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EVALUATION OF KNOWLEDGE, ATTITUDE AND PRACTICE AMONG GYNAE OPERATING ROOM STAFF ON STERILE TECHNIQUES IN MARDAN MEDICAL COMPLEX, MARDAN

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Abstract

Sterile technique practices are cornerstone to prevent infection in gynecology and obstetrics department that play a critical role to safeguard patient health during gynecological procedures. Gynecologists and other gynae operating room staff must strictly adhere to the standard sterile protocols to reduce the risk of surgical site infections, promote healing process and to minimize complications. The study aims to evaluate the knowledge, attitude and practice among gynae operating room staff on sterile techniques at Mardan Medical Complex, Mardan. A cross-sectional descriptive design was used, and data were collected from 110 staff members using a closed-ended structured questionnaire. The instrument assessed demographic information, and contained dedicated sections for knowledge, attitude, and practice, each measured on a 4-point Likert scale. A non-probability convenience sampling technique was used. All statistical investigations was performed by using IBM SPSS Version-22. Chi-square test was used to determine the association among knowledge, attitude and practice of sterile techniques. The findings revealed that the majority of participants demonstrated high knowledge (88.71%), a positive attitude (93.85%), and good practice (91.5%) toward sterile techniques. The knowledge, attitude and practice regarding the sterile techniques varied across different groups; the staff aged 31-40 years demonstrated the highest score in all three categories. In terms of education, staff with a BS (Bachelor of Science) degree had the highest knowledge (89.85%) and practice (92.80%). Staff with more than 10 years of experience unequivocally led all groups with the highest knowledge, attitude and practice. By designation, Technicians/Technologists scored higher in knowledge and attitude, while Gynecologists/Surgeons had a slightly higher practice score. A statistically significant relationships was found between knowledge, attitude, and practice ($p < 0.001$). The study recommends regular workshops, monitoring, and reinforcement of infection prevention practices to ensure patient safety and reduce surgical site infections in gynecological settings.

Frontier in Medical & Health Research

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INTRODUCTION

Infection control is essential for patient safety and quality healthcare. Healthcare-associated infections (HAIs) remain a major global challenge, increasing morbidity, mortality, hospital stay, and healthcare costs. The World Health Organization (WHO) reports that HAIs affect millions of patients annually, emphasizing the need for effective infection prevention strategies. Although international guidelines for sterilization and infection control exist, compliance remains inadequate, particularly in low- and middle-income countries, increasing the risk of infection transmission in healthcare settings (Kanwar et al., 2015; Alamri et al., 2024; Kartikasari et al., 2020).

Sterile techniques are evidence-based practices designed to prevent microbial contamination during surgical procedures. These include surgical hand hygiene, appropriate use of personal protective equipment (PPE), sterile handling of instruments, proper draping, and maintenance of a sterile surgical field. Adherence to these measures significantly reduces surgical site infections (SSIs) and improves patient outcomes. In gynecology and obstetrics, where procedures such as cesarean sections and hysterectomies are frequently performed, strict compliance with sterile protocols is particularly important to protect both maternal and neonatal health (Allegranzi et al., 2016; Suckleka et al., 2015; Alamri et al., 2024).

Standard sterile practices include proper hand hygiene, correct donning and doffing of PPE, safe handling and sterilization of surgical instruments, appropriate waste disposal, and maintenance of optimal operating room conditions. Steam sterilization using autoclaves, supported by chemical and biological indicators, remains the gold standard for ensuring instrument sterility. Failure to follow these practices increases the risk of cross-contamination and healthcare-associated infections (Shuai et al., 2025; Bharti et al., 2022; Zaman et al., 2021).

The Knowledge, Attitude, and Practice (KAP) model is widely used to evaluate healthcare workers' compliance with infection prevention measures. Knowledge reflects understanding of sterile techniques, attitude represents perceptions and willingness to comply with protocols, and practice refers to the actual implementation of these measures. Assessing all three domains helps identify gaps that may compromise patient safety and guides the development of targeted educational and institutional interventions (Andgrade et al., 2020; Garg et al., 2020; Nabavi et al., 2015; Almediani et al., 2021).

In gynecology operating rooms, inadequate adherence to sterile techniques may result in surgical site infections, prolonged hospitalization, infertility, maternal and neonatal complications, and increased healthcare costs. Contributing factors include inadequate training, heavy workload, limited resources, and weak policy enforcement. Evaluating the knowledge, attitudes, and practices of operating room staff is therefore essential for identifying deficiencies and improving compliance with infection prevention protocols, ultimately enhancing patient safety and quality of care (Hajar et al., 2022; Shaheen et al., 2023).

3. METHODOLOGY

This study employed a quantitative descriptive cross-sectional design to assess the knowledge, attitude, and practice (KAP) of sterile techniques among gynecology operating room staff. The research was conducted at Mardan Medical Complex (MMC), Mardan, a tertiary care teaching hospital in Khyber Pakhtunkhwa, Pakistan. The target population included surgeons, gynecologists, doctors, operating theater technologists, and technicians directly involved in surgical procedures and sterile practices. The study was completed over

Frontier in Medical & Health Research

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six months, covering proposal development, literature review, data collection, and analysis.

A convenience sampling technique was used to recruit participants who were available and willing to participate. The sample size was calculated using Cochran's formula, considering a population of 150, resulting in a final sample of 110 participants (Golja et al., 2020). Eligible participants were staff working in the gynecology operating room, directly involved in sterile techniques, aged 20 years or older, and willing to participate. Staff with less than six months of operating room experience or those unwilling to participate were excluded.

Data were collected using a structured, closed-ended questionnaire adapted from Almediani et al. (2021). The questionnaire comprised four sections: demographic characteristics, knowledge (10 items), attitude (10 items), and practice (10 items). Knowledge, attitude, and practice were assessed using four-point Likert scales appropriate to each domain. Scores were categorized using established cut-off values: 80–100% indicated high knowledge, positive attitude, and good practice; 60–79% indicated moderate knowledge, neutral attitude, and average practice; and scores below 60% indicated low knowledge, negative attitude, and poor practice (Kalingamudali et al., 2023).

Questionnaires were administered personally by the researcher during participants' duty hours after obtaining informed consent. Each questionnaire required approximately 20 minutes to complete, and confidentiality was maintained throughout the study.

Ethical approval and a No Objection Certificate (NOC) were obtained from the relevant hospital authority before data collection. Participation was voluntary, informed consent was obtained from all respondents, and confidentiality of participants' information was strictly maintained.

Data were analyzed using IBM SPSS Version 22. Descriptive statistics summarized demographic characteristics and KAP scores, while the Chi-square test was applied to determine the association among knowledge, attitude, and practice regarding sterile techniques.

4. RESULTS AND DISCUSSION

4.1 Results

This chapter describes the detail findings and discussion on the knowledge, attitude and practice of gynecological operating room staff regarding sterile techniques. The analysis includes descriptive statistics, frequency distributions, percentages, means, and chi-square test for association. The findings of this study provides significant insights regarding staff's adherence to sterile techniques, highlighting both commendable practices and areas that require improvement.

4.1.1. Demographic Characteristics of Gynae Operating Room Staff

Table 4.1 shows the demographic characteristics of the study population that include age, gender, years of experience, educational status and designation. The study included 110 Gynae operating room staff with diverse demographic characteristics. In terms of age, the majority (75.5%) were between 20-30 years old, while 16.4% fell within the 31-40 years age group, and 8.2% were 41 years or above. The gender distribution showed a predominance of females (66.4%) compared to males (33.6%). Regarding experience, 69.1% of the staff had 0-5 years of experience, whereas 15.5% had 6-10 years and another 15.5% had more than 10 years of experience. The education status revealed that 49.1% held MBBS/FCPS qualifications, 30.0% had a BS (Bachelor of Science), and 20.9% had a diploma. In terms of designation, 66.4% were Gynecologists /Surgeons/Doctors, and 33.6% were Technicians/Technologists. These demographic characteristics provide insight into the background

Frontier in Medical & Health Research

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and composition of the Gynae operating room staff participating in the study on sterile techniques.

Fig. 4.1 shows a visual representation of the demographic characteristics in bar chart, highlighting all the variables of demographics. This graphical depiction helps in quickly grasping the composition of the study participants and can aid in understanding how these factors might relate to knowledge, attitude, and practice regarding sterile techniques.

Table 4.1: ***Demographic Characteristics of the Study Population***

Demographic Characteristics	Frequency	Percentage
Age of Gynae Staff		
20-30 Years	83	75.5%
31-40 Years	18	16.4%
41 and Above	9	8.2%
Gender of Gynae Staff		
Male	37	33.6%
Female	73	66.4%
Years of Experience		
<5 Years	76	69.1%
6-10 Years	17	15.5%
> 10 Years	17	15.5%
Education Status		
Diploma	23	20.9%
BS (Bachleor of Science)	33	30.0%
MBBS/FCPS	54	49.1%
Designation of Gynae Staff		
Technician/Technologist	37	33.6%

Frontier in Medical & Health Research
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Gynecologist/Surgeon/Doctor	73	66.4%
Total	110	100%

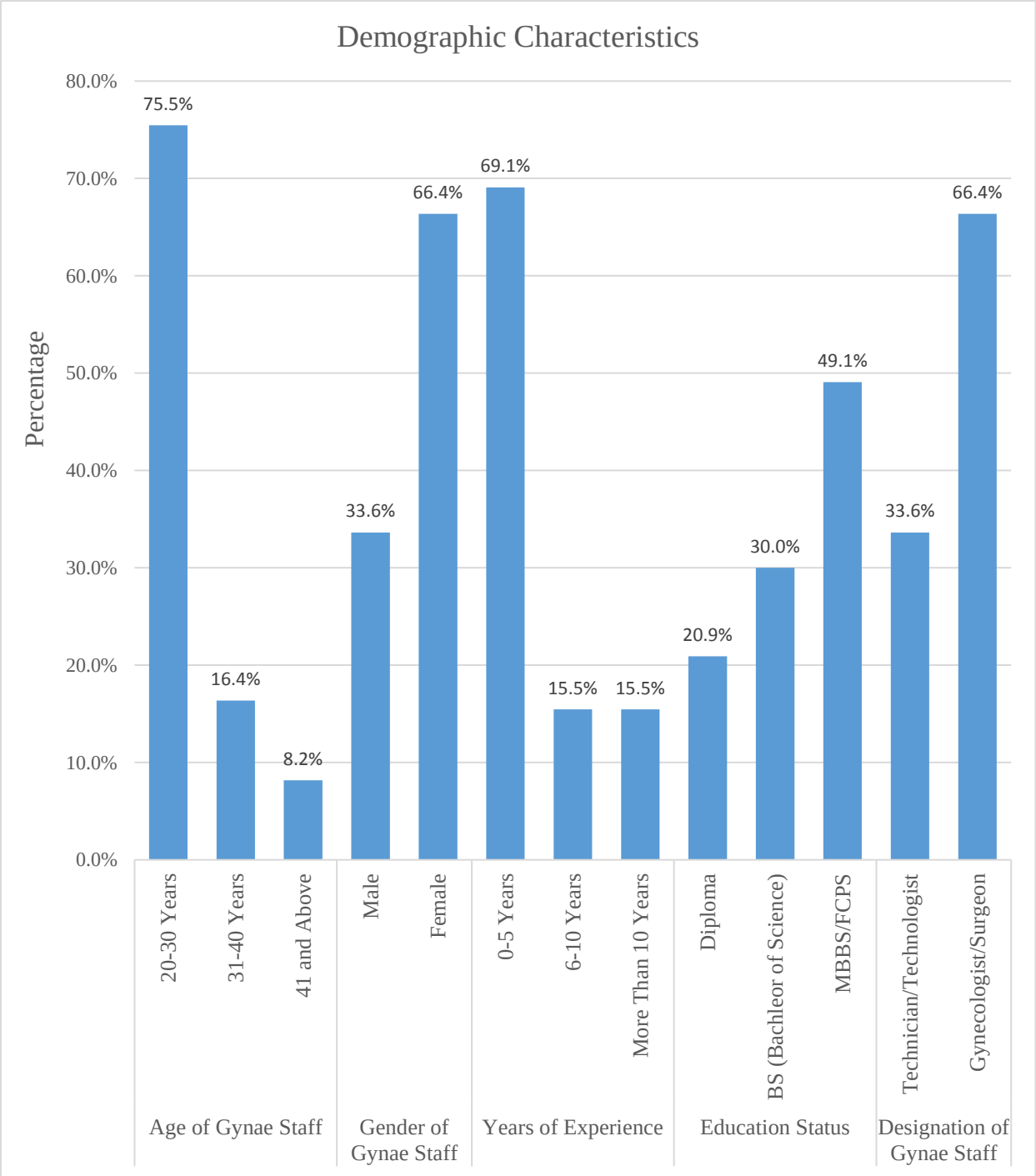

Figure 4.1: Demographic Characteristics of the Study Population

Frontier in Medical & Health Research

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4.1.2. Knowledge of Gynae Operating Room Staff towards Sterile Techniques

Table 4.2 shows that majority of the respondent's demonstrated good understanding of hand hygiene practices. Specifically, 78.2% (86 out of 110) of the respondents answered "Yes, Very Well", indicating a high level of knowledge about the correct method and required duration of hand hygiene. Additionally, 20.0% (22 out of 110) responded with "Yes, Well", showing a good level of knowledge. A minimal percentage, 1.8% (2 out of 110), indicated knowledge "Yes, To Some Extent". The average percentage of the variable is 94.1%, suggesting a high level of knowledge among the respondents regarding hand hygiene practices in the context of sterile techniques in the gynae operating room. In assessing the knowledge of proper donning and doffing techniques of wearing PPE among the staff, the results showed that a substantial proportion (79.1%) of the respondents reported knowing these techniques "Very Well", while 20.9% knew them "Well". The average percentage score for knowledge of these techniques is 94.75%, indicating a high level of knowledge among the gynae operating room staff regarding proper PPE usage techniques.

Our study results regarding the knowledge of standard components of proper surgical attire required in different zones of the surgical suite among gynae operating room staff in Mardan Medical Complex, Mardan, show that a majority (66.4%) of the respondents answered "Yes, Very Well", indicating a strong understanding of the standard components. A significant portion (24.5%) responded "Yes, Well", while some (9.1%) said "Yes, To Some Extent", indicating high knowledge with an average score of 89.25%. A considerable majority of participants demonstrated a strong understanding of the correct pattern of application for antiseptics at the surgical site in gynae operating rooms. Specifically, 71.8% (n=79) of respondents indicated they knew the pattern "Very Well", and 28.2% (n=31) knew it "Well". The average score for this knowledge variable is 93% which indicated a high level of knowledge with the correct application of antiseptics due to critical importance of maintaining sterility and strict adherence to established guidelines and protocols.

In this study, the knowledge about the role of laminar airflow in maintaining a sterile environment in the OR among gynecological operating room staff shows that 50% of respondents knew the role very well, 33.6% knew it well, 12.7% knew it to some extent, and 3.6% did not know the role. The average percentage score is 82.5%, indicating a high level of knowledge overall. The knowledge of the purpose of enzymatic cleaning/pre-soaking among gynecological operating room staff on sterile techniques indicated 50.0% of the respondents knew the purpose "Very Well", 27.3% knew it "Well", 18.2% knew it "To Some Extent", and only 4.5% did not know the purpose. The average percent value for the response is 80.75%. This indicates that a majority of the gynecological operating room staff have a good understanding of the purpose of enzymatic cleaning/pre-soaking in sterile techniques.

In the study, the level of knowledge regarding different types of indicators used to monitor the sterilization process showed that 57 (51.8%) of the staff knew the different types of indicators "Very Well", 38 (34.5%) knew them "Well", and 15 (13.6%) knew them "To Some Extent". Cumulatively, 86.4% of the respondents knew the different types of indicators "Very Well" or "Well". The average percent value of 84.50% showed that the Gynae operating room staff have high knowledge about the different types of indicators that are used to monitor the sterilization process.

Frontier in Medical & Health Research

ISSN: (e) 3007-1607 (p) 3007-1593

The assessment of knowledge about the different methods of sterilization used in healthcare settings revealed that majority of respondents (55.5%) said they know the methods "Very Well", and another 29.1% said they know them "Well". A smaller percentage (13.6%) said they know the methods "To Some Extent", and very few (1.8%) said they do not know the methods. The average percent value of the responses is 84.5%, indicating a generally high level of knowledge among respondents about sterilization methods in Gynae operating room staff.

The assessment of critical parameters for standard autoclave sterilization cycles among gynae staff shows varying levels of knowledge. In terms of knowing the critical parameters (temperature, time, pressure), 50% of the staff responded "Yes, Very Well", indicating a strong understanding. Another 20.9% said "Yes, Well", showing a good grasp. Meanwhile, 22.7% knew the parameters "To Some Extent", and a small percentage (6.4%) did not know the critical parameters at all. The average percent score for knowledge of this variable is 78.5%, which shows a moderate level of knowledge about the critical parameters for standard autoclave sterilization cycle. This moderate level of knowledge suggests for improvements in the staff's knowledge as compared to other variables of this study. In our study, examining the knowledge of staff on how to fumigate the Operating Room (OR), results from 110 staff members were analyzed. The findings indicate that 47.3% of the staff know very well how to fumigate the OT. 28.2% of the staff know well how to fumigate. 15.5% of the staff know to some extent, meanwhile, 9.1% of the staff do not know how to fumigate the OT. Overall, the average percent for the responses is 78.25% which shows moderate level of knowledge about the fumigation of OR and need improvement to understand how the operating room is fumigated.

The gynecological operating room staff exhibits a commendable level of knowledge to sterile techniques, with an impressive overall average percent score of 88.71%. This reflects a high level of knowledge regarding sterile techniques, ultimately contributing to a safe and infection-controlled surgical environment.

Fig. 4.2 shows a graphical representation of the data in the form of a bar chart, which visually depicts the frequency, percentage and mean cutoff of the respondents' knowledge regarding sterile techniques that facilitates more comprehensive understanding of the findings.

Table 4.2: ***Knowledge of Gynae Operating Room Staff on Sterile Techniques***

Q #	Questions	Scale	Frequency (n)	Percent (n %)	Average Percent (N)
K1	Do you know the correct method and required duration of hand hygiene (hand wash, hand rub, hand scrub)?	Yes, Very Well	86	78.2%	94.10%
		Yes, Well	22	20.0%	
		Yes, To Some Extent	2	1.8%	
		No	0	0%	

Frontier in Medical & Health Research

ISSN: (e) 3007-1607 (p) 3007-1593

K2	Do you know the proper donning and doffing techniques of wearing PPE?	Yes, Very Well	87	79.1%	94.75%
		Yes, Well	23	20.9%	
		Yes, To Some Extent	0	0%	
		No	0	0%	
K3	Do you know the standard components of proper surgical attire required in different zones of the surgical suite?	Yes, Very Well	73	66.4%	89.25%
		Yes, Well	27	24.5%	
		Yes, To Some Extent	10	9.1%	
		No	0	0%	
K4	Do you know the correct pattern of application for antiseptics at the surgical site?	Yes, Very Well	79	71.8%	93%
		Yes, Well	31	28.2%	
		Yes, To Some Extent	0	0%	
		No	0	0%	
K5	Do you know the role of laminar airflow in maintaining a sterile environment in OR?	Yes, Very Well	55	50.0%	82.50%
		Yes, Well	37	33.6%	
		Yes, To Some Extent	14	12.7%	
		No	4	3.6%	
K6	Do you know the purpose of enzymatic cleaning/pre-soaking?	Yes, Very Well	55	50.0%	80.75%
		Yes, Well	30	27.3%	
		Yes, To Some Extent	20	18.2%	
		No	5	4.5%	

Frontier in Medical & Health Research

ISSN: (e) 3007-1607 (p) 3007-1593

		Yes, Very Well	57	51.8%	
		Yes, Well	38	34.5%	
K7	Do you know the different types of indicators used to monitor sterilization process?	Yes, To Some Extent	15	13.6%	84.50%
		No	0	0%	
		Yes, Very Well	61	55.5%	
		Yes, Well	32	29.1%	
K8	Do you know the different methods of sterilization used in healthcare setting?	Yes, To Some Extent	15	13.6%	84.50%
		No	2	1.8%	
		Yes, Very Well	55	50.0%	
		Yes, Well	23	20.9%	
K9	Do you know the critical parameters (temperature, time, pressure) for standard autoclave sterilization cycle?	Yes, To Some Extent	25	22.7%	78.50%
		No	7	6.4%	
		Yes, Very Well	52	47.3%	
		Yes, Well	31	28.2%	
K10	Do you know how to fumigate the Operating Room?	Yes, To Some Extent	17	15.5%	78.25%
		No	10	9.1%	
Total Average					88.71%

Volume 4, Issue 6, 2026

Frontier in Medical & Health Research

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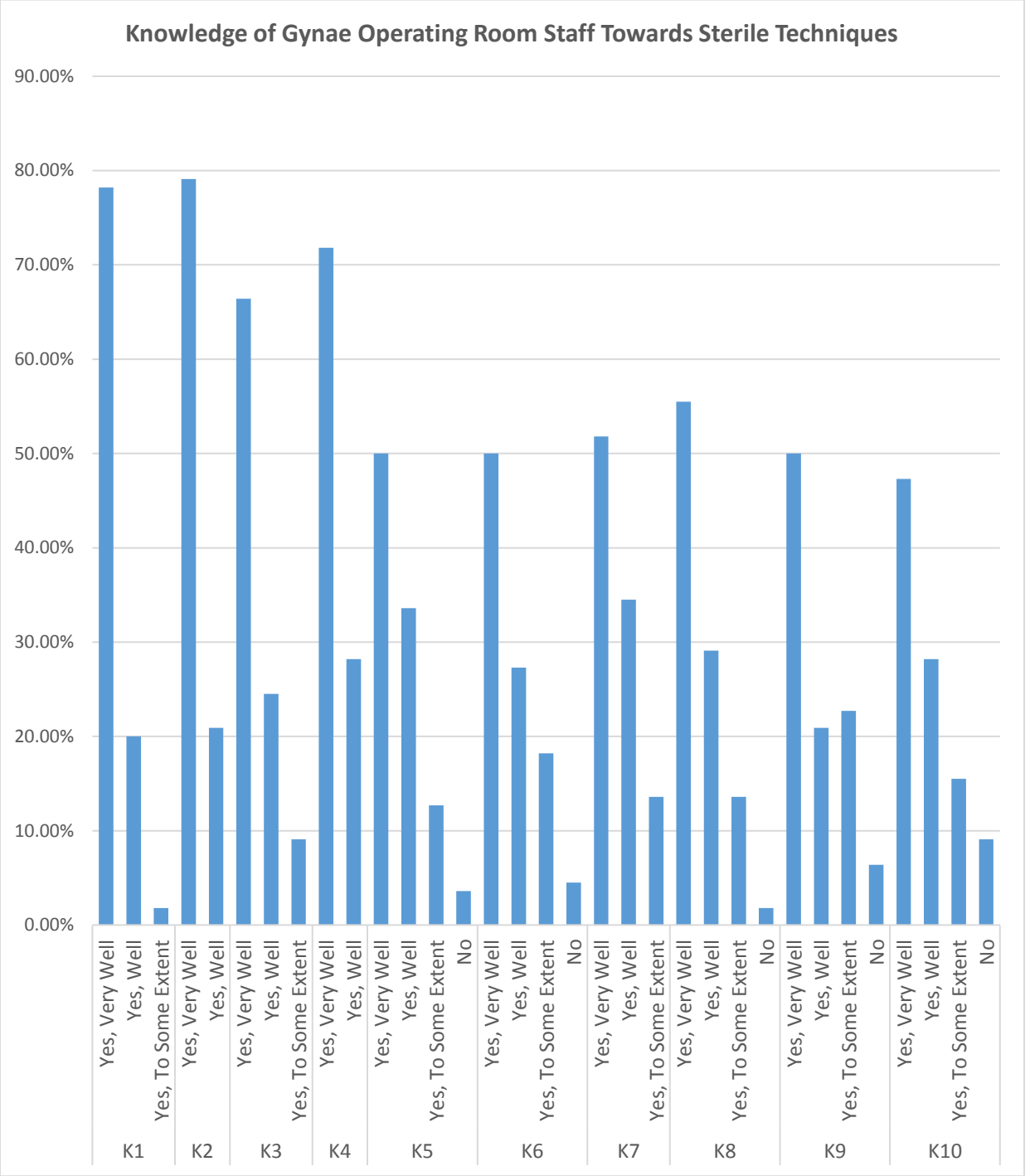

Figure 4.2: Knowledge of Gynae Operating Room Staff on Sterile Techniques

4.1.3. Attitude of Gynae Operating Room Staff towards Sterile Techniques

Table 3.3 shows that, Gynae operating room staff should wear full PPE (gown, gloves, mask, cap etc.) during the procedure show a strong consensus in favor of this practice. Out of 110 responses, 97 respondents (88.2%) strongly agreed that full PPE should be worn, while 13 respondents (11.8%) agreed. This indicates that majority of the respondents were in agreement on the necessity of

Frontier in Medical & Health Research

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wearing full PPE during gynae procedures. The average percent score for the responses was 97%, reflecting a high level of attitude on the importance of full PPE in gynae operating rooms. To assess the attitude of hand hygiene practice among Gynae OR staff before and after each procedure, it is noted that a significant majority, 74.5%, strongly agreed that Gynae OR staff should practice hand hygiene before and after each procedure, while 20.9% only agreed with this statement. A small percentage, 4.5%, remained neutral on the matter. The average percent score for the responses was 92.50% which suggest a positive attitude towards hand hygiene before and after each procedure.

A considerable majority of participants demonstrated positive attitude that the Gynae staff should follow the correct sequence for donning and doffing of PPE. A significant majority of 78.2%, strongly agreed that gynae staff should adhere to the proper sequence. Additionally, 21.8% of the total respondents, only agreed with the statement. The average percent score is 94.50%, which highlights positive attitude among respondents working in the Gynae operating room. The findings indicate the importance of prioritizing sterile techniques in the gynecological operating room. A significant majority, 78.2% of respondents (86 out of 110), strongly agreed that sterile techniques should be a top priority in operating room. An additional 19.1% (21 respondents) agreed with this stance, bringing the cumulative percentage to 97.3%. Only a small percentage, 2.7% remained neutral on the matter. The average percent score of 93.75% determines a positive attitude and strong adherence to sterile techniques in the gynecological operating room.

Regarding whether gynecology staff should require vaccination before working in the operating room, majority of respondents were in favor of mandatory vaccination. Specifically, 63 respondents (57.3%) strongly agreed with the requirement, and 43 respondents (39.1%) agreed. Only 4 respondents (3.6%) remained neutral on the matter. The average percent of 88.5% indicates positive attitude towards vaccination before working the operating room. In response to the attitude of dealing the staff with sharp disposable items in accordance with the color-coded dustbin system, the result showed 79.1% of the respondents strongly agreed that Gynae staff should know how to deal with sharp disposable items in accordance with the color-coded dustbin system. Meanwhile, 20.9% respondents agreed with the statement. With all respondents either agreeing or strongly agreeing, an average percent value of 94.75% indicates a positive attitude among respondents.

Our findings revealed that 81.8% of the respondents strongly agreed that the gynae staff should be helped to understand the importance of sterile techniques if they notice a breach. Meanwhile, 16.4% respondents agreed with the statement, and only 1.8% respondents were neutral. In summary, the vast majority of respondents (98.2% when combining "Strongly Agree" and "Agree") supported the notion that gynae staff should be helped to understand the importance of sterile techniques upon noticing a breach. The average percent value for the responses was 95%, indicating a positive attitude towards the importance of sterile techniques.

The findings of the study revealed that the majority of the gynecology operating room staff strongly agreed that regular audits should be conducted to ensure adherence to sterile techniques. Out of a total of 110 participants, 84 respondents, representing 76.4%, strongly agreed with the statement, while 26 respondents, making up 23.6%, agreed. This indicates that all participants were in favor of conducting regular audits, with none expressing disagreement. The average percent

Frontier in Medical & Health Research

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score was 94%, suggesting a positive attitude among the staff toward the importance of regular audits in maintaining sterile techniques.

The findings of the study indicates an overwhelmingly positive response from gynecology staff regarding participation in regular team briefings to reinforce sterile techniques. The vast majority, 70.9% of respondents, strongly agreed while the remaining 29.1% agreed merely. The average percent score of 92.75% revealed a positive attitude regarding the sterile techniques.

An overwhelming majority of gynecology operating room staff agree that there should be a team leader responsible for monitoring sterility during procedures, with 84.5% of respondents strongly agreed and a further 13.6% merely agreed with the statement. This means that 98.2% of the 110 participants expressed a positive stance on the statement. A very small minority, 1.8%, remained neutral on the matter. The collective attitude is further confirmed by the high average score of 95.75%, which indicates a positive attitude that there should be a team leader responsible for monitoring sterility during procedures.

Gynecological operating room staff demonstrate positive attitude with respect to maintaining of the sterile techniques, achieving a notable overall aggregate score of 93.75%. This underscores their expertise in upholding rigorous infection control standards that plays a crucial role in ensuring the safety and sterility of surgical procedures.

Fig. 4.3 shows a graphical representation of the data in the form of a bar chart, which illustrates the distribution of attitudes toward sterile techniques, highlighting key trends and patterns in the data providing a clearer understanding of the staff's perspectives.

Table 4.3: ***Attitude of Gynae Operating Room Staff on Sterile Techniques***

Q #	Questions	Scale	Frequency (n)	Percent (n %)	Average Percent (N %)
A1	Gynae operating room staff should wear full PPE (gown, gloves, mask, cap etc.) during the procedure?	Strongly Agree	97	88.2%	97%
		Agree	13	11.8%	
		Neutral	0	0%	
		Disagree	0	0%	
A2	Gynae OR staff should practice hand hygiene before and after each procedure?	Strongly Agree	82	74.5%	92.5%
		Agree	23	20.9%	
		Neutral	5	4.5%	
		Disagree	0	0%	
A3	Do you think that gynae staff should follow correct sequence for donning and doffing of PPE?	Strongly Agree	86	78.2%	94.5%

Frontier in Medical & Health Research

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		Agree	24	21.8%	
		Neutral	0	0%	
		Disagree	0	0%	
		Strongly Agree	86	78.2%	
A4	Do you think that sterile techniques should be a top priority in the gynae operating room?	Agree	21	19.1%	93.75%
		Neutral	3	2.7%	
		Disagree	0	0%	
		Strongly Agree	63	57.3%	
A5	Gynae staff should require vaccination before working in the department?	Agree	43	39.1%	88.50%
		Neutral	4	3.6%	
		Disagree	0	0%	
		Strongly Agree	87	79.1%	
A6	Gynae staff should know how to deal with sharp disposable items in accordance with the color-coded dustbin system?	Agree	23	20.9%	94.75%
		Neutral	0	0%	
		Disagree	0	0%	
		Strongly Agree	90	81.8%	
A7	Do you think the gynae staff should be helped to understand the importance of sterile techniques if they notice a breach in them?	Agree	18	16.4%	95%
		Neutral	2	1.8%	
		Disagree	0	0%	
		Strongly Agree	84	76.4%	
A8	Do you think the gynae staff should conduct regular audits to ensure adherence to sterile techniques?	Agree	26	23.6%	94%
		Neutral	0	0%	
		Disagree	0	0%	

Frontier in Medical & Health Research

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A9	Gynae staff should participate in regular team briefings to discuss and reinforce sterile techniques?	Strongly Agree	78	70.9%	92.75%
		Agree	32	29.1%	
		Neutral	0	0%	
		Disagree	0	0%	
A10	Gynae staff should have a team leader responsible for monitoring sterility during the procedures?	Strongly Agree	93	84.5%	95.75%
		Agree	15	13.6%	
		Neutral	2	1.8%	
		Disagree	0	0%	
Total Average Attitude					93.85%

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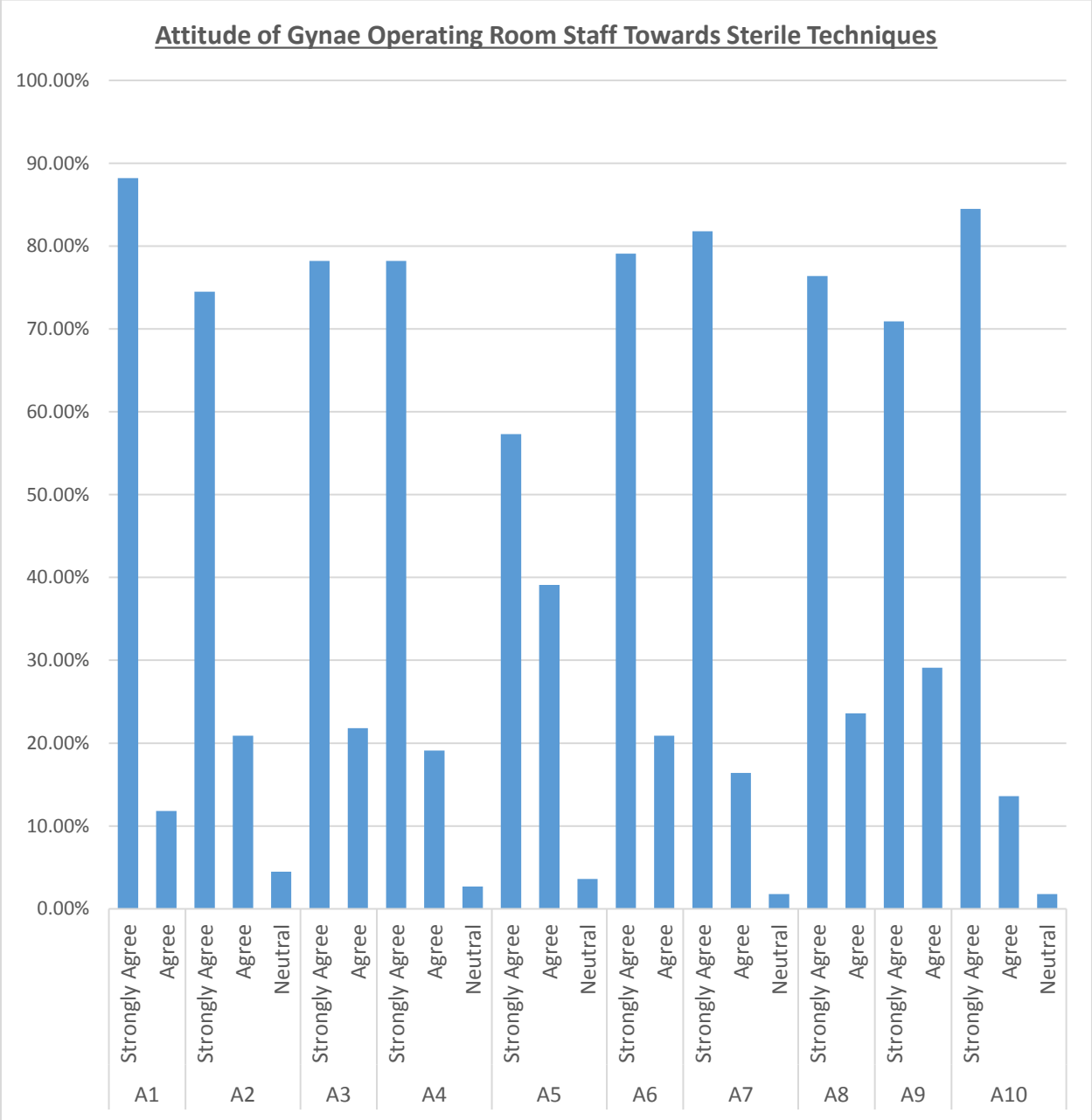

Figure 4.3: Attitude of Gynae Operating Room Staff on Sterile Techniques

4.1.4. Practice of Gynae Operating Room Staff towards Sterile Techniques

Table 4.4 shows that, in response to the practice of sterile techniques every time during a procedure, 80% of the respondents stated they 'Always' practice sterile techniques. 14.5% respondents indicated they do so 'Most of the time', and a smaller group of 5.5% respondents said they practice sterile techniques 'Sometimes'. The average response of 93.50% for practicing of sterile techniques indicate a good practice towards sterile techniques every time during the procedures. Likewise, the findings in our study on the use of full Personal Protective Equipment (PPE) during a procedure, the majority of respondents 82.7% wear full PPE always, 11.8% wear it most of the time,

Frontier in Medical & Health Research

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3.6% wear it sometimes, and 1.8% wear it rare. The average score of 93.75% indicate a good practice of wearing full PPE during the procedure. In response to the practice of hand hygiene, 78.2% of the participants always wash hands with antiseptic before and after handling patients. 17.3% respondents said they do this most of the time, and 4.5% respondents do it sometimes. Overall, 95.5% of respondents wash hands with antiseptic always or most of the time before and after handling patients. The 93.50% average value reveal a good practice of hand wash with antiseptics before and after patient handling.

Checking material sterilization before use was the most consistently reported practice, with 86.4% of respondents always check materials. Meanwhile, 13.6% of the remaining respondents check most of the time. The average value of 96.50% report a good practice regarding the checking of materials for sterilization before use. Communication with team about maintaining sterile techniques was done by 55.5%, and most of the time by 36.4%, resulting in an average value of 86.75% which reveal good practice of communication with team members about maintaining sterile techniques. Avoiding touching non sterile objects with gloved hands was the practice with the highest adherence as 91.8% reported always doing so, while 8.2% adhere to this practice most of the time contributing to the highest average score of 97.75% that indicates the staff demonstrate good practice in avoiding to touch pens or other non-sterile objects when gloved hands.

Following color coded dustbin for waste disposal was always practiced by 58.2% and most of the time by 33.6%, meanwhile 6.4% sometimes follow this practice while 1.8% do so rarely. The average score of 87% indicate that the staff have good practice to follow color coding dustbins while disposing waste. The use of single-use items for HIV and Hepatitis suspected patients was always reported by 88.2%, while 11.8% of the respondents used this for most of the time, resulting an average percent of 97% which indicate good practice regarding the use of single-use items for HIV and Hepatitis suspected patients. Regarding the loading and unloading of BP Handle, the majority of respondents 64.5% always use instruments/forceps for placement and removal of blades from the BP handle to maintain sterility, 27.3% do this most of the times, and 8.2% use this technique sometimes. The average percent score of 89% for this practice indicate that it is a good practice for staff to use instruments or forceps for placement and removal of blades from the BP handle to maintain sterility. Participation in training on sterile techniques was always reported by 47.3%, followed by 32.7% participating most of the time, while 10.9% and 9.15% participated sometimes and rare respectively, resulting an average score of 79.5% which reveal moderate level of practice towards participation in training or other programs on sterile techniques.

The overall adherence to sterile techniques among gynecological operating room staff is notably high, as evidenced by the collective average score of 91.50%, resulting good practice in maintaining sterile techniques which ensures a general safe surgical environment.

Fig. 4.4 shows a graphical representation of the data in the form of a bar chart, which visually depicts the frequency, percentage and mean cutoff of the respondents' practice regarding sterile techniques that facilitates more comprehensive understanding of the findings.

Frontier in Medical & Health Research

ISSN: (e) 3007-1607 (p) 3007-1593

Table 4.4: *Practice of Gynae Operating Room Staff on Sterile Techniques*

Q #	Questions	Scale	Frequency (n)	Percent (n %)	Average percent (N %)
P1	Do you practice sterile techniques every time during the procedure?	Always	88	80.0%	93.50%
		Most of the time	16	14.5%	
		Sometimes	6	5.5%	
		Rare	0	0%	
P2	Do you wear full PPE during the procedure?	Always	91	82.7%	93.75%
		Most of the time	13	11.8%	
		Sometimes	4	3.6%	
		Rare	2	1.8%	
P3	Do you wash hands with antiseptic before and after handling patients?	Always	86	78.2%	93.50%
		Most of the time	19	17.3%	
		Sometimes	5	4.5%	
		Rare	0	0%	
P4	Do you check whether the materials are sterilized before use?	Always	95	86.4%	96.5%
		Most of the time	15	13.6%	
		Sometimes	0	0%	
		Rare	0	0%	
P5	Do you communicate with your team about maintaining sterile techniques?	Always	61	55.5%	86.75%
		Most of the time	40	36.4%	
		Sometimes	9	8.2%	
		Rare	0	0%	
P6	Do you avoid touching pen or any other non-	Always	101	91.8%	97.75%

Frontier in Medical & Health Research

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	sterile objects with gloved hands?	Most of the time	9	8.2%	
		Sometimes	0	0%	
		Rare	0	0%	
		Always	64	58.2%	
P7	Do you follow color coding dustbins while disposing waste?	Most of the time	37	33.6%	87%
		Sometimes	7	6.4%	
		Rare	2	1.8%	
		Always	97	88.2%	
P8	Do you use single-use items for HIV and Hepatitis suspected patients?	Most of the time	13	11.8%	97%
		Sometimes	0	0%	
		Rare	0	0%	
		Always	71	64.5%	
P9	Do you use instrument /forceps (instead of fingers) for placement and removal of blades from the BP handle to maintain sterile techniques?	Most of the times	30	27.3%	89%
		Sometimes	9	8.2%	
		Rare0	0%		
		Always	52	47.3%	
P10	Do you participate in trainings or educational programs on sterile techniques?	Most of the time	36	32.7%	79.50%
		Sometimes	12	10.9%	
		Rare	10	9.1%	
Total Average Practice					91.50%

Frontier in Medical & Health Research

ISSN: (e) 3007-1607 (p) 3007-1593

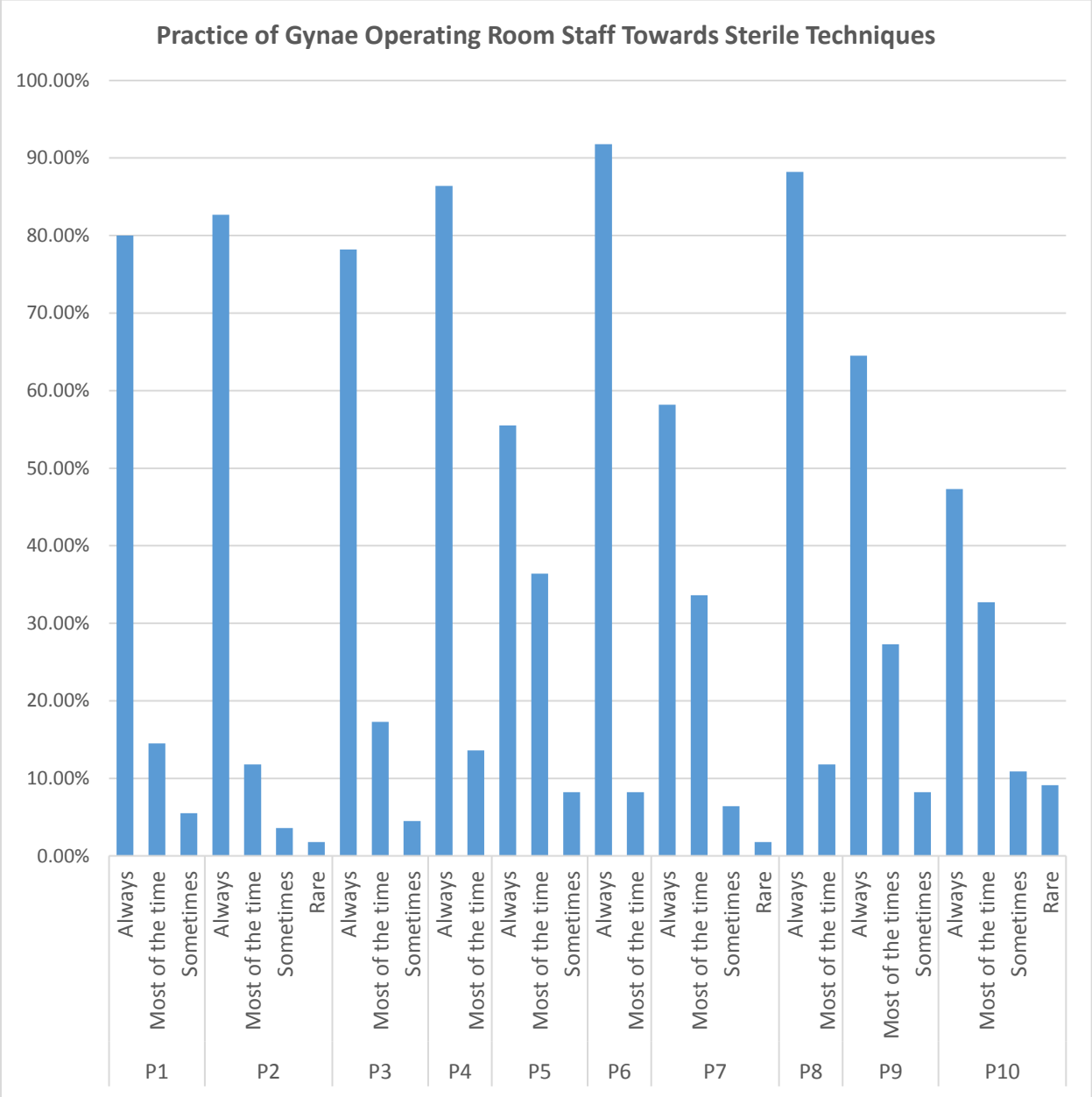

Figure 4.4: Practice of Gynae Operating Room Staff on Sterile Techniques

4.1.5. Association between Demographic Variables and Knowledge, Attitude and Practice

Table 4.5 shows the analysis of gynecological staff reveals variations in Knowledge, Attitude, and Practice (KAP) scores across different demographics. When examined by age, staff in the 31-40 years group demonstrated the highest scores in all three categories, with 89.30% knowledge, 96.68% attitude, and 93.75% practice, outperforming the 20-30 years and 41 and above age groups.

Regarding gender, the differences were minimal; male staff had a slightly higher knowledge score (88.30%) compared to females (84.90%), while female staff showed a marginally better practice score (91.65%), and attitudes were nearly identical.

In terms of education, staff with a BS (Bachelor of Science) degree had the highest knowledge

Frontier in Medical & Health Research

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(89.85%) and practice (92.80%), whereas those with an MBBS/FCPS had the most positive attitude (94.90%). Diploma holders consistently had the lowest scores across all three KAP categories.

Years of experience showed a strong positive correlation with performance; staff with more than 10 years of experience unequivocally led all groups with the highest knowledge (93.68%), attitude (97.05%), and practice (95.00%), followed by those with 6-10 years and then those with less than 5 years of experience.

Finally, by designation, Technicians/Technologists scored higher in knowledge (88.92%) and attitude (93.96%), while Gynecologists/Surgeons had a slightly higher practice score (91.85%). Overall, the most experienced staff were the highest performers, with the 31-40 age group and BS degree holders also ranking highly regarding the adherence with the sterile techniques.

Fig.4.5 shows the association between demographic variables and knowledge, attitude and practice in the form of bar chart for better understanding and comparison. The bar chart shows the percentages of knowledge, attitude and practice among gynae operating staff based on age, gender, education status, years of experience and designation.

Table 4.5: ***Association between Demographic Variables and Knowledge, Attitude and Practice***

Variables	Mean Knowledge	ofPercent Knowledge	ofMean Attitude	ofPercent Attitude	ofMean Practice	ofPercent of Practice
Age of Gynae Staff						
20-30 Years	34.11	85.28%	37.43	93.58%	36.52	91.30%
31-40 Years	35.72	89.30%	38.67	96.68%	37.50	93.75%
41 and Above	34.67	86.68%	36.33	90.82%	35.56	88.90%
Gender of Gynae Staff						
Male	35.32	88.30%	37.57	93.92%	36.49	91.22%
Female	33.96	84.90%	37.53	93.82%	36.66	91.65%
Education Status						
Diploma	33.30	83.25%	36.48	91.20%	34.22	85.86%
BS (Bachleor of Science)	35.94	89.85%	37.61	94.02%	37.12	92.80%
MBBS/FCPS	33.96	84.90%	37.96	94.90%	37.30	92.25%
Years of Experience						
<5 Years	33.61	84.02%	37.24	93.10%	36.11	90.27%
6-10 Years	35.00	87.5%	37.65	94.12%	37.41	92.76%

Frontier in Medical & Health Research
ISSN: (e) 3007-1607 (p) 3007-1593

>10 Years	37.47	93.68%	38.82	97.05%	38.00	95%
Designation of Gynae Staff						
Technician/ Technologist	35.57	88.92%	37.59	93.96%	36.32	90.80%
Gynecologist /Surgeon	33.84	84.60%	37.52	93.80%	36.74	91.85%

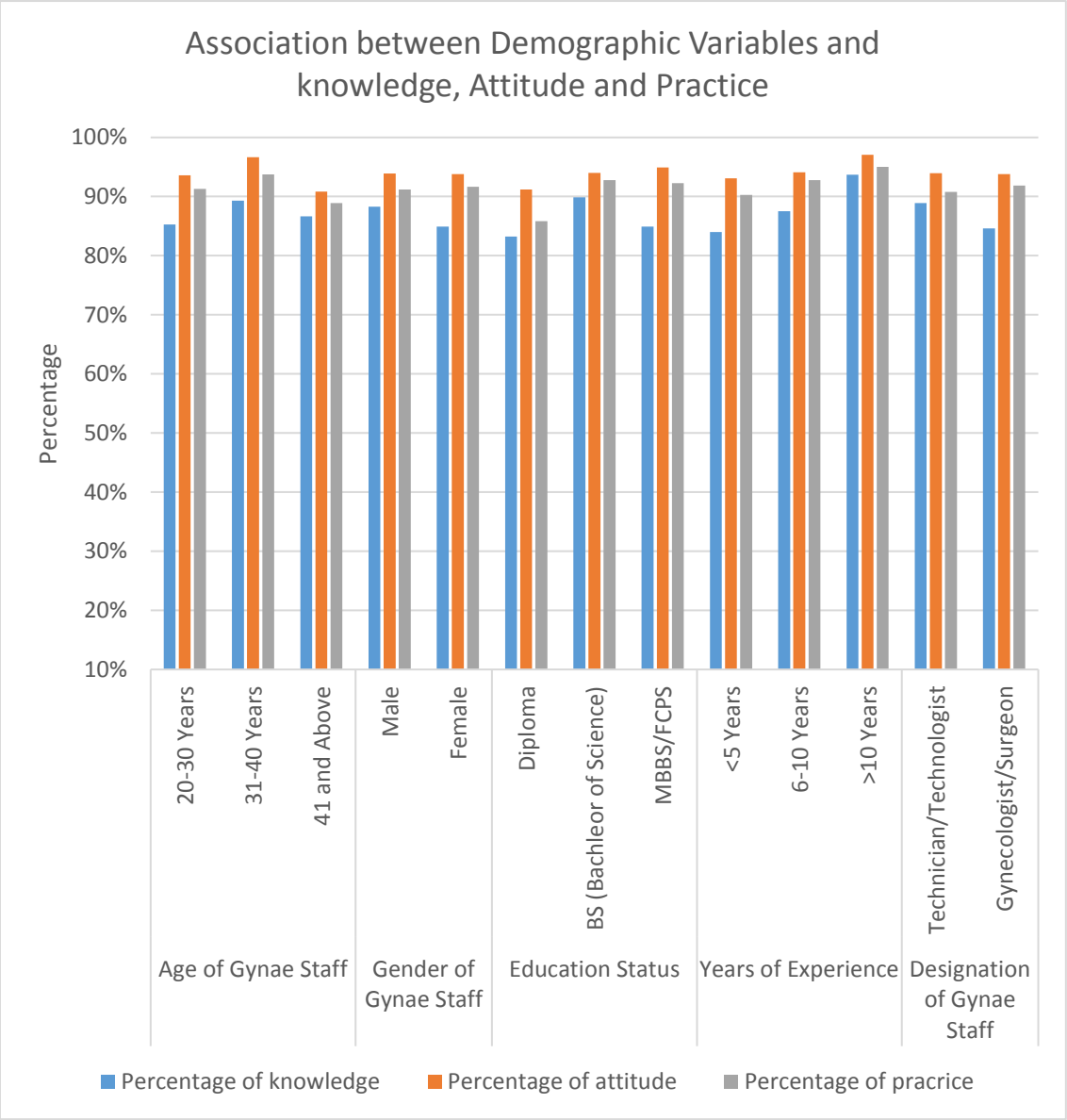

Figure 4.5: Association between Demographic Variables and Knowledge, Attitude and Practice

Frontier in Medical & Health Research

ISSN: (e) 3007-1607 (p) 3007-1593

4.1.6. Average Percent Score of Knowledge, Attitude and Practice

Table 4.6 shows that the gynecological operating room staff exhibits a commendable level of knowledge to sterile techniques, with an impressive overall average score of 88.71%. This reflects a high knowledge regarding sterile techniques, ultimately contributing to a safe and infection-controlled surgical environment.

Gynecological operating room staff demonstrate positive attitude with respect to maintaining of the sterile techniques, achieving a notable overall average score of 93.85%. This underscores their expertise in upholding rigorous infection control standards that plays a crucial role in ensuring the safety and sterility of surgical procedures.

The overall adherence to sterile techniques among gynecological operating room staff is notably high, as evidenced by the collective average score of 91.5%, resulting good practice in maintaining sterile techniques which ensures a general safe surgical environment.

Fig. 4.6 shows a graphical representation of the average percent score of knowledge, attitude and practice in the form of bar chart that facilitates more comprehensive understanding of the findings regarding the sterile techniques.

Table 4.6: ***Average Percent Score of Knowledge, Attitude and Practice***

Variables	Average Percent Score
Knowledge	88.71%
Attitude	93.85%
Practice	91.5%

Frontier in Medical & Health Research

ISSN: (e) 3007-1607 (p) 3007-1593

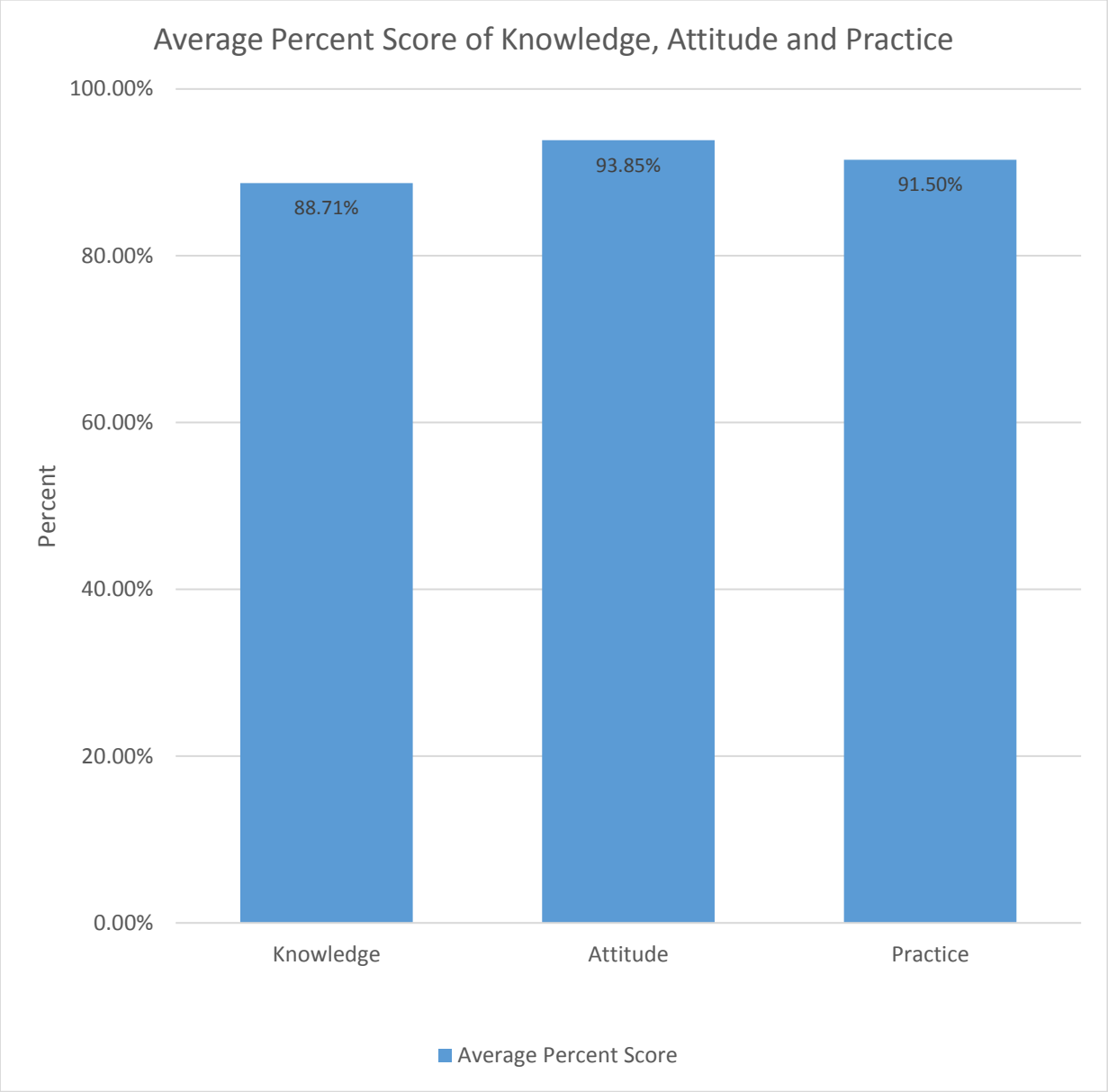

Figure 4.6: Average Score of Knowledge, Attitude and Practice

4.1.7. Association among Knowledge, Attitude and Practice

Table 4.7 shows that, a clear and statistically significant association is found among the knowledge, attitude, and practice of gynecology operating room staff at Mardan Medical Complex, Mardan concerning sterile techniques. All three pairs of variables demonstrated positive correlations, with all p-values being <0.001, indicating high knowledge, positive attitude and good practice with respect to sterile techniques in the operating room.

Specifically, the association between knowledge and practice showed the strongest positive correlation, with a coefficient of 0.540. This suggests that as the staff's knowledge of sterile techniques increases, there is a corresponding and meaningful improvement in their practical application of these techniques. Similarly, a positive correlation was found between knowledge

Frontier in Medical & Health Research

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and attitude, indicating that higher levels of knowledge are associated with more positive attitudes towards the importance of sterility. Furthermore, the analysis revealed a positive correlation between attitude and practice, meaning that staff members with a greater attitude towards sterile techniques are more adhere to practice the sterile techniques. Overall, these findings underscore that knowledge, attitude, and practice are interconnected components, where enhancements in one area are likely to be associated with positive outcomes in the others.

Table 4.7: ***Association among Knowledge, Attitude and Practice***

Variables	Correlation Coefficient	P Value – (2 tailed)
Knowledge – Attitude	0.503	0.000
Knowledge – Practice	0.540	0.000
Attitude – Practice	0.482	0.000

4.2. Discussion

In the present study, 78.2% of respondents reported that they knew the correct method and required duration of hand hygiene "very well," while 20% responded "well," and only 1.8% indicated knowledge "to some extent." This means that overall, 98.2% of gynecology operating room staff demonstrated good knowledge, reflecting a strong awareness of hand-hygiene practices. When compared with other studies, these findings appear more favorable. For instance, Zil-E-Ali *et al.,* (2017) reported that 47.9% of the respondents in Lahore indicated satisfaction with their knowledge of hand hygiene. The 98.2% knowledge level in our study is notably higher, suggesting better awareness among Gynae staff in Mardan. Similarly, in a study from Iran, *Nabavi et al.,* (2015) highlighted significant knowledge gaps, where only 4.3% of the participants achieved a good level of knowledge, 26.9% had moderate knowledge, while the majority (67.5%) had poor knowledge. Moreover, only 12.1% washed their hands for 20-30 seconds, the WHO-recommended minimum duration for many hand hygiene actions. Thus, compared to the Nabavi *et al.*, population, our respondents report higher knowledge and better understanding of method and duration of hand hygiene.

In the present study, a high proportion of gynaecology operating room staff at Mardan Medical Complex reported adequate knowledge of proper donning and doffing of PPE, with 79.1% stating they knew the techniques "very well" and 20.9% "well," yielding a mean score of 3.79 out of 4. These findings are consistent with the results of Pandey *et al.,* (2021), who also reported that approximately 79.5% of the participants in Nepal demonstrated satisfactory knowledge of PPE donning and doffing. A study conducted in India, among healthcare workers in a tertiary care hospital showed that 91.6% knew the complete procedure of donning and doffing of PPE. Another study by Almediani *et al.,* (2021), where 83% of respondents knew the techniques "Very Well" and 17% knew them "Well". Our study shows slightly lower "Very Well" knowledge and slightly higher "Well" knowledge. Both studies indicate a high level of knowledge regarding proper donning and doffing techniques of wearing PPE among the respondents. A study conducted in India, by Garg *et al.,* (2020) showed that majority of the healthcare workers were aware of the practices of donning and doffing of PPE, with 91.6% of HCWs exhibiting complete knowledge regarding the procedure of donning and doffing of PPE.

In our study, a strong understanding of the correct pattern of application for antiseptics at the surgical site in gynecological operating rooms among participants were shown. Specifically, 71.8% of

Frontier in Medical & Health Research

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respondents knew the pattern "Very Well", 28.2% knew it "Well", and the average score of 93%, indicating a high level of knowledge. In contrast, a study conducted by Kalingamudali *et al.,* (2023) found that a majority (92.9%) of participants had poor knowledge, 6.2% had moderate knowledge, and only 1% had good knowledge. There's a significant difference in the level of knowledge about the correct application of antiseptics between the two studies. The present study indicates a high level of knowledge among participants in gynecological operating rooms, while the Kalingamudali *et al.,* (2023) study suggests a lack of knowledge among a majority of participants. Factors like training, guidelines adherence, and the critical importance of maintaining sterility might contribute to these differences.

In our study, 50.0% of respondents knew the purpose of enzymatic cleaning or presoaking "Very Well", 27.3% knew it "Well", and 18.2% knew it "To Some Extent". In contrast, Almediani *et al.,* (2021) found that 75% of respondents knew the importance of pre-cleaning "Very Well", 20% knew it "Well", and only 5% knew it "To Some Extent". This indicates that in the Almediani *et al.,* (2021) study, a significantly higher percentage of respondents had a "Very Well" understanding of the importance of pre-cleaning compared to your study. Overall, both studies show that a majority of respondents had a good understanding of the purpose or importance of enzymatic cleaning/pre-soaking. Similarly, Alamri *et al.,* (2024) found that 77% of nurses knew the importance of pre-cleaning, 16% may be knew, and 7% did not know. Both studies show a majority of staff/nurses knowing the importance/purpose of pre-cleaning/enzymatic cleaning. Our study had a slightly lower percentage of respondents not knowing the purpose (4.5%) compared to Alamri *et al.,* (2024) (7%).

In the current study, a cumulative 86.4% of respondents knew the different types of indicators "Very Well" or "Well", which is higher than the 76% "yes" reported by Alamri *et al.,* (2024). The distribution in the current study (51.8% "Very Well", 34.5% "Well", 13.6% "To Some Extent") differs from Almediani *et al.,* (2021), who reported 80% "yes very well", 16% "yes well", 3% "yes to some extent", and 2% "no". The current study did not have a "no" response category, but the proportion of those with "Very Well" knowledge is lower than in Almediani *et al.,* (2021). Overall, the current study suggests a high level of knowledge among gynecological operating room staff regarding indicators for monitoring sterilization, comparable or slightly higher in cumulative "Very Well" and "Well" categories than other studies.

In our study, a total of 84.6% of respondents claimed to know the different methods of sterilization either "Very Well" or "Well" (55.5% yes very well and 29.1% answered yes, well) , 13.6% responded to Yes to some extent, with only 1.8% saying they didn't know the methods. Sukhlecha *et al.,* (2015) reported a lower "yes" rate of 68.5% with 31.5% saying "no". In contrast, Bang *et al.,* study showed a 100% "yes" rate, indicating all respondents knew the different methods of sterilization. The high level of knowledge in your study and the extreme result in Bang *et al.,* (2022) study suggest that in some contexts or among certain groups, awareness of sterilization methods is very high, while Sukhlecha *et al.,* (2015) results indicate a more mixed level of knowledge.

The gynae staff have a very good understanding of critical parameters (temperature, time, pressure) for autoclave sterilization indicated that most staff (70.9% combined "Yes, Very Well" and "Yes, Well") have a good to very good grasp. A small percentage (6.4%) weren't aware. In contrast a study conducted in Bangladesh among healthcare

Frontier in Medical & Health Research

ISSN: (e) 3007-1607 (p) 3007-1593

professionals at the National Institute of Cardiovascular Diseases & Hospital, 80.20% had knowledge of sterilization methods and their harmful effects, while 71.60% knew about the temperature for sterilization in autoclaves (Akanda *et al.,* 2024). Similarly, a study conducted by Panda *et al.,* (2022) in Nepal among healthcare workers in primary and secondary care public hospitals found that 80.0% of the respondents knew about the recommended temperature as 121°C for steam sterilization for the autoclaves used at their hospitals, whereas 54.6 % of the healthcare workers reported 30 minutes as the effective holding/exposure period for sterilizing wrapped medical devices.

Our study showed varying levels of knowledge among staff on how to fumigate the Operating Room (OR). Specifically, 47.3% of staff know very well, 28.2% know well, 15.5% know to some extent, and 9.1% do not know how to fumigate. In contrast, the study by Kulkarni *et al.,* (2015) revealed that 100% of the central sterile services department staff (n=26) had complete knowledge about fumigation gas and fumigation time. Additionally, all of them had a completely positive attitude towards fumigation and practiced it at proper intervals. This comparison highlights a significant difference in knowledge, attitude, and practice of fumigation between the two studies. While the Kulkarni *et al.,* (2015) study shows perfect knowledge, attitude, and practice among the staff, the present study indicates a more varied level of understanding and potentially a need for further training or education among Gynae operating room staff.

The findings in our study showed that 88.2% of respondents strongly agreed and 11.8% only agreed that Gynae operating room staff should wear full PPE during the procedure. In contrast, Alamri *et al.,* (2024) found 78% of nurses think they should always wear minimum PPE inside a clean area. However, 9% of the respondents reported in terms of "may be" and 13% think that they should not wear minimum PPE inside clean area. Another study by Almediani *et al.,* (2021) reported 59% strongly agreed, 31% agreed, 4% were neutral, and 6% disagreed that staff should wear full PPE inside a clean area. Similarly, the findings of Zaman *et al.,* (2021) showed 82.2% of staff agreed that staff should always put on proper PPE measures in sterilization and disinfection procedures, somewhat comparable to our findings. Overall, our study showed more positive attitude on wearing full PPE in Gynae operating rooms as compared to Almediani *et al.*, (2021) and Zaman *et al.,* (2021).

In our study, a significant majority (74.5% strongly agreed, 20.9% agreed) of the respondents should think that the gynae staff should practice hand hygiene before and after each procedure. This is somewhat comparable to the study by Sucklecha *et al.,* (2015) where 77.6% revealed that health staff should always wash hands with antiseptics before and after handling patients. The study by Alamri *et al.,* (2024) showed a higher percentage (87%) of participants thinking that the staff should apply hand wash regularly before and after entering a clean area. A study conducted by Almediani *et al.,* (2021) showed 77% of participants strongly agreed, 21% merely agreed and 1% remained neutral that the central sterile services staff should apply hand wash regularly before and after sterilization and disinfection procedures. Similarly, a study by Zaman *et al.,* (2021) study had a unanimous response (100%) that staff should always washing hands with antiseptics before and after handling patients. Our study's findings align with other studies emphasizing the importance of hand hygiene practices in healthcare settings.

In our findings, 78.2% of gynae staff strongly agreed and 21.8% agreed that they should follow

Frontier in Medical & Health Research

ISSN: (e) 3007-1607 (p) 3007-1593

the correct sequence for donning and doffing of PPE. A study by Almediani *et al.*, (2021) found that 76% of CSSD staff strongly agreed, 22% agreed, and 2% were neutral about following the correct sequence. Another study by Alamri *et al.*, (2024) showed 84% of staff said "yes", 13% said "maybe", and 3% said "no" to follow the correct sequence. Similarly, a study by Zaman *et al.*, (2021) indicated 82.2% were think that the staff should always putting on proper PPE measures during donning and doffing in sterilization and disinfection procedures, while 17.8% of the respondents reported that they should not always follow the proper sequence. Overall, all studies show a positive attitude of following the correct sequence of donning and doffing of PPE across different staff groups, highlighting the consensus on safety protocol.

In our findings, a majority of 57.3% of the respondents strongly agreed while 39.1% merely agreed that the gynae staff should require vaccination before working in the operating room. A low percentage of 3.6% of the respondents remained neutral in this case. In contrast, a study by Zaman *et al.*, (2021) reported that 91.8% of the participants were in favor that the CSSD should require vaccination before working in the department while 9.2% of the participants responded that the staff should not require vaccination before performing disinfection and sterilization procedures.

In our result, it showed that 79.1% of respondents strongly agree that Gynae staff should know how to deal with sharp disposable items in accordance with the color-coded dustbin system, and 20.9% agree merely with this matter. A study by Alamri *et al.*, (2024) found that 81% of the participants responded yes, 14% maybe, and 5% reported no, regarding staff should know how to deal with sharp disposable items. Almediani *et al.*, (2021) found 82% strongly agreed and 16% agreed that CSSD staff should know how to deal with sharp disposable items, with 2% being neutral. This study showed a comparable consensus with other similar studies that staff should know how to handle sharp disposable items properly.

The findings in our study reported high level adherence to sterile techniques during the procedures, majority of the respondents (80%) always practiced sterile techniques while 14.5% of the respondents practices most of the time, which indicates good practice towards sterile techniques while a study by shaheen *et al,*. (2023) found that 96.1% of the respondents practiced and 3.9% did not practiced sterile techniques every time. Similarly, Hajar *et al.*, (2022) reported a perfect adherence rate of 100% among their participants regarding the sterile techniques.

Likewise, the findings in our study on the use of full Personal Protective Equipment (PPE) during a procedure, the majority of respondents (82.7%) wear full PPE always while 11.8% wear it most of the time, contributing an average score of 93.75% which indicate a good practice of wearing full PPE during the procedure. A study by Zaman *et al.*, (2020) who reported that 61.6% of the respondents use properly protective measures with disinfection and sterilization procedures. Similarly, our results show a striking similarity to Almediani *et al.*, (2021) with nearly identical rates for always wearing full PPE inside dirty area (82.7%), followed by 13%, 3% and 2% most of the time, sometimes and rare respectively, which revealed good practice towards practicing sterile techniques.

In response to the practice of hand hygiene, 78.2% of the participants always wash hands with antiseptic before and after handling patients while 17.3% respondents wash hands with antiseptics most of the time, and 4.5% respondents do it sometimes, contributing 93.5% average percent

Frontier in Medical & Health Research

ISSN: (e) 3007-1607 (p) 3007-1593

revealed a good practice of hand wash with antiseptics before and after patient handling. The present study findings align very closely with Suchlecha *et al.*, (2025) which reported 78.8% of the respondents having good practice regarding wash hands with antiseptics before and after handling patients. Similarly, Zaman *et al.*, (2020) reported a perfect adherence rate of 100% among their participants who wash hands with antiseptics before and after disinfection and sterilization procedures.

Checking material sterilization before use was the most consistently reported practice, with 86.4% of respondents always check materials. Meanwhile, 13.6% of the remaining respondents check most of the time. The average score of 96.5% for this variable report a good practice that the staff check materials for sterilization before use. A study conducted by Shaheen *et al.*, (2023) revealed that 91.2% of the respondents check the sterilization of materials before use while 8.8% of respondents did not check whether the materials are sterilize before use. Similarly, a study by Hajar *et al.*, (2022) revealed 100% adherence to check the sterility of materials before use. Participation in training on sterile techniques was always reported by 47.3%, followed by 32.7% participating most of the time in our study, resulting a mean score of 3.18 which reveals good practice towards participation in training or other programs on sterile techniques. In contrast, a study by Zaman *et al.*, (2020) reported that 79.5% of the respondents have any training on sterilization and disinfection procedure for surgical instruments.

The overall adherence to sterile techniques among gynecological operating room staff is notably high, as evidenced by the collective average score of 91.5%, resulting good practice in maintaining sterile techniques which ensures a general safe surgical environment.

In short, the statistical analysis of this study revealed that there was a positive correlations among knowledge, attitude, and practice. Specifically, the correlation between knowledge and practice ($r = 0.540$, $p < 0.001$) was the strongest, followed by the correlation between knowledge and attitude, and attitude and practice. In contrast, a study by Shaheen *et al.*, (2023) revealed that many respondents exhibited good knowledge, a positive attitude and solid practices regarding sterile techniques in which a direct established positive relationship was found between knowledge, attitude and practice. A study by Habtewart *et al.*, (2024) revealed that 58.1% of respondents had good knowledge, 56.1% had good practice with respect to sterile techniques in the operating room. Similarly, a study by Almediani *et al.*, (2021) reported a positive correlation between knowledge and attitude, knowledge and practice, and attitude and practice.

5. CONCLUSIONS AND RECOMMENDATION

5.1 Conclusion

The study concluded that gynecology operating room staff at Mardan Medical Complex, Mardan demonstrated overall high levels of knowledge, positive attitudes, and good practices regarding sterile techniques. The findings revealed a high level of knowledge across key domains such as hand hygiene, PPE usage, antiseptic application, and sterilization methods, with an overall average knowledge score of 88.71%. Similarly, staff attitudes toward sterile techniques were overwhelmingly positive, as evidenced by an average attitude score of 93.85%. Practices were also consistently upheld, with an average practice score of 91.5%, demonstrating reliable application of sterile protocols in daily clinical routines. The knowledge, attitude and practice regarding the sterile techniques varied across different groups;

Frontier in Medical & Health Research

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the staff aged 31-40 years demonstrated the highest score in all three categories, with 89.30% knowledge, 96.68% attitude, and 93.75% practice, ensuring the highest excellency regarding the adherence to sterile techniques. Regarding gender, male staff had a slightly higher knowledge score (88.30%) compared to female (84.90%), while female staff showed better practice score (91.65%). In terms of education, staff with a BS (Bachelor of Science) degree had the highest knowledge (89.85%) and practice (92.80%), whereas those with an MBBS/FCPS had the most positive attitude (94.90%). Diploma holders consistently had the lowest scores across all three KAP categories. Years of experience showed a strong positive correlation with performance; staff with more than 10 years of experience unequivocally led all groups with the highest knowledge (93.68%), attitude (97.05%), and practice (95.00%), followed by those with 6-10 years and then those with less than 5 years of experience. By designation, Technicians/Technologists scored higher in knowledge (88.92%) and attitude (93.96%), while Gynecologists/Surgeons had a slightly higher practice score (91.85%). Importantly, significant positive correlations were identified among knowledge, attitude, and practice, with the strongest link between knowledge and practice ($r = 0.540$), underscoring that enhanced understanding directly translates into better implementation. These results affirm that the gynecology operating room staff at MMC are well-equipped to minimize surgical site infections and uphold high standards of aseptic care, thereby contributing positively to maternal and neonatal outcomes.

5.2 Recommendations and Future Research Directions

The study affirms that gynecology operating room staff at Mardan Medical Complex demonstrate commendably high levels of knowledge, positive attitudes, and good practices regarding sterile techniques. However, despite these strengths, certain areas such as knowledge of autoclave parameters, fumigation procedures, and laminar airflow systems showed room for improvement, suggesting that targeted interventions could further optimize compliance. To build on these encouraging findings, it is recommended that the hospital administration implement regular, structured continuing education programs focusing on these identified gaps, particularly through hands-on workshops and simulation-based training. Additionally, introducing periodic sterile technique audits, strengthening supervision by appointing dedicated infection control staff, and ensuring consistent availability of modern sterilization equipment and resources would help sustain and enhance current practices. Ultimately, by implementing these recommendations, healthcare institutions can significantly reduce the risk of surgical site infections, enhance patient outcomes, and contribute to safer gynecological surgical care. The directions for future research include conducting comparative studies to analyze KAP disparities between gynecological operating rooms and other surgical departments to identify specialty specific challenges. Future researches should focus on longitudinal follow-up to assess how knowledge, attitude and practice evolve with increasing clinical experience and exposure to ongoing training programs.

5.3 Limitations of the study

The limitation of the study includes that this study conducted at a single institution, the findings may not be fully generalizable to other healthcare settings. The use of future multi-center studies could provide a more comprehensive understanding. Furthermore, confirmation of the findings will require the use of larger sample size in

Frontier in Medical & Health Research

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order to assess and validate understanding and adherence to sterile techniques.

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