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The Extent of Health Care Providers' Commitment to Personal Protection Equipment at Riyadh Elm University Teaching Hospitals

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Abstract

Background: Proper use of Personal Protective Equipment (PPE) is an integral part of infection control and prevention of cross-infection during dental treatment, which has gained momentum following the SARS-CoV-2 pandemic.

Aim: This cross-sectional descriptive study aimed to assess the attitude and commitments of Dental Health Care Providers (DHCP) and students at Riyadh Elm University (REU) teaching hospitals to (PPE) during their daily practice.

Material and Method: Data was collected using an electronic, close-ended questionnaire uploaded through Google Forms and sent via email to the study population. It consisted of twenty questions targeting the health care provider at (REU) dental hospitals in Riyadh, Saudi Arabia. In addition to the demographic data, the questions were directed at assessing the participants' attitudes and commitment toward (PPE) during their daily clinical work.

Results: The total number of participants was 136 (57.4% male and 42.6% female). Most of the participants used to wear surgical medical masks (63.2%). N95 masks were used by only 11.8% of the respondents. More than half of the participants (58.8%) used to wear the masks for four hours, with a statistically significant difference between males and females regarding the masks' time (P-value =.0021). 91.9% of the time, the mask was worn during the patient examination and history taking. Only 58.1% and 85.3% of respondents reported using face coverage and eye protection, respectively. A head cap was used routinely by 55.1% of the participants. Dental assistants adhered to PPE and measures better than the other groups, especially when wearing gowns and head caps (P 0.05). Only 69.9% of the respondents answered correctly about the correct sequence of wearing PPE, and only 54.1% knew the correct sequence of removing PPE.

Conclusion: The general practices and commitment to PPE among DHCPs at REU are acceptable. There was a lack of knowledge regarding proper donning and doffing sequences. Compliance with eye protection and hand hygiene practice recommendations needs improvement. Dental assistance demonstrated better commitment to eye protection, gown, and head cap-wearing and better knowledge regarding donning and doffing than other DHCPs.

Keywords: Personal Protective Equipment, Cross-Infection, Infection Control, Dental.

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Introduction:

Due to the unique aerosol apparatus used in dentistry, dental health workers (DHW) have an increased risk of occupational exposure to several infections. As a result of the recent coronavirus disease 2019 (COVID-19) pandemic, there has been a heightened focus on the issue of occupational infections and how to prevent them among healthcare professionals. Dental hygienists have the highest occupational risk of getting severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) among all jobs evaluated, according to data published in The New York Times in March 2020 from the United States Department of Labor. The close proximity to patients and the presence of infectious germs presents a significant danger (Gamio L 2021). As aerosols typically arise during dental procedures, their potential for virus transmission is of particular concern to DHW (Buonanno et al., 2022). Pathogens in the air can be inhaled and cause illness, and the use of ultrasonic scalers, high-speed air rotors, air-water syringes, and air polishing all contribute to this problem (Innes et al., 2021).

Due to their proximity to the mouth, contact with saliva, and handling of sharp equipment, oral healthcare professionals are perpetually at risk of contracting or transmitting airborne, saliva-borne, or blood-borne illnesses from their patients (Kobza J et al., 2018). When it comes to respiratory illnesses like covid-19, dentists are among the most at risk. A rubber dam is a necessary piece of equipment in the operating room. When it comes to protecting healthcare workers from respiratory viruses, FFP2 (or N95) and FFP3 respirators are superior to surgical masks.

An aerosol-generating procedure leaves SARS-CoV-2 detectable in the environment for three hours under experimental conditions. Employers are responsible for implementing measures like safer sharps disposal and the provision of safety-engineered sharps devices if they exist. The onus of training HCWs in safe procedures falls on employers as well. In addition, DHW are required to use PPE (Personal Protective Equipment).

Every piece of safety gear a dentist or dental nurse might wear during a procedure is categorized under the umbrella term "personal protective equipment" (PPE). Glasses, masks, disposable gloves, durable gloves (for cleaning instruments), aprons, gowns, etc. are all examples of items that might be included.

Standard precautions, and especially their application, are widely regarded as the most effective preventative measure against the spread of infectious diseases among human service workers (Baqir M. 2018). The term "cross-infection" refers to the spread of disease from one patient to another while at a healthcare facility (Buonanno G. 2020).

Face coverings may help reduce close-range transmission (less than 2 m) and aerosol transmission, especially in indoor spaces with poor ventilation.The greatest impact on lowering aerosol transmission risks is likely to come from wearing the mask for a longer period of time, at least in most settings. A surgical mask should not be worn for longer than 4 hours. Based on a 2009 study showing that after 4 hours, the acceptability and tolerance of

the mask by healthcare personnel begins to decrease, the World Health Organization (WHO) recommended a maximum of 4 hours of mask use in March 2020.

A growing number of people are seeking dental care due to a rising awareness of the benefits of good dental aesthetics and the importance of maintaining good oral hygiene. The health and safety of oral health care professionals and other subordinate workers who may be indirectly involved in the intervention procedure makes the maintenance and exercise of stringent nonsocial infection control operations more crucial than ever before. In light of these considerations, dental healthcare providers have a duty to adhere to prescribed norms and rules on contamination; wearing personal protective equipment (PPE) can reduce the spread of certain pathogens and limit the spread of cross-infection (Kumar R. 2013).

Mycobacterium tuberculosis, hepatitis viruses, staphylococci, streptococci, herpes simplex virus types, human immunodeficiency virus, mumps, influenza, and rubella are just a few of the many germs that pose a concern to patients and dental professionals alike. Direct contact with infected blood, saliva, or other body fluids, or indirect contact with contaminated equipment, materials, and surfaces are the two most common routes of pathogen transmission in a dental setting. Pathogens can also be spread through the air, via saliva or respiratory fluid droplets or aerosols (Taiwo, J. 2002).For example, the Infection-Control Practices for Dentistry was an early set of standards for protecting healthcare workers from the spread of disease via patients' bodily fluids. According to these recommendations for preventing disease spread (Kazi MM. 2012), all patients should be considered potentially infectious. In order to safeguard both patients and dental care providers, it is essential to practice infection control measures in the workplace. Personal protection equipment (PPE), hand washing, proper garbage disposal, and sterilization are all examples of such measures (Gordon B 2001). Immunization is also an effective method for preventing the spread of infection in dental care settings. This is why many dental schools and clinics enforce strict immunization requirements on their students and staff (DeCastro MG. 1999). However, the vast majority of patients are not similarly protected, which may increase the likelihood of the spread of infectious diseases (Di Giuseppe G 2006).

Personal protective equipment (PPE) such as gowns, gloves, face masks, and eye protection can effectively halt the spread of disease. However, patients and medical staff can be harmed if infection-control procedures aren't strictly adhered to (Kazi MM, 2012; Gordon B, 2001). Only 30% of males and 35% of females in Saudi Arabia regularly wore protective eyewear, according to a study by Binalrimal S. et al. Also, 26% of men and 24% of women who had dental work done said they always wore a face shield (Binalrimal S et al., 2019).

Because of the risks posed by aerosols and floating debris, it was determined that wearing protective eyewear was in everyone's best interest, both the dentist and the patient. The danger of conjunctivitis, eye injury, or even full loss of vision can be mitigated through the use of eye protection with side shields and the routine inspection of its structural integrity (Ekmenkcioglu H et al., 2017).

Abukhelaif's 2019 study on nurses' knowledge, practice, and factors influencing compliance with the use of (PPE) found that nurses viewed the proper use of PPE as crucial to preventing harm to healthcare workers and the transmission of infection. (ABukelaif Annual Economic Report 2019) In a 2021 study aimed at dentists in India, Bains VK et al. reported that both undergraduates and postgraduates lacked adequate awareness of proper PPE components, donning, and doffing. Graduates (47.9%) and postgraduates (52.9%) were less likely to get the doffing sequence of PPE properly than undergraduates (43.7%).

Phan et al. conducted a study to determine whether or not healthcare professionals employ correct PPE and doffing procedures. They found that 90% of doffing instances they saw had problems with either the doffing sequence, the doffing method, or the use of proper PPE. When taking off their protective clothing, many people make the common mistakes of doffing from the front, taking off their face shield or mask, and touching objects and PPE that could be contaminated (Phan et al., 2021). Researchers found that dentists had an above-average understanding of COVID-19 but were less well-versed in the disease's implications for dental care, patient safety, and hand hygiene (Bains VK et al., 2021).

Saudi undergraduate dental students were found to have high levels of knowledge and positive attitudes toward infection prevention, but poor levels of compliance and practice, according to a study conducted to analyze these factors. Ninety-eight percent said they always wear gloves, and ninety percent said they always wear masks when they see the dentist. Only 29.2 percent of respondents said they were using safety glasses. (Al Maweri SA, et al., 2015)

Compliance with the use of protective barriers was high, with the exception of protective eyewear, which was only used by 27% of students, in a 2013 study undertaken in the United Arab Emirates to evaluate the practices of infection control among dentistry students. Even though all infection control methods are now taught at dental schools, the issue remains in getting students to actually follow them. (B. Rahman et al., 2013)

Meisha DE, in her Saudi Arabian study published in 2021, she found that failing to use eye protection and failing to immediately follow hand hygiene instructions after removing gloves were the two most common infractions in both audits. Male students were found to have breached infection controls much less frequently than female students were during both audits. Infection control practices were more strictly adhered to by dental students during the COVID-19 pandemic than they had been previously. In contrast to the prevalence of poor hand hygiene, there was a greater degree of compliance with regulations pertaining to PPE. (De Meisha 2021)

Researchers Mahasneh AM et al. 2020 discovered that dental assistants were less likely than dentists to follow infection-control protocols. Participants have shown excellent infection-prevention practices by adhering to standard precautions. The compliance of dental care providers with infection-control recommendations can be maximized and improved through

the implementation of educational programs and training initiatives. It was reported in 2020 (Mahasneh AM et al.).

Gown use was reported at a lower rate of 57 percent, as was the use of face masks (81 percent), disinfection of impression materials (87 percent), and dental prostheses (74 percent). Less than a third of the people in the study used corrective lenses or a face shield. Researchers discovered that most students followed recommended protocols for preventing the spread of infectious diseases. However, more training is required to enhance current practices of infection control, such as the use of Hepatitis B vaccines, the use of protective eyewear, gowns, and face masks, and the sterilization of impression materials and dental prostheses. These findings were published in 2013 (Ahmad I et al)

Aim of the Study:

To assess the attitude and commitment of dental health care providers (DHCPs) and students at Riyadh Elm University (REU) to Personal Protective Equipment (PPE) during their daily practice.

Rationale of the Study:

Sufficient knowledge and awareness of health care providers and their Adherence to infection control measures and guidelines are of most importance. Any defect in applying such protective measures is alarming and requires further revision of the rules and regulations controlling such practices. Continuous assessment is mandatory through different tools, including questionnaire-based studies.

Materials and Method:

Study Design: Cross-sectional Descriptive Survey.

Study Population: Dental students practicing in the clinic and DHCPs at REU teaching hospitals- Riyadh- Saudi Arabia.

Inclusion Criteria: DHCPs working in Riyadh Elm University Dental hospitals including students, interns, postgraduates, Instructors, and supporting staff.

Exclusion Criteria: Administrative and non-clinical staff.

Data Collection Tool: This cross-sectional study utilized a self-administered electronic close-ended questionnaire uploaded through Google forms and sent via email to the study population. It consists of twenty questions aimed at health care providers working in REU dental hospitals in Riyadh, Saudi Arabia.The questions were directed to assess the participants' attitude and commitment toward PPE during their daily clinical work. It is composed of information about demographic and occupational characteristics of the respondents like (gender, age, education, and position) and their knowledge and practices

regarding compliance with the usage of (PPE) and hand hygiene. The questionnaire was verified for validity and reliability by two expert health care practitioners. A pilot study was conducted with twenty participants to check the clarity of the survey. Data collection was conducted between March 20, 2022, and April 10, 2022, using self-administered questionnaires.

Ethical Considerations

This study has been registered at the Research Center of the Riyadh Elm University with registration number FUGRP/2021/260/653 and approved by the Institutional Review Board at Riyadh Elm University with IRB approval number is FUGRP/2021/260/653/629.

Results:

Statistical Analysis

Descriptive statistics of frequency distribution and percentages were calculated for the categorical variables. The relationship between demographic variables and knowledge and attitude toward personal protection measures was assessed by applying Chi-square tests. A value of $p<0.05$ was considered statistically significant. All the data were analyzed using SPSS version 25 (Armonk, NY: USA).

Demographics and Work Characteristics of the Study Sample:

The total number of participants was 136 (57.4% male and 42.6% female).

The demographic characteristics of the study participants are presented in Table1.

Table 1: Demographic characteristics of the study participants (N=136)

Characteristics		**n**	**%**
Age (Years)	18-29	77	56.6%
	30-39	48	35.3%
	40-49	11	8.1%
Position	Dental student/intern	53	39.0%
	Dental assistant student/Nursing	20	14.7%
	General dentist/postgraduate	24	17.6%
	Specialist or consultant	16	11.8%
	Assistant/Nurse	23	16.9%
Gender	Male	78	57.4%
	Female	58	42.6%

Type of the masks:

Majority of the participants used to wear surgical medical masks (63.2%). N95 masks were used by only 11.8% of the respondents. Figure 2 represents the type of masks used routinely in the clinic among REU health care providers.

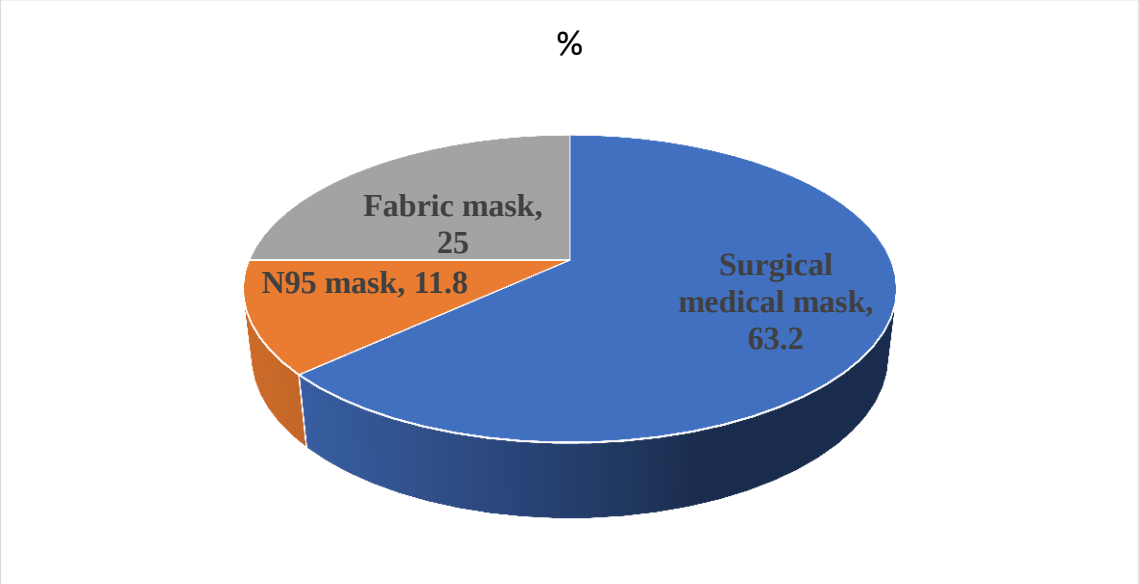

Figure 1: What type of masks do you wear routinely?

Donning and Doffing:

Table 2: The correct sequence of wearing and removing of PPE			
Items	Responses	n	%
The correct sequence for wearing PPE	Gown-Mask-Face shield-Gloves	95	69.9
	Mask-Gloves-Gown-Face shield	31	22.8
	Face shield-Mask-Gown-Gloves	8	5.9
	Other	2	1.5
	Total	136	100.0
The correct sequence of removing PPE	Face shield- Gown- Gloves- Mask	41	30.4
	Gloves- Face shield- Gown- Mask	73	54.1
	Gown- Mask- Face shield- Gloves	21	15.6
	Total	135	100.0

Regarding the proper sequence of donning and doffing of PPE, the results showed a lack of knowledge regarding the correct sequence of doffing and donning since only 69.9% answered correctly about the correct sequence of wearing PPE and only 54.1% had knowledge about the correct sequence of removing PPE. No statistically significant difference was noticed between male and female respondents regarding the usage of masks and donning and doffing sequences.

Table 3: Relationship between the type of masks, donning/doffing, and demographic variables.												
Variables		Age			Position					Gender	
		18-29	30-39	40-49	DS/Intern	DA/Nursing student	GDP/PG	specialist or consultant	Ass/Nurse	Male	Female
Type of mask	Surgical medical	53.2%	75.0%	81.8%	54.7%	85.0%	58.3%	56.3%	73.9%	60.3%	67.2%

	mask										
	N95 mask	13.0%	8.3%	18.2%	11.3%	0.0%	20.8%	18.8%	8.7%	12.8%	10.3%
	fabric mask	33.8%	16.7%	0.0%	34.0%	15.0%	20.8%	25.0%	17.4%	26.9%	22.4%
	p	0.036			0.212				0.705		
Sequence of wearing PPE	Gown-Mask-Face shield-Gloves	76.6%	60.4%	63.6%	71.7%	70.0%	79.2%	62.5%	60.9%	71.8%	67.2%
	Mask-Gloves-Gown-Face shield	19.5%	27.1%	27.3%	26.4%	30.0%	16.7%	18.8%	17.4%	23.1%	22.4%
	Face shield-Mask-Gown-Gloves	3.9%	8.3%	9.1%	1.9%	0.0%	4.2%	18.8%	13.0%	5.1%	6.9%
	p	0.330			0.046*					0.396	
Sequence of removing PPE	Face shield-Gown-Gloves-Mask	31.6%	31.3%	18.2%	25.0%	30.0%	33.3%	37.5%	34.8%	31.2%	29.3%
	Gloves-Face shield-Gown-Mask	52.6%	54.2%	63.6%	57.7%	55.0%	54.2%	43.8%	52.2%	53.2%	55.2%
	Gown-Mask-Face shield-Gloves	15.8%	14.6%	18.2%	17.3%	15.0%	12.5%	18.8%	13.0%	15.6%	15.5%
	p	0.927			0.984					0.970	

***DA: Dental Assistant GD: General Dentist DS: Dental students PG: Postgraduate**

A statistically significant correlation was observed between the type of mask and age group (P-value <0.05) since surgical masks were the choice in 81.8% of the participants within the age group of 40 and more while 53.3% of age group 18-29 utilize this mask. Gender and position didn't show any significant correlation to the type of mask. Table 3 summarizes the relationship between the type of masks, donning/doffing, and demographic variables.

Personal Protective Equipment (PPE) and Hand Hygiene:

Majority of participants reported an acceptable level of personal protective equipment use (Table 4). 91.9% used to wear the mask during patient examination and history taking.

Table 4: Compliance of the participants to PPE and the practice of hand hygiene				
Items	Responses	Always	Occasionally	Rarely/none
Do you change the mask between patients?	n	56	48	32
	%	41.2%	35.3%	23.5%
Do you wear the mask during patient examination and before starting the procedure?	n	125	8	3
	%	91.9%	5.9%	2.2%
Do you utilize a face shield during the treatment procedure?	n	79	43	14
	%	58.1%	31.6%	10.3%
Do you wear a gown during the treatment procedure?	n	116	15	5
	%	85.3%	11.0%	3.7%
Do you wear a head cap during patient treatment?	n	75	27	34
	%	55.1%	19.9%	25.0%
Do you wash your hands before patient treatment?	n	88	38	10
	%	64.7%	27.9%	7.4%
Do you use hand sanitizer instead of handwashing before wearing the gloves?	n	48	53	35
	%	35.3%	39.0%	25.7%

As presented in Table 5, Dental assistants demonstrated good adherence to PPE and measures compared to the other groups, especially in wearing the gowns and head caps (P-value <0.05).

Furthermore, compliance with face coverage and eye protection was higher among Dental Assistants (87%) compared to undergraduates, postgraduates, and consultant groups, but with no statistical significance. Gender and age groups didn't show any significant correlation to the practice of PPE among the respondents (P-value >0.05). Only 58.1% of respondents reported using face coverage and eye protection on a regular basis. 85.3% of the participants always wear a gown during dental treatment, and 55.1% of them use headgear on a regular basis.

Table 5: Association between PPE practice and demographic variables														
Practice items		Age				Position						Gender		
		18-29	30-39	40-49	p	DS/Intern	DA/Nursing student	PG	Specialist or consultant	DA/nursing	p	Male	Female	p
Change the mask	A	44.2%	35.4%	45.5%	0.175	47.2%	35.0%	33.3%	18.8%	56.5%	0.171	44.9%	36.2%	0.259
	O	37.7%	29.2%	45.5%		32.1%	50.0%	29.2%	43.8%	30.4%		29.5%	43.1%	
	R/N	18.2%	35.4%	9.1%		20.8%	15.0%	37.5%	37.5%	13.0%		25.6%	20.7%	
Wear mask during patient examination	A	92.2%	93.8%	81.8%	0.467	94.3%	90.0%	100.0%	81.3%	87.0%	0.196	96.2%	86.2%	0.058
	O	5.2%	4.2%	18.2%		1.9%	10.0%	0.0%	18.8%	8.7%		3.8%	8.6%	
	R/	2.6	2.1	0.0		3.8%	0.0%	0.0%	0.0%	4.3%		0.0	5.2%	

	N	%	%	%								%		
Face shield	A	58.4 %	56.3 %	63.6 %	0.775	52.8%	45.0%	58.3%	50.0%	87.0%	0.090	56.4 %	60.3 %	0.829
	O	31.2 %	35.4 %	18.2 %		34.0%	50.0%	29.2%	31.3%	13.0%		32.1 %	31.0 %	
	R/N	10.4 %	8.3 %	18.2 %		13.2%	5.0%	12.5%	18.8%	0.0%		11.5 %	8.6%	
Wear gown	A	89.6 %	81.3 %	72.7 %	0.066	96.2%	85.0%	83.3%	50.0%	87.0%	<0.001	84.6 %	86.2 %	0.561
	O	9.1 %	14.6 %	9.1 %		3.8%	15.0%	12.5%	25.0%	13.0%		10.3 %	12.1 %	
	R/N	1.3 %	4.2 %	18.2 %		0.0%	0.0%	4.2%	25.0%	0.0%		5.1 %	1.7%	
Wear head cap	A	55.8 %	56.3 %	45.5 %	0.942	67.9%	55.0%	29.2%	18.8%	78.3%	<0.001	62.8 %	44.8 %	0.060
	O	18.2 %	20.8 %	27.3 %		13.2%	20.0%	25.0%	50.0%	8.7%		19.2 %	20.7 %	
	R/N	26.0 %	22.9 %	27.3 %		18.9%	25.0%	45.8of %	31.3%	13.0%		17.9 %	34.5 %	
wash hands	A	61.0 %	77.1 %	36.4 %	0.068	60.4%	60.0%	70.8%	50.0%	82.6%	0.371	65.4 %	63.8 %	0.947
	O	29.9 %	20.8 %	45.5 %		28.3%	35.0%	29.2%	37.5%	13.0%		26.9 %	29.3 %	
	R/N	9.1 %	2.1 %	18.2 %		11.3%	5.0%	0.0%	12.5%	4.3%		7.7 %	6.9%	
Use sanitizer	A	31.2 %	45.8 %	18.2 %	0.177[b]	34.0%	40.0%	41.7%	25.0%	34.8%	0.841	34.6 %	36.2 %	0.592
	O	40.3 %	37.5 %	36.4 %		43.4%	40.0%	25.0%	50.0%	34.8%		42.3 %	34.5 %	
	R/N	28.6 %	16.7 %	45.5 %		22.6%	20.0%	33.3%	25.0%	30.4%		23.1 %	29.3 %	

A=Always O=Occasionally R/n=Rarely/none DA=Dental assitants PG=Postgraduates DS=Dental students

Regarding the practice of hand hygiene, 64.7% used to wash their hands before starting the treatment and wearing gloves. 35.3% used to replace hand washing with hand sanitizer before wearing the gloves. The association between hand hygiene and demographic variables is presented in Table 6.

Table 6: Association between hand hygiene practice and demographic variables

Practice items		Age				Position						Gender		
		18-29	30-39	40-49	p	DS/Intern	DA/Nursing student	GDP/PG	Specialist or consultant	Ass/Nurse	p	Male	Female	p
wash hands	A	61.0 %	77.1 %	36.4 %	0.068	60.4%	60.0 %	70.8%	50.0%	82.6%	0.371	65.4 %	63.8 %	0.947
	O	29.9 %	20.8 %	45.5 %		28.3%	35.0 %	29.2%	37.5%	13.0%		26.9 %	29.3 %	
	R/N	9.1 %	2.1%	18.2 %		11.3%	5.0%	0.0%	12.5%	4.3%		7.7%	6.9%	
Use sanitizer	A	31.2 %	45.8 %	18.2 %	0.177[b]	34.0%	40.0 %	41.7%	25.0%	34.8%	0.841	34.6 %	36.2 %	0.592
	O	40.3 %	37.5 %	36.4 %		43.4%	40.0 %	25.0%	50.0%	34.8%		42.3 %	34.5 %	
	R/N	28.6 %	16.7 %	45.5 %		22.6%	20.0 %	33.3%	25.0%	30.4%		23.1 %	29.3 %	

A=Always O=Occasionally R/n=Rarely/none DA=Dental assitants PG=Postgraduates DS=Dental students

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Attitude toward the use of Personal Protection Equipment (PPE):

When the participants were questioned about their attitude toward the use of PPE, 47.1% viewed that a face shield is not necessary to be worn routinely during dental treatment. Furthermore, nearly half of them (48.5%) answered that head cap is not necessary during performing dental procedures. Similarly, 66.2% answered that wearing a gown is necessary during dental treatment. In contrast, 57.4% find washing their hands before starting the procedure is necessary. The attitude of the participants toward the use of PPE is presented in Figure 2.

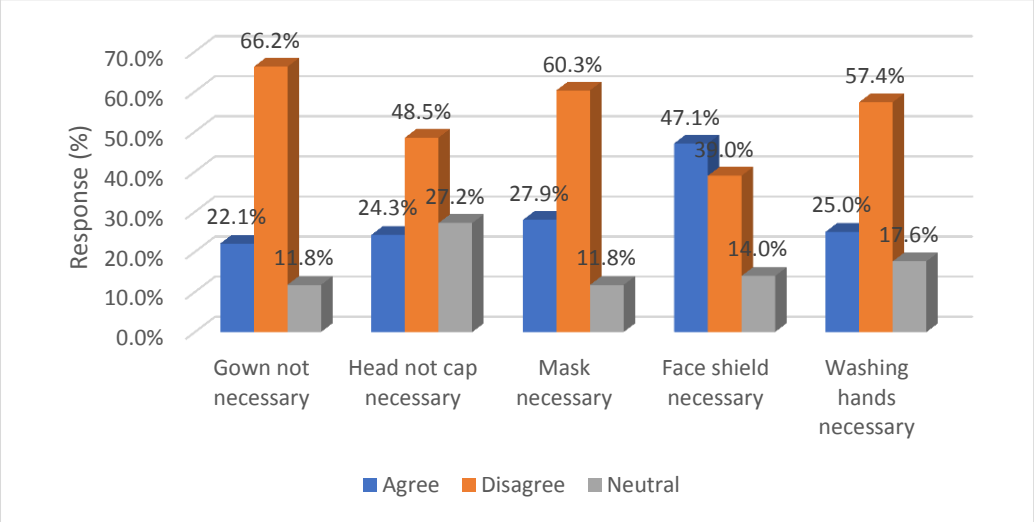

Figure 2: Attitude toward the use of personal protection equipment (PPE)

When the respondents were questioned about the duration they wear the mask, more than half of the participants (58.8%) answered four hours. Figure 3 represents the time the participants used to replace their masks. There was a statistically significant difference between males and females regarding the time of wearing the masks (P-value =.0021) as seen in Table 6.

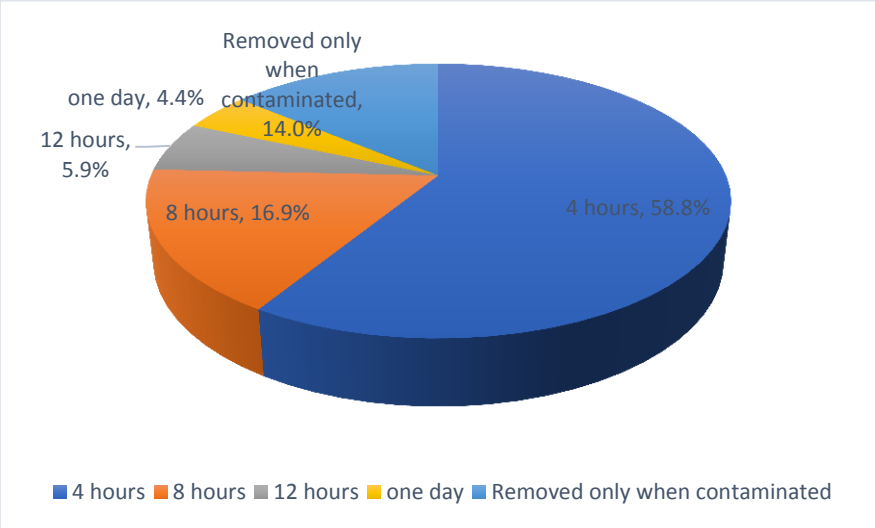

Figure 3: What is the ideal time for wearing the surgical facemask?

Table 7: Association between attitude and demographic variables

Attitude items		Age			Position					Gender	
		18-29	30-39	40-49	DS/Intern	DA/Nursing student	GDP/PG	Spec/cons	Ass/Nurse	Male	Female
Gown not necessary	Agree	24.7%	20.8%	9.1%	24.5%	25.0%	20.8%	25.0%	13.0%	26.9%	15.5%
	Disagree	64.9%	68.8%	63.6%	66.0%	70.0%	70.8%	43.8%	73.9%	61.5%	72.4%
	Neutral	10.4%	10.4%	27.3%	9.4%	5.0%	8.3%	31.3%	13.0%	11.5%	12.1%
	p	0.458			.329					.277	
Head cap not necessary	Agree	27.3%	18.8%	27.3%	32.1%	15.0%	16.7%	43.8%	8.7%	29.5%	17.2%
	Disagree	46.8%	54.2%	36.4%	50.9%	40.0%	41.7%	12.5%	82.6%	44.9%	53.4%
	Neutral	26.0%	27.1%	36.4%	17.0%	45.0%	41.7%	43.8%	8.7%	25.6%	29.3%
	p	0.734			P<0.001					.256	
Mask necessary treatment	Agree	35.1%	18.8%	18.2%	35.8%	20.0%	16.7%	31.3%	26.1%	32.1%	22.4%
	Disagree	51.9%	72.9%	63.6%	52.8%	70.0%	70.8%	43.8%	69.6%	56.4%	65.5%
	Neutral	13.0%	8.3%	18.2%	11.3%	10.0%	12.5%	25.0%	4.3%	11.5%	12.1%
	p	0.173			.373					.456	
Ideal time face mask	4 hours	53.2%	68.8%	54.5%	49.1%	80.0%	62.5%	50.0%	65.2%	51.3%	69.0%
	8 hours	16.9%	20.8%	0.0%	20.8%	10.0%	8.3%	31.3%	13.0%	21.8%	10.3%
	12 hours	9.1%	0.0%	9.1%	9.4%	0.0%	8.3%	0.0%	4.3%	2.6%	10.3%
	one day	6.5%	0.0%	9.1%	7.5%	0.0%	0.0%	6.3%	4.3%	5.1%	3.4%
	Removed contaminated	14.3%	10.4%	27.3%	13.2%	10.0%	20.8%	12.5%	13.0%	19.2%	6.9%
	p	0.107			0.527					0.021	
Face shield aerosols and splashes	Agree	48.1%	43.8%	54.5%	56.6%	35.0%	54.2%	43.8%	30.4%	55.1%	36.2%
	Disagree	37.7%	39.6%	45.5%	30.2%	50.0%	33.3%	37.5%	56.5%	32.1%	48.3%
	Neutral	14.3%	16.7%	0.0%	13.2%	15.0%	12.5%	18.8%	13.0%	12.8%	15.5%
	p	0.698			0.501					0.084	
Washing hands between	Agree	20.8%	31.3%	27.3%	22.6%	35.0%	25.0%	43.8%	8.7%	24.4%	25.9%
	Disagree	58.4%	58.3%	45.5%	64.2%	35.0%	66.7%	31.3%	69.6%	57.7%	56.9%
	Neutral	20.8	10.4	27.3	13.2%	30.0%	8.3%	25.0%	21.7%	17.9	17.2

patients		%	%	%						%	%
	p	0.400			0.062					0.979	

Statistical correlation revealed a significant relationship between attitude to head coverage during dental treatment and position in the dental clinic ($p<0.05$) as seen in table 6. However, there was no significant relationship between PPE attitudes gender, and age groups.

Discussion:

The purpose of this descriptive cross-sectional study was to investigate the dedication and outlook of DHCPs working at REU-Riyadh, Saudi Arabia, toward PPE. Twenty questions were distributed throughout three sections of an online, closed-ended survey. Participants' demographic information was collected in the first portion, and their performance and PPE compliance were assessed in the second. The third segment tested how the athletes felt about using PPE on a regular basis. Two REU medical professionals checked the accuracy of the questionnaire. Twenty people filled out the survey as a pilot to check for readability and content quality.

Dental personnel are at a higher risk of contracting COVID-19 than their counterparts since they work in such close proximity to their patients during dental procedures. The majority of current study participants (63.2%) reported prior use of surgical medical masks. 11.8% of participants reported using a N95 mask. N95 masks were used by fewer dental students (12% in the Meisha et al. study vs. 39% in the 2020 study by Duruk G et al. from Turkey). Aerosols can cause serious health problems, therefore it's important to wear protective gear like a N95 mask, which filters out 95% of particles as small as 0.3 microns. (Offeddu V. et al. 2017).

There was a significant gender difference in the frequency with which masks were altered in the present investigation, with females more likely to do so than males (P 0.05). Sixty-nine percent of female respondents wore the mask for four hours, whereas only 52.3% of male respondents did so. The World Health Organization (WHO), in March of 2020, apparently recommended a maximum of four hours of mask use. The results of this study showed that REU DHCWs had a generally favorable outlook on PPE and a reasonable level of dedication to it, but they were not always following the prescribed PPE recommendations. Graduates and postgraduates performed similarly on measures of PPE dedication and attitude, if results were broken out by level of education. The results of this study highlight the importance of emphasizing eye protection even more. 58.1 percent of people who took the survey said they always or sometimes covered their eyes during visits to the dentist. Because of the risks posed by aerosols and floating debris, it was determined that wearing protective eyewear was in everyone's best interest, both the dentist and the patient. Conjunctivitis, eye injury, or even complete loss of vision can be avoided with the use of eye protection with face shields and regular checking of its structural integrity (Ekmekcioglu H et al., 2017). Previous research has revealed that only a small proportion of Saudi dental students, residents, and practicing dentists wear eye protection (Ahmad IA 2013, BinAlrimal et al. 2019, Al Maweri SA 2015).There was a generally higher level of compliance among the people in our research

population, although it could be better. In contrast to the 2019 BinAlrimal study, in which just 30% of males and 26% of females routinely utilized protective eyewear, 58.1% of our respondents reported always using some form of facial coverage or eye protection.

Infection management and the avoidance of cross-infection rely heavily on the diligent application of PPE. Disease transmission in healthcare settings is ensured by the consistent and correct use of PPE and its doffing, although any error may lead to contact with a pathogen. Training in the proper use of personal protective equipment (PPE) and strict observance of donning procedures are essential for keeping people safe from the spread of highly contagious diseases. It was found that (Poller B et al., 2018). When it comes to effective PPE components, donning, and doffing, the present investigation found no significant differences in understanding between academic jobs. Researchers Phan et al. looked into whether or not healthcare workers were donning and removing their PPE correctly. They found that 90% of doffing instances they saw had problems with either the doffing sequence, the doffing method, or the use of proper PPE. Incorrect doffing practices include removing the face shield or mask, removing the gown from the front, and contacting potentially contaminated objects and PPE. For this study, 69.9% of participants properly identified the proper order for donning PPE, while only 54.1% correctly identified the proper order for taking it off. There was a statistically significant difference between the knowledge of the right donning and doffing sequence displayed by nurses and dental assistants. The process of donning and removing personal protective equipment (PPE) is time-consuming and complicated; studies show that even with essential PPE, a significant knowledge and technique gap exists when it comes to donning and removing PPE. Given the current state of knowledge, it is likely that more training and simulation exercises would assist bridge the gap between ideal performance and real experience. Good hand hygiene on the part of dental professionals is widely recognized as an important measure for limiting the spread of illness in clinical settings. Our research showed that 64.7% of participants washed their hands before beginning treatment, while 35.3% used hand sanitizer instead. Our results are similar to those from Jordan, where the majority of respondents reported practicing hand washing before beginning treatment (66.3%), but lower than those from Saudi Arabia, where 96.7% and 89.4% of the participants performed hand hygiene before and after contacting patients, respectively (AlAhdal A et al., 2019). That was the conclusion reached by researchers (Mahasneh et al., 2020). Evidence like this shows just how important it is to keep teaching infection prevention to dental students in Saudi Arabia. In contrast to what was found by Almahasneh et al. (2020), who found that dental support staff showed low compliance with PPE compared to dentists, dental assistants in the current study demonstrated greater dedication to PPE than students, instructors, and interns. Nurses shared our view that protecting DHCWs and preventing the spread of infection through the use of proper PPE was crucial. (ABukelaif Annual Economic Report 2019)

Limitations of the study:

Larger sample size with a wider geographical distribution would be more useful for reaching a definite conclusion about the attitude and commitment of DHCWs regarding PPE.

Conclusions:

- The general practice and commitment to PPE among REU healthcare providers are acceptable.
- There was a lack of knowledge regarding proper donning and doffing sequences.
- The compliance to eye protection and hand hygiene practice recommendations needs improvement.
- Dental assistance demonstrated better commitment to eye protection, gown and head cap-wearing, and better knowledge regarding donning and doffing than other DHCPs.

Recommendations:

- Refreshing and updating students' knowledge through seminars or lectures on universal infection control measures each academic year.
- Educational programs and training strategies should be implemented to maximize the compliance of DHCPs and enhance the compliance of dental support staff with infection-control guidelines.
- In addition to a questionnaire-based assessment, the formulation of an infection control audit team with a standardized protocol for the process is strongly recommended.

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Questionnaire

Part I: Personal Data:

Age:

- 20- 29
- 30-39
- 40 and above

Gender:

- Male
- Female

Position:

- Student
- Intern
- General dentist
- Assistant
- Specialist or consultant

Part II: Protective Personal Equipment:

Do you wear the mask during the patient examination?

- Always
- Occasionally

- rarely/none

What type of masks do you wear routinely?

- N95 Masks
- Surgical medical mask
- Fabric mask

Do you change the mask between patients?

- Always
- Occasionally
- Rarely/none

Do you utilize a face shield during the treatment procedure?

- Always
- Occasionally
- rarely/none

Do you wear a gown during the treatment procedure?

- Always
- occasionally
- rarely/none

Do you wear a head cap during patient treatment?

- Always
- occasionally
- rarely/none

Part II: Hand hygiene:

Washing hands before patient treatment?

- Always
- Occasionally
- rarely/none

Washing hands after patient treatment

- Always
- Occasionally
- rarely/none

Washing hands before donning gloves:

- Always
- Occasionally

- rarely/none

Using hand sanitizer instead of washing:

- Always
- Occasionally
- rarely/none

Part IV: Attitude toward PPE

Wearing a gown is not necessary for every procedure:

- Agree
- disagree

Wearing a head cap is not necessary during routine dental practice?

- Agree
- disagree

Wearing the mask is necessary only when I start the treatment procedure:

- Agree
- disagree

What is the ideal time for wearing a mask?

- 4 hours
- 12 hours
- One day
- No time limit

Face shields are necessary only if splashes are expected during the treatment procedure?

- Agree
- disagree

Washing hands in between patients is not necessary since I will change the gloves:

- Agree
- disagree