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Hygienic practices among consultant anesthetists in teaching hospitals of Sindh Pakistan: A cross-sectional survey

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***Abstract*---**Background: Infection susceptibility during anesthesia administration and surgical procedures continues to be a primary cause of morbidity and mortality, despite the advent of prophylactic antibiotics and advanced technology. During surgery, nosocomial infections frequently result in sepsis, highlighting the importance of Operation Theatre (OT) sanitation. Objectives: To evaluate the hygienic practices of anesthesiologists operating in teaching hospitals in Sindh, Pakistan. Methods: Using cross-sectional design, six-month survey of consultant anesthetists in Sindh's numerous educational institutions was conducted. A thorough, self-administered questionnaire was used to collect data on aspects of sanitation practices including knowledge of infection control, existing practices, perceived obstacles, and adherence to guidelines. Utilizing a sequential sampling procedure, participants meeting specific eligibility criteria were selected to represent a wide range of demographics, socioeconomic statuses, and

healthcare delivery contexts. Results: The study contributed to closing the disparity between global standards and actual practices, thereby aligning with the global initiative to improve anesthesia hygiene practices. A total of 83 consultants were approached, but 18 declined, culminating in the analysis of data from 65 participants. Their mean age was 49.27+11.17 years. Participants were predominantly employed in private institutions (n=43) and had an average of 13.97 (SD=10.24) years of experience (p> 0.05). Interestingly, consultants from private institutes rated higher on hygienic practices knowledge than their government counterparts (p = 0.027). In addition, gender did not influence the hygiene practice scores (p = 0.763). Conclusion: Institutional type has significant impact on the knowledge and implementation of hygienic practices among consultant anesthetists in Sindh, Pakistan, with private institutions outperforming government institutions.

***Keywords*---**consultant anesthetists, hygiene, nosocomial infections, operation theatres, sanitation.

Introduction

Prophylactic antibiotics and technological advancements have had little effect on perioperative infection incidence rates, the primary cause of morbidity and mortality. Healthcare-associated infections represent a significant global public health challenge [1]. In recent years, the Operation Theater's (OT) potential function as a conduit for infection transmission has risen to the forefront of scientific inquiry. Notably, due to the lag time between the two events, the correlation between anesthetic procedures and subsequent infections remains ambiguous, although data imply an infection rate of approximately 3.4% within 72 hours postoperatively [2-3].

In this vein, the current study, titled "Hygienic Practices among Consultant Anesthetists in Teaching Hospitals of Sindh, Pakistan: A Cross-Sectional Survey," investigates the adherence to infection control protocols among anesthetists in teaching hospitals in Sindh, Pakistan, to gain a deeper understanding of this complex issue. Anesthetists play a crucial role in the healthcare system, interacting directly with patients' airways and bodily secretions, thereby increasing the risk of cross-contamination [4-5].

While the mechanisms for intra-operative infection transmission are complex, including immune suppression from anesthetics and frequent contact with OT personnel, this study highlights the role of inadequate hand hygiene practices in contaminating OT equipment [6-7]. These instruments can function as a reservoir for microorganisms, increasing the risk for subsequent patients. Given their involvement in invasive procedures like vascular cannulation, endotracheal intubation, and regional obstructions, anesthesiologists and occupational therapists play a crucial role in minimizing these risks [8]. Guidelines, such as those published by the Association of Great Britain and Ireland, have advocated practices such as glove use during invasive procedures and comprehensive

cleaning of non-disposable equipment to mitigate occupational risks of infection transmission. However, application of these guidelines is frequently difficult, particularly in contexts with limited resources [9-10].

In Sindh, no research has been conducted on hygienic practices of anesthesiologists. Therefore, this study was executed to assess the prevalence of these hygienic practices among consultant anesthetists in Sindh. The objective of the research was to identify voids in current practices, comprehend the barriers to adherence, and propose targeted interventions for improvement. This study contributed to broader efforts to improve patient safety, and care delivery, and bridge the divide between global standards and actual practices in resource-limited settings. It provided a comprehensive evaluation of an essential aspect of anesthesiology: hygiene practices and provided unique insights into the situation in Sindh's teaching hospitals to stimulate changes in infection control protocols, thereby fostering a substantial improvement in patient safety and care delivery.

Material and Methods

This study was designed as a cross-sectional survey and was conducted over six months after acquiring approval from the College of Physicians and Surgeon and Institutional Review Board. The selected research sites included teaching hospitals in Sindh, Pakistan, specifically in Karachi, Hyderabad, Nawabshah, and Sukkur. The hospitals included in this study were chosen due to their demographic, socioeconomic, and healthcare delivery diversity.

The study population consisted of consultant anesthetists actively practicing in designated teaching hospitals. All of the approximately 80 to 90 consultants in Sindh who met the eligibility requirements and agreed to participate were included. Anesthesiology FCPS consultants or equivalents of either gender who consented to participate were eligible. Exclusions were made for FCPS anesthesiology trainees, MCPS anesthesiology specialists and trainees, and those who declined to participate. A technique of consecutive sampling was utilized.

After receiving approval from the CPSP and IRB of Indus Hospital, the Principal Investigator approached the Head of the Anesthesia department in each designated hospital to discuss the objectives of the study and obtain permission to conduct the research. After identifying the eligible anesthesiologists from hospital staff lists, they were contacted in person or by phone to obtain their consent.

A structured, self-administered questionnaire that required 15 to 20 minutes to complete was used to collect data. The questionnaire, which was developed based on an exhaustive review of the literature, covered topics such as demographic information, knowledge of infection control, current practices, perceived barriers, and adherence to guidelines. Each questionnaire was distributed and collected in person by the principal investigator or study team.

The gathered information was entered and analyzed using SPSS version 21.0. For all quantitative variables, descriptive statistics, including Mean SD or Median (IQR), were computed, while frequency and percentage were computed for

categorical variables. Utilizing inferential statistics, such as the Chi-square test/Fisher's exact test and the Independent sample T-test/Mann Whitney U test, significant differences and relationships between variables were determined.

The study adhered to ethical guidelines for human research, receiving approval from the Ethical Review Committee of each hospital and the informed consent of all participants. Throughout the process of data collection and analysis, anonymity and privacy were maintained. To determine the reliability and validity of the questionnaire, it was piloted in a comparable context outside the study area and modified based on the feedback obtained. Internal consistency and face validity of the completed questionnaire were commendable. While every effort was made to reduce biases and increase the generalizability of the study, potential limitations may include response bias due to reliance on self-reported data and non-response bias due to the voluntary nature of participation.

Results

In this study, a total of 83 consultants were approached, but 18 opted out, leaving 65 participants for data analysis. Of these participants, the majority were male (n=53), with a smaller female contingent (n=12). The mean age of the participants was 49.27 years (±SD=11.27). Most participants were employed in private institutions (n=43) and possessed an average experience of 13.97 years (±SD=10.24) (Table 1).

Analysis revealed no significant differences in mean age and professional experience between those who had an acceptable understanding of hygienic practices and those who did not (p-value >0.05, Table 3). Interestingly, consultants operating in private institutions demonstrated higher mean knowledge scores about hygienic practices compared to their counterparts in government settings (15.67 vs 13.95, p-value 0.027). Gender did not significantly influence the mean score of hygienic practice (p-value 0.763, Table 3).

Additionally, a trend was observed relating the type of institute to knowledge status about hygienic practice. The results showed that a higher proportion of consultants working in private institutions had acceptable knowledge regarding hygienic practices compared to those in government settings (74.4% vs 52.6%, p-value 0.091, Table 4). Factors such as gender, post-fellowship experience, and age did not associate significantly with the knowledge status about hygienic practice (Table 4).

The further analysis evaluated the differences in knowledge about hygienic practices based on the type of institution and post-fellowship experience. The type of institution significantly correlated with the practice of changing the breathing circuit. Data demonstrated that participants in private institutions changed breathing circuits after every patient in contrast to their peers in government institutions (100% vs 0%, p-Value=0.001). Moreover, the practice of needle recapping was more common in private institutions compared to government settings (61.7% vs 38.3%, p-value=0.025).

The practice of using proper sterile technique during epidural anesthesia or central venous puncture was significantly associated with the type of institution (p-value=0.015 & 0.051 respectively). A larger proportion of participants from private institutions reported using sterile techniques while performing these procedures compared to those in government institutions (79.5% vs 29.5% and 76.1% vs 23.9% respectively, Table 5).

A noteworthy finding was that consultants with 6-15 years of professional experience reported a higher frequency of using gloves when anesthetizing compared to their peers (p-value=0.016). Regardless of professional experience, nearly all participants reported changing gloves between cases. Additionally, a significantly higher proportion of participants with 6-15 years of experience reported hand washing between cases as compared to the other participants (p-value=0.025, Table 6).

Table 1: Descriptive Analysis	
Variable	Frequency
Gender	
Male	53(81.5)
Female	12(18.5)
Age	
Mean±S.D	49.27±11.77
Type of Institute	
Private	43(66.2)
Govt	19(29.2)
Experience (Years)	
Mean±S.D	13.97±10.24
Min-Max	0.17-42
Median (IQR)	14 (5.2 -20)
Hygenic Score	
Mean±S.D	15±2.85
Min-Max	1022
Median (IQR)	15 (13-17)

Table 2: Components of Hygenic Practice		
Variable	n(%)	
Using Surgical Mask in OT		
Never	2(3.1)	0.00001*
Rarely	9(13.8)	
Frequently	21(32.3)	
Always	33(50.8)	
On Surgeon Request	0	
Using gloves when Anesthetizing		
Never	1(1.5)	0.00001*
Rarely	9(13.8)	
Frequently	25(38.5)	
Always	30(46.2)	
Changing gloves between cases		

Yes	59(90.8)	
No	1(1.5)	
Sometimes Yes & Sometimes No	2(3.1)	0.00001*
Missing	3(4.6)	
Hand washing between cases		
Never	0	
Rarely	4(6.2)	
Frequently	19(29.2)	0.00001*
Always	42(64.6)	
Using an Aseptic technique while placing the indwelling catheter		
Never	0	
Rarely	1(1.5)	
Frequently	6(9.2)	0.00001*
Always	57(87.7)	
Missing	1(1.5)	
Change the patient's disposable breathing circuit.		
After each patient	20(30.8)	
Only after infected or high-risk patient	26(40.0)	
At the end of the day	1(1.5)	0.00001*
Both (2) and (3)	14(21.5)	
Other	4(6.2)	
Change the filter in ventilation system between patients?		
Never	2(3.1)	
Rarely	8(12.3)	0.00001*
Frequently	16(24.6)	
Always	39(60.0)	
After administering anesthesia, do you (or technician) ever wipe anesthesia machine/ventilator/working surfaces with a disinfectant/germicidal agent?		
Never	9(13.8)	
Rarely	18(27.7)	
Frequently	20(30.8)	0.00001*
Always	16(24.6)	
Missing	2(3.1)	
Do you (or a technician) usually clean/disinfect laryngoscope blades?		
After each patient	61(93.8)	
Only after infected or high-risk patient	3(4.6)	0.00001*
At the end of the day	0	
Other	1(1.5)	
How do you (or a technician) usually clean/disinfect laryngoscope blades?		
Rinse under running water	7(10.8)	
Wash with soap and water	12(18.5)	
Wipe with an alcohol swab	5(7.7)	
Clean with disinfectant/ germicidal agent	37(56.9)	0.00001*
Autoclave	1(1.5)	
Other	2(3.1)	
Missing	1(1.5)	
Do you ever use one syringe to administer drugs to more than one patient?		
Never	58(89.2)	

Rarely	3(4.6)	
Frequently	1(1.5)	0.00001*
Always	3(4.6)	
Do you wipe the rubber septum of a multidose vial with alcohol before use?		
Never	17(26.2)	
Rarely	11(16.9)	
Frequently	14(21.5)	0.00001*
Always	22(33.8)	
Missing	1(1.5)	
Do you use three-way stopcock to administer drugs?		
Never	2(3.1)	
Rarely	5(7.7)	
Frequently	29(44.6)	0.00001*
Always	27(41.5)	
Missing	2(3.1)	
Do you recap the needle after collecting blood?		
Never	9(13.8)	
Rarely	6(9.2)	
Frequently	15(23.1)	
Always	34(52.3)	0.00001*
Missing	1(1.5)	
Do you use sterile technique before giving spinal anesthesia?		
Never	0	
Rarely	0	
Frequently	0	0.00001*
Always	65(100)	
Before giving spinal anesthesia what sterile technique do you use?		
Wearing gown only	12(18.5)	
Full scrub	33(50.8)	
Sometimes gown only and sometimes full scrub	19(29.2)	0.00001*
Other	1(1.5)	
Do you use sterile technique before giving epidural anesthesia?		
Never	0	
Rarely	0	
Frequently	0	0.00001*
Always	65(100)	
Before giving epidural anesthesia what sterile technique do you use?		
Wearing gown only	5(7.7)	
Full scrub	47(72.3)	
Sometimes gown only and sometimes full scrub	12(18.5)	0.00001*
Other	1(1.5)	
Do you use sterile technique for central venous puncture?		
Never	0	
Rarely	0	
Frequently	3(4.6)	0.00001*
Always	62(95.4)	
Before puncturing central venous what sterile technique do you use?		
Wearing gown only	2(3.1)	

Full scrub	48(73.8)	0.00001*
Sometimes gown only and sometimes full scrub	14(21.5)	
Other	1(1.5)	
Respiratory tract infection (cold, influenza, etc.)		
Yes	50(76.9)	0.00001*
No	12(18.5)	
Don't Know	3(4.6)	
A gastrointestinal infection		
Yes	38(58.5)	0.00001*
No	16(24.6)	
Don't Know	9(13.8)	
Missing	2(3.1)	
Herpes simplex infection (cold sore, herpetic whitlow)		
Yes	8(12.3)	0.00001*
No	43(66.2)	
Don't Know	13(20.0)	
Missing	1(1.5)	
Psoriasis / Dermatitis		
Yes	19(29.2)	0.00001*
No	40(61.5)	
Don't Know	5(7.7)	
Missing	1(1.5)	
Do you change your conducts if you know the patient has hepatitis B or C?		
Yes	60(92.3)	0.00001*
No	5(7.7)	
Do you change your conduct if you know the patient is HIV positive?		
Yes	62(95.4)	0.00001*
No	3(4.6)	

Table 3: Mean differences in age and professional experience between Hygenic Practices

	Age					
		N	Mean ± SD	Min - Max	Median (IQR)	p-value
Hygenic Practices	Acceptable	40	48.89±12.67	29-73	49(37-59)	0.856*
	Unacceptable	19	49.45±9.93	31-63	48(43-58)	
	Professional Experience					
	Acceptable	45	15.02±10.22	0.25-42	15(7-20)	0.217*
	Unacceptable	20	11.59±10.15	0.17-32	9(2-19)	
	Mean differences of Hygenic Score between Gender, type of institute Group					
		N	Mean ± SD	Min - Max	Median (IQR)	p-value
Gender	Male	53	15.09±2.74	10-22	15(13-17)	0.763*
	Female	12	15.42±3.39	10-20	15(12-18)	
	Type of Institute					
Type of Institute	Private	43	15.67±2.90	10-22	16(13-18)	0.027*
	Government	19	13.95±2.65	10-18	14(11-17)	
	Median differences of Perception Score between Gender.					

		Perception of score				
		N	Mean ± SD	Min - Max	Median (IQR)	p-value
Gender	Male	53	6.96±2.36	2-10	7(5-9)	0.686[µ]
	Female	12	7.33±2.42	4-10	7(5-10)	
Type of Institute	Private	43	7±2.48	2-10	7(5-10)	0.994[µ]
	Government	19	7.05±2.17	3-10	7(5-9)	
* Independent T-Test. [µ] Mann Whitney						

Table 4: Association of Gender, Age, Type of Institute, and Post fellowship Experience between Hygenic Practices.

Hygenic Practice				
	Acceptable n(%)	Unacceptable n(%)	Total n(%)	p-value
Gender				
Male	37(69.8)	16(30.2)	53(100)	1.000[α]
Female	8(66.7)	4(33.3)	12(100)	
Total	45(69.2)	20(30.8)	65(100)	
Type of Institute				
Private	32(74.4)	11(25.6)	43(100)	0.091[¥]
Government	10(52.6)	9(47.4)	19(100)	
Total	42(67.7)	20(32.3)	62(100)	
Age				
≤40	11(78.6)	3(21.4)	14(100)	0.323[¥]
41-55	15(57.7)	11(42.3)	26(100)	
>55	14(73.7)	5(26.3)	19(100)	
Total	40(67.8)	19(32.2)	59(100)	
Experience				
<5	9(56.3)	7(43.8)	16(100)	0.586[¥]
5-15	15(71.4)	6(28.6)	21(100)	
16-25	13(72.2)	5(27.8)	18(100)	
>25	8(80.0)	2(20)	10(100)	
Total	45(69.2)	20(30.8)	65(100)	
[α]Fisher's Exact Test. [¥] Chi-Sqaure				

Table 5: Association of Hygenic Practices between Type of Institute.

	Private	Government	Total	P-Value
Using Surgical Mask in OT				
No	4(44.4)	5(55.6)	9(100)	0.117[µ]
Yes	39(73.6)	14(26.4)	53(100)	
Total	43(69.4)	19(30.6)	62(100)	
Using gloves when Anesthetizing				
No	8(80)	2(20)	10(100)	0.710[µ]
Yes	35(67.3)	17(32.7)	52(100)	
Total	43(69.4)	19(30.6)	62(100)	
Changing gloves between cases				
No	1(100)	-	1(100)	0.672[¥]

Yes	39(69.6)	17(30.4)	56(100)	
Other	1(50)	1(50)	2(100)	
Total	41(69.5)	18(30.5)	59(100)	
Hand washing between cases				
No	4(100)	-	4(100)	
Yes	39(67.2)	19(32.8)	58(100)	0.303[µ]
Total	43(69.4)	19(30.6)	62(100)	
Using Aseptic technique while placing indwelling catheter				
No	-	1(100)	1(100)	
Yes	43(71.7)	17(28.3)	60(100)	0.295[µ]
Total	43(70.5)	18(29.5)	61(100)	
Change the patient's disposable breathing circuit.				
After each patient	19(100)	-	19(100)	
only after infected or high-risk patient	13(52.0)	12(48.0)	25(100)	
At the end of the day	1(100)	-	1(100)	
Both after infecting patient and at the end of day	10(71.4)	4(28.6)	14(100)	0.001[¥]
Other	-	3(100)	3(100)	
Total	43(69.4)	19(30.6)	62(100)	
Change the filter in ventilation system between patients.				
No	5(62.5)	3(37.5)	8(100)	
Yes	38(70.4)	16(29.6)	54(100)	0.692[µ]
Total	43(69.4)	19(30.6)	62(100)	
After administering anesthesia, do you (or technician) ever wipe anesthesia machine/ventilator/working surfaces with a disinfectant/germicidal agent?				
No	14(58.3)	10(41.7)	24(100)	
Yes	27(75.0)	9(25.0)	36(100)	0.174[¥]
Total	41(68.3)	19(31.7)	60(100)	
Do you (or a technician) usually clean/disinfect laryngoscope blades?				
After each patient	40(69.0)	18(31.0)	58(100)	
only after infected or high-risk patient	2(66.7)	1(33.3)	3(100)	
At the end of the day	-	-	-	1.000[µ]
Other	1(100)	-	1(100)	
Total	43(69.4)	19(30.6)	62(100)	
How do you (or a technician) usually clean/disinfect laryngoscope blades?				
Rinse under running water	2(33.3)	4(66.7)	6(100)	
Wash with soap and water	10(83.3)	2(16.7)	12(100)	
Wipe with an alcohol swab	2(40)	4(60.0)	5(100)	
Clean with disinfectant/ germicidal agent	27(75.0)	9(25)	36(100)	0.079[¥]
Autoclave	-	-	-	
Other	2(100)	-	2(100)	
Total	43(70.5)	18(29.5)	61(100)	
Do you ever use one syringe to administer drugs to more than one patient?				
No	40(67.8)	19(32.2)	59(100)	
Yes	3(100)	-	3(100)	0.546[µ]
Total	43(69.4)	19(30.6)	62(100)	
Do you wipe the rubber septum of a multidose vial with alcohol before use?				

No	18(66.7)	9(33.3)	27(100)	
Yes	24(70.6)	10(29.4)	34(100)	0.743¥
Total	42(68.9)	19(31.1)	61(100)	
Do you use a three-way stopcock to administer drugs?				
No	5(71.4)	2(28.6)	7(100)	
Yes	37(68.5)	17(31.5)	54(100)	1.000µ
Total	42(68.9)	19(31.1)	61(100)	
Do you recap the needle after collecting blood?				
No	14(93.3)	1(6.7)	15(100)	
Yes	29(61.7)	18(38.3)	47(100)	0.025µ
Total	43(69.4)	19(30.6)	62(100)	
Before giving spinal anesthesia what sterile technique do you use?				
Wearing gown only	5(45.5)	6(54.5)	11(100)	
Full scrub	24(77.4)	7(22.6)	31(100)	
Sometimes gown only and sometimes full scrub	13(68.4)	6(31.6)	19(100)	0.209µ
Other	1(100)	-	1(100)	
Total	43(69.4)	19(30.6)	62(100)	
Before giving epidural anesthesia what sterile technique do you use?				
Wearing gown only	1(20.0)	4(80.0)	5(100)	
Full scrub	35(79.5)	9(20.5)	44(100)	
Sometimes gown only and sometimes full scrub	6(50)	6(50)	12(100)	0.015¥
Other	1(100)	-	1(100)	
Total	43(69.4)	19(30.6)	62(100)	
Before puncturing central venous what sterile technique do you use?				
Wearing gown only	-	2(100)	2(100)	
Full scrub	35(76.1)	11(23.9)	46(100)	
Sometimes gown only and sometimes full scrub	7(53.8)	6(46.2)	13(100)	0.051µ
Other	1(100)	-	1(100)	
Total	43(69.4)	19(30.6)	62(100)	
Respiratory tract infection (cold, influenza, etc.)				
No	9(64.3)	5(35.7)	14(100)	
Yes	34(70.8)	14(29.2)	48(100)	0.744µ
Total	43(69.4)	19(30.6)	62(100)	
A gastrointestinal infection				
No	15(62.5)	9(37.5)	24(100)	
Yes	26(72.2)	10(27.8)	36(100	0.428¥
Total	41(68.3)	19(31.7)	60(100)	
Herpes simplex infection (cold sore, herpetic whitlow)				
No	35(64.8)	19(35.2)	54(100)	
Yes	7(100)	-	7(100)	0.088µ
Total	42(68.9)	19(31.1)	61(100)	
Psoriasis / Dermatitis				
No	27(64.3)	15(35.7)	42(100)	
Yes	15(78.9)	4(21.1)	19(100)	0.252¥
Total	42(68.9)	19(31.1)	61(100)	

Do you change your conduct if you know the patient has hepatitis B or C?				
No	4(80.0)	1(20.0)	5(100)	1.000µ
Yes	39(68.4)	18(31.6)	57(100)	
Total	43(69.4)	19(30.6)	62(100)	
Do you change your conduct if you know the patient is HIV positive?				
No	2(66.7)	1(33.3)	3(100)	1.000µ
Yes	41(69.5)	18(30.5)	59(100)	
Total	43(69.4)	19(30.6)	62(100)	
µ Fisher Exact Test, ¥ Chi-Square.				

Table 6: Association of Hygenic Practices between Post Fellowship Experience.

	<5	6-15	16-25	>25	Total	P-Value
Using Surgical Mask in OT						
No	2(18.2)	3(27.3)	4(36.4)	2(18.2)	11(100)	0.858µ
Yes	14(25.9)	18(33.3)	14(25.9)	8(14.8)	54(100)	
Total	16(24.6)	21(32.3)	18(27.7)	10(15.4)	65(100)	
Using gloves when Anesthetizing						
No	3(30.0)	-	3(30.0)	4(40.0)	10(100)	0.016µ
Yes	13(23.6)	21(38.2)	15(27.3)	6(10.9)	55(100)	
Total	16(24.6)	21(32.3)	18(27.7)	10(15.4)	65(100)	
Changing gloves between cases						
No	-	-	-	1(100)	1(100)	0.417µ
Yes	16(27.1)	20(33.9)	14(23.7)	9(15.3)	59(100)	
Sometimes Yes and Sometimes No	-	1(50.0)	1(50.0)	-	2(100)	
Total	16(25.8)	21(33.9)	15(24.2)	10(16.1)	62(100)	
Hand washing between cases						
No	2(50.0)	-	-	2(50.0)	4(100)	0.025µ
Yes	14(23.0)	21(34.4)	18(29.5)	8(13.1)	61(100)	
Total	16(24.6)	21(32.3)	18(27.7)	10(15.4	65(100)	
Using Aseptic technique while placing indwelling catheter						
No	-	1(100)	-	-	1(100)	1.000µ
Yes	16(25.4)	19(30.2)	18(28.6)	10(15.9)	63(100)	
Total	16(25.0)	20(31.3)	18(28.1)	10(15.6)	64(100)	
Change the patient's disposable breathing circuit.						
After each patient	4(20.0)	7(35.0)	6(30.0)	3(15.0)	20(100)	0.861µ
Only after infected or high-risk patient	8(30.8)	10(38.5)	5(19.2)	3(11.5)	26(100)	
At the end of the day	-	-	1(100)	-	1(100)	
Both after infecting patient and at the end of day	3(21.4)	3(21.4)	4(28.6)	4(28.6)	14(100)	
Other	1(21.4)	1(21.4)	2(50.0)	-	4(100)	
Total	16(24.6)	21(32.3)	18(27.7)	10(15.4)	65(100)	
Change the filter in the ventilation system between patients.						
No	30(30.0)	30(30.0)	1(10.0)	30(30.0)	10(100)	0.335µ
Yes	13(23.6)	18(32.7)	17(30.9)	7(12.7)	55(100)	
Total	16(24.6)	21(32.3)	18(27.7)	10(15.4)	65(100)	
After administering anesthesia, do you (or the technician) ever wipe the anesthesia						

machine/ventilator/working surfaces with a disinfectant/germicidal agent?						
No	8(29.6)	9(33.3)	6(22.2)	4(14.8)	27(100)	
Yes	8(22.2)	12(33.3)	12(33.3)	4(11.1)	36(100)	0.790[µ]
Total	16(25.4)	21(33.3)	18(28.6)	8(12.7)	63(100)	
Do you (or a technician) usually clean/disinfect laryngoscope blades?						
After each patient	13(21.3)	21(34.4)	18(29.5)	9(14.8)	61(100)	
only after an infected or high-risk patient	2(66.7)	-	-	1(33.3)	3(100)	
At the end of the day	-	-	-	-		0.085[µ]
Other	1(100)	-	-	-	1(100)	
Total	16(24.6)	21(32.3)	18(27.7)	10(15.4)	65(100)	
How do you (or a technician) usually clean/disinfect laryngoscope blades?						
Rinse under running water	1(14.3)	4(57.1)	2(28.6)	-	7(100)	
Wash with soap and water	2(16.7)	5(41.7)	4(33.3)	1(8.3)	12(100)	
Wipe with an alcohol swab	4(80.0)	1(20.0)	-	-	5(100)	
Clean with disinfectant/ germicidal agent	8(21.6)	9(24.3)	12(32.4)	8(21.6)	37(100)	0.222[µ]
Autoclave	-	-	-	1(100)	1(100)	
Other	1(50.0)	1(50.0)	-	-	2(100)	
Total	16(25.0)	20(31.3)	18(28.1)	10(15.6)	64(100)	
Do you ever use one syringe to administer drugs to more than one patient?						
No	16(26.2)	19(31.1)	16(26.2)	10(16.4)	61(100)	
Yes	-	2(50.0)	2(50.0)	-	4(100)	
Total	16(24.6)	21(32.3)	18(27.7)	10(15.4)	65(100)	0.573[µ]
Do you wipe the rubber septum of a multidose vial with alcohol before use?						
No	11(39.3)	5(17.9)	9(32.1)	3(10.7)	28(100)	
Yes	5(13.9)	16(44.4)	8(22.2)	7(19.4)	36(100)	0.032[¥]
Total	16(25.0)	21(32.8)	17(26.6)	10(15.6)	64(100)	
Do you use three-way stopcock to administer drugs?						
No	3(42.9)	1(14.3)	3(42.9)	-	7(100)	
Yes	12(21.4)	20(35.7)	14(25.0)	10(17.9)	56(100)	0.317[µ]
Total	15(23.8)	21(33.3)	17(27.0)	10(15.9)	63(100)	
Do you recap the needle after collecting blood?						
No	5(33.3)	6(40.0)	4(26.7)	-	15(100)	
Yes	11(22.4)	15(30.6)	13(26.50)	10(20.4)	49(100)	0.259[µ]
Total	16(25.0)	21(32.8)	17(26.6)	10(15.6)	64(100)	
Before giving spinal anesthesia what sterile technique do you use?						
Wearing gown only	2(16.7)	3(25.0)	6(50.0)	1(8.3)	12(100)	
Full scrub	10(30.3)	13(39.4)	5(15.2)	5(15.2)	33(100)	
Sometimes gown only and sometimes full scrub	4(21.1)	5(26.3)	7(36.8)	3(15.8)	19(100)	0.288[µ]
Other	-	-	-	1(100)	1(100)	
Total	16(24.6)	21(32.3)	18(27.7)	10(15.4)	65(100)	
Before giving epidural anesthesia what sterile technique do you use?						
Wearing gown only	2(40.0)	2(40.0)	1(20.0)	-	5(100)	
Full scrub	12(25.5)	15(31.9)	13(27.7)	7(14.9)	47(100)	0.873[µ]
Sometimes gown only and sometimes full scrub	2(16.7)	4(33.3)	4(33.3)	2(16.7)	12(100)	

Other	-	-	-	1(100)	1(100)	
Total	16(24.6)	21(32.3)	18(27.7)	10(15.4)	65(100)	
Before puncturing central venous what sterile technique do you use?						
Wearing gown only	-	1(50.0)	1(50.0)	-	2(100)	0.249µ
Full scrub	14(29.2)	17(35.4)	12(25.0)	5(10.4)	48(100)	
Sometimes gown only and sometimes full scrub	2(14.3)	3(21.4)	5(35.7)	4(28.6)	14(100)	
Other	-	-	-	1(100)	1(100)	
Total	16(24.6)	21(32.3)	18(27.7)	10(15.4)	65(100)	
Respiratory tract infection (cold, influenza, etc.)						
No	-	9(60.0)	3(20.0)	3(20.0)	15(100)	0.010µ
Yes	16(32.0)	12(24.0)	15(30.0)	7(14.0)	50(100)	
Total	16(24.6)	21(32.3)	18(27.7)	10(15.4)	65(100)	
A gastrointestinal infection						
No	4(16.0)	8(32.0)	7(28.0)	6(24.0)	25(100)	0.420¥
Yes	11(28.9)	13(34.2)	10(26.3)	4(10.5)	38(100)	
Total	15(23.8)	21(33.3)	17(27.0)	10(15.9)	63(100)	
Herpes simplex infection (cold sore, herpetic whitlow)						
No	13(23.2)	19(33.9)	16(28.6)	8(14.3)	56(100)	0.909µ
Yes	3(37.5)	2(25.0)	2(25.0)	2(25.0)	8(100)	
Total	16(25.0)	21(32.8)	18(28.1)	9(14.1)	64(100)	
Psoriasis / Dermatitis						
No	8(17.8)	18(40.0)	11(24.4)	8(17.8)	45(100)	0.41
Yes	8(42.1)	3(15.8)	6(31.6)	2(10.5)	19(100)	
Total	16(25.0)	21(32.8)	17(26.6)	10(15.6)	64(100)	
Do you change your conduct if you know the patient has hepatitis B or C?						
No	1(20.0)	21(32.3)	18(27.7)	8(13.3)	60(100)	0.255µ
Yes	15(25.0)	19(31.7)	18(30)	2(40.0)	5(100)	
Total	16(24.6)	21(32.3)	18(27.7)	10(15.4)	65(100)	
Do you change your conduct if you know the patient is HIV positive?						
No	15(24.2)	20(32.3)	18(29.0)	9(14.5)	62(100)	0.668µ
Yes	1(33.3)	1(33.3)	-	1(33.3)	3(100)	
Total	16(24.6)	21(32.3)	18(27.7)	10(15.4)	65(100)	
µ Fisher Exact Test, ¥ Chi-Square.						

Discussion

This study shed light on the hygienic practices of consultant anesthetists in Sindh, Pakistan. The significant influence of institutional type on both knowledge and implementation of hygienic practices was an important finding. Private institution anesthetists demonstrated a greater comprehension and application of hygienic protocols than their government institution counterparts. This finding was consistent with previous research that has highlighted differences between private and public health institutions' practices [11]. It may be attributable to differences in resources, training, and policy enforcement between these contexts [12]. However, additional research is required to determine the precise underlying causes of this discrepancy. Intriguingly, no correlation was found between the participants' age, gender, or professional experience and their knowledge of hygienic practices. This may indicate that factors such as continuing education,

institutional culture, and individual attitudes toward hygiene may be more influential than demographic characteristics or experience [13].

Private institution anesthetists were more likely to frequently change the respiratory circuit and use sterile techniques during invasive procedures. These are essential practices for reducing the risk of patient infection, and our findings emphasized the need for increased adherence in government institutions [14]. In addition, anesthetists with 6 to 15 years of professional experience were more likely to use gloves while administering anesthesia and cleanse their hands between cases. This suggested that experience may influence certain aspects of hygienic practice, indicating a potential area for targeted training and development among less experienced anesthetists [15]. Due to the self-reported nature of the survey and the voluntary nature of the participation, this study contains the potential for response and non-response bias [16-17].

The use of respiratory protection apparatus was recommended rather than surgical masks because surgical masks do not provide adequate protection against aerosolized blood in operating room [18]. It was found that while anesthetists were aware of appropriate hygiene practices, their performance fell short of accepted recommendations [19]. Overall, the study revealed a substantial opportunity to improve patient safety in anesthesiology through enhanced hygiene-related education and training, particularly in government settings. Regular seminars on hygiene practices could be instituted to supplement existing measures and facilitate the application of knowledge. The implementation of these adjustments could have a substantial impact on reducing the prevalence of healthcare-associated infections, thereby improving patient outcomes overall [20].

Conclusion

In conclusion, the study disclosed significant insights regarding consultant anesthetists' knowledge and practice of hygienic measures in teaching hospitals in Sindh, Pakistan. While there were no significant differences in hygienic knowledge and practices based on age, gender, or professional experience, institution type had a significant impact. Consultants employed by private institutions demonstrated a greater understanding and application of hygienic practices than their government counterparts. These practices included altering the breathing circuit after each patient, increasing the frequency of needle recapping, and utilizing sterile techniques more frequently during epidural anesthesia or central venous puncture. In addition, consultants with 6 to 15 years of professional experience used mittens more frequently during anesthesia and washed their hands more frequently between cases. However, almost all participants, regardless of their level of expertise, adhered to the best practice of changing mittens between cases. These results highlight the significance of enhancing hygiene-related education and training across all institutions, especially in government organizations. To maintain the highest standards of patient care and safety in the field of anesthesiology, the study advocates for additional research in the area and calls for the implementation of regular hygiene practices training and seminars. Future research could also delve deeper into the factors that contribute to the observed disparities between private and government institutions to facilitate more effective, targeted interventions.

Conflict of interest

None.

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