Healthcare Workers Awareness And Knowledge of Covid-19 Infection Control Precautions and Waste Management: Saudi Arabia Cross Sectional Study

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Abstract

Objective

Healthcare workers (HWs) perform a critical role not only in the clinical management and organization of patients but also in providing adequate infection control and prevention measures and waste management to be implemented in health care facilities. It is important therefore for HWs to have adequate and correct knowledge and awareness towards any pandemic. The aim of this study is to evaluate HWs awareness and knowledge of COVID-19 infection control precautions and waste management in Saudi Arabia hospitals.

Methods

This is a descriptive cross-sectional study. Information on knowledge, awareness and practice of HWs of infection control and waste management were obtained with the aid of a structured questionnaire. Thematic analysis was used to analyse the data.

Results

Our findings of assessing the Saudi HWs awareness and knowledge of COVID-19 infection control precautions and waste management during COVID-19 pandemic indicate that most study participants were knowledgeable and achieved a mean of 78.3%. About (92.5%) were aware of the infection control precautions, and 90.3% knew waste management during COVID-19 and 91.7% knew of all the infection control supplies availability. The knowledge of HW regarding waste procedure in their facility correlate significantly with gender ($p = 0.0001$), education ($p = 0.024$), and working experience ($p = 0.029$). The knowledge of infection control precaution correlate with gender ($p = 0.0003$), education ($p = 0.043$) and working experience ($p = 0.009$).

Conclusion

Most participants appreciated the importance of their role in infection control, surveillance and monitoring the ongoing safety of their patients themselves and their facility and community. Saudi Ministry of health initiatives to improve education and provide training to HW during COVID-19 pandemic has facilitated to expand HW knowledge.

Introduction

On December 2019, pneumonia cases of unknown origin were officially reported in China, named COVID-19 [1]. The disease has rapidly spread around many other regions within China then to the entire global. Globally, as of 1:41 pm CEST, 13 September 2020, there have been 28,637,952 confirmed cases of COVID-19, including 917,417 deaths, reported to WHO from 216 countries, areas or territories with cases [2]. In Saudi Arabia, from Mar 2 to 1:41 pm CEST, 13 September 2020, there have been 325,050 confirmed cases of COVID-19 with 4,240 deaths [3].

The disease mainly transmitted through respiratory droplets [4], as MERS, SARS and severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) [5–7]. Covid-19 has more clinical symptoms of dyspnoea and has radiological abnormalities on chest computed tomography showing multiple lesions located in the posterior or peripheral lung [8–10]. Symptoms as headaches and diarrhoea are rare with COVID-19 [8]. The COVID-2019 progresses rapidly and early intervention and treatment are critically crucial for patients' prognosis [10]. Patients infected with COVID-19 usually die of acute respiratory distress syndrome (ARDS) and multiple organ failure caused by cytokine storm [9, 10].

With the unusual and profligate increasing number of global reported cases, an international concern is raised around the world [2, 3]. Therefore, HWs globally need to be ensuring that they are aware of the disease and to be vigilant and prepared to prevent additional spread of this infection. They must put in place enhanced public health surveillance for identifying suspected cases using the WHO-recommended case definition and investigation protocols in order to protect both global health and the wellbeing of the local community [11].

In Saudi Arabia, COVID-19 infection is of great concern at governmental and public levels because the cumulative number of infected individuals and deaths despite extensive persistent effort considered limiting the disease spread [12, 13]. This includes a wide range of interventions related to prevention and control procedures, distinct measures for people working in healthcare facilities, risk communications and community engagement, and national, ministerial and international coordination for the investigation and management of cases in the country and research studies [12–16].

During previous MERS-CoV spread infection, Saudi Arabian Ministry of Health has reported a total of 1297 confirmed infected cases with MERS-CoV from June 2012 to February, 2016, accounting for about 79% of the global cases; of these, 554 cases died (43%) accounting for 94% of total global deaths [17, 18]. As reported possible source of infection, since January 2015, 32% of cases acquired the infection in a health care setting, while 12% of infected cases were HWs [17, 18]. Based on the available data and WHO's risk assessment and Saudi Arabian Ministry of Health Command and Control Centre for COVID-19, human-to-human transmission within communities has been documented and careful monitoring of the current situation is crucial, particularly in the absence of any prophylactic vaccines or curative treatment globally [17, 18]. Until now, the global protective measures include curfew and quarantines either at homes or healthcare facilities [19, 20]. HWs perform a critical role not only in the medical management of patients but also in confirming acceptable infection control and prevention measures are implemented in health care facilities. Health care providers in hospitals are at risk of infection through occupational exposure to suspected cases during the pandemic. It is important therefore that they have adequate and correct knowledge, attitudes and

practices towards any pandemic. The aim of this study is to evaluate HWs awareness and knowledge of COVID-19 infection control precautions and waste management in Saudi Arabia hospitals.

Methods

Study design

The questionnaire was sent by e-mail through Saudi Commission For Health Specialties to be distributed to all HWs and healthcare providers in all Saudi healthcare facilities. The sample included all health care providers (physicians, specialists, pharmacist, technicians and nurses) in all departments in Saudi hospitals. Inclusion criteria were: working at hospitals, direct contact with patients, and willingness to be involved in the study and complete the questionnaire. We evaluated their knowledge and awareness of infection control precautions and waste management during covid-19 pandemic.

Sample size and participants

Based on previous study [21], the total number of HWs is about 350,000 thus the sample to be sufficiently representative with a margin of error of 5% and a confidence level of 95% it should have 384 participants using the following sample size calculation websites (<https://select-statistics.co.uk/calculators/sample-size-calculator-population-proportion/>).

Dependent Variables

Respondents were asked to respond to knowledge items as either yes or no, with an additional "don't know" option. Uncertain (don't know) responses were given a score of zero, and correct answers were assigned a score of one. The total score for knowledge ranged from zero to 22, with high scores indicating better knowledge of COVID-19. Items were evaluated for internal reliability, using Chi-square test, Non-parametric Binomial test, Kruskal-Wallis test and Multi-linear regression analysis. In the sections of knowledge and awareness, scores were calculated based on the respondents' answers to each attitudinal statement, 1 = I don't know, 2 = yes and 0 = no. In the section of the availability of supplies 1= available and 0 = not available.

Statistical methods:

Statistical analysis was performed using Statistical Package for the Social Sciences (SPSS) version 24.0 software (SPSS Inc., Chicago, IL, USA). Calculated frequencies and percentages of all nominal variables, also, calculated mean, stander deviation (SD), median and range (minimum – maximum) for total score of all variables. Pearson's correlation coefficient (r) was calculated to find the relationship between different variables from total score. Chi-square test and non-parametric Binomial test were used to compare the frequencies (percentages) for different items of different variables. Non parametric Mann-Whitney and Kruskal-Wallis test was used to compare total score of different variables with respect to demographic characteristics variables (gender, ages groups, year of experience and educational levels). Multiple linear regression analysis was used for different variables to get the predict equation between the total score of different variables with demographic characteristics. Results are considered significant for p -values below 0.05 ($P < 0.05$).

Results

The survey was divided in to four main sections each for explicit categorical information. (**Section 1**); demographical information, (**Section 2**); knowledge and awareness of infection control and prevention guidelines, (**Section 3**); knowledge of waste procedure, (Section 4); knowledge of infection control resources/supplies usage and availability. A total of 710 health care providers have participated in this study. **Table 1** shows the social and demographic characteristics of the study participants. As shown in **Table 1**, of the total sample, 373 (52.5%) were women, and 337 (47.5%) were men. The majority of the samples (46.6%) were between the ages of 31 and 40 years which shows a significant difference $p < 0.0001$. All the participants had a college or university degree ranging from Diploma degree (10%), Bachelor's degree (52%) and Master's degree and above (38%). In terms of years of experience, the majority were significantly between 5 to 10 years (32.8 %) and 11 to 20 years (30.3 %), while (25.8 %) were in their work for less than 5 years and (11.1 %) were more than 20 years.

Regarding HWs knowledge and awareness of the infection control and prevention guidelines (**Table 2**), the mean knowledge and awareness of infection control and prevention guidelines score was 23.46 (SD = 5.911, range: 1– 30). Analysis of HWs awareness and knowledge of waste procedure (**Table 3**), reveals that the mean score for knowledge of waste management and procedure was 26.92 (SD = 7.961, range: 0–36). Analysis of HWs awareness about the availability of infection control resources/supplies at their facilities was shown in (**Table 4**). The mean knowledge of infection control resources/supplies availability score was 11.92 (SD = 1.731, range: 1– 13), all results indicate virtuous level of knowledge.

The results of a multiple regression analysis were demonstrated in (**Table 5**), in which knowledge of infection control and prevention guideline, knowledge of health waste procedure in their facility, and knowledge of infection control precaution were the **dependent variables against possible demographic and basic characteristics of the surveyed respondent**. The knowledge of infection control and prevention guideline has significant correlation with gender ($p = 0.005$) and working experience ($p = 0.009$), and not affected by age, educational level and occupation. The knowledge of health regarding waste procedure in their facility correlate significantly with gender ($p = 0.0001$), education ($p = 0.024$), and working experience ($p = 0.029$) but not with age and education. The knowledge of infection control precaution correlate with gender ($p = 0.0003$) and education ($p = 0.043$) but not with age, occupation and working experience.

From (**Table 6**), it is clearly shown that female was significantly higher than male in all sections. Age had significant contribution in respondent comeback to all sections as revealed Kruskal-Wallis test. Further analysis using Mann-Whitney Test indicated that participants with age group of 20 to 30 year responded significantly more in **section II, III, and IV** than 41–50 years ($p < 0.05$). People aged 20 to 30 year and 31 to 40 responded significantly more to **section III** when compared with people aged ≥ 50 years. Age group 31- 40 years was significantly higher than 41 -50 years in responding to **section III and IV** ($p = 0.004$ and $p =$

0.023, respectively). All knowledge was higher in respondent with longer working experience more than 5 years ($p < 0.05$). Educational level did not have significant influence on participant response except for **section IV**, in which bachelor group respond more than master's degree group ($p = 0.002$). Furthermore, occupation has significant effect on all knowledge of surveyed providers ($p < 0.05$). Using Mann-Whitney Test the result shows that MD doctor were significantly more knowledgeable than pharmacist regarding infection control and prevention guideline and concerning the infection control precaution but not of health waste procedure in their facility. Nurses were significantly more knowledgeable than pharmacist in all sections.

Moderate positive relation was found between the total score of section II: information of infection control and prevention guidelines and total score of section III: knowledge of waste management and procedure since $r = 0.635$, $P < 0.0001$. Also, weak positive relation was found between total score of section IV: knowledge of infection control resources/supplies usage and availability and each of total score of section II: information of infection control and prevention guidelines and section III: knowledge of waste management and procedure since $r = 0.468$, $P < 0.0001$ and $r = 0.40$, $P < 0.0001$ respectively. Where r is Pearson's correlation coefficient.

Discussion

Recently there has been significant threat to public health with the emerging of COVID-19 pandemic globally. A necessity of protective measures to overcome and control the spread of COVID-19 pandemic, such measures not only include household and community contacts management [12, 13]. Different waste is generated in all health establishments, which can be categorized into hazardous and non-hazardous waste. Hazardous health waste include laboratory and isolation materials, sharps, pathological specimens, expired drugs, chemotherapeutic drugs and items used to prepare and administer them, radioactive and chemical elements. Non-hazardous health waste includes dietary, packaging and boxes of drugs and medical supplies. Hospitals also generate ordinary household waste from the kitchens, housekeeping and administrative jobs. Hazardous health waste is harmful to people and the environment, and unlike the non-hazardous health waste, has to be treated in a special way following guidelines related to dealing with health waste [22, 23]. Adherence to preventive and control measures, which is affected by the knowledge, awareness and practices of HWs toward health waste. Our findings of assessing the Saudi HWs' awareness and knowledge of COVID-19 infection control precautions and waste management during COVID-19 pandemic indicate that most study participants were knowledgeable and achieved a mean of 78.3%. This finding is consistent with other studies that have shown satisfactory levels of knowledge, across the Saudi population, for epidemics, such as MERS [24–26]. In our study, the high rate of correct answers to knowledge-related questions among participants, was not surprising, which may be due to the characteristics of the sample, as 90% had a college or university degree, or above, and 74.23% were with more than five years of experience. It may also be due to the distribution of the questionnaire, within the COVID-19 outbreak. In that time, with extensive education locally and internationally, people have gained awareness and knowledge about the disease and its transmission, via television, news and media platforms, to protect themselves and their families. The positive association found between knowledge, and educational background and age, supports this study's argument. Most of the participants in this study (92.5%) were aware of the infection control precautions, and 90.3% knew waste management during COVID-19 and 91.7% knew of all the infection control supplies availability. The qualitative assessment reveals differences in experience and awareness of HWs across all professional groups were nurse, MD doctor, lab technician, pharmacists and paramedic showed the highest mean of knowledge among all HWs.

Several previous studies showed inadequacy of knowledge and poor practice among HWs regarding biomedical waste. These studies have been reported from different countries such as Brazil [27], Dhaka [28], India [29, 30] and Turkey [31]. These studies were mainly focused on biomedical waste management in general while this study focused in infectious waste to minimize the spread of the infection and maintain the adequate and proper disposal. Risks of improper management and improper disposal of biomedical waste are global concern, in particular infectious waste [32]. In our study, the knowledge of HWs regarding waste procedure in their facility was found to correlate significantly with gender ($p = 0.0001$), education ($p = 0.024$), and working experience ($p = 0.029$) but not with age and education. The knowledge of infection control precaution correlate with gender ($p = 0.0003$) and education ($p = 0.043$) but not with age, occupation and working experience. The Knowledge of infection control and prevention guideline showed significant correlation of with gender ($p = 0.005$) and working experience ($p = 0.009$), and not affected by age, educational level and occupation. Gender differences association to knowledge might be due to the fact that higher number of respondents were female; however, working experience has influenced the participants' knowledge that comes in agreement with pervious study [33]. Due to the nature of HWs profession they should always remember the risk of treating patients with infectious diseases. HWs and patients may be exposed to COVID-19 infection and cross infection could happen and might lead to further transmission to their families, knowing that might add further pressure on personnel to gain more knowledge of all aspects of COVID-19 infection and related hazards. In the present study, it was found that most of the HWs were knowledgeable about the biomedical waste disposal particularly from COVID-19 infected personnel's. Saudi Ministry of health not only educated HWs about the COVID-19 disease but also have emphasized the instruction about the hazards of infectious waste to the HWs [12, 13, 17].

Conclusions

This study provides an overview of experience and beliefs of healthcare professional groups in relation to knowledge and awareness of infections precautions and waste management. The qualitative assessment reveals differences in experience and awareness of HWs across all professional groups. Most participants appreciated the importance of their role in infection control, surveillance and monitoring the ongoing safety of their patients themselves and their facility and community. Saudi Ministry of health initiatives to improve education, such as increasing training to health care workers, particularly, medical professionals, during COVID-19 pandemic.

Declarations

Ethics approval and consent to participate

The study obtained written informed consent from the Standing Committee for Research Ethics at King Saud University, Ref No: KSU-HE-20-184, and personal agreement from all respondents was required before they completed the online questionnaires.

Consent for publication

Not applicable

Availability of data and materials

The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

Competing interests

The authors declare no conflict of interest.

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None

Author Contributions

FSA and FYA both have made substantial contributions to conception and design. FSA and FYA both work together in the survey and the analysis and interpretation of data. All authors contributed to writing, editing and reviewing the final manuscript.

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Tables

Table-1: Demographic characteristics

	Frequency (%)	P-value
Gender		
Male	337 (47.5 %)	0.189 **
Female	373 (52.5 %)	
Age		
20 – 30 y	204 (28.7 %)	< 0.0001*
31 – 40 y	331 (46.6 %)	
41 – 50 y	129 (18.2 %)	
>50 y	46 (6.5 %)	
Years of experience		
Less than 5 y	183 (25.8 %)	< 0.0001*
5 – 10 y	233 (32.8 %)	
11 – 20 y	215 (30.3 %)	
More than 20 y	79 (11.1 %)	

* By Chi-square test. **By Non- parametric Binomial test.

Table-2: Analysis of HWs awareness about the information of infection control and prevention guidelines at their facilities.

Survey element		Yes	I don't know	No	*P-value
Infection control management	1. Do you have infection control program at your institution?	624 (87.9 %)	43 (6.1 %)	43 (6.1 %)	< 0.0001
	2. Do you have infection control policies and guidelines in your unit?	655 (92.3 %)	21 (3.0 %)	31 (4.4 %)	< 0.0001
	3. As health provider do you know guidelines on standard precautions for infection prevention?	657 (92.5 %)	21 (3.0 %)	29 (4.1 %)	< 0.0001
	4. Do you have an emerging infectious diseases taskforce (dealing with outbreaks)?	467 (65.8 %)	83 (11.7 %)	157 (22.1 %)	< 0.0001
	5. Have you encountered any outbreak?	406 (57.2 %)	58 (8.2 %)	243 (34.2 %)	< 0.0001
	6. Do you think that all staff in your unit is following promptly infection control policies, rules and guidelines?	434 (61.1 %)	91 (12.8 %)	182 (25.6 %)	< 0.0001
	7. Do you think that all staff can differentiate between different isolation protocol such as droplet or contact	469 (66.1 %)	95 (13.4 %)	143 (20.1 %)	< 0.0001
	8. Do you know if checks of standards are being met for personal protection, infection prevention and control, for cleaning, disinfection and laboratory waste management at your hospital?	473 (66.8 %)	168 (23.7 %)	66 (9.3 %)	< 0.0001
Training	1. Have you received any training about infection prevention and control management and guidelines and protocol?	583 (82.1 %)	15 (2.1 %)	109 (15.4 %)	< 0.0001
Surveillance	1. Is your hospital enrolled in national surveillance system?	440 (62.0 %)	210 (29.6 %)	57 (8.0 %)	< 0.0001
	2. Do you have a list of reportable infectious disease available at your unit and accessible to all staff?	451 (63.5 %)	127 (17.9 %)	129 (18.2 %)	< 0.0001
	3. Do infectious agents reported to Ministry of Health?	533 (75.1 %)	128 (18.0 %)	46 (6.5 %)	< 0.0001
	4. Is there a known turnaround time of laboratory results of the reportable infectious agents at your institution?	375 (52.8 %)	238 (33.5 %)	94 (13.2 %)	< 0.0001
	5. Do you think your hospital is prepared for any infection outbreak?	483 (68.0 %)	114 (16.1 %)	110 (15.5 %)	< 0.0001
	6. Do you agree that surveillance tool used in your institution is effective to prevent or control infection?	487 (68.6 %)	108 (15.2 %)	112 (15.8 %)	< 0.0001

*By Chi-square test.

Table-3: Analysis of HWs awareness and knowledge of waste procedure in their facility.

Survey element		Yes	I don't know	No	*P-value
Procedure and guidelines	1. Do you know the management practices and protocol for sharps waste, such as needles or blades?	641 (90.3 %)	36 (5.1 %)	33 (4.6 %)	< 0.0001
	2. Do you know the procedure and protocol for processing of equipment's for reuse?	351 (49.4 %)	238 (33.5 %)	118 (16.6 %)	< 0.0001
	3. Do you know if Policies and procedures that are used for managing routine (i.e. non-emergency) laboratory services are adaptable to an emergency situation?	368 (51.8 %)	245 (34.5 %)	94 (13.2 %)	< 0.0001
	4. Do you know that all laboratory staff members have to prepare Job Action Sheets describing their roles and tasks in an emergency situation?	309 (43.5 %)	281 (39.6 %)	117 (16.5 %)	< 0.0001
	5. Do you know Laboratory biosafety measures of your institution and if they comply with national guidelines or the guidelines provided in the WHO Laboratory Biosafety Manual (Third Edition, WHO 20041)	340 (47.9 %)	261 (36.8 %)	106 (14.9 %)	< 0.0001
	6. Do you know that the Laboratory waste management and cleaning should be given high priority among the hospital's activities?	482 (67.9 %)	155 (21.8 %)	70 (9.9 %)	< 0.0001
	7. Do you know WHO guidelines for collecting, preserving, and shipping specimens?	321 (45.2 %)	182 (25.6 %)	204 (28.7 %)	< 0.0001
	8. Do you know standardized laboratory procedures, checklists, forms and log sheets used in your hospital?	370 (52.1 %)	179 (25.2 %)	158 (22.3 %)	< 0.0001
	9. Do you know that laundry and cleaning procedures should comply with national Ministry of Health guidelines, especially those on preventing spread of infection to maintain sterility requirements?	484 (68.2 %)	161 (22.7 %)	62 (8.7 %)	< 0.0001
	10. Do you know that in the course of an epidemic, handling and transportation of dead bodies and autopsy procedures should comply with national Ministry of Health guidelines, especially those on preventing spread of infection	454 (63.9 %)	200 (28.2 %)	53 (7.5 %)	< 0.0001
Compliance Training	11. Do laboratory staffs receive training?	332 (46.8 %)	325 (45.8 %)	50 (7.0 %)	< 0.0001
	12. Do you know if Staff providing waste management, cleaning and laundry services should have been trained in infection prevention and control?	465 (65.5 %)	196 (27.6 %)	46 (6.5 %)	< 0.0001
Practice	13. Do you know the effective and correct way to dispose sharps waste?	644 (90.7 %)	31 (4.4 %)	32 (4.5 %)	< 0.0001
	14. Do you know how to dispose medical waste other than sharps boxes?	606 (85.4 %)	44 (6.2 %)	57 (8.0 %)	< 0.0001
	15. Do you know how to dispose medical waste as blood containers?	544 (76.6 %)	67 (9.4 %)	96 (13.5 %)	< 0.0001
Coordination	16. Do you know if your hospital establish and maintain agreements with other laboratories, to cope with increased demand for laboratory services?	336 (47.3 %)	317 (44.6 %)	54 (7.6 %)	< 0.0001
	17. Do you know if there is coordination between clinical staff and waste management and cleaning staff?	427 (60.1 %)	211 (29.7 %)	69 (9.7 %)	< 0.0001

18. Do you know if laboratory management in your hospital cooperates with other hospitals and throughout national, regional and international laboratory networks?

356 248 103
(50.1 %) (34.9 %) (14.5 %)
< 0.0001

*By Chi-square test.

Table-4: Analysis of HWs awareness about the availability of infection control resources/supplies at their facilities.

Survey element	Available	Not Available	*P-value
Clean running water	671 (94.5 %)	39 (5.5 %)	< 0.0001
Hand-washing soap/liquid soap	694 (97.7 %)	16 (2.3 %)	< 0.0001
Alcohol based hand rub	689 (97.0 %)	21 (3.0 %)	< 0.0001
Disposable latex gloves	680 (95.8 %)	30 (4.2 %)	< 0.0001
Waste receptacle (pedal bin) with lid and plastic bin liner	614 (86.5 %)	96 (13.5 %)	< 0.0001
Sharps container ("safety box")	692 (97.5 %)	18 (2.5 %)	< 0.0001
Service Availability and Readiness Assessment tool	599 (84.4 %)	111 (15.6 %)	< 0.0001
Environmental disinfectant (e.g., chlorine, alcohol)	667 (93.9 %)	43 (6.1 %)	< 0.0001
Gowns	680 (95.8 %)	30 (4.2 %)	< 0.0001
Eye protection (goggles, face shields)	590 (83.1 %)	120 (16.9 %)	< 0.0001
Medical (surgical or procedural) masks	680 (95.8 %)	30 (4.2 %)	< 0.0001
Disposable syringes with disposable needles	684 (96.3 %)	26 (3.7 %)	< 0.0001
Auto-disable syringes	524 (73.6 %)	186 (28.2 %)	< 0.0001

*By Non- parametric Binomial test.

Table 5. Results from Multi-linear regression analysis obtained to verify associations with age, gender, education, occupation, location of facility and type of facility

Variables		Gender	Age	Education	Occupation	Year of experience
Section II: knowledge and awareness of infection control and prevention guidelines	Coefficient β	1.253	0.050	0.648	0.191	0.928
	P value	0.005*	0.903	0.089	0.152	0.009*
Section III: Knowledge of waste management and procedure	Coefficient β	3.173	0.855	-0.323	0.397	1.028
	P value	0.0001*	0.115	0.521	0.024*	0.029*
Section IV: Knowledge of infection control resources/supplies availability	Coefficient β	0.396	0.102	0.227	-0.001	0.110
	P value	0.003*	0.399	0.043*	0.979	0.294

Table 6. Comparison of knowledge and awareness of infection control guidelines, resources and waste management with age, gender, years of experience, education and occupation (n=710).

		Section II: Information of infection control and prevention guidelines				Section III: Knowledge of waste management and procedure				Section IV: Knowledge of infection control resources/supplies availability			
		N	Mean	SD	*P-value	N	Mean	SD	*P-value	N	Mean	SD	*P-value
Gender	Male	337	22.8750	6.20466	0.017	337	25.3155	8.52014	< 0.0001	337	11.7507	1.88593	0.017
	Female	373	23.9946	5.58763		373	28.3747	7.12341		373	12.0751	1.56568	
Age	20 - 30 y	204	22.7941	6.18569	0.049	204	26.2010	8.14667	0.001	204	11.7304	1.84921	0.023
	31 - 40 y	331	23.2409	6.16788		331	26.1829	8.45369		331	11.8792	1.74179	
	41 - 50 y	129	24.5581	5.18397		129	28.9302	6.33343		129	12.1783	1.66981	
	> 50 y	46	24.9348	3.83204		46	29.7391	5.95701		46	12.3478	1.03746	
Years of experience	< 5 y	182	21.7253	6.06241	< 0.0001	182	25.2033	8.25541	< 0.0001	183	11.5683	1.97914	0.013
	5 - 10 y	235	23.9310	5.91604		235	26.9698	7.71314		235	12.0601	1.45797	
	≥ 10 y	293	24.171	5.609		293	27.949	8.12773		294	12.031	1.87475	
Education	Diploma degree	70	22.328	6.858	0.421	70	28.171	9.160	0.139	70	11.657	2.484	0.010
	Bachelor's degree	370	23.351	6.199		370	26.695	8.341		370	11.827	1.614	
	Master's degree and above	270	23.914	5.164		270	26.906	7.031		270	12.119	1.636	
Occupation	Dentist	12	19.667	6.0503	< 0.0001	12	25.417	5.7755	< 0.0001	12	12.167	1.1146	< 0.0001
	Lab technician	14	23.231	5.7323		14	31.00	6.00		14	12.929	0.2673	
	MD doctor	243	23.798	5.3068		243	25.605	7.3429		243	12.091	1.2985	
	Medical technician	53	20.774	7.6325		53	23.491	10.3341		53	10.755	2.4251	
	Nurse	230	24.947	5.4673		230	30.123	6.6434		230	12.106	1.5874	
	Pharmacists	92	21.217	5.7368		92	24.233	7.8812		92	11.457	2.4292	
	Paramedic	38	23.474	5.9217		38	26.447	9.3164		38	12.105	1.3909	
	Physiotherapist	10	20.50	3.6286		10	22.70	5.2504		10	12.40	0.9661	
	Administrative employee	18	24.944	4.5306		18	28.722	7.3629		18	12.611	0.6077	

*By Kruskal-Wallis test.