Knowledge and Practice of Healthcare Personnel Regarding Disinfection and Sterilization of Surgical Instruments at Tertiary Level Hospitals in Rajshahi

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Abstract

Background: The process of sterilization involves eliminating or completely destroying all germs, including bacterial spores. Controlling and preventing infections is a crucial component of providing safe patient care.

Objective: The objective of this study was to assess the knowledge and practice of healthcare personnel regarding disinfection and sterilization of surgical instruments at tertiary level hospitals in Rajshahi.

Methodology: This cross-sectional type of descriptive study was conducted over a period of 1 year in the Department of Community Medicine, Rajshahi Medical College, Rajshahi. In this study, study population was healthcare personnel who were working in different tertiary level hospitals in Rajshahi. The knowledge and practice of healthcare personnel regarding disinfection and sterilization of surgical instruments were done by semi-structured questionnaire with score 1 for Yes and 0 for No answer. Health Care Workers (HCWs) score equal to or above 50% were considered having safe knowledge and instrument processing practice (IPP) and score below 50% having unsafe knowledge and IPP on disinfection and sterilization of surgical instruments. The data were analyzed via SPSS (version 24.0) and $p < 0.05$ was considered statistically significant.

Result: The study population included 236 healthcare workers, of which 142 (60.2%) had safe knowledge and 94 (39.8%) had unsafe knowledge, while, 131 (55.5%) were practicing safely and 105 (44.5%) were practicing unsafely. The majority of healthcare workers with safe knowledge and practice were in the age range of 20-25 years. The relationship between healthcare workers' knowledge and practice with age, sex, marital status, professional status, working departments and duration of service were not statistically significant ($p > 0.05$ each). While with infection prevention training, awareness on infection prevention, availability of poster, standard operating procedure (SOP) or guideline and vaccination against hepatitis B were statistically significant ($p < 0.05$ each).

Conclusion: The findings of this study indicated that the way medical staff members clean and store equipment was unsafe. HCWs must be more knowledgeable about infection prevention and control (IPC) and possess superior operational abilities if healthcare facilities are to be free of infections.

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Introduction

Sterilization is a process by which complete destruction or killing of all microorganisms including bacterial spores is achieved. Prevention of infection and control is an important part of safe patient care. Concerns about the possible spread of blood - borne diseases, and the impact of emerging, highly contagious respiratory and other illnesses, require physicians to establish, evaluate, continually update and monitor their infection prevention, control strategies and protocols.[1] Surgical procedures frequently cause bleeding and exposure to infected blood, saliva and aerosol are a known means of infectious disease transmission. Sometimes, surgeons have to work in a pathogen - rich, contaminated environment usually deals with blood. They are exposed to a variety of microorganisms present in blood and saliva, coupled with possible injury from the sharp instruments.[2]

While treating patients, physicians become susceptible to various infectious diseases. Diseases such as hepatitis B and acquired immunodeficiency syndrome (AIDS) can spread through unsterile instruments. There are effective infection control procedures and universal precautions for hospitals and surgical operatories to prevent cross contamination,

which should be practiced by doctors, interns and healthcare staff including nurses, theater assistants, lab technicians, and sanitation staff of hospitals.[3] Increased awareness about risks of transmission of infection through blood and saliva has led to increased use of protective barrier techniques and prevention of communicable diseases.[4]

As sterilization is the most important step in prevention of cross infection. Few studies have been done worldwide which show gaps in the knowledge of some healthcare staff regarding modes of transmission of infectious diseases. The awareness about the importance of sterilization in reducing communicable diseases needs to be increased among medical faculty. There is also a pressing need to identify the areas where improvements can be made in hospital setup toward disinfection and sterilization practices. Hence this study was conducted to assess knowledge and practice of healthcare personnel regarding disinfection and sterilization of surgical instruments in different tertiary level hospitals in Rajshahi.

Materials and Methods

It was a cross-sectional type of descriptive study that was carried out over a period of 1 year from January 2022 to December 2022 in the Department of Community Medicine, Rajshahi Medical College, Rajshahi. Health care personnel working in different tertiary level hospitals like Rajshahi Medical College Hospital (RMCH), Islami Bank Medical College Hospital (IBMCH) and Barind Medical College Hospital (BMCH) of Rajshahi were included in the study. The sample size of this study was 236. Modified Cochran formula was used to calculate the sample size. A score ≥ 50% was considered as safe and < 50% was considered as unsafe.

Inclusion criteria

a) Health care personnel working in different tertiary level hospitals like Rajshahi Medical College Hospital (RMCH), Islami Bank Medical College Hospital and Barind Medical College Hospital of Rajshahi.

b) Respondents who participated voluntarily.

Exclusion criteria

a) Respondents who did not give consent to participate in this study.

On obtaining ethical clearance from the Ethical Committee of Rajshahi Medical College, Rajshahi data collections were commenced with the help of semi structured questionnaire.

Result

The study population included 236 healthcare workers, of which 142 (60.2%) had safe knowledge and 94 (39.8%) had unsafe knowledge, while, 131 (55.5%) were practicing safely and 105 (44.5%) were practicing unsafely. The majority of healthcare workers with safe knowledge and practice were in the age range of 20-25 years. The relationship between healthcare workers' Knowledge and practice with age, sex, marital status, professional status, working departments and duration of service were not statistically significant ($p > 0.05$ each). On the other hand, the relationship between healthcare workers' infection prevention training, awareness on infection prevention, availability of poster, SOP or guideline and vaccination against hepatitis B were statistically significant ($p < 0.05$ each).

Table I: Socio-demographic information of the respondents (n=236)

Variables	Number	Percentage
Age in years		
20-25	116	49.2
26-30	99	41.9
> 30	21	8.9
Mean±SD	26.29±3.26	Range 20-38 years
Marital status		
Unmarried	143	60.6
Married	93	39.4
Profession		
Nurses and midwives	170	72.1
Physicians (Postgraduate fellows and interns)	43	18.2
Laboratory technicians and others	23	9.7
Department		
OPD, Emergency and Triage	84	35.6
Delivery, Dressing and Injection room	54	22.9
OT of different departments	42	17.8
Laboratory	30	12.7
Follow up and inpatients	26	11.0
Infection prevention training		
Yes	132	55.9
No	104	44.1
Awareness on infection prevention		
Aware	142	60.2
Not aware	94	39.8
Duration of service		
< 3 years	128	54.2
3-6 years	71	30.1
> 6 years	37	15.7
Poster, SOP or guideline available		
Yes	137	58.1
No	99	41.9
Vaccinated		
Yes	176	74.6
No	60	25.4

Table II: Distribution of respondents by their knowledge on disinfection and sterilization of surgical instruments (n = 236)

Variables	Yes (n)	Percentage
Ever know the Spaulding categories of potential infection risks?	123	52.1
Items and practices affect sterile tissues or the blood system consider as critical item/practice	116	49.2
Decontamination is the first step in instrument processing	151	64.0
The objective of decontamination is to protect HCWs while handling used instruments	149	63.1
Decontamination inactivate HBV, HCV and HIV	153	64.8
Chemical disinfection can kills all living microorganisms ncluding bacterial spores	157	66.5
After proper decontamination and cleaning 0.1% chlorine solution for 20 min provide HLD	153	64.8
Sterilization is a process where all microorganisms, including bacterial spores are killed	152	64.4
Steam sterilization is a preferred method for reusable surgical instruments	146	61.9
Sterilization can be achieved by high-pressure steam, dry heat oven or using chemical sterilants	149	63.1
All instruments should be decontaminated first, thoroughly cleaned and dried before being sterilized	142	60.2
The temperature, pressure, and time combinations for steam sterilization is 121°C (250°F), pressure of 106 kPa (15lb/in2) for 20 minutes unwrapped items and 30 minutes for wrapped items	146	61.9

Table III: Distribution of respondents by their practice on disinfection and sterilization of surgical instruments (n = 236)

Variables	Yes (n)	Percentage
Do you always perform proper disinfection and sterilization as per the recommendations?	140	59.3
Do you always perform decontamination before cleaning?	148	62.7
Do you always place contaminated items in decontaminate solution for 10 minutes?	136	57.6
Do you immediately immerse surgical instruments in decontaminant solution after use?	141	59.7
Do you always wear all the necessary PPE during disinfection and sterilization?	130	55.1
Do you always disinfect stethoscopes?	143	60.4
Do you always thoroughly clean items before sterilization?	138	58.5
When you prepare 0.5% decontaminate chlorine solution do you take one part concentrated solution and add to nine parts of water?	143	60.6
Do you always perform HLD after applying proper decontamination and thorough cleaning?	140	59.3
Do you always monitor the correct temperature, pressure and time combination for sterilization cycle?	23	9.7
Do you perform weekly biological test for dry heat or steam sterilizer?	0	0
Do you use chemical indicators to monitor time, temperature and pressure for steam sterilization and time and temperature for dry heat sterilization?	18	7.6

Table IV: Association between respondents' knowledge on surgical instruments disinfection and sterilization and determinant variables (n = 236)

Demographic Characteristics	Knowledge		
	Safe No. (%)	Unsafe No. (%)	
Age in years			
20-25	70 (49.3)	46 (48.9)	x^2= 0.09
26-30	60 (42.2)	39 (41.5)	***p*** = 0.95
>30	12 (8.5)	9 (9.6)	
Sex			
Male	48 (33.8)	31 (33.0)	x^2=0.01
Female	94 (66.2)	63 (67.0)	***p*** = 0.89
Marital status			
Unmarried	90 (63.4)	53 (56.4)	x^2=1.15
Married	52 (36.6)	41 (43.6)	***p*** = 0.28
Profession			
Nurses & Midwives	104 (73.2)	66 (70.2)	x^2= 1.63
Physicians (Postgraduate fellows and interns)	27 (19.0)	16 (17.0)	***p*** = 0.43
Laboratory technicians and others	11 (7.8)	12 (12.8)	
Department			
OPD, Emergency and Triage	51 (35.9)	33 (35.1)	x^2= 4.56
Delivery Room & Dressing and Injection room	30 (21.1)	24 (25.5)	***p*** = 0.33
OT of different departments	28 (19.7)	14 (14.9)	
Laboratory	21 (14.8)	9 (9.6)	
Follow up and inpatients	12 (8.5)	14 (14.9)	
Duration of service			
< 3 years	76 (53.5)	52 (55.3)	x^2= 2.03
3-6 years	40 (28.2)	31 (33.0)	***p*** = 0.36
>6 years	26 (18.3)	11 (11.7)	
Infection prevention training			
Yes	112 (78.9)	20 (21.3)	x^2= 76.15
No	30 (21.1)	74 (78.7)	***p*** < 0.001
Awareness on infection prevention			
Aware	96 (67.6)	46 (48.9)	x^2= 8.23
Not aware	46 (32.4)	48 (51.1)	***p*** < 0.01
Poster, SOP or guideline available			
Yes	91 (64.1)	46 (48.9)	x^2= 5.33
No	51 (35.9)	48 (51.1)	***p*** < 0.05
Vaccinated			
Yes	120 (84,5)	56 (59.6)	x^2= 18.55
No	22 (15.5)	38 (40.4)	***p*** < 0.001

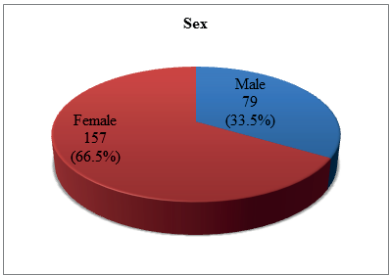

Fig. 1: Sex distribution of the study population (n = 236)

Table V: Association between respondents' practice on surgical instruments disinfection & sterilization and determinant variables (n = 236)

Demographic Characteristics	Practice		
	Safe No. (%)	Unsafe No. (%)	
Age in years			
20-25	65 (49.6)	51 (48.6)	x^2= 0.09
26-30	55 (42.0)	44 (41.9)	***p*** = 0.95
>30	11(8.4)	10 (9.5)	
Sex			
Male	43 (32.8)	36 (34.3)	x^2= 0.05
Female	88 (67.2)	69 (65.7)	***p*** = 0.81
Marital status			
Unmarried	85 (64.9)	58 (55.2)	x^2= 2.27
Married	46 (35.1)	47 (44.8)	***p*** = 0.13
Profession			
Nurses & Midwives	95 (72.5)	75 (71.4)	x^2= 0.68
Physicians (Postgraduate fellows and Interns)	25 (19.1)	18 (17.2)	***p*** = 0.71
Laboratory technicians and others	11 (8.4)	12 (11.4)	
Department			
OPD, Emergency and Triage	48 (36.6)	36 (34.3)	x^2= 5.07
Delivery Room & Dressing and Injection room	25 (19.1)	29 (27.6)	***p*** = 0.28
OT of different departments	26 (19.8)	16 (15.2)	
Laboratory	20 (15.3)	10 (9.5)	
Follow up and inpatients	12 (9.2)	14 (13.4)	
Duration of service			
< 3 years	69 (52.7)	59 (56.2)	x^2= 1.55
3-6 years	38 (29.0)	33 (31.4)	***p*** = 0.46
>6 years	24 (18.3)	13 (12.4)	
Infection prevention training			
Yes	104 (79.4)	28 (26.7)	= 65.73
No	27 (20.6)	77 (73.3)	***p*** < 0.001
Awareness on infection prevention			
Aware	89 (67.9)	53 (50.5)	x^2= 7.42
Not aware	42 (32.1)	52 (49.5)	***p*** < 0.01
Poster, SOP or guideline available			
Yes	85 (64.9)	52 (49.5)	x^2= 5.64
No	46 (35.1)	53 (50.5)	***p*** < 0.05
Vaccinated			
Yes	111 (84.7)	65 (61.9)	x^2= 16.03
No	20 (15.3)	40 (38.1)	***p*** < 0.001

Discussion

In this study it was observed that the majority (49.2%) of participants were aged between 20-25 years, followed by those (41.9%) aged between 26-30 years. Only a small percentage (8.9%) of participants was over 30 years old. The mean age of the population was 26.29 (±3.26) years. Sukhlecha et al.,reported the majority (60%) of respondents were in the age group of 21–30 years.[1] In a study conducted in Nigeria, the majority (89%) of respondents were in the age bracket of 21–40 years.[5] Geberemariyam et al., reported the mean (standard deviation) age of healthcare workers was 28.23 (±5.2) years.[6] Nishu et al., reported the mean 34.71 (± 9.448).[7] In this study majority (66.5%) of the study population was female with a male female ratio 1:2. Similar observations were found in different studies. Sukhlecha et al. reported the respondent group consisted of 107 (42.1%) men and 147 (57.9%) women.[1] But reverse ratio was found in the studies like, Geberemariyam et al., reported 446 (68.8%) and Eskander et al.,reported 225 (56.7%) of the participants were males.[6,8]

According to the findings of this study, regarding knowledge on disinfection and sterilization of surgical instruments three-fifth 142 (60.2%) of the respondents had safe knowledge and while two-fifth 94 (39.8%) had unsafe knowledge. There was no significant difference in knowledge based on age, sex, marital status, profession, working area/departments or duration of service ($p > 0.05$ each). In Geberemariyam et al., study, the proportion of healthcare workers who reported safe infection prevention practice was found to be 235 (36.3%).[6] Similarly, the result is inconsistent with that of Abdella et al., who found that 77.3% of the respondents were knowledgeable on hand hygiene compliance, Gulilat and Tiruneh who reported 63.9% of the respondents had good knowledge on tuberculosis infection control, and Shrestha et al., who also found that more than half (54%) of healthcare workers had good level of knowledge on tuberculosis infection control.[9,10,11]

In this study it was observed that there was a significant association between the HCWs' knowledge who received infection prevention training and who did not receive ($p < 0.05$). Those who had received infection prevention training had safe knowledge 112 (78.9%) and those who had not received infection prevention training had unsafe knowledge 74 (78.7%). Similarly, there was a significant association between HCWs' knowledge with awareness on infection prevention and patient safety guideline ($p < 0.05$). Those who were aware about infection prevention and patient safety guideline had safer knowledge 96 (67.6%) compared to those who were not aware 48 (51.1%). In the current study it was evident that, there was a significant association between HCWs' knowledge who had the availability of poster, SOP or guideline in their workplace ($p < 0.05$). Healthcare workers who had the availability of poster, SOP or guideline in their workplace had safe knowledge 91 (64.1%) on disinfection and sterilization of surgical instruments compared to those healthcare workers 48 (51.1%) who did not have the availability of poster, SOP or guideline in their workplace. Finally, there was also highly significant association between healthcare workers knowledge who were vaccinated against hepatitis B virus compared to those who were not vaccinated ($p < 0.05$). A study reported that sex, profession, year of service, presence of infection prevention committee, presence of infection prevention guideline, and ever taking training on infection prevention were factors which were significantly associated ($p < 0.05$) with HCWs' knowledge about

surgical instruments disinfection and sterilization.[6] Another study reported that there was significant association between healthcare workers knowledge with awareness on infection prevention and patient safety guideline, vaccination against hepatitis B, availability of poster, SOP or guideline in workplace, working department and year of service ($p < 0.05$ each).[12]

There were 131 (55.5%) healthcare workers practicing safe practices and 105 (44.5%) healthcare workers practicing unsafe practices. There were no significant differences in safe or unsafe practices based on age, sex, profession, and department, marital status and duration of service ($p > 0.05$ each). Similarly, Sahiledengle had reported that there was no significant association between healthcare workers instrument processing (disinfection and sterilization) practice based on age, sex, profession and marital status ($p > 0.05$) but they reported significant association between HCWs' instrument processing (disinfection and sterilization) practice based on duration of service and working departments ($p < 0.05$).[12] Other research by Parmeggiani et al., in Italy has reported dissimilarity in instrument disinfection and sterilization practices between physicians and nurses.[13]

This study revealed that association between HCWs' surgical instruments disinfection and sterilization practices with infection prevention training was highly significant ($p < 0.05$). Those who had infection prevention training were practicing safe practices 104 (79.4%) compared to those who had not received infection prevention training. However, Sahiledengle, reported that there was no significant association between HCWs' instrument processing (disinfection and sterilization) practice with infection prevention training ($p > 0.05$).[12] This study also found significant association between HCWs' surgical instruments disinfection and sterilization practice with awareness on infection prevention and patient safety guideline, availability of poster, SOP or guideline in workplace and vaccination against hepatitis B ($p < 0.05$ each). Similarly, Sahiledengle also reported significant association between healthcare workers instrument processing (disinfection and sterilization) practice with awareness on infection prevention training and patient safety guideline, availability of poster, SOP or guideline on workplace and vaccination against hepatitis B ($p < 0.05$).[12] In Gebresilassie et al., study, the proportion of healthcare workers who appear to be practicing safe instrument processing practice was 36.3%.[14]

Conclusion

The results of this study showed that the way healthcare workers clean and store surgical instruments is not safe enough. In this study we found that 60.2% health workers had safe knowledge while, 55.5% were practicing safely on disinfection and sterilization of surgical instruments. The relationship between healthcare workers' knowledge and practice with infection prevention training, awareness on infection prevention, availability of poster, SOP or guideline and vaccination against hepatitis B were statistically significant ($p < 0.05$ each). In general, a significant proportion of HCWs lack appropriate instrument processing expertise. In addition, none of the HCWs do regular monitoring of the sterilizing process. For healthcare facilities to be free of infections, HCWs need to know more about infection prevention and control (IPC) and acquire better operational skills.

Limitations

1. The study population was selected from three selected tertiary level hospitals in Rajshahi City, so the results of the study might not reflect the exact picture of the country.

2. The present study was a cross-sectional study and conducted at a very short period of time.

3. Small sample size was also a limitation of the present study. Therefore, in future further study might be undertaken with large sample sizes.

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