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Original Research Article

Assessment of Nurses' Knowledge and Practices Regarding Prevention of Surgical Site Infection

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Abstract: Surgical Site Infection (SSI) is a one of the most common healthcare-associated infection which has a great impact on patient safety. Knowledge and practices of nurses play a key role for the prevention of spread of infection. To provide quality of care, it is very important for nurses to have good knowledge and practice towards prevention of SSI. A descriptive correlation study was conducted in two public hospitals Mayo Hospital and Lady Willingdon Hospital Lahore Pakistan to assess nurses' knowledge and practice regarding prevention of Surgical Site Infection and to determine relationship between both variables. A validated questionnaire and convenient sampling technique was used on 131 nurses to collect data. Descriptive statistics and Pearson Product Moment Correlation test was used to analyze the data on SPSS version 21. Data revealed that majority of the participants were within age between 20-30 yrs with job experience 1-5 years, majority were holding General nursing and Midwifery Diploma. Majority nurses showed poor level of knowledge while good level of practices towards prevention of surgical site infection was found. A strong negative significant relationship was found between knowledge and practice of nurses. The Findings of current study demonstrated poor knowledge which suggests an urgent need of educational and awareness programs for improvement in nurses' knowledge regarding prevention of surgical site infection.
Keywords: Knowledge, Practice, Nurse, Surgical Site Infection prevention, patient safety

INTRODUCTION

Patient safety is an important concern for all health care professionals. They all are involved in patient care [16]. But, it has a major importance for nurses. They provide health care services 24 hours a day to their clients in the hospitals and other health care settings. Nurses are considered as the "heart and soul" of every hospital. Nurses' knowledge and practices play a significant role to control infections which ultimately enhances quality care of patients [22].

An American journalist and nursing advocate, Suzanne Gordon says that; by using extensive knowledge, nurses work as a rescuer who secures patients from the risks and consequence of disease, disability as well as from the risks and consequences of the treatment of diseases. Consequently, they make a real difference in outcomes [8].

Healthcare associated infections are major healthcare problems for the people worldwide. Millions of people are affecting by them each year [24]. Nurses have a distinctive chance to lessen the probability of hospital-acquired infections. They can assist patients in their recovery and reduce the complications associated with infections by the utilization of adequate knowledge and practices [3].

One of the most common types of Healthcare-Associated infection is Surgical Site Infection (SSI) which is considered 20% to 25% of all Healthcare-Associated infections. It is an infection which occurs within 30 days after a surgical procedure or up to one year in those surgical patients in which an implant has been placed in an organ [20].

It is estimated that 2–5% of all the patients who endure a surgical procedure will suffer from surgical site infection. Patients who develop Surgical site infection are two times more probable to die as other postoperative patients [13] and It is resulting increased morbidity, extended hospital stay and increased financial expenditure [4].

It is a significant patient safety issue, primary risk for the patients and a vast concern in the healthcare setting [10]. Which places a major economic burden on the healthcare system [16]. Its prevention is known as a key component of care quality and patient safety [25].

Nurses are the ones who provide constant care of in-patients and thus, they can be the most reliable persons to spread their knowledge, attitude and practices for the health and wellbeing of the people, humankind or nation. From the beginning, nursing is a profession which has been working to promote peoples' health, relieve their pain and misery, advocate for the weak and the susceptible and educate the people to attain a better quality of life [7].

Florence Nightingale was the first infection control nurse. She established the relationship between nursing and infection control in 1854 in the period of the Crimean war where she provided her services to the victims of the war in a military hospital of Scutari. The hospital's condition was very poor, where she claimed that if we will improve the hygienic conditions of the hospital we can reduce the number of deaths [23].

It is estimated that 25 % of infections can be prevented by nurses by implementing standard precautions during care of the surgical patients. So, nurses can help to prevent surgical site infection, decreases patients 'economic burden as well as hospitals expenses and enhance quality of life of the patients by the application of knowledge and recommended practices [22].

The World Health Organization (WHO), in its guidelines has set a number of recommendations towards prevention of surgical site infection. By the implementation of these guidelines nurses can prevent their patients from surgical site infection and can promote the health of patients. Recommendations of these guidelines include avoidance of pre-operative hair removal, advice for pre-operative showering, hand hygiene, appropriately and timely administration of antibiotics, pre and post-operative glycemic control, wound management, nutritional assessment and surgical site preparation etc [1].

Considering the importance and significance of nurses in the healthcare settings, this study has been carried out to assess their knowledge and practices towards prevention of surgical site infection in order to find permanent solutions to the problem and to alleviate the suffering of patients and reduce the economic burden on the health care system.

Surgical site infection has been documented as a significant problem which is affecting the quality of health care and has a serious impact on patients' safety. Surgical site infection incidence rate is high in developing countries like Pakistan. Many studies documented that these infections can be caused by health care workers. The majority of healthcare professionals are nurses; they have a greater risk for both self-acquiring and transmitting infections to others. Breakdown in the knowledge and low standard practice of nurses can cause the transmission of infection especially among open wound/site surgeries.

This study therefore, conducted to assess the knowledge and practice level of nurses related to surgical site infection prevention to promote patients' safety and to increase the quality of patient care.

Purpose of the study was assessment of Nurse's knowledge and practice towards prevention of surgical site infection and to examine the relationship between knowledge and practice in which knowledge of nurses' towards prevention of surgical site infection was independent variable and practices of nurses' towards prevention of surgical site infection were dependent variable.

Research questions for this study were;

- What is the Nurses' knowledge level towards prevention of surgical site infection?
- What is the nurses' practice level towards prevention of surgical site infection?
- What type of relationship exist between Nurses' knowledge and practice towards prevention of surgical site infection?

This study investigates the knowledge and practices of nurses' towards surgical site infection prevention in two public hospitals of Lahore, Pakistan. Firstly, this study will be helpful for me to improve my knowledge and practice for the prevention of surgical site infection during my clinical period. In addition, the research findings will enable the organization to develop and organize training programs by identifying the gaps in knowledge and practices of nurses towards prevention of surgical site infection. Efficient knowledge and good practices by the nurses can facilitate patient care and may contribute to decrease the rate of infection in the hospitals. Moreover, the study results will help for the further research in nursing profession.

LITERATURE REVIEW

Frequency of surgical site infection is high in developing countries than developed countries. In developing countries the risk of infection is 2 to 20 times higher [13]. For example in Ethopia 19.1%, [15], Nigeria 38.1% [20] and 12 % reported in India [23].

Incidence rate of surgical site infection in Pakistan also documented as high. A study conducted in Nawab shah in 2010 in which the rate of surgical site infection rate was found as 9.3% [2]. In addition, another study conducted by Malik *et al.* [15] in Islamabad in 2011 where incidence rate of surgical site infection was 8.6% reported [16].

Nurses' knowledge and practices can contribute to prevention of surgical site infection. Many studies discussed knowledge and practices of nurses on prevention of surgical site infection by using different methodologies in which some studies found the knowledge and practices of nurses as good and in some studies it was reported as poor.

A study conducted in Nigeria in which majority of the nurses had poor knowledge as regards to the prevention of post operative wound infection [5].

In 2014, a study was conducted in Rawalpindi, Pakistan in which Knowledge of the Health care workers about Health care associated infections was adequate, but Practices were lacking. Respondents having good knowledge about Health care associated infection were 281 (94%) and regarding practices it was only 143 (47%) [24].

In 2013, Mwakanyamale had done a study in Tanzania which showed that more than half of the nurses 57.7% were having poor post operative wound care practice. 30 participants (42.3%) had good practice on post operation wound care [16].

A study done by [22] in Bangladesh showed the knowledge level of majority of nurses (70%) was low. On the other hand, practice of majority nurses (98.3%) was at a high level regarding prevention of surgical site infection.

Fashafsheh *et al*. [6], performed a stud in the Government hospitals of Palestine in which around half (53.9%) of the participants had fair knowledge level and the majority (91.1%) of the participant had good practices towards infection control [7]

A survey done by Labeau *et al.* [12] in Belguim showed, that nurses were not familiar with the proper evidence based guidelines about the Surgical Site Infection Prevention. The overall scores of nurses were poor. The nurses' mean score on the knowledge test was only 2.61 (29%).

According to a study which was conducted in Ethiopia where Knowledge and practice of nurses were found to be low. There were only (40.7%) of the nurses were found to be knowledgeable about the prevention of surgical site infection and the proportion of nurses who had good practice activities was (48.7%) [24].
A survey study was done by [11] in India in which the nurses' total level of knowledge was found to be low while nurses' practice regarding surgical site infection prevention was at high level.

MATERIAL AND METHODS

A descriptive correlation study design was used to get information on knowledge and practice of nurses and determine a relationship between knowledge and practice regarding prevention of surgical site infection. Data was collected from surgical wards of Mayo Hospital and Lady Willingdon Hospital Lahore. Staff nurses, working in surgical wards were recruited for the study. Convenient sampling technique was used in this study and sample size was 131 as determined by using slovins formula.

Female Staff nurses of 20 years to 50 years of age, with at least 1 year job experience and the nurses who voluntarily participated and gave consent were included in the study. Head nurses, student nurses, staff nurses with less than 20 years and more than 50 years of age, less than 1 year experience and nurses who refused to participate were excluded from the study**.** This study was conducted from February to May 2017 in the selected hospitals of Lahore.

The main tool used for the data collection was a standardized close-ended Questionnaire which was adopted by Sickder *et al.* [22]. The questionnaire was divided into three sections;

- Nurses' socio-demographic characteristic as regard to their age, organization, marital status, qualification and working experience.
- Participants' knowledge was assessed by 25 multiple choice questions in which each question had a group of 3 options. Two options were incorrect and one was with correct answer. The correct response for each question was scored as "1" and incorrect as "0". Those participants who answered more than 14 questions correctly were categorized as "Good knowledge" and those who scored less were categorized as "Poor knowledge".
- Practice was assessed by 25 statement using a 5-point Likert scale (ranging from never practice=1, rarely practice=2, sometimes practice=3, often practice =4, always practice=5. Those participants who were used to do preventive practices as always and often practice of more than 14 questions were categorized as "Good Practice" and those who either did not ever practice, rarely and sometimes were categorized as "Poor Practice".

Data was analyzed as descriptive and inferential statistics by using computer software statistical package for social sciences (SPSS) software version 21. Frequencies and percentages were calculated to all variables of the study. Pearson product moment correlation was applied to measure the strength of relationship between dependent and independent variable.

Permission for research was obtained by Ethical Review Board of Lahore School of nursing, University of Lahore. Permission for data collection was taken from Nursing Superintendent of Mayo Hospital and Lady Willingdon Hospital Lahore and signed consent of the participants.

RESULTS AND DISCUSSION

This chapter includes 3 portions of analysis. First analysis was demographic analysis. It gives us details of demographic questions. Descriptive analysis was used for two variables. One was independent variable (Knowledge) and one was dependent variables (Practice). It tells us about the effect of knowledge on nurse's practice about prevention of surgical site infection.

Table-1: Demographic Profile of Participants (n=131)

	Characteristics	Frequency	Percentage
Organization	Mayo Hospital	103	78.6%
	Lady Willindgon Hospital	28	21.4%
	Total	**131**	**100%**
Age	20-25yrs	42	32.1%
	26-30yrs	34	26.0%
	31-35yrs	19	14.5 %
	36-40yrs	21	16.0 %
	41-45yrs	09	6.9%
	46-50yrs	06	4.6%
	Total	**131**	**100%**
Qualification	General Nursing & Midwifery	120	91.6 %
	Post RN/BSN	11	8.4%
	Total	**131**	**100%**
Marital Status	Single	69	52.7%
	Married	62	47.3 %
	Total	131	100%
Job Experience	1-5yrs	52	39.7 %
	6-10yrs	43	32.8 %
	Above 10 yrs	36	27.5%
	Total	**131**	**100%**

(Table 1) shows that 103 (78.63%) of the respondents were from Mayo Hospital and 28 (21.3%) participating in this study were from Lady Willingdon hospital.

Range of participants' age was between 20 to 50 years. According to data received from participants. (Table 1) below analysis is found that the mostly selected sample was based on 20-25 years of nurses which were 42 (32.06%), 26-30 years 34 (25.95%), 31-35 years 19 (14.50%), 36-40 years of age were 21 (16.03%), 41-45 years 9(6.87%) and only 6(4.58%) nurses were between range of 46-50 years old.

Respondent qualification represents (Table 1and Fig no. 4) that most of the respondents were having nursing diploma 120 (91.60%) and only 11 (8.3%) respondents were post RN/BSN.

(Table 1) shows that 69 (52.6%) of the respondents were single and 62 (47.3%) respondents which participated in this study were married.

52 (39.69%) of the respondents had 1-5yrs of job experience, 43 (32.82%) were 6-10yrs and 36 (27.48%) participants had above 10 years job experience.

Table-2: Correlation Analysis

Correlations			
		Knowledge	Practice
Knowledge	Pearson Correlation	1	-.562**
	Sig. (2-tailed)		.000
	N	131	131
Practice	Pearson Correlation	-.562**	1
	Sig. (2-tailed)	.000	
	N	131	131
**. Correlation is significant at the 0.01 level (2-tailed).			

Person correlation of Normal Hypervent = -.562
P-Value = 0.000

In conclusion the results indicate that the strength of association between the variable is negative (r= -.562) and that the correlation coefficient is very highly significant different from zero (p <0.001) .Also we can say that 31% (0.562^2) practice of staff nurses affect by knowledge in a significant way.

Table-3: Frequency and percentages of Correct and Incorrect answers given by the respondents on each item of the Knowledge section (n = 131)

S No	Multiple choice Questions	Correct answers	Incorrect answers	Total n %
1	What is best time for pre-operative hair removal	17 (12.98%)	114 (87.02%)	131 100%
2	What is best time for pre-operative hair removal	28 (21.73%)	103 (78.62%)	131 100%
3	What is best agent for pre-operative skin preparation	86 (76.65%)	45 (34.35%)	131 100%
4	What is purpose of pre operative skin preparation	80 (61.07%)	51 (38.93%)	131 100%
5	How would you disinfect surgical site before surgery	80 (61.07%)	51 (38.93%)	131 100%
6	Which one is true answer for prophylaxis antibiotic	54 (41.22%)	77 (58.78%)	131 100%
7	When should you administer prophylaxis antibiotic to surgical patients	25 (19.08%)	106 (80.91%)	131 100%
8	What is the purpose of pre operative showering?	41 (31.3%)	90 (68.71%)	131 100%
9	What is the best agent of pre-operative showering to prevent surgical site infection?	58 (44.27%)	73 (55.7%2)	131 100%
10	Which one is correct for the malnourished surgical patients?	51 (38.93%)	80 (61.07%)	131 100%
11	What are laboratories in assessing patients' nutritional status?	96 (73.28%)	35 (26.71%)	131 100%
12	What is correct level of blood sugar which enhances function of white blood cell adequate to prevent SSI	84 (64.12%)	47 (35.88%)	131 100%
13	What is the best antiseptic solution to disinfect the surface of dressing trolley?	33 (25.19%)	98 (74.81%)	131 100%
14	Which is the correct purpose of surgical hand washing?	97 (74.05%)	34 25.96%)	131 100%
15	Which are the correct steps of hand washing?	85 (64.89%)	46 (35.12%)	131 100%
16	Which one is the correct answer for the benefit of wound dressing?	36 (27.48%)	95 (72.32%)	131 100%
17	When do you change the surgical dressing?	19 (14.5%)	112 (85.49%)	131 100%
18	How do you select dressing solution?	40 (30.53%)	91 (64.46%)	131 100%
19	What is the purpose of maintenance of normal nutritional status for surgical patients?	95 (72.52%)	36 (27.48%)	131 100%
20	What kind of diet should be provided for the post operative patients?	77 (58.78%)	54 (41.22%)	131 100%
21	Which one is correct answer for surgical patients with compromised immune system?	84 (64.1%)	47 (35.88%)	131 100%
22	.How do you prevent infection of patients with immunodeficiency disorder?	63 (48.09%)	68 (51.91%)	131 100%
23	Which statement is correct for diagnosis of surgical site infection?	51 (39.93%)	80 (61.12%	131 100%
24	Which answer is a good sign of no surgical site infection?	55 (41.98%)	76 (58.01%)	131 100%
25	Which laboratory is used to ensure surgical site infection?	44 (35.59%)	87 (66.41%)	131 100%

Table no. 3 the participants of the study were asked about the question that what is the best method for pre-operative shaving 87.02% (n=114) of the participants gave wrong answer while only 12.98% (n=17) of the participants gave correct answer. The participants of the study were asked about the best time

for pre-operative hair removal for which 78.62% (n=103) of the participants give wrong answer while only 21.37% (n=28) of the participants give right answer to this question. In Table no. 6shows that particpanst of the study were asked about the question that what is the best agent for pre-operatve skin preparation for which 65.65% (n=86)of the participants gave correct answer while 34.35% (n=45) gave wrong answer to this statement .The knowledge of study participants about what is the purpose of pre-operative skin preparation for which 61.07% (n=80) of the particpants gave correct answer while 38.93% (n=51)of the particpants were wrong. The participants of the study were asked about the question that how would you disinfect surgical site before surgery for which 61.07% (n=80) of the participants gave correct answer while 38.93% (n=51) gave wrong answer to this question.

Table no. 3 shows that the participants of the study were asked about the question that which one is the true answer for prophylactic antibiotic for which 41.22% (n=54) of the participants gave correct answer while 58.78% (n=77) of the participants gave wrong answer to this statement. Participants of the study were asked about question that when they should administer prophylactic antibiotic to surgical patient for which only 19.08% (n=25) of the participants gave correct answer while the 80.91% (n=106) of the participants didn't know the actual time for administering prophylactic antibiotics. 31.30% (n=41) of the participants give correct answer to the statement that what is the purpose of pre-operative showering, which 68.71% (n=90) of the participants gave wrong answer to this question.44.27% (n=58)of the participants give correct answer to the statement that what is best agent for pre-operative showering which 55.72% (n=73) of the participants gave wrong answer to this statement. 38.93% (n=51) of the participants give correct answer to the statement that which one is correct for the malnourished surgical patients while the remaining 61.07% (n=80) of the participants gave wrong answer to this question. 73.28% (n=96) of the participants were asked about what are laboratories in assessing patients' nutritional status, gave correct answer, while the remaining 26.71% (n=35) gave wrong answer to this statement. Participants of the study were asked about what is the correct level of blood sugar which enhances function of white blood cells adequate to prevent surgical site infection for which 64.12% (n=84) response of the participants were correct while 35.88%(n=47) were wrong. 25.19% (n=33) of the participants gave correct answer to the question that what is best antiseptic solution to disinfect surface of dressing trolley, while the remaining 74.81% (n=98) of the participant gave wrong answer to this question.74.05% (n=97) of the participants give correct answer to the statement that Which is the correct purpose of surgical hand washing, while the remaining 25.96% (n=34) gave wrong answer to this statement.

64.89% (n=85) of participants know about the correct steps of hand washing while the reaming 35.12% (n=46)didn't know proper hand washing steps.27.48% (n=36) of participants give correct answer to the question that Which one is the correct answer for the benefit of wound dressing, while the reaming 72.52% (n=95) gave wrong answer to this statement. 14.5% (n=19) of the participants gave correct answer to the statement that When do you change the surgical dressing, while the remaining 85.49% (n=112) gave wrong answer to this question.30.53% (n=40) of the participants gave correct answer to the question that How do you select dressing solution, *w*hile the remaining 69.46% (n=91)of participants gave wrong answer to this question. 72.52% (n=95) gave correct answer to the question that what is the purpose of maintenance of normal nutritional status for surgical patients, while the remaining 27.48% (n=36)of the participants give wrong answer to this question.

58.78% (n=77) of participants give correct answer to the statement that what kind of diet should be provided for the post-operative patients, while 41.22% (n=54) participants gave wrong answers to this statement.64.12% (n=84) of the participants give correct answer to the statement that Which one is correct answer for surgical patients with compromised immune system ?While the remaining 35.88% (n=47)give wrong answer to this question.48.09% (n=63) of the participants give correct answer to the question that How do you prevent infection of patients with immunodeficiency disorder, while the remaining 51.91% (n=68) gave wrong answer to this question.38.93% (n=51) of the participants give correct answer to the statement that Which statement is correct for diagnosis of surgical site infection, while the reaming 61.12% (n=80) gave wrong answer to this question**.** 41.98% (n=5) of the participants give correct answer to the statement that Which answer is a good sign of no surgical site infection, while the remaining 58.01% (n=76) gave wrong answer to this question 35.59% (n=44) of study participants give correct answer to the statement that Which laboratory is used to ensure surgical site infection, while the remaining 66.41% (n=87) gave wrong answer to this question.

Table-4: Responses given by the respondents on each item of the Practice section (n = 131)

Sr.No.	Items	Never practice n %	Rarely practice n %	Sometime practice n %	Often practice n %	Al ways practice n %	Total n %
1	Alcohol and chlorhexidine gluconate is most common antimicrobial used in my ward	6 (4.6%)	15 (11.5%)	7 (5.3%)	27 (20.6%)	76 (58%)	131 100%
2	I wash my hands before and after changing wound dressing and touching the surgical site	4 (3.1%)	8 (6.1%)	16 (12.2%)	37 (28.2%)	66 (50.4%)	131 100%
3	I wash my hands before wearing sterile gloves	9 (6.9%)	39 (29.8%)	20 (15.3%)	12 (9.2%)	51 (38.9%)	131 100%
4	I perform pre-operative shaving right before surgery	46 (35.1%)	27 (20.6%)	18 (13.7%)	13 (9.9%)	27 (20.6%)	131 100%
5	I administer pre-operative prophylactic antibiotic within one hour before surgery	27 (20.6%)	43 (32.8%)	7 (5.3%)	17 (13%)	37 (28.2%)	131 100%
6	I advice my patient to take pre-operative showering 6-12 hours before surgery	27 (20.61%)	17 (12.98%)	7 (5.34%)	38 (29.01%)	42 (32.06%)	131 100%
7	I advice my patient to take pre-operative showering with antimicrobial agent	24 (18.3%)	12 (9.2%)	14 (10.7%)	30 (22.9%)	51 (38.9%)	131 100%
8	I perform prescribed glucose test before and after surgery in a diabetic patient	13 (9.9%)	4 (3.1%)	7 (5.3%)	25 (19.1%)	82 (62.6%)	131 100%
9	I administer injection insulin or give oral medication as ordered in diabetic patient	6 (4.6%)	10 (7.6%)	5 (3.8%)	22 (16.8%)	88 (67.2%)	131 100%
10	I assess my patient body mass index (BMI) before and after surgery	83 (63.4%)	9 (6.9%)	13 (9.9%)	12 (9.2%)	14 (10.7%)	131 100%
11	I advice a malnourished patient to intake nutritious diet (especially protein diet)	1 (0.8%)	9 (6.9%)	12 (9.2%)	10 (7.6%)	99 (75.6%)	131 100%
12	I advice a malnourished patient to take vegetables and fruits before & after surgery	1 (0.76%)	16 (12.21%)	13 (9.92%)	19 (14.5%)	82 (62.6%)	131 100%
13	I advice a malnourished patient with compromised immune system avoiding contact people who have infections	10 (7.6%)	16 (12.2%)	12 (9.2%)	21 (16%)	72 (55%)	131 100%
14	I advice obese patients to less intake of carbohydrate	11 (8.4%)	22 (16.8%)	15 (11.5%)	6 (4.6%)	77 (58.8%)	131 100%
15	I use sterilized dressing materials for cleansing surgical wound dressing	17 (13%)	15 (11.5%)	13 (9.9%)	20 (15.3%)	66 (50.4%)	131 100%
16	I use povidone-iodine and normal saline for cleansing surgical wound dressing	22 (16.8%)	5 (3.8%)	1 (0.8%)	31 (23.7%)	72 (55%)	131 100%
17	I use an antiseptic technique during surgical wound dressing	13 (9.9%)	18 (13.7%)	15 (11.5%)	19 (14.5%)	66 (50.4%)	131 100%
18	I learn shaving method from others and apply to pre-operative patients	27 (20.6%)	26 (19.8%)	16 (12.2%)	19 (14.5%)	43 (32.8%)	131 100%
19	I use an antiseptic technique during obtaining swab culture	21 (16%)	19 (14.5%)	16 (12.2%)	22 (16.8%)	53 (40.5%)	131 100%
20	I advice immunodeficiency disorder patient to maintain personal hygiene	13 (9.9%)	10 (7.6%)	12 (9.2%)	15 (11.5%)	81 (61.8%)	131 100%
21	I assess and monitor surgical site condition	30 (22.9%)	9 (6.9%)	0 (0%)	14 (10.7%)	78 (59.5%)	131 100%
22	I separate infected from non-infected cases during dressing	19 (14.5%)	21 (16%)	14 (10.7%)	18 (13.7%)	59 (45%)	131 100%
23	I use face mask during cleansing surgical wound dressing	0 (0%)	16 (12.2%)	16 (12.2%)	31 (23.7%)	68 (51.9%)	131 100%
24	I clean and disinfect the surface of the dressing trolley with antiseptic solution	26 (19.8%)	19 (14.5%)	17 (13%)	23 (17.6%)	46 (35.1%)	131 100%
25	I discard the soiled material in the proper place after performing wound dressing	31 (23.7%)	9 (6.9%)	14 (10.7%)	21 (16%)	56 (42.7%)	131 100%

Table no. 4 shows that participants of the study were asked about the statement that do they practice and use alcohol or Chlorhexidine gluconate antimicrobial in their ward, for which 4.6% (n=6) Never practiced it, 11.45% (n=15) Rarely, 5.3% (n=7)sometime, 20.6% (n=27) Often while 58% (n=76) Always practiced it.3.05% (n=4) of Staff Nurses did not wash their hands before and after changing wound dressing, 6.1%

(n=8)rarely, 12.2% (n=16), Sometime, 28.24% (n=37), Often, 50.4% (n=66) Always wash their hands before and after changing wound dressing and touching surgical site.6.9% of staff nurses wash their hand before wearing surgical Gloves, 29.8% Rarely, 15.3% Sometime, 9.2% Often While 38.9% always wash their hands. 35.1% of staff Nurses never perform preoperative shaving right before surgery, 2.6% Rarely, 13.7% Sometime, 9.9% often while only 20.6% always perform this procedure. 2.6% of staff Nurses never administer preoperative prophylactic antibiotics within one hour before surgery, 32.8% rarely, 5.3% sometime, 13% often while only 28.2% do this practice always.20.6% of staff Nurses Near advice their patients to take preoperative showering 6-12 hour before surgery, 13% advice Rarely, 5.3% sometime, 29% Often while 32.1% always advice.18.3% of the participants Never advice their patient to take preoperative showering with antimicrobial agent, 9.2% advice Rarely, 10.7% Sometime, 22.9% Often while 38.9% of the study participants always advice.9.9% of the study participants never perform prescribed glucose test before and after surgery in a diabetic patient, 3.1% perform rarely, 5.3% sometime, 19.1% often while 62.6% always perform Prescribed Glucose test.

4.6% of study participants Never administer inject insulin or give oral medication as ordered in Diabetic patient, 7.6% Rarely, 3.8% Sometime, 16.8% Often While 67.2% always perform this practice. 63.4% of study participants never assess patient Body Mass Index (BMI) before and after surgery, 6.9% rarely assess BMI, 9.9% sometime, 9.2% often while 10.7% always assess BMI of Patient.1% of study participants never advise their malnourished patient to intake nutritious diet, 6.87% advice rarely, 9.16% Sometime, 7.63% often and 75.57% always advise their malnourished patient to intake nutritious diet (especially protein diet). 8% of study participants Never advice their patient to Take vegetables and Fruits before and after surgery, 12.2% Advice Rarely, 9.9% Sometime, 14.5% Often while 62.6% Always their patient about vegetables and Fruits.7.6% of study participants Never advice their malnourished and immune compromised patients to avoid contact with infected people, 12.2% Advice Rarely, 9.2% Sometime, 16% Often While 55% Always do this practice.8.4% of staff Nurses Never advice obese patient to take less intake of Carbohydrate, 16.8% advice Rarely, 11.5% Sometime, 4.6% Often, while 58.8% Always Advice obese patients about their diet.13% of study participants never use sterilized dressing material for cleaning surgical wound, 11.5% use rarely, 9.9% sometime, 15.3% often while 50.4% always used sterile dressing.16.8% of study participants never use povidone and normal saline for cleaning surgical wound, 3.8% use rarely, 0.8% sometime, 23.7% often while 55% always used povidone and Normal saline for surgical dressing.

9.9% of study participants Never used and antiseptic techniques during surgical wound dressing, 13.7% Rarely Used, 11.5% Sometime, 14.5% Often while 50.4% always do this practice. 20.6% of study participants never learn shaving method from others, 19.8% rarely, 12.2% sometime. 14.5% often while the response of 32.8% was always about this statement.16% of study participants Never use an antiseptic techniques during obtaining swab culture, 14.5% use Rarely, 12.2% Sometime, 16.8% Often while 40.5% always perform this practice. 9.9% of study participants Never advice immunodeficiency patient to maintain personal Hygiene, 7.6% Rarely advice, 9.2% sometime, 11.5% often while 61.8% always advice for personal Hygiene.22.9% of staff nurses Never assess and Monitor surgical site condition, 6.9% Rarely assess, 10.7% Often assess while 59.5% always assess surgical site condition 14.5% of staff nurses Never separated infected patients form non-infected during dressing, 16% rarely do this practice, 10.7% sometime, 13.7% often while 45% always do this practice. 12.2% of staff nurses never use Face Mask during cleaning surgical wound dressing, 12.2% Rarely use face mask, 23.7% Often, while 51.9% always use face mask.19.8% of staff nurses Never clean and disinfect the surface of the dressing trolley with antiseptic solution, 14.5% clean rarely, 13% sometime, 17.6% often while 35.1% always clean the trolley. 23.7% of staff nurses never discard the solid material in the proper place after performing wound dressing, 6.9% rarely, 10.7% often, 16% often discard while 42.7% always discard solid material.

Surgical site infection is a common healthcare associated infection worldwide which is a burden on both patients and health care systems. Nursing is an integral part of health care system. Nurses' knowledge and practice is a vital part in patient care. Their up to date knowledge and practices play a significant role to control these infections. That is why this study was carried out to assess their knowledge and practice towards prevention of surgical site infection in two public hospitals, Mayo Hospital and Lady Willingdon Hospital Lahore, Pakistan in which 131 staff nurses were participated.

The response of the participants were taken through convenient sampling techniques and the demographics of the participants shows that all the staff nurses were female, no male nurse was found in this study. The high percentage of participants fall in age group of 20_25 years which was more than 32.1% while high range of participants having qualification of Diploma in Nursing which was more than 91.6% while only 8.4% of the participants were having qualification of Post RN BSN.

Nurses' knowledge towards prevention of surgical site infection

This is prevailed from this study results that the overall knowledge of staff nurses for surgical site infection prevention was poor. Due to type and period of nurses' relation with patients knowledge is very necessary.

However, Low level of nurses' knowledge in this study of can be due to many factors, First of all qualification of nurses majority of staff nurses having qualifications of Diploma nursing while only 8.4% having bachelor degree, this might affect nurses knowledge.

This result is supported by Sickder [22], who conduct a study in Bangladesh, stated that nurses knowledge is significantly affected by their qualification, if nurses have Bachelor degree or Master degree than they will manage and know the sign of infection well and prevent the patient from further complications.

The second factor which may cause the low level of Nurses knowledge regarding surgical site infection prevention was Job Experience. Majority of the study participants had Job experience less than 5 years which can affect knowledge of Nurses.

This result is also supported by Sickder, [22] who stated that it is very necessary for staff nurses to have enough experience specially experience in surgical ward by which they can easily identify the signs and complications of surgical site infection.

The findings of this study are similar to a study was conducted in Ethiopia, in which only 172 (40.7%) of the nurses were found to be knowledgeable about surgical site infection prevention[24]. Another study which was conducted in Nigeria, in which (68%) of the nurses had also reported poor knowledge towards prevention of post operative wound infection [5].

Nurses' practices regarding prevention of surgical site infection

It was revealed from the study that overall practice of staff nurses regarding preventing and managing of surgical site infection was at good level. The findings of this study are similar to a study which was done by Joshi [11] in India in which nurses' practice regarding surgical site infection prevention was also at high level.

The results are similar to a study which was conducted in Ethiopia, in which nurses' practice activities regarding surgical site infection prevention were good [24]. But the findings of this study are in contrast to a study conducted in Tanzania which showed more than half of the participants 57.7% practices were poor regarding postoperative wound care [17].

Relationship between Nurses' knowledge and practice regarding prevention of surgical site infection

A strong significant negative correlation was found between Knowledge and practice of nurses regarding preventing of surgical site infection. But still knowledge is linked to practice but indifferent direction. It revealed that low level knowledge was related to high level practice. This phenomenon was very surprising. It was expected in this study that a positive correlation will be held but the relation was significantly negative.

However, a previous study had also found that a weak negative correlation was existed between knowledge and practice while he conducted a study on nurses and Doctors regarding infection control [18]. In another study negative relationship was found between knowledge and practice of nurses regarding prevention of surgical site infection [22]. Therefore, relationship between knowledge and practice is uncertain.

However, infection prevention is a huge concern for nurses. Nurses' knowledge and practices have a great impact to decrease the incidence rate of surgical site infection and provide quality of care to the patients.

CONCLUSION, LIMITATIONS AND RECOMMENDATIONS

A descriptive Correlation study was conducted in two Public hospitals of Lahore, Pakistan on the nurses towards prevention of surgical site infection. Based on the study findings, it can be concluded that the nurses in the present study had poor level of knowledge and good level of practices regarding prevention of surgical site infection. Moreover, in this study correlation between knowledge and practice was found to be negative.

One of the limitations to this study was lack of time. Willingness of nurses to participate in study was also the big obstacle. Hospital policy and nurse patient ratio in the surgical wards was not included in the study which might have an effect on the knowledge and practices of nurses regarding prevention of surgical site infection. Convenient sampling technique was used which often suffers from biasness. Respondents' practices should have been observed through checklist and not to rely only on the respondents' subjective self-assessment. Therefore, their responses may not have accurately reflected their true practice; their reported level of practice might have been higher than the real level.

To improve quality of care and patient safety from suffering of surgical site infection, continuing in-service educational programs should be conducted by the Hospital organization to update the evidence based knowledge and practices of nurses. Hospital administration should provide standard guidelines for the prevention of surgical site infection for nurses in the surgical departments. A replication of this study should be done by using observational check list to assess the actual level of practice of nurses.

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