

EVALUATION AND QUANTITATIVE ANALYSIS OF OPERATING ROOM PERSONAL KNOWLEDGE, ATTITUDE, AND PRACTICE OF STERILE TECHNIQUES IN KHYBER TEACHING HOSPITAL PESHAWAR

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Abstract: *The pivotal aspect of patient care within the operating room is the operating room personnel. Therefore, assessing their knowledge, attitudes, and practices concerning sterile techniques in the operating theatre is crucial, as infections pose a significant risk to post-operative patient morbidity and mortality. Wound infections are the second most prevalent type of hospital-acquired nosocomial infection in the United States. Recognizing that inadequate infection control and sterile technique practices in the operating room can contribute to wound infections, it is imperative to establish infection control principles and adhere to sterile technique standards. The primary aim of this study was to evaluate the knowledge, attitudes, and practices of operating room personnel with respect to sterile techniques at Khyber Teaching Hospital (KTH) in Peshawar. A cross-sectional descriptive study approach was employed to assess the knowledge, attitudes, and practices of operating room personnel in the operating theaters of KTH. One hundred and eighty operating room personnel from the selected hospitals were chosen from the population using a non-probability convenient sampling method. The self-administered questionnaires were used to gauge their understanding of, attitude toward, and adherence to sterile techniques. The study's findings revealed that most respondents (74%) were male, 44.2% fell within the age range of 25-30 years, and most (74.6%) had less than 10 years of experience. Many respondents exhibited good knowledge, a positive attitude, and solid practices regarding sterile techniques. In conclusion, the study found that operating room personnel displayed good knowledge, a positive attitude, and sound practices about sterile techniques. Furthermore, the study established a direct relationship between knowledge, attitude, and practice. As a result, it is recommended that operating room personnel should participate in additional workshops or seminars on sterile techniques to stay updated on new developments in this field.*

Keywords: Knowledge, Practices, Attitude, Sterile Techniques, Surgical Site Infection,

Introduction

The main rationale of this study is to define the knowledge, attitude, and practice of operating room personnel regarding sterile technique in the OR complex. The sterile techniques must strictly be followed to prevent infection because infection delays healing. The primary goal of our personnel is to prevent infection, which is achieved by using sterile techniques principle and infection control principles. This study is based on the principle of sterile techniques and is searched through various databases and journals, including Google Scholar, nature, and Research Gate (Chitimwango, 2017). The pathogen would not cause an infection alone in the host, but there would be a process that involves the host, agent, and environment. Agent which causes disease and host in which disease occurs. The environment is the surroundings in which the agent survives in the host. The chain of infection, which consists of six elements (agent of infection, reservoir, portal of exit from the reservoir, mode of transmission, portal of entry into the host, and susceptible host) infection can be prevented by any interruption of the chain of infection (Oloya, 2023). Disease transfer from one person to another person is called transmission. Transfer of disease occurs through various modes. Contact transmission

is one of the most common modes of transmission (Elgazzar and Qalawa, 2020). Contact transmission is further divided into direct and indirect. Direct contact transmission occurs through physical contact from person to person, and indirect involves intermediate objects. The other modes of transmission are droplet and airborne.

Droplets are larger size and fall to the ground due to gravity. Airborne particles are smaller in size, remain in the air for longer time and spread widely (Oloya, 2023). One of the most common problems throughout the world for healthcare centers is nosocomial infection. Nosocomial infections are a type of infection that was not present at the time of admission to the hospital. A study conducted in the U.S. known as the (SONK) nosocomial infection control study found that one-third of all nosocomial infections were prevented by following sterile technique principles and infection control principles (Sunkwa-Mills et al., 2020). Any break in the infection control because of various infections in patients. Immunocompromised patients are more easily affected. Organisms causing nosocomial infection are *Clostridium difficile*, methicillin resistance staphylococcus aureus, staphylococci, enterococci, pseudomonas, and streptococci vancomycin resistance enter

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coccus (Chan et al., 2008). These are infection control principles at the basic level designed for all patients' care regardless of diagnosis. These precautions recommended environmental control practices and minimum precautions for invasive procedures. PPE prevents infection transmission, including gloves, gowns, mask, eye wear, and hair cover. The type of PPE used depends on exposure (Puttaiah et al., 2011). Many infections are caused by needle stick injury. So it is important that all sharps should be discarded in puncture proof container and transfer by metallic tray. In oral procedures ambu bag, mouth protection and ventilation device must be available for emergency resuscitation. Specimen should be handled with great care to prevent contamination. All instruments, floors, and furniture should be decontaminated. All waste should be clearly identified as infectious or noninfectious and placed in a separate container (Pittet and Duce, 1994). The most important way of preventing infection is hand washing. All healthcare personal be encouraged to know their status of HIV and HBV and should be HBV immunized (Mbanya et al., 2001).

According to Phillips, environmental services are important, like environmental control. Cleaning and disinfectants are procedures of environmental services with the use of an environmental Air conditioning system that is important in controlling airborne contamination. In the operating room, complex use of an air conditioning system will maintain a positive pressure greater than the surrounding corridors (Pittet and Duce, 1994). This will keep unidirectional flow in the operating room and reduce the amount of air entering the OR from corridors. If the cooling fan were used, it would recirculate settled bacteria. In high-risk procedures, laminar air flow, called ultra-clean airflow, is used in the OR environment. This flow is unidirectional and positive pressure steam of air. A degree of 100 to 400 air changes per hour is possible and eliminates more than 99% of particles greater than 0.3 micrometers. When the study was conducted, it was noticed that staphylococcus auras were present in 73% of all 100% air samples (Hinkle and Cheever, 2018). Infections are the main cause of morbidity and mortality of patients in the post-operative phase. Wound infections are the second most common type of nosocomial hospital-acquired infection in the United States (Shinde and Mohite, 2014). Because wound infection can be caused by incompetent infection control measures and sterile techniques in the operating room, it is essential to implement and operate sterile technique principles (Dhakal et al., 2016). Surgical site infection (SSI) is still one of the main problems for the perioperative team.

SSIs are caused by microorganisms that enter the injured area through incisions made during surgery if sterile techniques are not followed. SSIs warn the lives of lots of people every year and support the spread of antibiotic resistance. SSIs cause a 3% mortality rate, and 75% of SSI-related deaths are directly related to SSI (Karera, 2017). Prevention of infections in the O.T. is one of the basic goals of the surgical team. Despite this, many studies show that attentiveness to recommendations is very low. Research endures to report less than 100% adherence to standard precautions among healthcare workers despite the proven benefits of adherence to standard precautions, including reducing disease transmission by reducing the risk of exposure.

Although the hospitals have a multidisciplinary infection control committee, infection prevention practices are applied differently (Malan, 2009). According to Infections Control and Hospital Epidemiology, approximately 4.5 to 5.7 billion people are affected by SSIs annually due to poor aseptic techniques in the hospital. 11% of clients who undergo surgery are infected in undeveloped and underdeveloped countries (Mandona et al., 2019). In Africa, over 20% of women who undergo cesarean section acquire a wound infection that affects their health and children. Although the incidence of SSI is lower in well-developed countries, it represents the second most common type of HAI in the United States (Labrague et al., 2012). According to Phillips, sterile techniques are the basis of modern surgery, and therefore, strict attention to recommended sterile technique procedures is crucial for patient and staff safety in the operating room complex. Adherence to the principles of infection control and sterile technique in practice can lower nosocomial infections in the OR complex. It will result in shorter patient hospitalizations and lower costs for medical devices and hospitals, while infections lead to increased institutional costs due to increased length and complexity of hospitalization (Wahba, 2016). According to a WHO report (2008), 50-60% of neonatal deaths in India occur within the first month of life due to a lack of aseptic technique in the delivery room. More than half of them die within the first week of life, so the study aimed to assess staff nurses' knowledge of aseptic techniques (Singh et al., 2016). There is a paucity of studies on this topic in Asia, although the prevalence of healthcare-associated infections is high in this region; in particular, medical and nursing students' knowledge of standard measures is rarely compared. Adherence to sterile techniques by students is reported as poor. Therefore, exploring and knowing OR's knowledge, attitudes, and practices about sterile techniques is imperative to develop appropriate strategies to promote adherence to sterile techniques (Kolade et al., 2017).

Methodology

The research was conducted within the operating theaters of Khyber Teaching Hospital in Peshawar. A descriptive cross-sectional study design was employed to conduct this research. The study spanned four months, commencing on July 8, 2022, and concluding on September 8, 2022. The study encompassed all operating theater staff working within Khyber Teaching Hospital. Data was collected using a self-administered questionnaire comprising four distinct sections. The first section captured sociodemographic information, including age, gender, marital status, level of education, years of experience, and current employment status in the operating theater.

The second section assessed personal knowledge regarding sterile techniques and featured ten closed-end questions. The third section focused on personal attitudes toward sterile techniques and included ten questions, scoring using a five-point rating scale (Strongly Agree - 5, Agree - 4, Neutral - 3, Disagree - 2, Strongly Disagree - 1). The final section consisted of closed-ended questions regarding participants' practices related to sterile techniques. Questionnaires were reviewed for completeness and consistency by a supervisor. The research commenced after obtaining the necessary approvals. Participants were

provided with an explanation of the study, the importance of their participation, and the study's procedure and purpose. Questionnaires were distributed among the operating theater staff, accompanied by an explanation of the questionnaire and the study's objectives. Data collection was completed over a period of 60 days. A total of 181 operating room personnel were selected for the study. The sample size was determined using online software, following the formula $n = N / (1 + N(e)^2)$. After calculation, a sample size of 181 participants was chosen to represent the entire population of operating room personnel (340) working at Khyber Teaching Hospital in Peshawar. The study included all operating room staff working in the selected hospitals (KTH) who were available during the study period, irrespective of their registration level. Medical students or trainees and individuals on leave during the study period were excluded from participating in the study. The collected data was subjected to statistical analysis using SPSS version 2022, presenting results in tables, graphs, and pie charts, among other appropriate formats.

Results

This descriptive analysis involves a total of 181 participants. Table 1 provides a comprehensive overview of the demographic characteristics of the study participants. The age distribution is quite even, with most participants falling in the "25-30 Years" category, accounting for 44.2% of the total participants. The second-largest age group is "Above 35 Years," comprising 22.7% of the participants, indicating a diverse range of ages among the respondents. The "31-35 Years" and "18-24 Years" categories make up 17.7% and 15.5%, respectively, showing a balanced representation of different age groups.

Regarding gender, the study participants are predominantly male, constituting 74.0% of the sample, while females make up 26.0% of the participants. This gender distribution reflects a male-majority presence among the operating theater staff in the study area.

Marital status shows that most participants are "Married," representing 63.5% of the total. "Single" participants account for 35.9%, indicating a sizable portion of unmarried individuals. A very small percentage of "Divorced" individuals is 0.6%. The educational background among the participants is diverse. The most common educational level is "Diploma," encompassing 51.4% of the participants, indicating a significant presence of diploma holders in the operating theater staff. "MBBS" follows at 24.3%, "B.S." at 19.9%, and "MS/M.PHIL" at 4.4%, showcasing a range of educational qualifications among the participants.

Regarding years of experience, "Less than 10 years" is the most prevalent category, comprising 74.6% of the participants, highlighting a substantial portion of relatively less experienced individuals. The "11-20 Years" category represents 17.1%, and "21-30 Years" accounts for 7.7%, showing a moderate presence of more experienced staff. A small fraction of participants fall into the "Above 30 Years" experience category at 0.6%.

Out of 181 participants, 55 (30.4%) participants were working in Main O.T. of KTH hospital, 22 (12.2%) were in ENT, 10 (5.5%) were in central sterile supply department (CSSD), 14 (7.7%) were in general surgery O.T., 17 (9.4%) were in orthopedic O.T., 10 (5.5%) were in emergency O.T., 15 (8.3%) were in O.T. complex, 16 (8.8%) were in eye O.T., 14 (7.7%) were in Gynae OT and 8 (4.4%) participants were working in pediatric O.T. Out of 181 participants, 128 (70.7%) said that they received formal training regarding sterile techniques, while 53 (29.3%) participants told that, that they did not receive any training regarding sterile techniques (Figure 2). Most respondents, 177 (97.8%), knew that only sterile objects are used within the sterile field. Of all the respondents, 150 (82.9%) replied that tables are sterile at table level. Mostly, 172 (95%) participants answered that a sterile field is established until the time of use. Most respondents had good knowledge regarding sterile techniques (Table 2).

In general, knowledge regarding sterile was assessed by using 10 questions. Out of 181 participants, 148 (81.77%) had good knowledge, 22 (12.15%) had moderate knowledge, while 11 (6.08%) had poor knowledge regarding sterile techniques. (Figure 2) The attitude of the OR personnel was analyzed using the responses' means. Mean was calculated by using the values of strongly agreed (5), agreed (4), neutral (3), disagreed (2), and strongly disagreed. The mean above 3 shows a positive attitude, while below 3 shows a negative attitude. Table 3 shows that operating room personnel have a positive attitude toward sterile techniques. In general, out of 181 respondents, 162 (89.50%) had a positive attitude and 19 (10.50%) had negative attitude (Figure 3). Analysis showed that 97.2% of OR personnel practiced sterile techniques, 96.1% of OR personnel practiced sterile techniques every time, 91.2% of OR personnel used gloves, gown, and mask during assisting surgery, 93.9% OR personnel considered the doubtful sterile items to be contaminated, 96.7% OR personal touch only sterile item in the sterile field while 89.5% touch unsterile item in the unsterile field and 91.2% OR personal minimize their movement within the sterile field as shown in table 4. In general, out of the 181 participants, 153 (83.98%) had good practice, 24 (13.26%) had moderate practice, and 5 (2.76%) had poor practice as shown in Figure 4.

Table 1: Demographic Characteristics of Participants

Characteristic	Frequency	Percent
Age Group		
18-24 Years	28	15.5
25-30 Years	80	44.2
31-35 Years	32	17.7
Above 35 Years	41	22.7
Gender		

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Male	134	74.0
Female	47	26.0
Marital Status		
Single	65	35.9
Married	115	63.5
Divorced	1	0.6
Education Level		
Diploma	93	51.4
MBBS	44	24.3
MS/M.PHIL	8	4.4
BS	36	19.9
Experience		
Less than 10 years	135	74.6
11-20 Years	31	17.1
21-30 Years	14	7.7
Above 30 Years	1	0.6

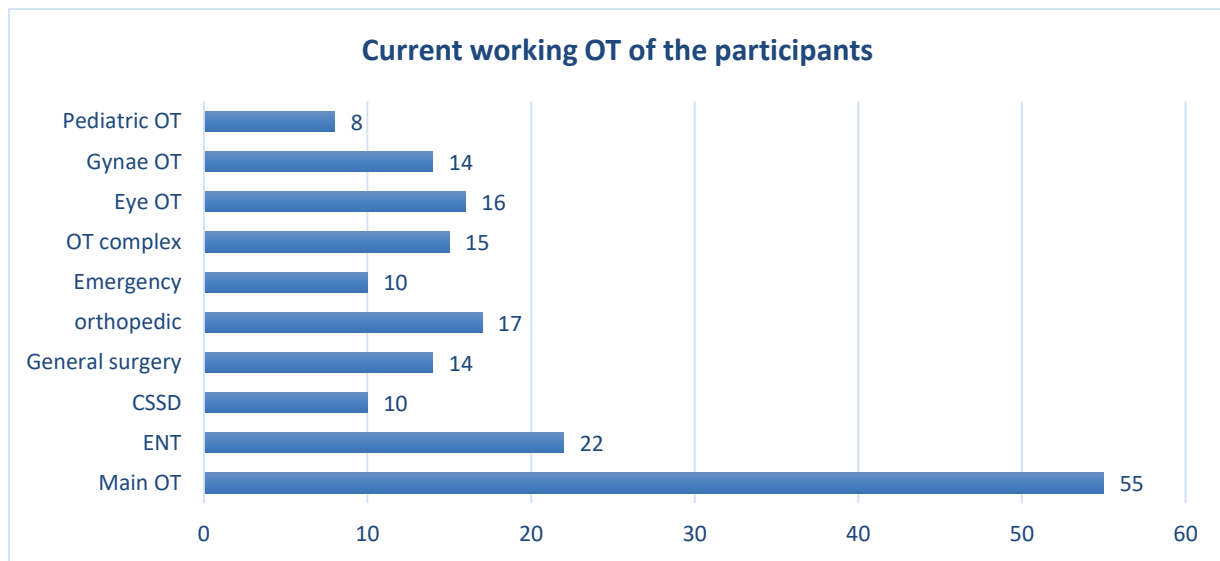


Figure 1: Current working O.T.

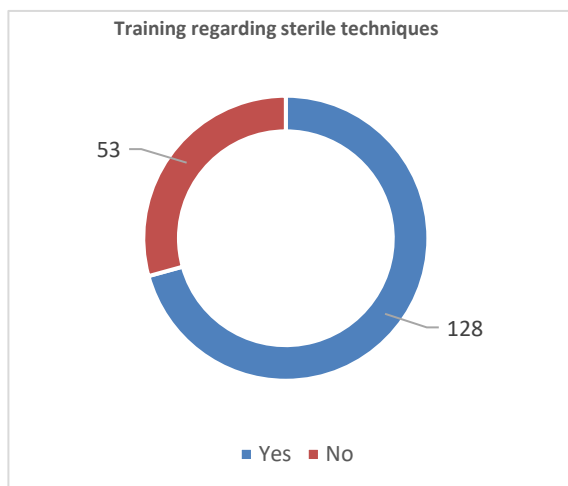


Figure 2: Training regarding sterile techniques.

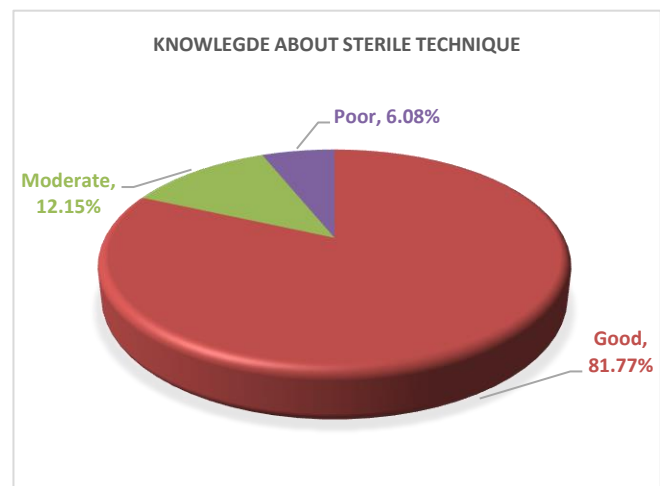


Figure 3: Knowledge about the sterile techniques:

Table 2 Knowledge of personnel regarding sterile

Statements	YES %	NO %
Just sterile objects are used in the sterile field	177 (97.8%)	4 (2.2%)
Sterilized packaging found in a contaminated area is not considered sterile	167 (92.3%)	14 (7.7%)
Tables are sterile only at table level.	150 (82.9%)	31 (17.1%)
Anything that falls or extends over the table's edge, such as sutures or suction tips, is considered unsterile.	150 (82.9%)	31 (17.1%)
A sterile field is established as close as possible to the time of use	172 (95%)	9 (5%)
A sterile field is contaminated whenever a sterile barrier is permeable.	157 (86.7%)	24 (13.3%)
Dressing and gloving should be done separately to prevent water from dripping onto sterile equipment or the table.	154 (85.1%)	27 (14.9%)
The stockinet cuffs are closed under sterile gloves.	157 (86.7%)	24 (13.3%)
The back of the gown is considered contaminated.	152 (84%)	29 (16%)
The gown is considered sterile only from the chest to the level of the sterile field in front and from 5 cm above the elbows to the sleeve cuffs	167 (92.3%)	14 (7.7%)

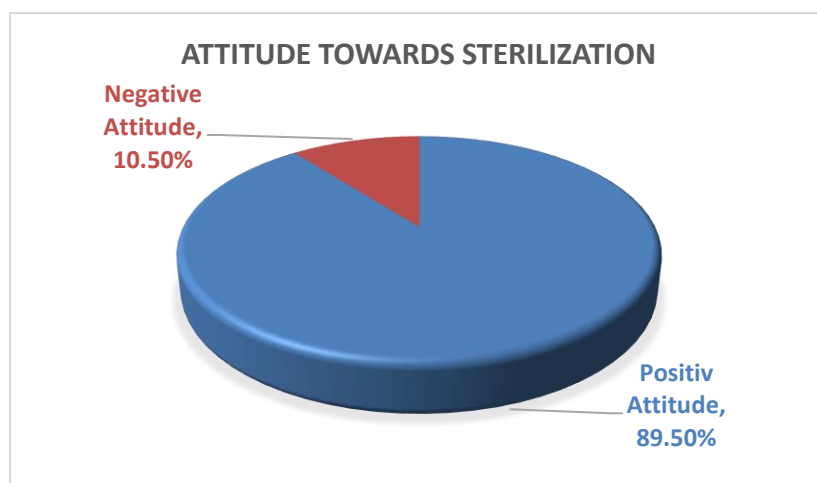


Figure 3: Attitude of the study population towards sterilization

Table 3 Attitude of the operating room personnel towards the sterilization

Statements	SD %	D %	N %	A %	S.A. %	MEA N	Std. dev
A sterile person should touch only sterile objects and vice versa.	3 (1.7%)	6 (3.3%)	7 (3.9%)	28 (15.5%)	137 (75.7%)	4.60	0.848
Sterile personnel must wear sterile gowns and gloves	6 (3.3%)	8 (4.4%)	4 (2.2%)	33 (18.2%)	130 (71.8%)	4.51	0.981
Dressing and gloving should be performed from a different sterile surface to prevent water from soaking into sterile equipment.	10 (5.5%)	2 (1.1%)	8 (4.4%)	48 (26.5%)	133 (62.4%)	4.39	1.031
The stockinet cuffs are closed under sterile gloves	5 (2.8%)	12 (6.6%)	8 (4.4%)	49 (27.1%)	107 (59.1%)	4.33	1.022
Sterile people must keep their hands in front of their eyes continuously and at waist level or above the level of the sterile field	2 (1.1%)	13 (7.2%)	5 (2.8%)	53 (29.3%)	108 (59.7%)	4.39	0.928
The back of the gown is considered contaminated	1 (0.6%)	5 (2.8%)	13 (7.2%)	53 (29.3%)	109 (60.2%)	4.46	0.792
The front of the gown is considered sterile only from the chest to the level of the sterile field and from 5 cm above the elbows to the sleeve cuffs.	6 (3.3%)	4 (2.2%)	14 (7.7%)	61 (33.7%)	93 (53%)	4.31	0.951
The non-sterile personnel does not directly touch the sterile field	3 (1.7%)	1 (0.6%)	22 (12.2%)	45 (24.9%)	110 (60.8%)	4.43	0.851
Sterile areas are continuously kept in view	5 (2.8%)	13 (7.2%)	9 (5%)	53 (29.3%)	101 (55.8%)	4.28	1.034
The outer package of the sterile package is opened, and the contents are removed with a sliding motion that ensures that the inner package is not touched	3 (1.7%)	5 (2.8%)	10 (5.5%)	42(23.2%)	121 (66.9%)	4.51	0.854

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Table 4 PRACTICE OF STERILE TECHNIQUE

Statements	YES	NO
Do you practice sterile technique?	176 (97.2%)	5 (2.8%)
Do you practice sterile techniques every time during the procedure?	174(96.1%)	7(3.9%)
Do you check whether the materials are sterile before use?	165(91.2%)	16(8.8%)
Do you wear a gown, gloves, and mask during facilitating surgery?	165(91.2%)	16(8.8%)
Do you use only sterile items within a sterile field?	174(96.1%)	7(3.9%)
Do you consider items of doubtful sterility to be contaminated?	170(93.9%)	11(6.1%)
Do you touch anywhere on the sterile gown?	51(28.2%)	130(71.8%)
As a sterile person, do you touch only sterile items or area?	175(96.7%)	6(3.3%)
As unsterile person, do you touch only unsterile items or areas?	162(89.5%)	19(10.5%)
Do you minimize movement within or around a sterile field?	165(91.2%)	16(8.8%)
Do you scrub your hands every time before assisting surgical procedure or invasive procedure	175(96.7%)	6(3.3%)
Do you keep your hand held above your elbow during surgical hand washing?	178(98.3%)	3(1.7%)

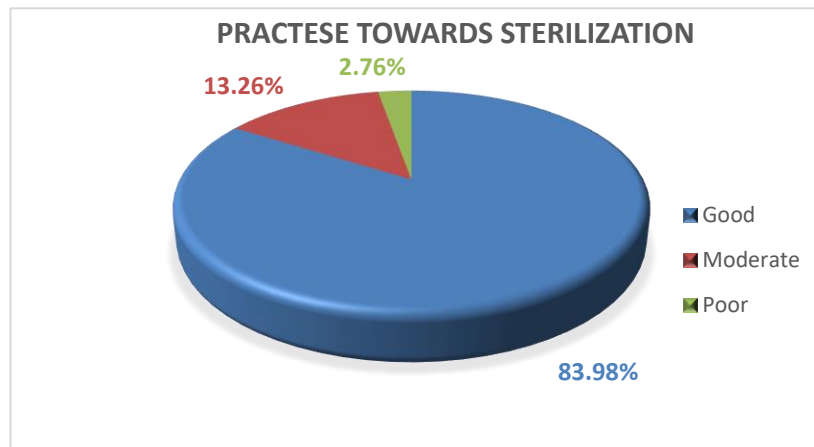


Figure 4: Practice of study population towards sterilization

Discussion

This study discovers the knowledge, attitude, and practice of sterile techniques among OR personnel in Khyber Teaching Hospital, Peshawar. OR personnel must have good knowledge, a positive attitude, and practice sterile techniques to provide effective perioperative care to surgical clients/patients. The analysis shows that the majority, 44.2%, of the contributors were between the age of 25-30 years, 17.7% were between 31-35 years, 22.7% were the age above 35 years, and 15.5% were between 18-24 years as shown in table 3.1. This conflicted with a report by Kigali, which revealed that the majority, 47.5% of the respondents, were the age above 35 years (Hinkle and Cheever, 2018). Regarding gender, the majority of the respondents, 74%, were males, and 26% of the respondents were females, as shown in Table 3.2. This conflicts with the report by Labrague, which revealed in their analysis that the majority of the respondents, 76.19%, were females while 23.81% were males (Labrague et al., 2012). Regarding educational level, the study showed that 51.4% of the respondents were diploma holders, 24.3% were MBBS doctors, and 4.4% were MS/M.PHIL graduates, and 19.6% were bachelor's graduates. Further analysis shows that 74.6% of the respondents had experience below 10 years and 70.7% received formal training regarding sterile techniques. These findings are supported by Dhakal, who revealed that the majority of respondents 80.4%, had completed medical diplomas, most of the participants 75%

had working skills of five years and below, and 35.7 had formal training in sterile technique (Dhakal et al., 2016). Regarding OR personal knowledge of sterile techniques, 148 (81.77%) of the respondents had good knowledge of sterile techniques, 22 (12.15%) had moderate knowledge, and 11 (6.08%) of the respondents had poor knowledge regarding sterile techniques. These findings agree with the Dhakal study, which declares that more than % of respondents, 62%, had the knowledge of sterile technique, 37.5% had moderate knowledge, and none of the respondents had low knowledge of sterile techniques (Dhakal et al., 2016). and Labrague, where the majority of the respondents, 57.14%, had excellent knowledge regarding sterile techniques and 38.09% had very good knowledge regarding sterile techniques (Labrague et al., 2012).

It is clear that 162 (89.50%) of the respondent had a positive attitude towards sterile techniques, and 19 (10.50%) had a negative attitudes. This report agrees with Kigali, which declares that the majority of their respondents had a positive attitude towards sterile techniques (Labrague et al., 2012). Concerning practice regarding sterile techniques, Analysis showed that 97.2% OR personnel practiced sterile techniques, 91.2% OR personal use glove, gown and mask during assisting surgery, 93.9% OR personal consider doubtful sterile item to be contaminated, 96.7% OR personal touch only sterile item in sterile field while 89.5% touch unsterile item in unsterile field. From Table 3.10, it is concluded that the majority, 152 (83.98%) of the

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respondents, 24 (13.26%) had moderate, and 5 (2.76) had low practice regarding sterile techniques. These findings agree with Leodoro's study, which revealed that the respondents had a great extent of practice regarding sterile technique.

Conclusion

This study evaluated the knowledge, attitude and practice of operating room personnel regarding sterile techniques at Khyber Teaching Hospital, Peshawar. The study's findings show that OR personnel have good knowledge regarding sterile techniques. A positive attitude towards sterile techniques and good practice of sterile techniques. Also, the study reveals the age, gender, level of education, experience level of the respondent, and formal training regarding sterile techniques. The study concluded that there is a direct relation between knowledge, attitude, and practice. When the respondents have knowledge of sterile techniques, their attitude towards sterile techniques will be positive, and they will have good practice with sterile techniques.

Declarations

Data Availability statement

All data generated or analyzed during the study are included in the manuscript.

Ethics approval and consent to participate.

Approved by the department concerned.

Consent for publication

Approved

Funding

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Conflict of interest

The authors declared an absence of conflict of interest.

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