

Knowledge Attitude and Practice (KAP) among Private Dental Sterilization Service Unit (SSU) Staff in Riyadh City

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Abstract OBJECTIVES: To investigate the knowledge, attitude, and practice regarding sterilization among SSU staff working in private dental center in Riyadh city. **STUDY DESIGN:** cross-sectional study. **METHODOLOGY:** This study carried out over 9 months from Mar 2023 till Dec 2023 targeted 150 private Dental Centers Sterilization Services Units (SSU) working staffs' who are directly involved in reprocessing surgical instruments and medical equipment in Private Dental Centers in Riyadh city, self-administered questionnaire consisting of close-ended questions has been used and collected through an online survey. **RESULTS:** The results suggest a positive correlation between nursing specialization and the proper execution of sterilization practices. **CONCLUSION:** In private dental centers, SSU staff demonstrate excellent knowledge, a positive attitude, and efficient practice of sterilization techniques. However, there is a notable absence of studies in Saudi Arabia emphasizing the significance of sterilization knowledge in infection prevention and control. It is recommended to conduct broader studies encompassing all hospital types and SSU staff nationwide to obtain a comprehensive understanding and enhance infection prevention measures across private dental centers in Saudi Arabia.

Keywords: dental sterilization service unit (SSU), comprehensive sterilization program (CSP), attitude, reusable medical device (RMD)

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1. Introduction

Dental instrument sterilization is a critical aspect of infection control in dental practice. Sterilization kills all microorganisms, including bacteria, viruses, and fungi, on dental instruments to stop the spread of infections between patients and dental healthcare workers. Dental instruments can become contaminated with infectious agents such as hepatitis B, HIV, and bacteria. If these contaminated instruments are not properly sterilized, they can transmit these infectious agents to patients and dental healthcare workers [1]. Dental centers are required to comply with the approved regulations & standards that set at national level such as the Ministry of Health (MOH) guidelines and the Saudi Central Board for Accreditation of Healthcare Institutions (CBAHI) and the international organizations such as the Centers for Disease Control and Prevention (CDC), the World Health Organization (WHO), and the Occupational

Safety and Health Administration (OSHA). These regulations mandate proper sterilization of dental instruments to prevent the spread of infectious agents [1].

Marcelo W B Araujo 2022 conformed that "Dental healthcare workers, through occupational exposure, may have a ten times greater risk of becoming a chronic hepatitis B carrier than the average citizen." Dental healthcare workers are at risk of exposure to infectious agents if contaminated RMD are not properly sterilized. Proper sterilization of dental appliances can protect dental healthcare workers from acquiring infectious diseases [3].

The research conducted in Lebanon by Jihad Dagher in 2017 mentions that 90.2% of dentists take the hepatitis B vaccine, which indicates the seriousness of these procedures and the importance of properly instrument sterilizing [2]. Patients expect and deserve a safe and clean environment when receiving dental care. Proper sterilization of dental RMD can help ensure patient safety and prevent the transmission of infectious agents.

According to (WHO) Standard precautions are a set of guidelines that help prevent the spread of infectious

diseases between patients and dental healthcare workers. These guidelines include practices such as hand hygiene, the use of personal protective equipment, and environmental controls. Standard precautions are essential in dental instrument sterilization because they help ensure that dental instruments are properly cleaned and sterilized to prevent the transmission of infectious agents. By following standard precautions, dental healthcare workers can protect themselves and their patients from healthcare-associated infections and provide safe and effective dental care [7].

A questionnaire was conducted through which questions measuring KAP were asked, including the point of use step, which constitutes an important step in this type of practice. It was mentioned in the study that ineffectiveness effects on sterilization and the spread of infection. "Without proper point of use care, effective decontamination and subsequent sterilization though not impossible, is more challenging and time consuming. When blood and other body fluids, bits of tissue are allowed to dry on the surface of an instrument, the proteins tend to coagulate and create a barrier along with micro-organisms forming a biofilm. Biofilm is an accumulated mass of bacteria and extracellular material that is tightly adhered to a surface and cannot be easily removed. Since it is difficult to remove and it can further reduce the efficacy of sterilization by preventing access of sterilant into the micro-organism contaminated device. Therefore it is important that used RMD are promptly cleaned at patient source to minimize the opportunity of biofilm formation and then sent to SSU for further processing" [4].

It should also be noted that tools that have been opened and not used should be treated as contaminated tools, as there is confusion at this stage. It causes the spread of infection among patients. "All instruments opened in the operating or procedure room should be considered contaminated whether or not they have been used. Rationale: Scrubbed persons might touch instruments without being aware of it. Used instruments also might come in contact with other instruments" [6].

Dental clinics should also have a system in place for tracking and monitoring the sterilization process to ensure that all RMD are properly sterilized and to maintain a record of the sterilization cycle for each device. This may involve using indicators or labels that change color when

the sterilization cycle is complete. The proper execution of these practices relies solely on the SSU worker's ability to apply them accurately [6].

The sterilization service unit plays a crucial role in the dental centers setting, contributing significantly to the safety and quality of patient care. By properly sterilizing medical instruments and equipment, the unit eliminates or reduces the presence of microorganisms. This ensures that reusable devices are safe for use on multiple patients, minimizing the risk of cross-contamination and the spread of infections. Sterilization is an essential component of patient safety. When medical instruments are not adequately sterilized, patients are at risk of developing serious infections, which can lead to complications, prolonged hospital stays, and even mortality. By maintaining a well-equipped and efficiently operated sterilization unit, dental centers can prioritize patient safety and reduce the occurrence of healthcare-associated infections.

In recent years, the Ministry of Health in Saudi Arabia has established courses known as the Comprehensive Sterilization Program (CSP) and Guideline that aim to increase awareness of correct practices inside the Central Sterilization Service Department (CSSD) and Sterilization Service Unit (SSU).

SSU workers may have long experience, but without adequate knowledge, Familiarity with the importance of sterilization and correct practices within these units is essential, so we prepared a questionnaire and tried to measure the extent of knowledge, practices and attitude between SSU staff. Besides, some of the backgrounds of SSU staff are not related to the sterilization field (e.g. Figure 1). The chart illustrates that 67% of the SSU staff consists of nurses.

We observe that the male ratio is 24, while the female ratio is 76. The variation in ratios could indeed be attributed to the training program initiated by the Saudi commotion for health specialties in 2018, specifically targeting the graduation of female sterilization technicians. In addition we observe that the majority, comprising 58.67% of the workforce, falls within the age range of 31-40."

This study aimed to investigate the level of knowledge, attitude, and practice of sterilization among staff working in the Sterilization Service Unit (SSU) in a private dental center in Riyadh.

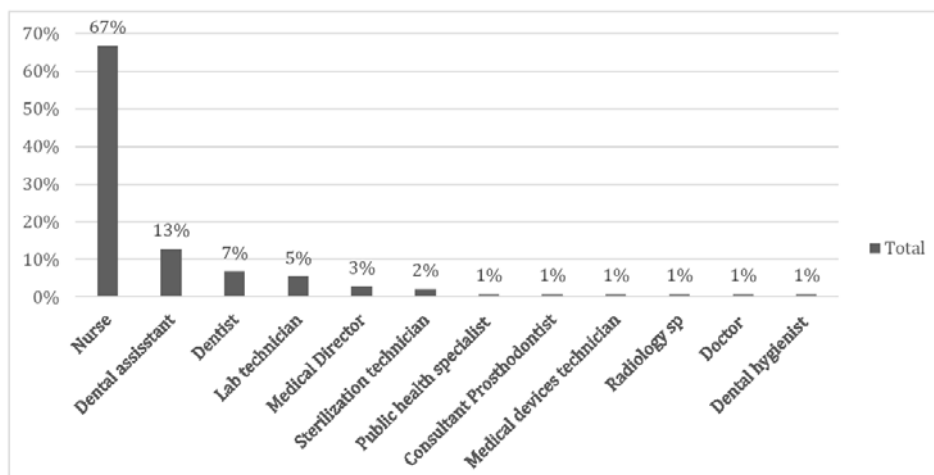


Figure 1. Job title of the study population

2. Method

Study Design and setting: This is a cross-sectional study carried out over 9 months from Mar 2023 till Dec 2023 targeted all Private Dental Centers Sterilization Services Unit (SSU) working staff who are directly involved in reprocessing surgical instruments and medical equipment in Private Dental Centers in Riyadh city.

Sample size: 150 private dental centers were selected from Riyadh city. Each center contains a sterilization unit, and each unit contains a sterilization employee, who filled out the questionnaire designated for this research. The 150 dental centers represent 30% of the number of centers in Riyadh city. They were distributed into the following division: 58 private dental centers east of Riyadh city, 20 private dental centers in southern Riyadh city, 19 private dental centers west of Riyadh city, 29 private dental centers in northern Riyadh city, 24 private dental centers in central Riyadh city.

These centers were chosen randomly, and they all represent 30 percent of the private dental centers in the city of Riyadh.

Data Collection tools and procedure: A self-administered questionnaire consisting of close ended questions has been used and collected through an online survey. The questionnaire includes two sections; the first part involves personal information of the participants, such as Region, Age, Gender, nationality. Second part was the Knowledge Attitude and practice scale (KAP) that contained 34 validated questions covering all three standards; Knowledge (with 15 items), Attitude (with 9 items), and Practice (with 10 items). Likert scales 3 point used to assess the level of Knowledge Attitude and practice ranked as; Knowledge [K1-K15]: (3-Yes, 2-maybe, 1-No). Attitude [A1 & A9]: (3-Yes, 2-maybe, 1-No). Practice [P1-P10]: (3-Yes, 2-maybe, 1-No).

Statistical Analysis: The data will be analyzed using the Statistical Package for Social Sciences (SPSS) version 1.0.0.1406, then it will be presented in descriptive statistics tables with frequency, percentage, mean, p-value,

and standard deviation. Besides, the proportional allocation of the study sample was done and distributed using random generator software.

Ethical Consideration: Participants' information will be kept confidential. Also, approval will be needed from the ethical review board at ministry of health.

3. Results

Table 1 presents the participant characteristics by specialty type (Nursing and other specialties). The majority of study participants were nurses (64%), females (76%), non-Saudis (77%), and in the age group 31 – 40 years (59%). The results show significant differences in both gender and nationality between the two groups, while there is no significant difference in the age groups.

Table 2 depicts the knowledge of both, nurses and other health workers, toward sterilization practice in private dental clinics. In general, both groups have good knowledge about sterilization practice. However, the results show that nurses have better knowledge in all elements of sterilization practice. For both groups, the lowest rate of reporting having knowledge (yes) was regarding how to use tracking systems (54% of nurses and 52% of others).

Table 3 presents the attitude of both groups of participants toward sterilization practice. The results indicate that both groups have positive attitude toward sterilization practice. Similar to the Knowledge, nurses, compared to other health workers, reported more positive attitude toward sterilization practice. It's notable that high rate of both groups reported less positive attitude toward that the SSU staff should wear minimum PPE (gloves & mask) inside clean area, compared to other practices.

Table 4 shows the results of sterilization practice related questions. Most of the study participants from both groups reported good sterilization practices. The results show that, compared to other health workers, nurses were more likely to apply all sterilization practices properly except checking the sterilizer parameters print out for each cycle.

Table 1. Summary of Sample Characteristics by Type of Specialty: Private Dental Settings, Riyadh, KSA, 2023

Characteristics		Total N (%)	Profession		P - value
			Nurse N= 96 (64%)	Other N= 54 (36%)	
Gender	Male	36 (24)	11 (11)	25 (46)	< 0.001
	Female	114 (76)	85 (89)	29 (54)	
Age	20 - 30	47 (31)	29 (30)	18 (33)	0.085
	31 - 40	88 (59)	61 (64)	27 (50)	
	41 and above	15 (10)	6 (6)	9 (17)	
Nationality	Saudi	35 (23)	10 (10)	25 (46)	< 0.001
	Non-Saudi	115 (77)	86 (90)	29 (54)	
Workplace	Private dental clinics	150 (100)			
Job Category	Nurse	96 (64)			
	Other	54 (36)			

Table 2. Knowledge of Study Population Toward Sterilization Practice

Q#	Question		Nurse	Other
K1	Do you know the correct sequence of hand hygiene?	Yes	81 (84%)	41 (76%)
		Maybe	10 (11%)	13 (24%)
		No	5 (5%)	0 (0%)
K2	Do you know the proper donning and doffing techniques of wearing personal protective equipment (PPE)?	Yes	78 (81%)	39 (72%)
		Maybe	15 (16%)	12 (22%)
		No	3 (3%)	3 (6%)
K3	Do you know about the safe handling of contaminated instruments ?	Yes	78 (81%)	41 (76%)
		Maybe	16 (17%)	11 (20%)
		No	2 (2%)	2 (4%)
K4	Do you Know the correct method of operating the equipment's machines ?	Yes	74 (77%)	39 (72%)
		Maybe	16 (17%)	11 (20%)
		No	6 (6%)	4 (7%)
K5	Do you know the importance of pre-cleaning ?	Yes	74 (77%)	40 (74%)
		Maybe	15 (16%)	11 (20%)
		No	7 (7%)	3 (6%)
K6	Do you know the principle of manual cleaning ?	Yes	80 (83%)	38 (70%)
		Maybe	14 (15%)	13 (24%)
		No	2 (2%)	3 (6%)
K7	Do you know the usage of the spill kit and the procedure to contain the biological hazardous spill ?	Yes	71 (74%)	31 (57%)
		Maybe	16 (17%)	12 (22%)
		No	9 (9%)	11 (20%)
K8	Do you know the difference between thermal and chemical disinfection ?	Yes	72 (75%)	36 (67%)
		Maybe	19 (20%)	13 (24%)
		No	5 (5%)	5 (9%)
K9	Do you know the difference between various packaging techniques ?	Yes	69 (72%)	33 (61%)
		Maybe	19 (20%)	11 (20%)
		No	8 (8%)	10 (19%)
K10	Do you know the Spaulding classification of patient care items ?	Yes	70 (73%)	31 (57%)
		Maybe	21 (22%)	13 (24%)
		No	5 (5%)	10 (19%)
K11	Do you know the difference between steam sterilization and low temperature sterilization ?	Yes	70 (73%)	35 (65%)
		Maybe	17 (18%)	14 (26%)
		No	9 (9%)	5 (9%)
K12	Do you know the indication usage of chemical indicator/biological indicator ?	Yes	73 (76%)	40 (74%)
		Maybe	17 (18%)	12 (22%)
		No	6 (6%)	2 (4%)
K13	Do you know the environmental control (pressure) required in the decontamination area in the SSU?	Yes	61 (64%)	31 (57%)
		Maybe	22 (23%)	13 (24%)
		No	13 (14%)	10 (19%)
K14	Do you know the environmental control (pressure) required in the clean and sterile area in the SSU?	Yes	68 (71%)	34 (63%)
		Maybe	15 (16%)	10 (19%)
		No	13 (14%)	10 (19%)
K15	Do you know how to use tracking systems if available?	Yes	52 (54%)	28 (52%)
		Maybe	27 (28%)	17 (31%)
		No	17 (18%)	9 (17%)

Table 3. Attitude of Study Population Toward Sterilization Practice

Q#	Question		Nurse	Other
A1	Do you think that the SSU staff should wear minimum PPE (gloves & mask) inside clean area?	Yes	75 (78%)	39 (72%)
		Maybe	9 (9%)	10 (19%)
		No	12 (13%)	5 (9%)
A2	Do you think that the SSU staff should apply hand wash regularly before and after entering the work area?	Yes	83 (87%)	39 (72%)
		Maybe	10 (10%)	13 (24%)
		No	3 (3%)	2 (4%)
A3	Do you think that the SSU staff should be arrange reusable medical devices in an orderly fashion in tray so that all surfaces are exposed to clearing action?	Yes	75 (78%)	34 (63%)
		Maybe	14 (15%)	15 (28%)
		No	7 (7%)	5 (9%)

Q#	Question		Nurse	Other
A4	Do you think that the SSU staff should Know how to deal with sharp disposable item if receive it by mistake?	Yes	78 (81%)	42 (78%)
		Maybe	13 (14%)	10 (19%)
		No	5 (5%)	2 (4%)
A5	Do you think that the SSU staff should be trained to use spill kit properly?	Yes	77 (80%)	38 (70%)
		Maybe	16 (17%)	16 (30%)
		No	3 (3%)	0 (0%)
A6	Do you think that the SSU staff should open and disassemble all reusable medical device correctly during manual cleaning?	Yes	74 (77%)	38 (70%)
		Maybe	17 (18%)	15 (28%)
		No	5 (5%)	1 (2%)
A7	Do you think that the SSU staff should dry the instrument after manual cleaning?	Yes	78 (81%)	41 (76%)
		Maybe	12 (13%)	12 (22%)
		No	6 (6%)	1 (2%)
A8	Do you think that SSU staff should follow correct consequences for donning and doffing PPEs?	Yes	81 (84%)	41 (76%)
		Maybe	12 (13%)	11 (20%)
		No	3 (3%)	2 (4%)
A9	Do you think that the SSU staff should test the sterilizer before operating (leak test, Bowie-Dick test, BI)?	Yes	80 (92%)	41 (76%)
		Maybe	13 (14%)	12 (22%)
		No	3 (3%)	1 (2%)

Table 4. Practice of Study Population Toward Sterilization Practice

Q#	Question		Nurse	Other
P1	Do you implement manufacturer instruction (MI) for cleaning, disinfection, and sterilization of reusable medical devices?	Yes	74 (77%)	41 (76%)
		Maybe	15 (16%)	7 (13%)
		No	7 (7%)	6 (11%)
P2	Do you put biohazard sign on the designated dirty instruments cart during transportation to SSU?	Yes	69 (72%)	41 (76%)
		Maybe	14 (15%)	8 (15%)
		No	13 (14%)	5 (9%)
P3	Do you lubricate the moving parts for surgical instruments?	Yes	75 (78%)	37 (69%)
		Maybe	15 (16%)	10 (19%)
		No	6 (6%)	7 (13%)
P4	Do you perform manual cleaning before loading the instrument inside the washer-disinfector?	Yes	73 (76%)	39 (72%)
		Maybe	15 (16%)	12 (22%)
		No	8 (8%)	3 (6%)
P5	Do you perform routine validation tests for the machines (washer-disinfector, sterilizer...)?	Yes	70 (73%)	38 (70%)
		Maybe	16 (17%)	9 (17%)
		No	10 (10%)	7 (13%)
P6	Do you do the inspection of the reusable medical devices after unloading from the washerdisinfector for (cleanliness stain, corrosion, cracks, breakage..)?	Yes	71 (74%)	39 (72%)

Q#	Question		Nurse	Other
		Maybe	18 (19%)	13 (24%)
		No	7 (7%)	2 (4%)
P7	Do you check the sterilizer parameters print out for each cycle?	Yes	61 (63%)	36 (67%)
		Maybe	20 (21%)	15 (28%)
		No	15 (16%)	3 (5%)
P8	Do you allow the instrument to cool down after unloading from the sterilizer ?	Yes	77 (80%)	39 (72%)
		Maybe	14 (15%)	11 (20%)
		No	5 (5%)	4 (7%)
P9	Do you wear full PPE inside dirty area?	Yes	73 (76%)	41 (74%)
		Maybe	15 (16%)	12 (22%)
		No	8 (8%)	1 (2%)
P10	Do you test the sterilizer regularly before operating (leak test, Bowie-Dick test, BI) ?	Yes	75 (78%)	36 (67%)
		Maybe	14 (15%)	13 (24%)
		No	7 (7%)	5 (9%)

We found statistically significant correlations between knowledge and practice, knowledge and attitude, and attitude and practice ($p < 0.001$) among all study subjects toward sterilization.

Table 5. Correlation among Knowledge, Attitude, and Practice

Variables	Correlation Coefficient	P - value
Knowledge - Practice	0.579	< 0.001
Attitude - Practice	0.563	< 0.001
Knowledge - Attitude	0.460	< 0.001

Table 6 illustrates the mean of knowledge, practice and attitude among nurses versus other health workers. The results show no statistically significant differences between nurses and other health workers in the average knowledge, practice and attitude toward sterilization in dental clinics.

Table 6. Mean, Standard Deviation of Knowledge, Practice, and Attitude by Nursing Profession

Variable	Nursing Profession	Mean	Std. Deviation	P - value
Knowledge	Yes	2.67	0.449	0.156
	No	2.56	0.482	
Attitude	Yes	2.76	0.421	0.338
	No	2.69	0.434	
Practice	Yes	2.66	0.435	0.787
	No	2.64	0.507	

4. Discussion

The study addressed a crucial topic by examining the cognitive levels and correct practices among personnel in sterilization units at private dental centers in Riyadh City, totaling 150 centers. The noteworthy finding was that the percentage of nurses implementing sterilization practices correctly surpassed other classifications. This could be attributed to the fact that nursing education includes fundamental training in infection control and sterilization

throughout their academic journey, unlike other specialized fields included in the study.

The results suggest a positive correlation between nursing specialization and the proper execution of sterilization practices. The emphasis on infection control in nursing education seems to contribute to a higher level of competence among nurses in this regard, compared to professionals in other disciplines. According to the previous study that consensus among the vast majority of nurses was in favor of upholding and implementing guidelines for disinfection and sterilization practices [8].

This underscores the significance of tailored training programs and educational interventions in promoting effective infection control practices across various healthcare specialties. The study highlights the need for comprehensive and specialized training to ensure a consistent and high standard of sterilization practices in dental healthcare settings.

The low affirmative response rates across all categories regarding electronic monitoring for tracking surgical instruments highlight a notable absence of electronic tracking systems within private dental centers. This suggests that these facilities may not have established or implemented electronic tracking system for dental instruments. The lack of such systems could potentially impact the efficiency, traceability, and overall management of surgical tools within these dental settings. Consideration of implementing electronic tracking mechanisms may enhance the overall quality and safety of surgical instrument management in private dental facilities. According to the previous study, establishing computerized tracking systems for surgical devices is crucial in hospital administration, aiding in quality management and clinical risk assessment [9].

Checking the parameters printout is important in SSU. one of the study said (to guarantee sterility, the process of sterilization must be validated. Because there is

no direct way to measure sterility, the techniques applied to validate the sterilization process are based on statistical principles. Steam sterilization is the most frequently applied sterilization method worldwide and can be validated either by indicators chemical or biological or physical measurements. The steam sterilization conditions are described in the literature. Starting from these conditions, criteria for the validation of steam sterilization are derived and can be described in terms of physical parameters), Utilizing this study, we note the significance of examining physical parameters. However, our study reveals that nurses exhibit lower commitment to assessing these indicators compared to other groups. This underscores the need to educate nurses on the importance of scrutinizing these physical parameters to ensure the validity of sterilization and the quality of outputs in the sterilization unit [10].

This paper presents more positive attitude toward sterilization practice. It's notable that high rate of both groups reported less positive attitude toward that the SSU staff should wear minimum PPE (gloves & mask) inside clean area, compared to other practices. (health& safety executive) refers to the use of personal protective equipment (PPE) to control risks at work The selection is made based on specific data, as mentioned Before selecting PPE, consider: Who is exposed? What they are exposed to How long are they exposed to? How much are they exposed to? Taking into account the aforementioned data, the clean area is considered safe, and there is no need to wear a mask and gloves, as there is no unsafe exposure during work [11].

5. Conclusion

In privet dental centers, SSU staff demonstrate excellent knowledge, a positive attitude, and efficient practice of sterilization techniques. However, there is a notable absence of studies in Saudi Arabia emphasizing the significance of sterilization knowledge in infection prevention and control. It is recommended to conduct

broader studies encompassing all hospital types and CSSD staff nationwide to obtain a comprehensive understanding and enhance infection prevention measures across privet dental centers in Saudi Arabia.

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