ORIGINAL ARTICLE

Analysing Anti-HBS Titer Levels in Vaccinated Students of Dentistry in A Tertiary Care Hospital

Fatima Khattak[1] **BDS, FCPS**
Sadia Paiker[2] **BDS, FCPS**
Syed Muhammad Zaki Mehdi[3] **BDS, FCPS**
Adam Khan Danish[4] **BDS, FCPS**
Muhammad Azhar Sheikh[5] **BDS, MSc, FDSRCS, FFDRCS, FDS**
Muhammad Wasim Ibrahim[6] **BDS, MCPS FCPS, OJT**

BACKGROUND: The Hepatitis B infection is a universal health issue, which causes considerable morbidity in humans. Students of dentistry in clinical rotations are prone to risks of HBV transmission. The Dentistry students should be informative about preventive steps and actions that can hamper the spread of hepatitis B virus.
OBJECTIVE: To determine the frequency of hepatitis B vaccination coverage and sero-protective levels of anti-HBs antibody titers among dental students.
METHODOLOGY: A cross sectional study was undertaken over the course of 6 months i.e. 9th May, 2019 to 9th Nov, 2019 on 130 dentistry students in Foundation University College of Dentistry, Islamabad. Permission was taken from hospital ethical committee FUCD for the study. Students who received full course of HBV vaccination after recording in a given performa and who gave consent for testing were sampled for anti-HBs antibody titers.
RESULTS: It was found that out of 130 dental students only 5 (3.8%) have checked Anti-HBs titer levels after full course of vaccination and 113 (86.9%) students reported to have received three complete doses of hepatitis B vaccine. After estimation of anti-Hbs antibody levels of 113(86.9%) students, it was found that 34 (30.1%) possessed negative seroprotective level while 79 (69.9%) positive seroprotective level.
CONCLUSION: The study concluded inadequate vaccination coverage among dentistry students where 86.9% students were fully vaccinated, with considerable reduction in anti-HBs titters found among 30.1% students.
KEYWORDS: Hepatitis B, Anti HBs Titer, Seroprotection, Dental students, HBV transmission, Vaccination
HOW TO CITE: Khattak F, Paiker S, Mehdi SMZ, Danish AK, Sheikh MA, Ibrahim MW. Analysing anti-HBS titer levels in vaccinated students of dentistry in a tertiary care hospital. J Pak Dent Assoc 2022;31(4):170-175.
DOI: https://doi.org/10.25301/JPDA.314.170
Received: 16 July 2022, Accepted: 09 January 2023

INTRODUCTION

The Hepatitis B infection is a universal health issue, which causes considerable morbidity in humans because this sickness is responsible for ill health and fatality, primarily through the consequences of chronic infection.[1] Worldwide approximately two billion people are infected[2] according to the WHO, of those 260 million are chronic carriers.[3] Central Africa and South-Eastern Asia has the highest prevalence of HBV infection.[4] There are around 9 million Hepatitis B virus carriers in Pakistan.[2] HBV genome gets conserve in the liver for the life time of carriers as infection becomes chronic.[5]

For a health care provider possibility of contracting HBV infection is four times greater in comparison to the general population and the likelihood of acquiring this infection after a single exposure is 6 to 30% in an unvaccinated person.[1,4,6] Amongst the professionals, the most susceptible group as the actual sufferers and carriers are the dentists.[1] Risk of HBV infection is greatest among the dental students in clinical training. Needle stick injuries and patient's bodily fluids contact make them prone to HBV transmission risk as their exposure rate is similar to that of hospital staff.[7] In majority circumstances antibody titers fail to increase due

1. Senior Registrar, Department of Oral & Maxillofacial Surgery, Dental College HITEC Institute of Medical Sciences, Taxila Cantt, Pakistan.
2. Senior Registrar, Department of Oral & Maxillofacial Surgery, Islamabad Medical & Dental College, Islamabad, Pakistan.
3. Registrar, Department of Oral & Maxillofacial Surgery, Rawal Institute of Health Sciences Islamabad, Pakistan.
4. Registrar, Department of Oral & Maxillofacial Surgery, Dental College HITEC Institute of Medical Sciences, Taxila Cantt, Pakistan.
5. Professor, Department of Oral & Maxillofacial Surgery, Islamic International Dental College and Hospital, Islamabad, Pakistan.
6. Professor, Department of Oral & Maxillofacial Surgery, Foundation University College of Dentistry and Hospital, Islamabad, Pakistan.

Corresponding author: "Dr. Fatima Khattak" < fatimakhattak12@gmail.com >

to either improper vaccination or loss of immune response.[8] In long-term follow-up studies of individuals who received 3 doses of the hepatitis B vaccine starting at birth, a significant portion of participants showed declining protection 5-15 years after the initial immunisation[9,10,11,12] and one of the study in India showed 11% to 24% of dental students had a moderate to poor immune response.[13] Similar studies in Pakistan found low anti-HBs titer levels of 25.8% among dental professionals and dental students in Karachi[14] and only 13.7%[15] of healthcare providers in Peshawar who had had vaccinations.Similar study among Multan dental students reported 46.7% of students who had never received vaccinations.[16]

If the Anti-HBs antibody levels to hepatitis B surface antigen is ≥10mIU/ml it is considered as protective response.If the titer is ≥100 mIU/ml then no infection is seen among the patients.[14] Since qualifying dental students go on to make the future healthcare providers, it is of grave importance that they should be mindful of the probability of spreading around and catching communicable diseases and infectious pathogens such as the HBV, during patient care and treatment and should be well aware about their immune response. This occupational hazard can be controlled to a major extent with the extensive use of HBV vaccination and to detect the anti HBs titer level which appears to be the main predictor of initial response to the vaccine and implementation of universal precautions.[17]

This study aimed to highlight the number of students who have been vaccinated against hepatitis B and their attitude towards checking post vaccine antibody titers and to find the number of students who have positive immune response in a tertiary care hospital & it will create awareness among dental graduates regarding the significance of hepatitis B vaccination and of post vaccination immune response which if not in protective range will be a consistent risk for the student to acquire infection while treating high risk patients during clinical practice. The objective of this study was to determine the frequency of hepatitis B vaccination coverage and sero-protective levels of anti-HBs antibody titers among dental students.

METHODOLOGY

A cross sectional study was undertaken over the course of 6 months i.e. 9th May, 2019 to 9th Nov, 2019 on dentistry students in Foundation University College of Dentistry & Hospital, Islamabad. The sample size was calculated using the WHO calculator. The Anticipated population proportion was 13.7%.[14] The sample population was estimated at 130 participants and level of confidence was set at 95%. However, to achieve best outcomes and obtain more precise findings, supplementary questionnaires were given to 150 students so that incomplete responses can be excluded. Permission was taken from hospital ethical committee (Approval letter no. FF/FUCD/632/ERC001 dated 5July2021) FUCD&H for the study. Dental students of 1st year till final year were included in the study while those who were already diagnosed with hepatitis B, immunocompromised, taking corticosteroids or immunosuppressant's were excluded. Non probability consecutive sampling technique was used. Written informed consent was taken from the subjects. Using a validated questionnaire from a prior study by Rizvi et al[14], a data collection format was created.Particulars of all the students who met the inclusion and exclusion criteria were recorded in proforma including age, gender, year of study, history of comorbidities and vaccination status including the number of doses,time elapsed since last dose and post vaccination titer levels whether checked or not. Those who received full course of HBV vaccination and who gave consent for testing were sampled for anti-HBs antibody titers. Charges of the tests were borne by hospital administration. The anti-HBs ELISA test was used for evaluating antibody levels. SPSS 23.0 was used to analyze data. Quantitative variables like age and antibody titer levels were calculated by mean and standard deviation. Frequency and percentage was calculated for qualitative variables like gender, student year of study and status of hepatitis B vaccination coverage regarding complete vaccinated, incomplete vaccinated and seroprotective levels. Effect modifier like age, gender, year of study of participant was stratified. Post stratification was done using Chi-square test. P value < 0.05 was taken as significant.

RESULTS

There were total 130 dental students who took part in this study. Out of 130, there were 34 males and 96 females. The mean age was calculated to be 22.35±2.84. The baseline demographic characteristics shows participation of 26 first year, 27 second year, 35 third year and 45 fourth year students respectively. Table 1 gives summary of findings related to vaccination status, number of doses administered and duration to last dose administered. It was found that 119 dental students were vaccinated for Hepatitis B and only 3.8% dental students had checked their anti-Hbs antibody titers after complete vaccination while rest of them never checked the titers as shown in figure 1. After estimation of anti-Hbs antibody levels, it was found that 30.1% students possessed negative seroprotective level while 69.9% positive seroprotective level i.e. anti-HBs antibody titer >10 mlU/ml in blood, as shown in figure 2.

The frequency of hepatitis B vaccination coverage and

sero-protective levels of anti-HBs antibody titers among dental students were compared with respect to age, gender and year of study.

Table 1: Hepatitis B (Hep-B) Vaccination Status of Dental Students (N=130) and Comparison with Respect to Age

Hepatitis B Vaccination Status	n (%)	Age groups		p
		< 20 years (n=34)	≥ 20 years (n=96)	
Are you ever vaccinated against hepatitis B virus?				
☐ Yes	119 (91.5%)	25 (73.5%)	94 (97.9%)	0.027
☐ No	11 (8.5%)	9 (26.4%)	2 (2.1%)	
Did you completed vaccine against Hepatitis B i.e. received three doses?				
☐ Yes	113 (86.9%)	34 (100%)	79 (82.2%)	0.022
☐ No	17 (13.1%)	0 (0%)	17 (17.7%)	
How long has it been since the completing of the vaccination schedule?				
☐ Less than 6 months	41 (36.3%)	13 (64.0%)	28 (29.8%)	0.003
☐ More than 6 months	72 (63.7%)	7 (35.0%)	65 (69.9%)	

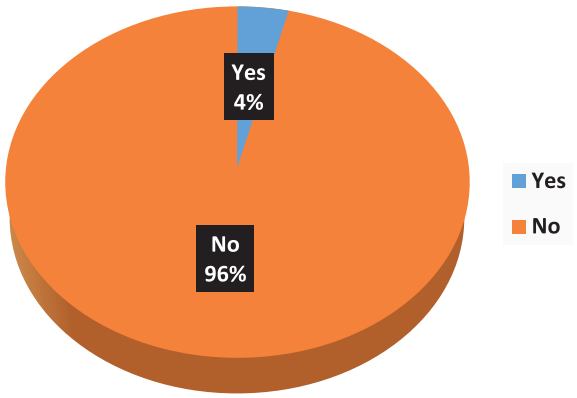

Figure 1: Percentage of Dental Students Who Had Checked Anti-Hbs Antibody Titers After Hepatitis B (Hep-B) Vaccination

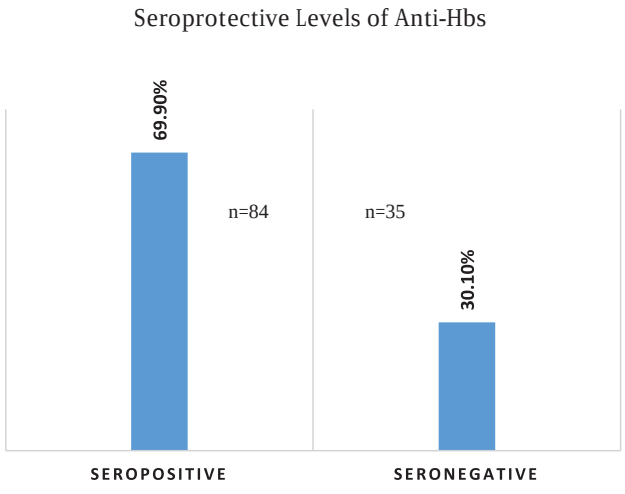

Figure 2: Percentage of Dental Students With Positive and Negative Seroprotective Levels of Anti-Hbs Antibody Titer

Table 2: Demographic Factors Effecting Seroprotective Levels of Anti-Hbs Antibody Titers Among Dental Students

Factors	Seroprotective Status		p
	Negative (<10 mIU/mL) n = 35	Positive (≥10 mIU/mL) n = 84	
Age group			
☐ < 20 years	8 (22.9%)	17 (22.2%)	0.749
☐ ≥ 20 years	27 (77.1%)	67 (79.8%)	
Gender			
☐ Male	18 (51.4%)	15 (17.9%)	<0.001
☐ Female	17 (48.6%)	69 (82.1%)	
Year of study			
☐ First	8 (22.9%)	17 (20.2%)	
☐ Second	11 (31.4%)	14 (16.7%)	0.072
☐ Third	10 (28.6%)	19 (22.6%)	
☐ Fourth	6 (17.1%)	34 (40.5%)	

Among male students, after estimation of anti-Hbs antibody levels it was found that 51.4% students possessed negative seroprotective level while 17.9% positive seroprotective levels i.e. anti-HBs antibody levels >10 mlU/ml in blood as given in table 2.

DISCUSSION

Hepatitis B infection is one of the most common blood borne viral infection and carries a major health concern, making medical and dental professionals and health care workers especially dentists amongst high risk occupational group.[18] The most common route of spread in dental setting is from infected patient bodily fluids contact like saliva and blood and needle stick injuries. The probability of spread of HBV after getting exposed to gingival crevicular fluid and saliva has been proven, which also endangered the oral health care provider against hepatitis infection.[19]

CDC guidelines for infection control in dental setting includes, but not limited to, wearing a face mask, eye protection, protective clothing, and other cautionary materials. Unfortunately, even dental students do not always conform to these practices, leading to greater risk to themselves and their patients.[17] The most cost-effective predictor for protection against HBV infection is anti-HBs.[20]

In the current study total 130 dental students were analyzed for hepatitis B vaccination coverage. The mean age (years) in the study was 22.35+2.84 with an age range of 16-28 years. SA Ara et al.[13] showed mean age of 28.12 ± 2.55 years with age range of 22-31 years.In another study by Acchammachary et al[21] mean age was 25.5 years. Study by Sernia et al[22] mean age was 25.4 years. Rizvi et al.[9] reported varying ages with age range between 18-45 years with mean age of 40 years. No remarkable association

was seen between the level of anti-HBs and the age of participant in the present study most likely due to minimal differences in participant's age.

In our study among 130 participants 34 were males 26.2% and 96 were females which makes 73.8%. Study by SA Ara et al[13] showed 52 females and 48 were males out of 100participants. In another study[21] 56.4% were males and 43.5% females make up the study population.

Vaccinated subjects percentage in this study was 91.5% while 8.5% were never vaccinated. This is higher than the studies conducted in India[18,21] where percentage of vaccinated subjects against hepatitis B was only 51.50%[18], 65%[21] and 25% were not vaccinated at all.[21] Similarly In a study conducted in Africa 18% were adequately vaccinated, 30.6% inadequately vaccinated and 51.4% were not vaccinated.[23] Other studies showed 78.1% among dental students of Saudi Arabia[24] and 76.8% amongst Palestinian students[25] and 60% among dental students of Pakistan.[26]

The disparity in immunisation rates among different groups may be caused by discrepancies in the laws already in place, a lack of awareness, or the existence of vaccination programmes in the locations where these studies were conducted.

In our study the vaccination coverage is highest amongst first year students (100%) followed by subsequent years. This is contradicting to the studies[21,27] conducted in India where it is highest amongst post graduate residents. This might be due to the fact that 1st year students were not included in those studies. Contradicting results were also reported by a Brazilian study[28], where also sixth year students have higher vaccination coverage as compared to first and subsequent years.

Findings of this study indicate 69.9% reactive HBs Ab titer among dental students and non-reactive HBs Ab titer in 30.1% which is considerable failure rate but lower as compared to other studies.A study by Mangkaraa et al.[29] reported only 33.1% had serological evidence of vaccination while 66.8% participants were unprotected against infection. Similarly Lingawi HS[30] reported 73.6%, failure rate. However, Rizvi et al[14] 28.7%, Monica et al 24.9%[31] and SA Ara[13] (11%) reported much reduced failure rate. This study is in harmony with another study[13,14] which reported antibody levels of 65% and 71.3% which is much higher than other studies. The current study revealed significant antibody titers among dentistry students .This may be due to the fact that they might have completed vaccination before joining the college as part of admission policy and time elapsed was shorter.

The result of this study regarding the association between gender and seroprotectivity was in line with other studies.[6,14,32] Even though 51.4% of the participants with < 10 mIU/ml antibody titer levels were male, only 17.9% with ≥ 10 mIU/ml were male.This indicates that there might be a negative relation between immune response and this gender. (p-value 0.000).

The perspective or attitude of dental students with respect to exploring their post vaccine titer level was poor in our study as only 3.8% of them checked their antibody levels as compared to studies undertaken in Turkey[33] 5.8% and India 7.4%[18] but it is better than another study[34] which have shown only 1.41% checked their titer post vaccination. Therefore, dental professionals after complete vaccination should opt for serological monitoring after 1-2month period.[14]

The limitations of the present study were that he majority of the factors, such as chronic illnesses, patients taking steroids or immunosuppressants, smoking, stress, and immunosuppression, which may affect a patient's response to a vaccine, were not taken into account. Additionally, the dental college where the study was conducted did not have a policy prohibiting previously immunised individuals from receiving the vaccination again, therefore there may be a probability for booster shots.

CONCLUSION

The study concluded inadequate vaccination coverage among dentistry students of Foundation University College of Dentistry, where 86.9% students were fully vaccinated and considerable reduction in anti-HBs titers was found among 30.1% post-vaccination. Consequently, it is imperative to consider serological testing after vaccination and before start of clinical practice to lessen the chance of infection and to refine the immunization programs.

CONFLICT OF INTEREST

Nil

ACKNOWLEDGEMENT

Nil

REFERENCES

1. Kashyap B, Tiwari U, Prakash A. Hepatitis B virus transmission and Health care workers: Epidemiology, Pathogenesis and Diagnosis. IJMS. 2018;9:30-35.
https://doi.org/10.1016/j.injms.2018.01.003

2. Pondé RA. Expression and detection of anti-HBs antibodies after hepatitis B virus infection or vaccination in the context of protective immunity. Archives of Virology. 2019;164:2645-58. *https://doi.org/10.1007/s00705-019-04369-9*

3. Mangkara B, Xaydalasouk K, Chanthavilay P, Kounnavong S, Sayasone S, Muller CP, et al. Hepatitis B virus in lao dentists: a cross-sectional serological study. Annals of Hepatology. 2021; 22:100282. *https://doi.org/10.1016/j.aohep.2020.10.010*

4. Mbamalu C, Ekejindu I, Enweani I, Kalu S, Igwe D, Akaeze G. Hepatitis B virus precore/core region mutations and genotypes among hepatitis B virus chronic carriers in South-Eastern, Nigeria. International J Health Sci. 2021;15:26.

5. Tariq S, Tareen MA, Uddin I, Qiam F. Assess the knowledge of dentists regarding Hepatitis B serological profile: a cross-sectional study. J Infection in Developing Countries. 2020;14:1210-6. *https://doi.org/10.3855/jidc.12295*

6. Nagpal B, Hegde U, Kulkarni M. Hepatitis B Seropositivity and Immune Status in Dental Students. J Advanced Medi Dent Sci Res. 2019;7:9-12.

7. Adenlewo OJ, Adeosun PO, Fatusi OA.Medical and dental students' attitude and practice of prevention strategies against hepatitis B virus infection in a Nigerian university. PAMJ. 2017; 28:28-33. *https://doi.org/10.11604/pamj.2017.28.33.11662*

8. Dowran R, Malekzadeh M, Nourollahi T, Sarkari B, Sarvari J. The prevalence of hepatitis B virus markers among students of Shiraz University of Medical Sciences. Advanced Biomedical Research. 2021;10.
https://doi.org/10.4103/abr.abr_173_20

9. Bialek SR, Bower WA, Novak R, Helgenberger L, Auerbach SB, Williams IT, et al. Persistence of protection against hepatitis B virus infection among adolescents vaccinated with recombinant hepatitis B vaccine beginning at birth: a 15-year follow-up study. Pediat J Infect Dis. 2008; 27:881-885.
https://doi.org/10.1097/INF.0b013e31817702ba

10. Gara N, Abdalla A, Rivera E, Zhao X, Werner JM, Liang TJ,et al. Durability of Antibody Response Against Hepatitis B Virus in Healthcare Workers Vaccinated as Adults. Clin J Infect Dis. 2015; 60:505-13. *https://doi.org/10.1093/cid/ciu867*

11. Salama II, Sami SM, Said ZN, Salama SI, Rabah TM, Abdel-Latif GA,et al. Early and long term anamnestic response to HBV booster dose among fully vaccinated Egyptian children during infancy. Vaccine. 2018; 36:2005-2011.
https://doi.org/10.1016/j.vaccine.2018.02.103

12. Shabanah W, Bukhari A, Alandijani A, Alyasi A, Youssef AR. Prevalence of HBV and Assessment of Hepatitis B Vaccine Response among Dental Health Care Workers in Dental Teaching Hospital, Umm Al-Qura University, Saudi Arabia. Egyptian J Immunology. 2019;26:11-7.

13. Ara SA, Fatima A. Acquired Immunity in Dentistry Students After Hepatitis B Vaccination. J Res Dent Maxillofacial Sci. 2020;5:33-6. *https://doi.org/10.29252/jrdms.5.3.33*

14. Rizvi KF, Arslaan M, Raza H, Hira A, Hamid S, Fatima A. Assessing sero-protective levels of anti-hbs titer in pre-vaccinated dental students and dental professionals at bahria university medical & dental college (BUMDC), Karachi. Pak Oral Dent J. 2017;37:472-6.

15. Attaullah S,Khan S,Naseemullah,Ayaz S,Khan S,Ali I,et al. Prevalence of HBV and HBV vaccination coverage in health care workers of tertiary hospitals of Peshawar. Pakistan.Virol J. 2011;8:275-81.
https://doi.org/10.1186/1743-422X-8-275

16. Sajid M, Jamil M, Javed M. Vaccination Status Of Dental Students Of Multan Dental College Multan Against Hepatitis B Virus. Pak Oral Dent J. 2018;38:513.

17. Peeran SW, Peeran SA ,Al Mugrabi M,Abdalla K , Murugan M, Alsaid F,Hepatitis B: Knowledge and Attitude of Graduating Dentists from Faculty of Dentistry, Sebha University, Libya. Dent Med Rcs.2017; 5:18-23.
https://doi.org/10.4103/2348-1471.198785

18. Benarji KA, Anitha A, Suresh B, Aparna V,Praveena A, Penumatsa LA. Knowledge and attitude of dental students toward hepatitis B virus and its vaccination - A cross-sectional study. J Oral Maxillofac Pathol. 2021;25:553.
https://doi.org/10.4103/jomfp.jomfp_387_21

19. Cocchio S, Baldo V, Volpin A, Fonzo M, Floreani A, Furlan P, et al. Persistence of anti-HBs after up to 30 years in health care workers vaccinated against hepatitis B virus. Vaccines. 2021;9:323. *https://doi.org/10.3390/vaccines9040323*

20. Lasemi E, Haddadpour N, Navi F, Rakhshan A, Rakhshan V. Rate of acquired immunity in dental students after hepatitis B vaccination. Dent Res J (Isfahan). 2011;8:128-31.

21. Acchammachary AA, Ubale M, Belurkar DD, Bhave PP, Malgaonkar AA, Kartikeyan S. A cross-sectional study of post-vaccination anti-HBs titer and knowledge of hepatitis B infection amongst medical students in a metropolitan city. Int J Research in Medical Sciences. 2017;5:83-8.
https://doi.org/10.18203/2320-6012.ijrms20164528

22. Sernia S, Ortis M, Antoniozzi T, Maffongelli E, La Torre G. Levels of anti-HBs antibody in HBV-vaccinated students enrolled in the faculty of medicine, dentistry and health professions of a large Italian University. BioMed research international. 2015; 2015. *https://doi.org/10.1155/2015/712020*

23. Noubiap JJN, Nansseu JRN, Kengne KK, Ndoula ST, Agyingi LA. Occupational exposure to blood, hepatitis B vaccine knowledge and uptake among medical students in Cameroon. BMC Med Educ. 2013;13:148.
https://doi.org/10.1186/1472-6920-13-148

24. Saquib S, Ibrahim W, Othman A, Assiri M, Al-Shari H, Al-Qarni A. Exploring the knowledge, attitude and practice regarding hepatitis B infection among dental students in Saudi Arabia: A cross-sectional study. Open access Macedonian J Medical Sci. 2019;7:805. *https://doi.org/10.3889/oamjms.2019.111*

25. Al-Dabbas M, Abu-Rmeileh NM: Needlestick injury among interns and medical students in the occupied Palestine territory. East Mediterr Health J. 2012;18:700-6.
https://doi.org/10.26719/2012.18.7.700

26. Kiyani A, Zafar M, Abbasi A, bin Saeed MH. Hepatitis B Vaccination Status of Students and Dentists in Dental Colleges of Pakistan. J Liaquat University of Medical & Health Sciences. 2020;19:62-5.

27. Malhotra V, Kaura S, Sharma H. Knowledge, attitude and practices about hepatitis B and infection control measures among dental students in Patiala. J Dent Allied Sci. 2017;6:65.
https://doi.org/10.4103/2277-4696.219977

28. Souza EP, Teixeira Mde S. Hepatitis B vaccination coverage and postvaccination serologic testing among medical students at a public university in Brazil. Rev Inst Med Trop Sao Paulo. 2014;56:307-11.
https://doi.org/10.1590/S0036-46652014000400007

29. Mangkara B, Xaydalasouk K, Chanthavilay P, Kounnavong S, Sayasone S, Muller CP,et al. Hepatitis B virus in lao dentists: a cross-sectional serological study. Annals of Hepatology. 2021;22:100282.
https://doi.org/10.1016/j.aohep.2020.10.010

30. Lingawi HS, Afifi IK. Seroprotection of Hepatitis B Vaccine in Dental Students Two Decades after Infant Immunization and the Possible Need for Revaccination. European J Dentistry. 2022.
https://doi.org/10.1055/s-0042-1743151

31. Lamberti M, Garzillo EM, Muoio MR, Arnese A, Nienhaus A, Abbondante E,et al. Seropositivity for Hepatitis B Virus, Vaccination Status and Response to Vaccine in a Cohort of Dental Students. Open J Preventive Medicine. 2017;7:32-9.
https://doi.org/10.4236/ojpm.2017.72003

32. Roupa Z, Noula M, Farazi E, Stylianides A, Papaneophytou C. Vaccination coverage and awareness of Hepatitis B virus among healthcare students at a university in Cyprus. Materia Socio-medica. 2019;31:190.
https://doi.org/10.5455/msm.2019.31.190-196

33. Yildirim TT, Kaya FA, Kaya CA. Assessment of Hepatitis B vaccination status of students of faculty of dentistry. Int Dent Research. 2017;7:46-53.
https://doi.org/10.5577/intdentres.2017.vol7.no3.1

34. Aparajita D Shitoot, Mukta Motwani, Durga P Chamele, Abhinay P Shitoot, Jay Chamele, Akash Ghosh. Hepatitis B awareness and attitudes among dental professionals in Central India. J Indian Acad Oral Med Radiol 2016;28:270-73
https://doi.org/10.4103/0972-1363.195650