



Hepatitis B: Knowledge, Preventive Attitude and Vaccine Status of Dental Students and Interns at Umm Al-Qura University, Makkah, Saudi Arabia

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ABSTRACT

Background: Cross infection of blood-borne pathogens during dental practice is a major infection control problem among dental health care workers. Of these infections, Hepatitis B causes significant morbidity and mortality, and imposes a great burden on the Saudi Arabia healthcare system. Therefore, awareness of Hepatitis B virus (HBV) infection, routes of transmission, preventive practices and vaccination are very important for the protection of dental students.

Aim: Determination of the level of knowledge, attitude and practice of preventive measures regarding the HBV as well as vaccine status among Umm Al-Qura University (UQU) dental students and interns.

Method: A descriptive cross sectional study was conducted on 182 undergraduate students in fourth, fifth and sixth grades as well as on interns at Umm Al-Qura College of Dentistry. A self-structured questionnaire of 31 questions was distributed among participants to determine knowledge, attitude, preventive measures about hepatitis B during dental practice as well as the vaccine status. Data were collected, tabulated and statistically analyzed by SPSS v.20.

Results: 182 questionnaires were answered, total males were 88 (48.4%) and females were 94 (51.6%). Among all students in 4th, 5th, 6th grades and interns, the overall knowledge was high (>70%). Also the scores for total attitude and knowledge about HBV infection were significantly higher in females than males ($p < 0.001$). All participants were vaccinated against HBV and received 1-3 doses. However, 10.9% of them did not complete their doses (they received only 2 doses).

Conclusions: UQU dental students and interns showed high knowledge and attitude about many aspects of HBV infection, but also there are some aspects in which they showed poor knowledge. So, sustained training and awareness about HBV infection and its preventive measures are recommended.

1. Introduction

Hepatitis is an inflammatory disease of the liver and a major health concern worldwide [1]. Among different types of hepatitis, Hepatitis B Virus (HBV) infection affects more than 350 million people worldwide of which approximately 75% are Asian [2].

Recent data reported that there are an estimated 257 million people living with HBV, resulting in 887,000 deaths due to its complications, which include cirrhosis and hepatocellular carcinoma [3]. The Center of Disease Control [4] estimated the prevalence of HBV by country and constructed a map of the data collected, showing that HBV prevalence in Saudi Arabia was low to intermediate (2-4%).

The HBV is a partially double-stranded DNA virus that belongs to the hepadnaviridae family [5]. Generally, it is transmitted by blood transfusion, unsafe use of therapeutic injections, tattooing, vertically from mother-to-child transmission and by sexual intercourse [6].

Occupational injuries which expose health care professionals to blood-borne pathogens are an important public health concern. Dental health-care workers (DHCWs) are at particularly high risk of exposure to cross infection with blood-borne pathogens including hepatitis B virus (HBV) [7,8].

Transmission of infections during dental procedures could occur through direct contact with blood, saliva or other secretions, injury with an anesthetic needle or splash exposure of the mucous membranes, droplets and aerosols as well as indirect contact with contaminated instruments, operatory equipment or environmental services [2,7,9,10].

As the dental clinic is an environment where cross infection occurs easily, preventing the spread of Hepatitis B infection is very important in dental practice and dental student should be aware of the risks involved in performing dental procedures, and must take appropriate steps while practising [11].

Accidental exposure to infections in dental settings can be avoided by using standard safety precautions including activities such as hand hygiene, proper disposal of sharps and wearing of personal protective equipment (gloves, gowns, goggles, cap wearing) [12]. However, because some exposures cannot be prevented, vaccination and proper post-exposure management are the main forms of protection [13]. Therefore, an awareness of HBV infection, routes of transmission, preventive practices are very important for protection of future dentists [14,15].

In southeast Asian region, there are estimated to be 80 million HBV carriers [16], and because the majority of infected diseases

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carriers cannot be identified, implementation of standard precautions in dental schools is the most effective way to control cross infection [17,18].

Despite the reduced prevalence of Hepatitis B in Saudi Arabia by a planned vaccination program that was started in 1989 [19], the disease still causes significant morbidity and mortality, and imposes a significant burden on the country's healthcare system [20].

To the best of our knowledge, there have been few attempts to evaluate the knowledge, attitudes and preventive practice of HCWs in Saudi Arabia regarding occupational risks of HBV. Previously Al-Hazmi, 2015 performed two studies on primary healthcare physicians [21] and medical students at Al Jouf University College of Medicine [14] and concluded that there were inappropriate practices and lack of knowledge about infectious and occupational risk of HBV. With regard to dentists and dental students in Saudi Arabia, three studies were published; the first concerned 41 dentists at Al Jouf [22], the second and third were performed at Riyadh and Abha on 420 and 723 participants respectively [22,24]. These studies on dental practitioners revealed unsatisfactory findings in which overall knowledge was below average. Although questionnaires used in the last two studies involved the practices of students regarding protective measures against HBV as well as their HBV vaccination status, there was no data on post vaccination antibody response among vaccinated dental students and interns.

This study was conducted with the aim of determining the level of knowledge about HBV infection, attitude and day-to-day practices that help to prevent its spread. The study also aimed to assess the existing status and response to hepatitis B virus vaccination among Umm Al-Qura University dental students and interns.

2. Materials and methods

A descriptive cross-sectional study was conducted on undergraduate students in fourth, fifth and sixth grades as well as on interns at Umm Al-Qura College of Dentistry, Makkah. The duration of the study was 3 months from December 2017 to February 2018. Students at grades 1-3 were excluded as the dental curriculum at the college includes six academic years of undergraduate study followed by one year of internship. Clinical sessions and patient contact start from the fourth grade onwards.

Ethical approval was taken from the college IRB and no study activities were started until the IRB approval was obtained. The questionnaire used for data collection in this study was self-structured with an introductory paragraph about the aim of the study and an endorsement that it did not include any personal information and so answering its questions was considered as an acceptance to participate in the study.

The questionnaire included 32 questions divided into 5 groups; first group of questions covered demographic characteristics of participant (gender and grade), the second group consisted of 10 questions explaining knowledge about Hepatitis B infection. The third group contained 12 questions about beliefs, attitude and behavior during dental procedures and the fourth group contained 7 questions to evaluate students' knowledge about Hepatitis B prevention. The fifth group composed of 3 open ended questions to evaluate the vaccine status and Anti-HBs level of participant.

An electronic form of prepared questionnaire was created through Google form for online surveys. Study subjects of

different selected grades and of both sexes were invited to participate in the study through social media networks after testing framed questions on 10 participants to confirm their clarity. Printed copies of the questionnaire were also distributed among study participants who did not respond to the electronic form.

The target sample size (n=196) was the total number of students in the three clinical grades together with the interns undergoing their training rotation at the college during the study period (n=16). The total number of participants who responded was 182 subjects with response rate of 84.5% (70 in 4th grade, 57 in 5th grade & 39 in 6th grade) and 16 interns. Female participants were 94 (51.6%) while male participants were 88 (48.4%).

After collecting data, an incorrect answer to the 29 close ended questions was given a zero score while the correct answer was given a score of 1. The total score obtained by each participant was converted to a percentage and was evaluated by considering a score less than 40% as low, 40-70% as average, and a score of 70-100% as high according to Sharif et al., 2016 [25]. Finally, the mean knowledge and practice scores (%) for all the participants were calculated.

Data were collected, tabulated and statistically analyzed using Statistical Package for Social Science (SPSS v.20). $P < 0.05$ was considered as significant; chi-square tests were used for the analysis of categorical data. T-tests were conducted to compare total knowledge between different grades.

3. Results

182 questionnaires responded with a return rate of 84.5%, total males were 88 (48.4%) and females were 94 (51.6%). Table 1 illustrates the respondents' characteristics. The majority of participants were in fourth year (n=70; 38%).

Table 1: Respondents' characteristics

Gender	Academic year				Total
	4th	5th	6th	Intern	
Female	33 35.1%	31 33%	20 21.3%	10 10.6%	94 100%
Male	37 42%	26 29.5%	19 21.6%	6 6.8%	88 100%

3.1. Knowledge about Hepatitis B virus

Among undergraduate students in 4th, 5th and 6th grades, there was good knowledge (70%) regarding their highest risk of acquiring infection, possibility of infection transmission to and from the patients, the fact that patients may or may not have jaundice and a risk of transmission of infection by needle stick injury. On the other hand, an average level of knowledge was found about HBV ability to cause infection outside the body and its incubation period and infectivity in comparison with HIV.

The knowledge was different among undergraduate students in different grades regarding survival of HBV on unsterilized surfaces where the knowledge was average (40-70%) except for grade 4 where the knowledge was high; and knowledge that HBV infection is not always symptomatic was high in 6th grade students while it was average in 4th and 5th grades.

Among interns participating in the study, high knowledge was detected for all questions except for infectivity of HBV by comparison with HIV where the knowledge was low (< 40%) (Table 2).

Table 2: Students’ knowledge about HBV distributed by their grade (correct answer rates)

Question item: Correct answer	% of Students with correct answers				
	4th grade	5th grade	6th grade	Interns	X2 (P value)
-Dentists are at higher risk of HBV infection than general population(Yes)	98.6	100	100	100	1.609 (0.657)
-HBV can be transmitted from dentist to patient (Yes)	74.3	73.7	74.4	100	5.921 (0.432)
-HBV can be transmitted from patient to dentist (Yes)	94.3	98	100	100	8.705 (0.191)
-HBV is not infectious outside the body (in the environment) (No)	42.9	40.4	53.8	75	10.466 (0.314)
-HBV can survive for prolonged time on unsterilized surfaces (Yes)	75.7	68.4	69.2	100	12.0 (0.213)
-The incubation period of HBV ranges from weeks to months (Yes)	62.9	52.6	61.5	75	7.381(0.598)
-Hepatitis B infection is always symptomatic (No)	57.1	63.2	74.4	87.5	1.763 (0.227)
-People with hepatitis B may or may not having jaundice. (Yes)	67.1	70.2	74.4	87.5	4.835 (0.848)
-Hepatitis B virus can be transmitted by needle stick during dental treatment (Yes)	91.4	98.2	94.9	100	10.551(0.308)
-HBV is less infectious when compared with HIV (No)	58.6	64.9	53.8	37.5	7.704 (0.564)

Table 3: Students’ Believes, Attitude and behavior during patient treatment (correct answer rates)

Question item: Correct answer	% of Students with correct answers				
	4th grade	5th grade	6th grade	Interns	X2 (P value)
-Dentists have rights to know their patients’ HBV infection status (Yes)	94.3	93	97.4	100	3.663 (0.722)
- You can safely treat patients with HBV infection (Yes)	77.1	82.5	87.2	100	7.820 (0.252)
-Shaking hands with hepatitis B patient makes you uncomfortable (No)	48.6	43.9	53.8	31.3	4.738 (0.578)
-You wear gloves before touching membranes and non -intact skin of patient (Yes)	92.9	94.7	94.9	100	3.98(0.679)
-You wash your hands before and after treatment procedure. (Yes)	97.1	93	87.2	93.8	4.715(0.581)
-You wear goggles during treatment procedures of patients. (Yes)	67.1	70.2	64.1	81.3	9.477(0.372)
-You wash your hands after contact with patient’s body fluids(Yes)	97.1	96.5	100	100	3.764(0.709)
-You use gowns to protect yourself when treating patient (Yes)	97.1	96.5	100	93.8	4.489(0.611)
-You use mask to protect yourself when treating patient. (Yes)	97.1	98.2	100	100	5.419(0.491)
-You bend needles after injections of your patients (No)	54.3	59.6	71.8	68.8	8.121(0.229)
-You discard used needles into a medical waste container(No)	10	17.5	10.3	12.5	4.206(0.649)
-You check the indicator showing whether or not instruments have been sterilized before using them in a procedure(Yes)	84.3	75.4	61.5	93.8	11.889(0.064)

3.2. Believes, attitude and behavior regarding HBV during dental procedure

Table 3 shows the percentage of correct answers to sample questions of the questionnaire regarding attitude and behavior towards HBV and standard infection control precautions. High percentages of participants have the correct attitude, however, all of them reported unaccepted attitude regarding discarding used needles into a medical waste container (with low score< 40%), bending needles after injections (high score in grade 6 and average scores in other grades and interns), using goggles during patient treatment (average scores in 4th and 6th grades and high in the other participants) and being uncomfortable when shaking hand with HBV patient (low score in interns and average scores in all undergraduate grades). Significant differences were observed between percentages of students checking the indicator

for efficient sterilization with the average score among 6th grade students and high scores among the other groups.

3.3. Prevention

With regard to knowledge about HBV prevention, all participants had high knowledge (<70%) except for 6th year students who had average knowledge (40-70%) about the recommendation that Hepatitis B immune globulin (HBIG) be used in emergency prevention (Table 4). Figure 1 shows the relationship between knowledge about HBV, attitude and prevention scores and grades. Higher knowledge about HBV (86%), prevention (90%) and better attitude (81%) were among interns. Figure 2 shows that scores of total attitude and knowledge about HBV infection were higher in females than males with a significant difference (p< 0.001). Nevertheless, the knowledge about HBV prevention was not statistically significant between male and female scores.

Table 4: Students’ Knowledge about Hepatitis B prevention (correct answer rates)

Question item: Correct answer	% of Students with correct answers				
	4th grade	5th grade	6th grade	Interns	X2 (P value)
- Is HBV infection preventable? (yes)	78.6	89.5	100	87.5	18.437(0.030)
- Is HBV vaccine available? (yes)	95.7	96.5	94.9	100	5.278(0.809)
-Is it necessary to all dental staff to be vaccinated? (yes)	97.1	98.2	100	100	5.419(0.796)
-Is vaccine for hepatitis B safe and effective for all ages? (yes)	72.9	87.7	79.5	75	12.392(0.192)
- Is it necessary to measure the Anti-HBs level after having vaccine? (yes)	95.7	84.2	79.5	93.8	12.327(0.196)
- Can Hepatitis B immune globulin (HBIG) be used in emergency prevention? (yes)	75.7	75.4	69.2	81.3	11.940(0.217)
- Do you believe that HBV vaccination should be mandatory for all the dental healthcare workers in Saudi Arabia? (yes)	94.3	96.5	92.3	93.8	5.891(0.751)

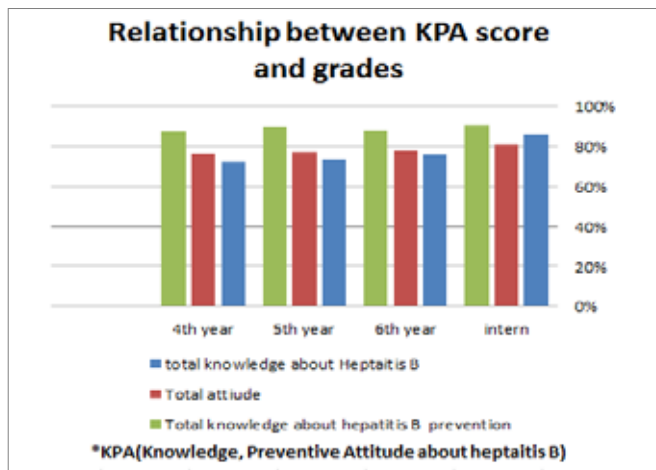


Figure 1: Comparison between different grades according to scores of total knowledge & attitude

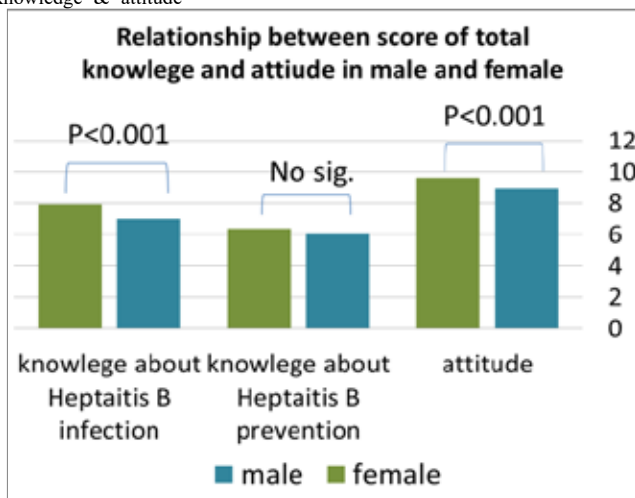


Figure 2: Comparison of males and females according to scores of total knowledge & attitude

Vaccine status

All participants were vaccinated against HBV and received 1-3 doses according to their Ab levels. 10.9% of them did not complete their doses (received only 2 doses)

Measuring Ab levels after vaccination was done by 145 (79.7%) of participants but 91 (62.76% out of them) did not know its level. On the other hand, 14 (0.77% out of all study participants) did not measure it (Figure 3).

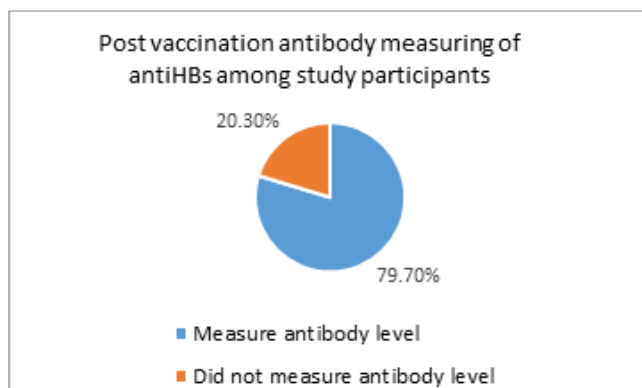


Figure 3: Percentages of study participants according to post vaccination antibody measurement

4. Discussion

Dental professionals have a significant occupational hazard for infection by Hepatitis B virus as they are frequently dealing with

blood, saliva, and commonly exposed to needle stick injuries [23]. Data about HBV knowledge, preventive attitude and vaccine of health care workers including dental students and interns, as future dentists, are important in designing health intervention methods and public health policies [26].

Among undergraduate students in the present study, there was high knowledge (70<%) regarding modes of infection and clinical picture of HBV. These results are similar to previous studies done in Saudi Arabia by Al-Shamiri et al., 2018 [23] and Alrahmah et al. 2018 [27] but higher than those recorded by Saquib et al., 2019 [24] for their study on dental students randomly selected from the various dental colleges across Saudi Arabia. In the study of Saquib et al., 2019 [24] only about 20% of their study participants were aware of how the virus is spread and 13.6% knew that most of the patients have no prominent symptoms. The high level of knowledge in our college may be attributed to the annual reinforcement sessions for infection control practice in dental clinics and periodic auditing of students and interns during clinical sessions. According to previous studies from other parts of the world, knowledge rates about these items vary from low in India [15] to high in Turkey [28], China [29] and Libia [30] which reflects the worldwide awareness about Hepatitis B virus.

Although the majority of Umm Al-Qura university dental students were aware of the common transmission routes for HBV and its clinical picture, their knowledge was less accurate (40-70%) with respect to the virus incubation period and its ability to cause infection outside the body. These results are similar to those of Al-Hazmi, 2015[22] at Aljouf, Saudi Arabia (53.7% and 51.2% respectively). Controversially, only 28.2% of study participants by Saquib et al., 2019 [24] knew the duration of HBV incubation period and 75.7% of dental students participated in study of Al-Shamiri et al., 2018 [23] reported that HBV is infectious outside the body.

Regarding HBV transmission by comparison with HIV, knowledge was average in our study which was similar to that of Saquib et al., 2019 [24] (53.8%), lower than that of Al-Hazmi, 2015 [22] (70.7%) Alsamghan,2012 [31] (79.3%) and higher than that of Al-Shamiri et al., 2018 [23] (less than 40%). The difference may be attributed to different numbers of study participants and the curriculum of basic medical sciences studied in different universities and due to the fact that senior students may forget some basic knowledge delivered at earlier levels of college.

Higher knowledge about the virus’s ability to cause infection outside the body of 4th grade students than other undergraduates participating in the present study, could be explained by their more recent study of basic medical sciences.

Among interns, high knowledge was detected for all questions except for infectivity of HBV by comparison with HIV where the knowledge was low (< 40%). High knowledge among them could account for the fact that graduate students who had clinical experience became more aware of HBV problem as well as the fact that they prepared themselves for the Saudi dental license examination which is an exam that assesses readiness of student to practice and proceed to post graduate training.

All participants in the current study reported unaccepted attitude regarding to discarding used needles into a medical waste container and bending needles after injections. Similarly, Haridi et al., 2016 [32] recorded that 22.1% of their study participants wrongly believed that bending needles helps them to avoid needle stick injuries. The percentage of students who agreed on discarding used needles into a medical waste container in the study of Akbulut et al. 2011 [28] is similar to our finding and may indicate a lack of knowledge regarding the differences between waste containers. The correct attitude of using goggles

during patient treatment ranged from average to high scores in our study participants which is similar to Al-Shamiri et al., 2018 [23], where 80.9 % of their participants reported that they use goggles during treatment.

In our study, high percentages of participants reported checking the indicator for efficient sterilization. Consistent with these results, Shigri et al. 2015 [33] reported similar percentages whereas in the Akbulut et al. 2011 [28] study only 14% among their dental clinical students used to check it.

Findings of the current study concluded that the highest knowledge about HBV, its preventive measures and attitude among study participants were detected in interns, higher in females than males. This result partially agrees with those recorded by Al-Shamiri et al., 2018 [23], and Saquib et al., 2019 [24], where both reported that females showed better attitude than males while in the Al-Shamiri et al., 2018 [23] study, final year students showed significantly better attitudes than interns and in the Al-Shamiri et al., 2018 [23] study, interns showed the highest level of attitude, a good level of practice but low level of knowledge.

With regard to knowledge about HBV prevention, all participants had high knowledge; this agrees with those of Saquib et al., 2019 [24] where 66.3% of study participants knew that a vaccine against HBV infection is available. Concerning knowledge about whether or not Hepatitis B Immunoglobulin (HBIG) can be used in emergency as prevention or not, the sixth grade students showed moderate knowledge (69%) which is slightly lower than the findings of a Chinese study which reported that sixth grade dental students have high knowledge (75.45%) [29].

All participants in the present study were vaccinated against HBV with 89.9% out of them completed their recommended doses. This rate is close to that reported in Canada (100%) [13]; comparable to that reported by other studies in United Arab Emirates 95.8% vaccinated; with 64.45% of them completed the required dosage [34] and in Saudi Arabia (89.9% vaccinated; with 74% completed their doses) [35], and (91.4 %; with 41% completed doses) [23]. The present study findings could be attributed to the college infection control policy that vaccination is an obligatory requirement for students before clinical sessions.

However, lower percentages were detected in Brazil (79.9.8%) [36], Yemen (70.7% were vaccinated; 50.0% completed doses) [37] and Central India [11] where only 38.8% of undergraduate students were vaccinated. These low vaccination rates could be explained by the high cost of the vaccination and a lack of awareness about the significance of vaccination in dental practice.

Similar to our study results, where 79.7% of students knew their post vaccination anti-HBs levels, Al-Hazmi, 2015[22] found that 85.8% of his study participants knew their status regarding anti-HBs. Because HBV vaccination does not always produce adequate antibody level for protection and it might give students a false sensation of safety, it is recommended for all vaccinated dental practitioners to know their post vaccination antibody levels.

Hepatitis B virus vaccine response confirmation, by measuring anti-HBs level within one to three months of primary vaccination, is recommended by Occupational Health and Safety Administration (OHSA) in all health care workers [38]. Antibody levels were measured after vaccination in 79.7% of the present study participants where this finding is much higher than those reported by Balcheva et al., 2015 [39] (34.3%) and Halboub et al., 2015 [37] (9.5%).

Limitations of the study are the small sample size, few number of interns by comparison with other groups may lead to misinterpretation of the level of knowledge and attitude. Also, the data collected by questionnaires were self reported and so answers

depended on the responder honesty.

5. Conclusions

Although dental students and interns in the present study showed high knowledge and attitude about many aspects of HBV infection and its prevention, average knowledge and/or low to average attitude about other aspects were recorded. Among study participants, higher attitude and knowledge were recorded among females and interns. With regard to their current HB vaccine status, all the participants received HBV vaccine but 9.7% of them did not measure HBs Ab levels after vaccination.

So, there is a need for sustained training and awareness about HBV infection and its preventive measures with periodic evaluation to overcome the gap of knowledge and to improve attitude. Students with incomplete vaccination doses should complete their programme of vaccination and measure post vaccination antibody levels to ensure adequate response to vaccine and protect UQU students and interns from HBV.

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- Conflict of interest

The authors declared that there is no conflict of interest.

- Funding

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- Ethical statement

- Ethical approval was taken from the college IRB and no study activities were started until the IRB approval was obtained.
- The questionnaire used for data collection in this study was self-structured with introductory paragraph about the aim of the study and an endorsement that it did not include any personal information and so answering its questions was considered as an acceptance to participate in the study.
- The manuscript is not currently being considered for publication in another journal

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