

Nurse's Knowledge Regarding Prevention of Post-Operative Surgical Site Infection at AL-Hilla Teaching Hospital

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Abstract

Background: Post-Operative Surgical Site Infection is a one of the most common healthcare-associated infection which has a great impact on patient safety. Knowledge of nurses play a crucial role for the prevention of spread of infection. To provide quality of care, it is very important for nurses to have good knowledge towards prevention of Post-Operative Surgical Site Infection. **Aim:** The study aimed to assess the Nurses' Knowledge Regarding Prevention of Post-Operative Surgical Site Infection. **Design:** A descriptive cross-sectional study was conducted. **Setting:** Surgical wards at AL-Hilla teaching hospitals. **Sample:** All nursing working in surgical ward was included in study (N=50) Nurses. **Tools of data collection:** Data were collected through a questionnaire and self-report technique. The questionnaire includes a total of ten items of socio-demographic characteristics, 28 knowledge items. **Results:** The mean of Nurse's knowledge regarding prevention of post-operative levels among nurses was (21.16), the majority of the study sample (65.6%) a high level of nurse's knowledge. **Conclusions:** As a final point, there is a significant difference between Nurse's knowledge among staff nurses and their socio-demographic characteristics. Finally; there are no significant between nurse's knowledge and (work experience in surgical ward, training regarding infection control, training program and surgical training courses). **Recommendation:** Education and training program should be conducted to improve nurses' knowledge and practice in some areas using evidence-based practice.

Keywords: Nurse's, Knowledge, Prevention, Post-Operative, Surgical, Infection

Introduction

Patient safety is an important concern for all health care professionals. They all are involved in patient care (McGaw et al. 2012). But it has a major importance for nurses. Nurses are considered as the "heart and soul" of every hospital. Nurses' knowledge plays a significant role to control infections which ultimately enhances quality care of patients (Sickder 2010).

Surgical Site Infection (SSI) is a one of the most common healthcare-associated infection which has a great impact on patient safety. Knowledge of nurses play a key role for the prevention of spread of infection (Yaouba et al. 2016). 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 (Ayamba 2022).

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 (Berríos-Torres et al. 2017). It is the third frequently occurring infection which accounts for about 10 to 40% of all nosocomial infections (Singh, R. et al. 2014). SSI, are a group of healthcare associated infections affecting millions of people globally, with an annual rate of 2.5% to 41.9% (Mawalla, B. et al. 2011), (Mangram, A. J. et al. 2020). Nurses at all levels of work have a crucial role in controlling and preventing infection (Labeau, S. O. et al. 2010).

Knowledge of the related evidence-based guidelines regarding the prevention of SSIs is necessary to provide high-quality nursing care (Farrelly, R. 2014). Nurses should apply standards of infection control and precautions to prevent cross contamination from both recognized and unrecognized sources of infection, and transmission-based precautions for special indicated cases (Harrington, P. 2014).

In patients who have surgical procedures such as; caesarean section, hip arthroplasty, knee arthroplasty, reduction of long bone fracture, or repair of neck of femur, nurses should collaborate with other health team members to control and prevent surgical site infection occurrence (**Zarchi, K., et al. 2014**). Nurses should continually learn the updates of evidence-based in prevention of surgical site infections (**Harrington, P. 2014**). Nurses play a key role in wound management and their theoretical understanding of basic wound management expected to influence the quality of wound therapy fundamentally (**Safdar, N., & Abad, C. 2008**). Subsequently, education of health care professionals can improve their knowledge level, thus promoting infection prevention guidelines implementation which directly contributes to health care associated infections reduction (**Teshager, F. A., et al. 2015**).

According to the World Health Organization (WHO), health-care-associated infections are a growing health-care concern that affects millions of individuals every year. According to recent studies in developed countries, at least 5% of hospitalized patients become infected. The most prevalent healthcare-associated infections (HAIs) were surgical site infections (SSIs), which accounted for more than 30% of HAI cases in most studies (**Hrynshyn, A., et al 2022**). Surgical site infections can have a significant effect on quality of life for the patient. SSIs occur when a bacterium is present within a wound, bacteria can be transmitted via touching surgeons' or nurses' hands, by being airborne during surgery, or by the patient coming into contact with bacteria after surgery. *Streptococcus pyogenic* and *staphylococcus aureus* are the most prevalent bacteria that cause surgical site infections (**Patil, V. B., et al. 2018**). SSIs have been associated in the literature to advanced age, malnutrition, metabolic problems, smoking, obesity, hypoxia, and immune suppression (**Qasem, M. N., & Hweidi, I. M. 2017**).

Surgical site infections can be caused by a number of circumstances, including 1) all abdominal operations; 2) all operations lasting more than two hours; 3) a contaminated or dirty wound site; and 4) patients who had three or more co-morbidities when they left the hospital (**Teija-Kaisa, A., et al. 2013**). A high BMI, re-

operation, and the use of a post-surgical drain all increased the risk of surgical site infection, in addition to a contaminated or unclean wound site (**Mengesha, A., et al. 2020**).

Nurses are in a unique position to engage in or lead programs aimed at reducing the incidence of SSI and thereby improving patient safety (**Schaefer, R. L. 2016**). Nurses, unlike other health care providers, spend most of their time with patients and are responsible for the majority of SSI preventive measures (**Zarchi, K., et al. 2014**). This shows that nurses are the primary responsible bodies and can play a key role in preventing efforts by improving the quality of care they deliver, such as; improving the improper use of prophylactic antibiotics, poor hand hygiene practice, improper donning and doffing of personal protective equipment, skin preparation practices and proper implementation of all other surgical safety checklists (**Mengesha, A., et al. 2020**).

The Nurses' role gives 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 utilizing their good knowledge skills in the management and prevention of SSIs (**Diaz, V., & Newman, J. 2015**). According to the (CDC), around 500,000 SSI occur each year, accounting for 3% of surgical mortality, longer hospital stays, and higher medical expenses (**Mengesha, A., et al. 2020**).

According to a prevalence survey, SSIs account for 31% of all HAIs among hospitalized patients. Depending on the surgical process and the quality of the data acquired, the incidence of SSIs in Europe might reach over 20% SSIs are linked to longer hospital stays, readmissions, interventions, lifelong impairment, and even mortality. Furthermore, statistics from the United States suggest that between 38.7 and 50.9% of microorganisms isolated from infected surgical wounds exhibit antibiotic resistance patterns (**Zucco, R., et al. 2019**).

Significance of study

SSI leads to serious consequences, including increased costs due to its treatment and increased length of hospital stay. The risk of

death in patients with SSI is increased when compared to those who did not develop an infection. The serious consequences imposed on patients who developed SSI determine the need for efforts to create strategies for the prevention of this infection. One of the strategies used is the determination of risk factors, which allows identifying clinical situations or conditions that predispose to the development of SSI. In this sense, the identification of risk factors for SSI contributes to the early adoption of nursing interventions that aim to minimize this type of postoperative complication (Diaz, V., & Newman, J. 2015).

Research method

Design of the study:

A descriptive study cross sectional design was conducted in Babylon city from 1 October 2023 until 1 May 2024 to Assessment of nurses' knowledge Regarding of post- operative surgical site infection at AL-Hilla Teaching Hospital.

The Setting of the Study

The study has been conducted in Surgical Unit at AL-Hilla Teaching Hospital in Babylon city.

The Study Sample

All the nursing working surgical ward (50) nurse was included in that study, from 15 January to 15 February 2024.

The Study Instrument Content

The study instrument of presenting the questionnaire to the experts the final instrument inform is compound of four-part.

part1. Sociodemographic information the present part is comprised of (10) (age, gender, marital status, level of education, work experience in surgical ward, work experience in surgical ward workplace, have you ever taken any training regarding infection, number of training program and number of credit hours spent in spent in surgical training courses

part2. Clinical data nurse's knowledge regarding prevention of post-operative surgical site infection comprises of (28):

(From your work experience, do you think Post-Operative surgical site infection is common in this health facility, does staff existing and reentering the theater affect the incidence of Post-

Operative surgical site infection, does removal of jewelry, artificial nails and nail polish reduces the incidence of Post-Operative surgical site infection, are preoperative showers with antiseptics are cost effective in preventing surgical site infection? , does administration of prophylactic antibiotics help in preventing surgical site infection , think nurses have a role to play in the care and management of patients with Post-Operative surgical site infection, microorganisms that causes Post-Operative surgical site infection are only from the patients skin, is preoperative counseling important in the prevention of Post-Operative surgical site infection, odor is include from Early signs of Post-Operative surgical site infection, fever is including from Early signs of Post-Operative surgical site infection , Muscle pain is include from Early signs of Post-Operative surgical site infection , Redness is include from Early signs of Post-Operative surgical site infection, Pain is including from Early signs of Post-Operative surgical site infection , Drainage is Early signs of Post-Operative surgical site infection, Patient hygiene Is of importance in preventing Post-Operative surgical site infection, Hand hygiene is important in the care of patients with Post-Operative surgical site infection, before any surgical procedure Every patient must receive antibiotics prophylaxis, Monitoring of patients vital signs after a surgical procedure is necessary. Betadine solution used in cleaning surgical wounds, Betadine solution used in cleaning surgical wounds ,Normal saline solution used in cleaning surgical, Hydrogen peroxide solution used in cleaning, Plain water solution used in cleaning surgical, Dakin's solution used in cleaning surgical wounds, Alcohol solution used in cleaning surgical wounds, Surveillance succeeds in reducing the incidence of Post-Operative surgical site infection, Stitch abscesses (minimal inflammation and discharge confined to the points of suture penetration) are classified as Post-Operative surgical site infection.

The Study Instrument Validity

The study instrument validity is used to determine that study tool will measure the data that is needed to measure the face validity using determined by the expert's panel to test relevance, clarity, and competence of the questions to measure the interesting concept. A draft of questionnaire of tool study is intended and presented to (7) experts, who have experience in field of nursing and medicine.

Pilot Study

The pilot study applied on 10 nurse's general of sample is excluded from of the present

study, it is a mini-study that we do so to know the time required to collect the sample, are the questions and information clear or not, and how much time does it take to interview with the nurse, the aims of pilot study:

1.To identify whether respondents comprehend the study tool's questions and their directions throughout the data collection process.

2.To ensure the reliability and increase the dependability of questionnaires.

3. To determine the time needed to gather the data for every subject.

The findings are obtained from the pilot study show the following:

1. The content of the questions is clear and comprehensible for the nurses.

2. The study instrument reliability was determined.

3. The questionnaire can be completed with (10-15 minutes). All these purposes are accomplished.

The Study Reliability

Reliability deals with the dependability and consistency of the research instrument to check the variable of interest by use test retest. The reliability of the present study personal correlation coefficient

$r = 0.87$, determination of reliability of the questionnaire.

The study findings of the questions are displayed, the study instrument is reliable to study a phenomenon on a similar population and in any time of study in the future.

Data collection

The data were collected through the use of constructive questions as a structured interviewer.

Data Management and Statistical Analysis:

The data of the study participants were examined for inconsistencies and data entry errors and analysis using the statistical package for social sciences, SPSS, version 25, for windows, Epicalc® 2000 statistical software and Microsoft Excel software version 2013. Before performing the statistical analysis, all continuous variables including the age, years of service in hospitals,

number of working hours /day, daily hours of sleep and hazard scores were tested for normal distribution using the histogram and normal distribution curve plot and all of these variables appeared to follow the statistical normal distribution curve.

Descriptive Data Analysis and Statistics:

The descriptive statistics were presented as frequencies, percentages, mean, standard deviation and ranges. This analysis was conducted through the following statistical procedures and methods:

1. Frequency distribution tables; using the frequencies and simple percentages, mean and standard deviation and were calculated according to the following equations:

2. Hazard Score Calculation; The hazard scored as one for the presence of hazardous factor and zero for none of each hazard item then the mean total hazard score was calculated out of one; the higher score value out of one indicated the higher hazardous factor. According to the mean of score, the hazard level evaluated as none (no hazard at all), low hazard level when the mean score was (45-60) or below out of one, moderate hazard (61-75) and high hazard level when the mean score was (76-90).

Inferential Data Analysis: To assess the association between work related health hazards and other variables of the participated nursing staff, the following statistical tests and procedures were applied: Bivariate Pearson's correlation test was used to test the correlation between hazard score and other continuous variable, while Spearman's test was used to assess the correlation between hazard score and other categorical variables. Level of significance set at (0.05) as cutoff below which the difference or correlation are significant. Finally, the results and findings presented in tables and figures with an explanatory paragraph for each using the Microsoft Word Software 2013.

Result

In this chapter presents the analysis of the data after being processed and tabulated, the results were analyzed through the application of statistical procedures which were manipulated and interpreted.

This table (1) shows that the most of the study samples was female (58%) and age was ranged (21–31) years, which represents (74%), Results also show that (55%) of the sample were married (53%). As a result, shows that the fifty

percentage of subjects (56%) representatives a married. Also regard to level of education, the results revealed that the percentage represented (70%) of samples were have a diploma or less. As regards the working experience, the results reported (52%) of them were between 1-5 years. Regarding years to work experience in surgical ward, this study found that the majority of rang years (1-5) was represented of study (82%) while the workplace **showed** (58 %) work in female surgical ward. In regard for training regarding infection control, the result showed that (35%) of them have it and (64%). 26% of them of them too have number related to training program between 1-5 number. Finally, (26%) of them have surgical training course between (6-10) number.

Table 2 Shows the mean of Nurse's knowledge regarding prevention of post-operative levels among nurses was (21.16), the majority of the study sample (65.6%) a high level of nurse's knowledge.

The table (3) shows the relationship between Nurse's knowledge among staff nurses

and their socio-demographic characteristics. Regarding nurse's knowledge and gender age that is relationship between them. (P-value = 0.029, 0.037) at the ($p \leq 0.05$) level of significance. In respect with marital status and level of education, the result shows that no relationship between them. (P-value = 0. 0.868, 0.044) at the ($p \leq 0.05$) level of significance and the relationship between Nurse's knowledge and working experience. (P-value = 0.021) at the ($p \leq 0.05$) level of significance

The table (3) shows the relationship between Nurse's knowledge among staff nurses and their socio-demographic characteristics. Regarding nurse's knowledge and workplace that is relationship between them. (P-value = 0.029,) at the ($p \leq 0.05$) level of significance. Finally, there are no relationship between nurse's knowledge and (work experience in surgical ward, training regarding infection control, training program and surgical training courses). (P-value = 0. 0.94, 0.44, 0.613, 0.238) at the ($p \leq 0.05$) level of significance.

Table (1). Distribution of Demographic Data for the Study

Demographic data	Rating	F.	%
Gender	male	21	42.0
	female	29	58.0
	Total	50	100
Age/ year	21-31	37	74.0
	32-42	9	18.0
	42-52	4	8.0
	Total	50	100
	Mean 29.44± SD ±7.097		
Marital Status	Single	21	42.0
	Married	28	56.0
	Widower	1	2.0
	Divorced	0	0
	Total	50	100
Level of education	Diploma or less	35	70.0
	Bachelor	15	30.0
	Total	50	100
Working experience	1-5	26	52.0
	6-10	18	36.0
	11-5	6	12.0
	Total	50	100

Table (1) to be Continue

work experience in surgical Ward	1-5	41	82.0
	6-10	7	14.0
	11-15	2	4.0
	Total	50	100
Workplace	Male surgical ward	21	42.0
	Female surgical ward	29	58.0
	Total	50	100
Have you ever taken any training regarding infection control	Yes	35	70.0
	No	15	30.0
	Total	50	100
If yes mention the number of training program you attend	1-5	32	64.0
	6-10	3	6.0
	Total	35	70.0
surgical training courses	1-5	10	20.0
	6-10	13	26.0
	11-15	8	16.0
	16-20	4	8.0
	Total	35	70.0
Total number of samples (n)		50	100

Table (2) Distribution Nurse’s Knowledge Regarding Prevention of Post-Operative levels among nurses.

Nurse’s Knowledge	Frequency	Percent	Mean	Stander deviation
Low	0	0	21.16	2.46
Moderate	6	12.0		
High	44	88.0		
Total	50	100.0		

Low=0-9.3, Moderate=9.4-18.7, High=18.8-28

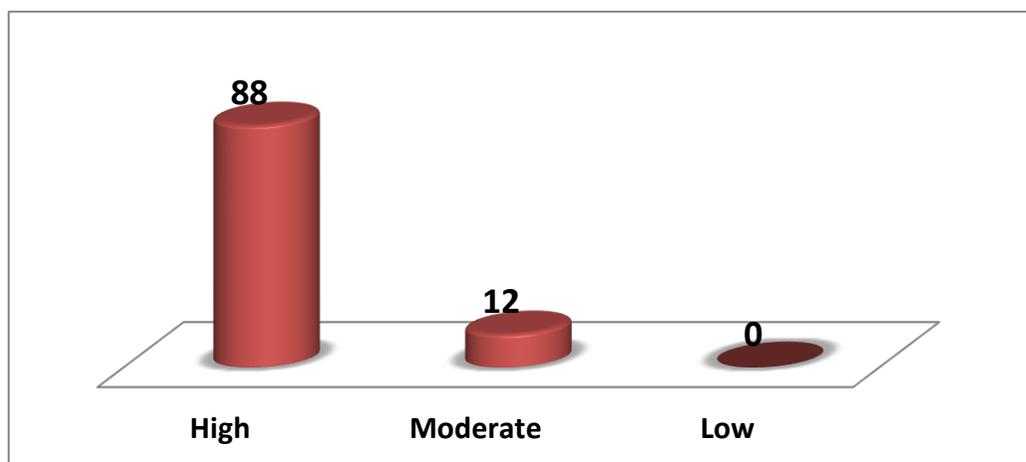


Figure (1): Nurse’s Knowledge Regarding Prevention of Post-Operative levels among nurses

Table (3) Determining the Relationship between Nurse’s Knowledge Regarding Prevention of Post-Operative toward their socio-demographic characteristics.

Demographic data	Rating	F.	%	Statistic test
Gender	male	21	42.0	X ² =4.782 ^a S=0.029 Df=1
	female	29	58.0	
	Total	50	100	
Age/ year	21-31	37	74.0	X ² =1.95 S=0.0378 Df=2
	32-42	9	18.0	
	42-52	4	8.0	
	Total	50	100	
	Mean 29.44± SD ±7.097			
Marital Status	Single	21	42.0	X ² =.284 ^a NS=0.868 Df=2
	Married	28	56.0	
	Widower	1	2.0	
	Divorced	0	0	
	Total	50	100	
Level of education	Diploma or less1	35	70.0	X ² =0.577 ^a NS=0.447 Df=1
	Bachelor2	15	30.0	
	Total	50	100	
Working experience	1-5	26	52.0	X ² =22.538 ^a S=0.021 Df=11
	6-10	18	36.0	
	11-5	6	12.0	
	Total	50	100	

F: Frequency %: Percentage X²: chie-square-test, S: significant, df: degree of freedom, N.S: not significant

Table (3) to be Continue

Demographic data	Rating	F.	%	Statistic test
work experience in surgical Ward	1-5	41	82.0	X ² =.3.383 ^a NS=.947 Df=11
	6-10	7	14.0	
	11-15	2	4.0	
	Total	50	100	
Workplace	Male surgical ward	21	42.0	X ² =4.782 ^a S=.029 Df=1
	Female surgical ward	29	58.0	
	Total	50	100	
Have you ever taken any training regarding infection control	Yes	35	70.0	X ² =.577 ^a NS=.447 Df=1
	No	15	30.0	
	Total	50	100	
If yes mention the number of training program you attend	1-5	32	64.0	X ² =4.471 ^a NS=.613 Df=6
	6-10	3	6.0	
	Total	35	70.0	
surgical training courses	1-5	10	20.0	X ² =16.212 ^a NS=.238 Df=13
	6-10	13	26.0	
	11-15	8	16.0	
	16-20	4	8.0	
	Total	35	70.0	
Total number of samples (n)		50	100	

F: Frequency %: Percentage X²: chie-square-test, S: significant, d.f: degree of freedom, N.S: not significant

Discussion

Surgical operations are vital procedures in the health care delivery system. Advancement in surgery has played a pivotal role in managing and treating complex health challenges requiring the process. Discussion The current study explores the nurse's information concerning Post-Operative Surgical Site Infection at AL-Hilla Teaching Hospital. The result shows that the more than the half of the study samples was female (58%) and age was ranged (21–31) years, which represents (74%) and that identity by results of study done by (Sadia et al. 2017). Also results showed that (55%) of the studied sample were married, and that come to an agreement with (Sadia et al. 2017). Regarding to level of education, (70%) of samples were have a diploma or less and that result similar to the result of study done by (Famakinwa et al.2014).

Distribution Nurse's Knowledge Regarding Prevention of Post-Operative levels among nurses. The result shows the mean of Nurse's knowledge was (21.16), the majority of the study sample (88.0 %) a high level of nurse's knowledge and this finding agree with result of previous study done by (Famakinwa et al.2014). Findings showed that respondents demonstrated relatively high level of knowledge on SSIs prevention, relatively poor attitude towards SSIs prevention and unsatisfactory level of SSIs prevention. When associations among the variables were examined.

Our study result shows there was significant relationship between Nurse's knowledge among staff nurses and their socio-demographic characteristics and that correspond with study done by (Scott, K., et al. 2012). There was significant association between nursing knowledge and gender, age at the (P-value = 0.029, 0.037), while marital status and level of education, the result shows that no relationship between them. (P-value = 0. 0.868, 0.044) at the ($p \leq 0.05$) level of significance and the relationship between Nurse's knowledge and working experience. (P-value = 0.021) at the ($p \leq 0.05$) level of significance and that result confirmed by (Famakinwa et al.2014), findings showed that there is positive association between the socio-

demographic variables like the age, gender and level of education and nursing knowledge at ($p = 0.001$). Also Findings confirmed by result done by (Sadia et al. 2017).

Conclusions

1. The most of the study samples was female and age was ranged (21–31) years.
2. More than the half of studied sample were married
3. more than three quarter of studied sample have diploma or less were the other ranged from bachelor or high educational degree.
4. As regards the working experience, the results reported more than half of nursing have working experience in surgical unit ranging between 1-5 years
5. The majority of the study sample show a high level of nurse's knowledge regarding prevention of post-operative in surgical ward.
6. There was significant relationship between the nurse's knowledge and their socio-demographic characteristics such as age and gender.
7. There was no significant relationship between the nurse's knowledge and marital

Recommendations

Based on the findings of this study, the researchers suggest the following recommendations:

1. Education and training program should be conducted to improve nurses' knowledge and practice in some areas using evidence-based practice.
2. Paying attention to providing a policy for precautions related to infection prevention and control after surgical intervention in hospitals.
3. Similar research should be conducted in other words, including operating theaters, other medical wards at Al Hilla teaching hospital.

4. A replication study using observation level of nurses' practice of surgical site method is recommended to examine the infection prevention

Reference

- Ayamba, E. V. E., Namondo, L. A., Ngek, E. S. N., & Ngala, E. (2022). Nurses' Knowledge and Practices on Surgical Site Infections in Sub-Saharan Africa: The Case of Buea Regional Hospital, South West Region in Cameroon. *American Journal of Humanities and Social Sciences Research (AJHSSR)*, 6(1), 105-111.
- Berríos-Torres, S. I., Umscheid, C. A., Bratzler, D. W., Leas, B., Stone, E. C., Kelz, R. R., ... & Healthcare Infection Control Practices Advisory Committee. (2017). Centers for disease control and prevention guideline for the prevention of surgical site infection, 2017. *JAMA surgery*, 152(8), 784-791.
- Diaz, V., & Newman, J. (2015). Surgical site infection and prevention guidelines: a primer for Certified Registered Nurse Anesthetists. *AANA journal*, 83(1).
- Famakinwa, T. T., Bello, B. G., Oyeniran, Y. A., Okhiah, O., & Nwadike, R. N. (2014). 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 Innovative Research*, 3(1), 23-28.
- Farrelly, R. (2014). NHS nurses' fight against infection. *British Journal of Nursing*, 23(2).
- Harrington, P. (2014). Prevention of surgical site infection. *Nursing Standard (2014+)*, 28(48), 50.
- Hrynshyn, A., Simões, M., & Borges, A. (2022). Biofilms in surgical site infections: recent advances and novel prevention and eradication strategies. *Antibiotics*, 11(1), 69.
- Labeau, S. O., Witdouck, S. S., Vandijck, D. M., Claes, B., Rello, J., Vandewoude, K. H., ... & Executive Board of the Flemish Society for Critical Care Nurses. (2010). Nurses' knowledge of evidence-based guidelines for the prevention of surgical site infection. *Worldviews on Evidence-Based Nursing*, 7(1), 16-24.
- Mangram, A. J., Horan, T. C., Pearson, M. L., Silver, L. C., Jarvis, W. R., & Hospital Infection Control Practices Advisory Committee. (2020). Guideline for prevention of surgical site infection, 1999. *Infection Control & Hospital Epidemiology*, 20(4), 247-280.
- Mawalla, B., Mshana, S. E., Chalya, P. L., Imirzalioglu, C., & Mahalu, W. (2011). Predictors of surgical site infections among patients undergoing major surgery at Bugando Medical Centre in Northwestern Tanzania. *BMC surgery*, 11, 1-7.
- McGaw, C. D., Tennant, I., Harding, H. E., Cawich, S. O., Crandon, I. W., & Walters, C. A. (2012). Healthcare workers' attitudes to and compliance with infection control guidelines in the operating department at the university hospital of the West Indies, Jamaica. *International Journal of Infection Control*, 8(3).
- Mengesha, A., Tewfik, N., Argaw, Z., Beletew, B., & Wudu, M. (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*, 15(4), e0231270.
- Patil, V. B., Raval, R. M., & 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.
- Qasem, M. N., & Hweidi, I. M. (2017). Jordanian nurses' knowledge of preventing surgical site infections in acute care settings. *Open Journal of Nursing*, 7(5), 561-582.

- Sadaf, S., Inayat, S., Afzal, M., & Hussain, M. (2018). Nurse's knowledge and practice regarding prevention of surgical site infection at allied hospital Faisalabad. *Int J Sci Eng Res*, 9(5), 351-69.
- Sadia, H., Kousar, R., Azhar, M., Waqas, A., & Gilani, S. A. (2017). Assessment of nurses' knowledge and practices regarding prevention of surgical site infection. *Saudi j. med. pharm. sci*, 3(6), 585-595.
- Safdar, N., & Abad, C. (2008). Educational interventions for prevention of healthcare-associated infection: a systematic review. *Critical care medicine*, 36(3), 933-940.
- Schaefer, R. L. (2016). *Structured Pre-Operative Patient Education Decreases the Rate of Surgical Site Infections*. Grand Canyon University.
- Scott, K., White, K., Johnson, C., & Roydhouse, J. K. (2012). Knowledge and skills of cancer clinical trials nurses in Australia. *Journal of advanced nursing*, 68(5), 1111-1121.
- Sickder, H. K. (2010). Nurses' knowledge and practice regarding prevention of surgical site infection in Bangladesh (Doctoral dissertation, Prince of Songkla University).
- Singh, R., Singla, P., & Chaudhary, U. (2014). Surgical site infections: classification, risk factors, pathogenesis and preventive management. *Int J Pharm Res Health Sci*, 2(3), 203-214.
- Teija-Kaisa, A., Eija, M., Marja, S., & Outi, L. (2013). Risk factors for surgical site infection in breast surgery. *Journal of clinical nursing*, 22(7-8), 948-957.
- Teshager, F. A., Engeda, E. H., & Worku, W. Z. (2015). Knowledge, practice, and associated factors towards prevention of surgical site infection among nurses working in Amhara regional state referral hospitals, Northwest Ethiopia. *Surgery research and practice*, 2015(1), 736175.
- Yaouba, D., Ngah, J. E., Perpoint, T., Amvene, J. M., Vanhems, P., & Bénet, T. (2016). Incidence and risk factors for surgical site infections in N'Gaoundéré regional hospital, Cameroon. *American Journal of Infection Control*, 44(10), 1195-1196.
- Zarchi, K., Latif, S., HAUGAARD, V. B., HJALAGER, I. R., & JEMEC, G. B. (2014). Significant Differences in Nurses' Knowledge of Basic Wound Management—Implications for Treatment. *Acta dermatovenereologica*, 94(4).
- Zarchi, K., Latif, S., HAUGAARD, V. B., HJALAGER, I. R., & JEMEC, G. B. (2014). Significant Differences in Nurses' Knowledge of Basic Wound Management—Implications for Treatment. *Acta dermatovenereologica*, 94(4).
- Zucco, R., Lavano, F., Nobile, C. G., Papadopoli, R., & Bianco, A. (2019). Adherence to evidence-based recommendations for surgical site infection prevention: Results among Italian surgical ward nurses. *PLoS one*, 14(9), e0222825.