain 0%, vomiting 7.5%, redness 85%, pain 100%, and drainage 95%. All nurses (100%) approved the importance of patient hygiene in the prevention of SSIs. Thirty-nine (97.5%) nurses said hand hygiene is important in the care of patients with SSI. Twenty-seven (67.5%) of the nurses said all patients must receive antibiotics prophylaxis before any surgical procedure, 39 (97.5%) of the nurses were of the opinion that monitoring of patients vital signs after a surgical procedure is necessary. All nurses 100% (40) disapprove the use of lotions on surgical wounds.

Nurses response on the solutions used in cleaning surgical wounds were Betadine 100% (40), normal saline 97.5% (39) and Hydrogen peroxide 7.5% (3). Majority of the nurses were fully aware of their practices in the prevention, management and care of patients.

### IV. DISCUSSION

This study aimed at investigating the nurses' knowledge and practices regarding the management and prevention of SSI. This was in order to improve on the quality of care nurses offer to patients with surgical site infections and hence, reduce their hospital stay, cost and complications.

Results of this study revealed that most of the respondents were females. This is in line with Grant, Robinson and Muir [21] who states that from the beginning nursing as a career has always been considered a female profession because of the motherly aspect. Again, our study revealed that majority of the nurses were in the age range 30-40 years, and that half of the respondents were single. These findings are in line with the findings of Awuviry [21] who found that a higher number of nurses were females, the participants were mostly single and majority were young.

With regards to knowledge on SSIs, it was revealed that majority of the nurses could correctly define surgical site infection and their knowledge was not dependent on their exposure to refresher courses. This is because most of the nurses had a good knowledge on SSI but very few have attended such programmes. This is contradictory to the finding of the study conducted by Qasem and Hweidi [14] where nurses' knowledge on SSI was low and relative to the poor exposure of nurses to refresher courses. Again, our study finding was in contrast with the study conducted by Steginga *et al.* [4] which showed that nurses who attended the nursing education course extremely improved their cancer nursing-related knowledge compared to those who did not attend. From our results, the nurses' knowledge was not dependent on the duration of service at their duty post.

Furthermore, our study revealed that, more than 77.5% of the nurses had good practices on surgical site infection for instance, with respect as to whether all wound dressing equipment should be sterilized before each use, all respondents gave a positive response. This finding is in line with the study conducted by Kabire *et al.* [6], as well as that of the Standard Surgical Procedures which state that all equipment must be sterilized after each use and before using them on other patients. Most of the nurses acknowledged the fact that preoperative shaving, administration of antibiotic prophylaxis, hand washing and sterilization of wound dressing equipment were important practices which were carried out in the prevention of SSI. This concurs with the study carried out by Seltzer *et al.*, [17], which concluded that application of skin antiseptics, adequate sterilization of instruments, surgical drains, surgical hand scrubs and dressing techniques had proven to be extrinsic factors which must be taken in to consideration to prevent the occurrence of SSIs. However, our findings revealed a few nurses did not recognise that dirty theatre rooms and equipment could result in sepsis. Dancer [4] in his study, emphasizes on the important role of environmental cleaning and decontamination in the control of clinical

hospital-acquired infections. Thus, dirty theatre room and equipment will promote transmission of microorganisms that can result in SSI and more complications like sepsis (POS). All most all of the participants disagreed with the statement that cotton was preferable to use in wound cleaning than gauze. This is supported by Haleema Sada et al. [18] finding which revealed that majority of the participants was for the point that gauze was preferable to cotton in wound dressing. With regards as to whether vital signs monitoring was important after surgery, our study showed that about three quarter of the participants approved it to be valid. This ties with the findings reported by Qasem and Hweid [14] where the participants agreed that vital signs were important because it gave the nurse a clue as to the patients' recovery.

As concerns antibiotics prophylaxis being given to all patients before surgery, all (100%) of the participants gave their approval. This could be because of the uncertainty about the cleanliness of the theatre rooms which may result in infections after surgery. Our study also revealed that most nurses reported age and nutrition as risk factors related to the development of SSI. This is in accordance with the findings of Seltzer et al. [10].

## V. CONCLUSION

The study revealed that all most all of the participants had good knowledge and practices regarding the prevention, care and management of patients SSI. Though there was a strong and positive correlation between knowledge and practices, more education needs to be given to nurses through seminars and re-educational programs to improve on their knowledge and keep them updated with the current trends. In addition, an observational study on nurses' practices on SSI prevention and management should be carried out to determine their actual practice.

## VI. ACKNOWLEDGEMENTS

The authors would like to thank all the participants who took part in this study.

### Limitations of the Study

The sampling technique was a convenient and a self-administered questionnaire was used to investigate nurses' practices regarding the prevention, care and management of SSI, the findings may not have given a true picture of the happenings on the field. However, both open and close ended questions were used and the questionnaire was administered on a face-face basis. In addition, the sample size was small as some nurses refused to participate in the study for personal reasons. Hence, it has been recommended that a more robust studies be carried out to increase the validity of our study.

### Conflict of Interest

The authors declare that they have no conflicts of interest.

### Authors' Contribution

All authors participated in all steps of the study from its commencement to writing. That is, conception and design, acquisition of data, analysis and interpretation of data as well as drafting and or revising and approving the final manuscript.

## REFERENCES

- [1] National Healthcare Safety Network, Centers for Disease Control and Prevention. Surgical site infection (SSI) event. Published January 2017. Retrieved from: <http://www.cdc.gov/nhsn/pdfs/pscmanual/9pscasicurrent.pdf>. Accessed November 25, 2017.
- [2] D. Yaouba, N. Joseph, N. Eloundou, T. Perpoint, et al. *Incidence and risk factors for surgical site infections in N'Goundéré regional hospital, Cameroon*. 2016.
- [3] I. Sandra, A. Craig, W. Dale, et al. Centers for Disease Control and Prevention Guideline for the Prevention of Surgical Site Infection. *JAMA Surg*. 2017;152(8):784-791.
- [4] V. Singh, P. Singla, U. Chaudhary, Surgical site infections: Classification, risk factors, pathogenesis and preventive management: review article. *Int J Pharma Research Health Sci*. 2014;2(3):203–14.
- [5] B. Mawalla, SE. Mshana, PL. Chalya, C. Imirzalioglu, et al. Predictors of surgical site infections among patients undergoing major surgery at Bugando Medical Centre in Northwestern Tanzania. *BMC Surg*. 2011;11(1):21.
- [6] A. Kourosh, B. Julie, Ch. Tamara, et al. Preventing surgical site infections Getting started kit. 2014.
- [7] WHO. Global guidelines for the prevention of surgical site infection: World Health Organization; 2016.
- [8] B. Allegranzi, S. BagheriNejad, C. Combescure, et al. Burden of endemic health-care-associated infection in developing countries: systematic review and meta-analysis. *Lancet*. 2011;377(9761):228–
- [9] SB. Nejad, B. Allegranzi, SB. Syed, et al. Health-care-associated infection in Africa: a systematic review. *Bull World Health Organ*. 2011;89:757–65. 2011;89:757–65.
- [10] W. Mulu, G. Kibru, G. Beyene, et al. Associated risk factors for Postoperative Nosocomial infections among patients admitted at FelegeHiwot Referral Hospital, Bahir Dar, Northwest Ethiopia. *Clin Med Res*. 2013;2(6):140–7.

- [11] RE. Mengesha, BG-S. Kasa, M. Saravanan, DF. Berhe, et al. Aerobic bacteria in post surgical wound infections and pattern of their antimicrobial susceptibility in Ayder Teaching and Referral Hospital, Mekelle, Ethiopia. *BMC Res Notes*. 2014;7(575):4–9.
- [12] M. Abbas, D. Pittet, Surgical site infection prevention: a global priority. *J Hosp Infect* 2016; 93: 319–322.
- [13] TT. Famakinwa, BG. Bello, YA. Oyeniran, O. Okhiah, and RN. Nwadike, “ Knowledge and practice of post-operative wound infection prevention among nurses in the surgical unit of a teaching hospital in Nigeria,” *International Journal of Basic, Applied and Innovation Research*, vol.3, no.1, pp. 23-28, 2014.
- [14] MN. Qasem, IM. Hweidi, Jordanain Nurses’ Knowledge of Preventing Surgical Site Infections in Acute Care Settings. *Open Journal of Nursing*, 2017; 7, 561-582
- [15] K. Zarchi, et al. Significant differences in nurses knowledge of basic wound management-Implications for Treatment. *ActaDermato-Venereologica*,2014; 94, 403-407.
- [16] WHO surgical infection prevention guide lines. 2017. Web appendix 13. Summary of systemic review on perioperative oxygenation.
- [17] X. Wen, N. Ren, A. Wu, Distributions of pathogens and antimicrobial resistance: An analysis of China healthcare-associated infection cross-sectional survey in 2010. *Chin J Infect Control* 11,1-6 (2012)
- [18] V. Diaz, J.Newman, Surgical site infection and prevention guidelines: a primer for Certified Registered Nurse Anesthetists. *AANA journal*, 2015 83(1).
- [19] D. Yaouba, Ngaroua, NJ. Eloundou, T. Perpoint, JA. Mbo, et al. Incidence and risk factors for surgical site infections in N’Goundéré regional hospital, Cameroon. (2016).
- [20] R. Farrelly, NHS Nurses’ Fight against Infection. *British Journal of Nursing*. 2014 23,121. [21] N. Awuviry. Effects of NPR on patients recovery; nurses Demographic data. *Journal of Nursing Standards*.2017 9(34)

**Table1: Demographic Characteristics of Participants**

Characteristic	No (%)	
Age	<30	16(40.0)
	30-40	19(47.5)
	41-50	5(12.5)
Marital status	Single	20(50.0)
	Married	18(45.0)
	Divorced	1(2.5)
	Widowed	1(2.5)
Qualification	Degree	9(25.5)
	HND	12(30)
	SRN	10(25)
	Nurse assistant	8(22.5)
Work experience(years)	>5	13(32.5)
	5-10	14(35.0)
	11-20	20(27.0)
	21-30	9(22.5)
	Others	4(10.0)
Took refresher courses	Yes	25 (62.5)
	No	15(37.5)

**Table 2: Thematic Analysis Depicting Why Participants have not taken Refresher Courses on SSI**

Code	Code description	Grounding	Quotations
Lack of opportunity	Seminars are sometimes costly or organized in distant locations reason why some nurses are unable to attend refresher courses to update their knowledge and practices on SSIs	6	“Never had the opportunity to attend” “Never been opportune to attend” “No opportunity”
	The lack of time is the reason nurses have been unable to attend refresher courses		3

Lack of awareness	Most nurses are not informed of such programs	6	“haven’t had time” “I’ve not heard of any” “I’m not aware” “I have not been informed”
Negligence	Some are informed and have the opportunity to attend but choose not to attend	1	“No reason”

**Table 3: Participants’ Knowledge on Surgical Site Infection**

Items	Yes	No
Have ever been involved in the care of any patient with surgical site infections	70.0% (28)	30% (12)
From your work experience, do you think surgical site infection is common in this health facility	95% (38)	5% (2)
Think nurses have a role to play in the care and management of patients with surgical site infection	100% (40)	0% (0)
Microorganisms that cause SSIs are only from the patients skin	45% (18)	55% (22)
Is preoperative counselling important in the prevention of surgical site infection	100% (40)	0% (0)
Early signs of surgical site infection include		
Odour	80% (32)	2.5% (1)
Fever	65% (26)	35% (14)
Muscle pain	% ( )	100% (40)
Vomiting	7.5% (3)	92.5% (37)
Redness	85% (34)	15% (6)
Pain	100% (40)	0% (0)
Drainage	95% (38)	5% (2)
Nose bleeding	0% (0)	100% (0)
Patient hygiene is of importance in preventing SSI	100% (40)	0% (0)
Hand hygiene is important in the care of patients with SSI	97.5% (39)	2.5% (1)
Every patient must receive antibiotics prophylaxis before any surgical procedure	67.5% (27)	32.5% (13)
Monitoring of patients vital signs after a surgical procedure is necessary	97.5% (39)	2.5% (1)
Lotions should be used on surgical wounds	0% (0)	100% ( )
Solution used in cleaning surgical wounds		
Betadine	100% (40)	0% (0)
Normal saline	97.5% (39)	97.5% (1)
Hydrogen peroxide	7.5% (3)	92.5% (37)
Cyteal	0% (0)	100% (40)
Plain water	0% (0)	100% SSS(0)
Dakins	5% (2)	95% (38)
Alcohol	57.5% (23)	42.5% (17)

**Table 4: Knowledge of Surgical Site Infection by Work Experience**

Number of years on duty	Stats	Know what is surgical site infection		Total
		Yes	No	
Less than 5 years	N	8	5	13
	%	61.5%	38.5%	100.0%
5-10 years	N	10	4	14
	%	71.4%	28.6%	100.0%
11-20 years	N	6	3	9
	%	66.7%	33.3%	100.0%
21-30 years	N	2	2	4

	%	50.0%	50.0%	100.0%
<b>Total</b>	<b>N</b>	<b>26</b>	<b>14</b>	<b>40</b>
	<b>%</b>	<b>65.0%</b>	<b>35.0%</b>	<b>100.0%</b>

$\chi^2$ -test:  $\chi^2=0.729$ ;  $df=3$ ;  $P=0.866$

**Table 5: Correlation of Nurses' Knowledge of Surgical Site Infection by having Taken Refresher Courses**

Has ever taken refresher courses	Stats	Know what is surgical site infection		Total
		Yes	No	
Yes	N	15	10	25
	%	60.0%	40.0%	100.0%
No	N	11	4	15
	%	73.3%	26.7%	100.0%
<b>Total</b>	<b>N</b>	<b>26</b>	<b>14</b>	<b>40</b>
	<b>%</b>	<b>65.0%</b>	<b>35.0%</b>	<b>100.0%</b>

$\chi^2$ -test:  $\chi^2=0.733$ ;  $df=1$ ;  $P=0.392$

**Table 6: Nurses' Practices regarding Management and Prevention of SSIs**

Statement	Yes	No
Wound dressing equipment should be sterilized before each use.	100% (40)	0% (0)
Hand washing is important in preventing SSI	100% (40)	0% (0)
Shaving reduces the chances of infections after surgery	100% (40)	0% (0)
Is patient nutrition a nursing concern in the prevention of SSI?	77.5% (31)	22.5% (9)
Vital signs are not of importance in monitoring patients after surgery	2.5% (1)	97.5% (39)
Antibiotics should not be given to patients with infection after surgery	100% (40)	0% (0)
Wounds should be cleaned from inside out.	100% (40)	0% (0)
Theatre garments and equipment should be washed only with plain water	2.5% (1)	97.5% (39)
Gloves protect only the nurses from infections	2.5% (1)	97.5% (39)
Dirty theatre rooms and equipment cannot result to SSIs	5.0% (2)	95.0% (38)
Cotton is preferable to use in wound cleaning to gauze	2.5% (1)	97.5% (39)
	Good	Wrong
Practice (MRA)	96.6% (425)	3.4% (15)

$N=40$ ;  $N_{\text{responses}}=440$