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Determination of Hepatitis B Antibody Titration and Related Factors in Dental Students in Guilan University of Medical Sciences

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ABSTRACT

Background and aim: As Hepatitis B is a viral infectious disease that transmits through blood, the purpose of this study was to evaluate the antibody titration against hepatitis B and its related factors in dental students at Guilan University of Medical Sciences in 2017.

Materials and methods: This was a descriptive and cross-sectional study. Blood samples were taken from each student, and the anti-hepatitis B antibody titrated. Data analyzed by SPSS Ver22 software. First, the standard variables determined by the Kolmogorov-Smirnov test. For analysis of variables, the T-test, Chi-square, and Fisher's exact test used. In all experiments, $P < 0.05$ considered a significant level.

Results: The mean age of men and women was 23.71 ± 1.75 and 22.73 ± .086. The anti-hepatitis B antibody titration was more than 100 mIU/ml in 47 samples. In the 21 samples, the antibody titration was between 10-100 mIU/ml, and in 21 samples, the antibody titration was less than mIU/ml 10. There was a significant relationship between the titration of anti-hepatitis B antibody and the gender, the duration of receiving the vaccine, the number of doses of the vaccine, and also with needle stick received.

Conclusion: The study showed that, despite receiving the hepatitis B vaccine, but a relatively high percentage of students did not have an adequate level of immunity.

1. Introduction

In third-world countries and developing countries, infectious diseases are considered major health problems and the major part of health care and clinical research that only used for the diagnosis and treatment of these diseases. The community's level of health and the presence of infectious diseases are directly related to each other. To explain each country's health status, indicators used about the state of infectious diseases.[1-4] Hepatitis means inflammation in the liver parenchyma and can be caused by a variety of causes. The factors that cause hepatitis include excessive alcohol consumption, the effects of certain drugs, and bacterial and viral contamination.[5-9] Although six types of hepatitis have been identified from A to G, virtually all acute viral hepatitis arose from one of the viral A, B, C, D, and E viruses. Among the infections mentioned, hepatitis B virus infection is a significant health problem. More than 350 million chronic hepatitis carriers scattered throughout the world.[4, 10, 11] Hepatitis B virus (HBV) is a coating virus with a diameter of about 42 nm. The virus has an external coating that provides hepatitis B surface antigens (HBs Ag) and has an internal nucleocapsid that consists of a central body antigen (HBc Ag), an antigen (e) HBe Ag) and Polymer DNA.[12] Human hepatitis B virus has an incomplete double-stranded DNA genome. The two genome sequences are different in size, and the negative strand has a more significant length than the positive strand.[13] Viral and host factors, co-infection with viruses such as HCV, HIV, and HDV, and obesity and alcohol consumption, can affect the natural course of HBV infection and cause death[14] Hepatitis B virus is commonly found in the serum of patients with high titration. In some patients, upper 1010 particles per milliliter of the serum of the sick people have observed. Therefore, the most the essential transmission of infection is that exposure to infected people's blood and blood products is as follows[15]:

- Sexual contact
- Injecting drug users
- Transfer from HBs Ag positive mother to child at birth
- Blood transition
- Hospital infections (Hospital transmissions include: Transmission through blood dialysis devices, random communications, and transfer from nurses to patients.[16])

Dental staff is at high risk for developing a hepatitis B virus due to constant contact with blood and other biological fluids in the patient. Today, the best

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way, in addition to personal care, is to vaccinate against hepatitis B virus. Current statistics show that the prevalence of hepatitis estimated to be between 3% and 5% of the total population in recent years. The lack of widespread vaccination has caused the spread of the disease in dental staff to be 2 to 5 times that of the community.[17] A remarkable point in this regard is that a dental operator's presence can prevent the occurrence of many problems caused by blood-borne diseases. several Studies indicate that health sector personnel have suffered from many illnesses during the transmission of disease from patient to therapist, and in some cases, irreversible and even result in disability and death.[18, 20].

2. Materials and methods

This study conducted as a descriptive, cross-sectional study to evaluate the anti-hepatitis B virus against hepatitis B. these factors have related to students of dental school at Guilan University of Medical Sciences. After obtaining permission from the research committee, clinical dentistry students entered the study in the year 2017 with written consent. Initially, 120 students enrolled in the study, of which 14 did not fill out the questionnaire, and six excluded from the project due to exclusion criteria. A total of 100 students as a community statistical data were studied. The requirements for entry in this study are all clinical students at the Faculty of Dentistry at Guilan University. They are eligible to enter the research and expressed their consent to participate in this study.

Sample exclusion criteria from the study are as follows:

- Hepatic impairment
- Injection drug addiction
- having genetic problems
- Malignancy
- Infectious Diseases
- Dissatisfaction in the study

Of all samples in the study, 2 ml of blood gathered in sterile tubes without anticoagulants. The tubes centrifuged for 10 min at 5000 rpm, and then serum was separated. In this study, the diagnostic kit used. The reason for our selection was the high sensitivity and specificity of this kit. The basis of the test in this kit based on Antigen Sandwich Enzyme Immunoassay. Plate wells coated with recombinant antigens of HBs Ag. The steps to do the analysis are as follows:

1) 100 µl of each standard, the control serum, and the sample were poured into wells.

2) Cover the wells with a plate-specific label and then incubate for 60 minutes at 37 ° C.

3) Empty the contents of the wells and washed five times with a ready-to-wash solution.

4) Add 100 µl of conjugated enzyme solution to all wells.

5) After covering the wells with a particular label, they incubated for 30 minutes at 37 ° C.

6) Then empty the contents of the wells and rinse.

7) Add 100 µl of the substrate-dye solution to all wells and incubate for about 15 minutes at room temperature and dark space.

8) Add 100 µl of stopping solution to all wells to stop the enzyme reactions.

9) Using the ELISA reader, we read all the wells at 450 nm.

10) Light absorbance of the controls and samples with the help of the ELISA reader at 450 nm wavelengths. By drawing the low light absorption of the criteria and their known concentration, we plotted the graphic drawing with the light absorption of the standards on the vertical axis (Y) and their concentration on the horizontal axis (X) and the point of intersection of the concentration and absorption of light for each standard. We connect the obtained points to draw a standard boundary. We obtained the average light absorption for each sample and found it on the vertical axis. The point is connected linearly to the curve so that the line is perpendicular to the vertical axis. After the intersection of the front and the curve, the vertical line plotted on the horizontal axis. The point of intersection of this line with the horizontal axis is the concentration value. SPSS software version 22 and statistical methods used to analyze the data. In describing quantitative variables from the tables of central indices, distribution of frequency, mean, standard deviation, or mid-range and inter-quartile domain are used to describe qualitative variables of percentage and rate. First, the normalization of quantitative variables determined is by the Kolmogorov-Smirnov test. To analyze the variables, the T-test, Chi-Square, and Fisher's exact test used. In all experiments, $P < 0.05$ considered a significant level.

3. Results

Among 100 dental students of Guilan University of Medical Sciences, 48 were female, and 52 were male. In terms of demographic indicators, the mean and standard deviation of the subjects was 23.24 ± 1.47 years. The mean and standard deviation of males and females participating in this study was 23.71 ± 1.75 and 22.73 ± 0.86. Figure 1 and Table 1 show that the mean age of both sexes was significantly different between men and women (P = 0.002).

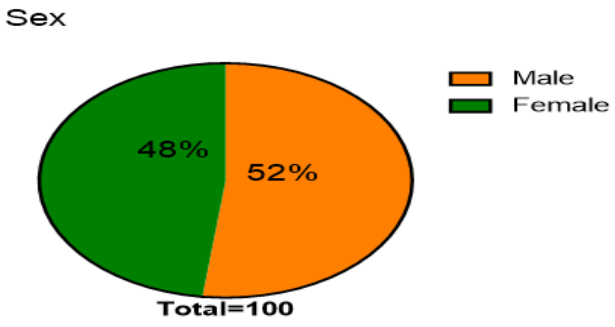

Figure 1. Frequency distribution chart of the samples studied by gender.

Table 1. Frequency distribution of the samples studied by gender.

			Age						Total	P-value
			22	23	25	26	27	29		
Gender	Male	Count	12	20	7	7	4	2	52	0.001
		% within sex	23.1%	38.5%	13.5%	13.5%	7.7%	3.8%	100%	
	Female	Count	26	9	13	0	0	0	48	
		% within sex	54.2%	18.8%	27.1%	0%	0%	0%	100%	
Total		Count	38	29	20	7	4	2	100	---
		% within sex	38%	29%	20%	7%	4%	2%	100%	

Of the individual who surveyed, 20 individuals who smoke, 18 were male, and two were female. The results of data analysis based on the Chi-square test showed that there was a significant difference between smoking in male and female groups (P = 0.001). Also, among the individuals studied in this study, only 6 had background conditions (asthma, heart disease, and epilepsy), of which four were female, and 2 were male. Based on the Chi-square test, there was no significant difference in the incidence of underlying disease in both genders (P = 0.226). Of the 100 individuals surveyed, 9 individuals, for different reasons, needed a complete blood transfusion, of which six were male, and three were female. The mean and standard deviation of BMI from 100 subjects was 22.68 ± 3.68. Mean BMI in males and females was 23.48 ± 4.29 and 21.81 ± 3.13, respectively. Independent T-test showed that there was no significant difference between BMI and gender (P = 0.097). Among the sampled dental students of the Guilan University of Medical Sciences, 32 individuals (32%) were 4^{th} years of education (semester 8), 27 individuals (27%) were 5^{th} years of schooling (semester 10) and 41 individuals (41%)) were 6^{th} years of education (semester 12). Based on statistical data analysis, there was no significant difference between gender and academic term of the studied students.

Table 2. Frequency distribution of studied samples based on the school year by gender.

			Semester			Total	P-value
			8*	10	12		
Gender	Male	Count	14	18	20	52	0.125
		% within sex	26.9%	34.6%	38.5%	100%	
	Female	Count	18	9	21	48	
		% within sex	37.5%	18.7%	43.8%	100%	
Total		Count	32	27	41	100	
		% within sex	32%	27%	41%	100%	

***** The term 8 is related to the 4th year of education, the 10th semester of the 5th year of education, and the 12th semester of the 6th year of study.

Out of 100 individuals, 53 (21 Males and 32 Females) had injected the hepatitis B vaccine in all three periods. Also, 33 (20 males and 13 females) injected two hepatitis B vaccine episodes, and 14 (11 males and 3 females) injected only one course of 3 hepatitis B vaccine courses. According to a survey conducted by the subjects on the immunization rate of vaccines to protect against hepatitis, it was found that 94% of the individuals did not consider the injection of a course of a hepatitis vaccine to protect their life span. Also, 99% of the individuals believe that the need for care for the hepatitis B virus is still essential if the vaccine injected.

Table 3. Frequency of samples in terms of the number of doses received by gender.

			Vaccine Time			Total	P-value
			3 time	2 time	1 time		
Gender	Male	Count	21	20	11	52	0.017
		% within sex	40.4%	38.5%	21.1%	100%	
	Female	Count	32	13	3	48	
		% within sex	66.7%	27.1%	6.2%	100%	
Total		Count	53	33	14	100	---
		% within sex	53%	33%	14%	100%	

Table 4. Frequency of samples in terms of receiving a reminder dose by gender.

			Booster		Total	P-value
			Yes	No		
Gender	Male	Count	4	48	52	0.033
		% within sex	7.7%	92.3%	100%	
	Female	Count	11	37	48	
		% within sex	22.9%	77.1%	100%	
Total		Count	15	85	100	---
		% within sex	15%	85%	100%	

Table 5. Frequency of samples in terms of time of receipt of the vaccine by gender.

			Vaccine Year				Total	P-value
			1 year	2 year	5 year	10 year		
Gender	Male	Count	5	3	23	21	52	0.246
		% within sex	9.6%	5.8%	44.2%	40.4%	100%	
	Female	Count	6	6	25	11	48%	
		% within sex	12.5%	12.5%	52.1%	22.9%	100%	
Total		Count	11	9	48	32	100	---
		% within sex	11%	9%	48%	32%	100%	

The results of the study of the participants in this study showed that needle sticks infected 53 individuals during their course. Of these, 17 (32.1%) once, 14 (26.4%) twice, 12 (22.6%) three times, 4 (7.5%) four times, and 6 (11.3%) had five scratches with sharpened hospital and needle stick. The results showed no relationship between gender and needle stick (P = 0.130).

Table 6. Frequency of samples in terms of the number of needle sticks by gender.

			Needlestick						Total	P-value
			0	1	2	3	4	5		
Gender	Male	Count	20	9	10	5	4	4	52	0.130
		% within sex	38.5%	17.3%	19.2%	9.6%	7.7%	7.7%	100%	
	Female	Count	27	8	4	7	0	2	48	
		% within sex	56.2%	16.7%	8.3%	14.6%	0%	4.2%	100%	
Total		Count	47	17	14	12	4	6	100	---
		% within sex	47%	17%	14%	12%	4%	6%	100%	

The results of data analysis based on the Chi-square test showed a significant relationship between the frequency of samples in antibody titration and gender (Table 7) (P = 0.01).

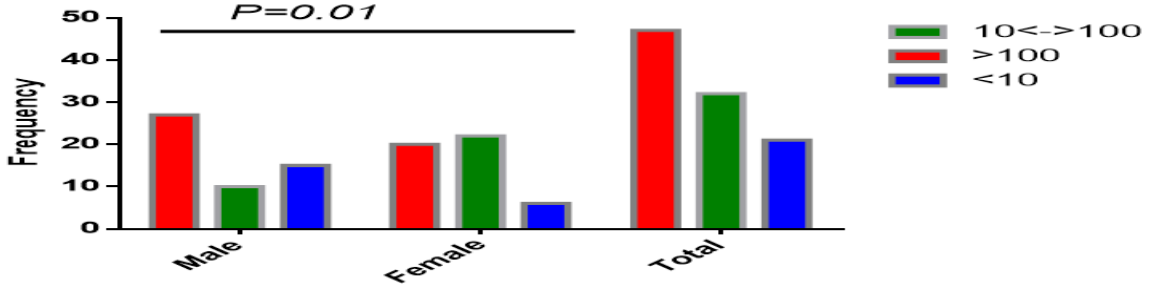

Figure 2. Frequency of antibiotic titration of anti-hepatitis B in samples analyzed by gender.

Table 7. Analysis of the relationship between the anti-hepatitis B titration in the samples studied with the gender.

			Ab Titer			Total	P-value
			>100	10<-<100	<10		
Gender	Male	Count	27	10	15	52	0.01
		% within sex	51.9%	19.2%	28.8%	100%	
	Female	Count	20	22	6	48	
		% within sex	41.7%	45.8%	12.5%	100%	
Total		Count	47	32	21	100	---
		% within sex	47%	32	21%	100%	

Table 8 shows that the highest age group with a titration of more than 100 mIU/ml was 29 years old (100% of the samples) and the lowest age group with a titration of more than 100 mIU/ml belonged to the age group 22 (28.9% of the sample. Also, 50% of the 27-year-old specimens had an antibody titration of less than 10 mIU/ml. The results showed that there was no significant relationship between antibody titration and age of participant samples. Table 8 describes in detail the antibody titration in different groups.

Table 8. Analysis of the relationship between the anti-hepatitis B titration in individuals with the age of participants.

			Ab Titer			Total	P-value
			>100	10<-<100	<10		
Age	22	Count	11	18	9	38	0.063
		% within Age	28.9%	47.4%	23.7%	100%	
	23	Count	16	5	8	29	
		% within Age	55.2%	17.2%	27.6%	100%	
	24	Count	11	7	2	20	
		% within Age	55%	35%	10%	100%	
	25	Count	5	2	0	7	
		% within Age	71.4%	28.6%	0%	100%	
	27	Count	2	0	2	4	
		% within Age	50%	0%	50%	100%	
	29	Count	2	0	0	2	
		% within Age	100%	0%	0%	100%	
Total		Count	47	32	21	100	---
		% within Age	47%	32%	21%	100%	

Also, the results of the samples' statistical analysis of antibody titration showed no significant relationship between smoking and anti-hepatitis B titration (P = 0.66).

Table 9. Analysis of the relationship between the anti-hepatitis B titers in patients with smoking.

			Ab Titer			Total	P-value
			>100	10<-<100	<10		
Smoking	Yes	Count	12	2	6	20	0.06
		% within Smoking	60%	10%	30%	100%	
	No	Count	35	30	15	80	
		% within Smoking	43.8%	37.5%	18.8%	100%	
Total		Count	47	32	21	100	---
		% within Smoking	47%	32%	21%	100%	

Also, the results of the samples' statistical analysis with antibody titration showed no significant relationship between BMI and anti-hepatitis B titration (P = 108). Table 10 shows the details.

Table 10. Analysis of the relationship between the anti-hepatitis B titers in patients with their BMI.

Ab Titer (mIU/ml)	N	Mean	Std. Deviation	95% Confidence Interval for Mean		Minimum	Maximum	P-value
				Lower Bound	Upper Bound			
>100	47	23.3404	3.39614	22.3433	24.3376	17	32	0.108
10<-<100	32	21.5000	3.30200	20.3095	22.6905	17	33	
<10	21	23	5.31037	20.5827	25.4173	18	37	
Total	100	22.6800	3.89218	21.9077	23.4523	17	37	---

Statistical analysis of Fisher's exact test showed a significant relationship between the anti-hepatitis B titration and the number of doses received from the hepatitis B vaccine (P = 0.006) that their details shown in table 11.

Table 11. Analysis of the relationship between the anti-hepatitis B titration and the number of doses received by the vaccine.

			Vaccine Time			Total	P-value
			3 time	2 time	1 time		
Ab Titer (mIU/ml)	>100	Count	29	16	2	47	0.006
		% within Ab Titer	61.7%	34.4%	4.25%	100%	
	10<-<100	Count	17	11	4	32	
		% within Ab Titer	53.1%	34.4%	12.5%	100%	
	<10	Count	7	6	8	21	
		% within Ab Titer	33.33%	28.57%	38.09%	100%	
Total		Count	53	33	14	100	---
		% within Ab Titer	53%	33%	14%	100%	

There was no significant correlation between the amount of anti-hepatitis B titration (P = 0.721) in the individuals receiving a reciprocal dose of the vaccine (Table 12). There was no statistically significant relationship between anti-hepatitis B titration in individuals with complete blood transfusion (P = 0.987) (Table 13).

Table 12. Analysis of the relationship between the anti-hepatitis B titration and the reminder dose.

			Ab Titer			Total	P-value
			>100	10<-<100	<10		
Booster	Yes	Count	8	5	2	15	P=0.721
		% within Booster	53.3%	33.3%	13.3%	100%	
	No	Count	39	27	19	85	
		% within Booster	45.9%	31.8%	22.4%	100%	

Table 13. Analysis of the relationship between the anti-hepatitis B titration in subjects with complete blood transfusion.

			Ab Titer			Total	P-value
			>100	10<-<100	<10		
Blood transfusion	Yes	Count	4	3	2	9	P=0.987
		% within the blood transfusion	44.4%	33.3%	22.2%	100%	
	No	Count	43	29	19	91	
		% within the blood transfusion	47.3%	31.9%	20.9%	100%	

According to the result of Table 14, in the analysis of the relationship between the anti-hepatitis B titration in the individuals with a needle stick, it was found that 50% of the individuals who had 4 or 5 times with the needle stick had a titration of less than ten mIU/ml. Also, only 4.2% and 2.12% of the samples, which were 4 or 5 times with needle stick respectively, had antibody titration of more than 100 mIU/ml. Also, 25% of the samples, which were three times needle stick, had a titer of less than 10 mIU/ml. The chi-square test's statistical analysis indicated a significant relationship between anti-hepatitis B titration and needle stick in the samples (P = 0.046).

Table 14. Analysis of the relationship between the anti-hepatitis B titration in individuals with the number of the needle stick.

			Needlestick						Total	P-value
			0	1	2	3	4	5		
Ab Titer (mIU/ml)	>100	Count	22	6	10	6	2	1	47	0.046
		%within Ab Titer	46.8%	12.8%	21.3%	12.8%	4.2%	2.12%	100%	
	10<-<100	Count	20	4	3	3	0	2	32	
		% within Ab Titer	62.5%	12.5%	9.4%	9.4%	0%	6.2%	100%	
	<10	Count	5	7	1	3	2	3	21	
		% within Ab Titer	23.8%	33.3%	4.8%	14.3%	9.5%	14.2%	100%	
Total		Count	47	17	14	12	4	6	100	---
		% within Ab Titer	47%	17%	14%	12%	4%	6%	100%	

4. Discussion

In this study and other studies over the past few years, it has always tried to find risk factors created in the work environment and appropriate solutions to reduce these risks. Identifying and monitoring high-risk occupations and identifying people with a low level of immunity can be very important in preventing infection and early treatment of the disease.[23, 24] The results of the samples' titration studies showed that anti-hepatitis B titration in 47 individuals was more than 100 mIU/ml; in 32 individuals, antibody titration ranged between 10-100 mIU/ml and 21 individuals with anti-hepatitis B titration were less than 10 mIU/ml. Non-Protection Antibody (mIU/ml Anti HBs <10) in Habibian, Heravi, Zad Fattah and Izad Panah, studies were 13.7%, 17.2%, 6.6%, and 11.6% respectively.[20, 21, 25, 26] In a study by Sharifi and et al. on dentists in Qazvin, 10.8% of the samples had antibody titration less than 10 m lU/ml.[4] These findings indicate that high levels of study samples, both in this study and similar studies, do not have acceptable safety. According to the study participants, 15 received a reminder dose, of which four were male, and 11 were female. The results show that sensitivity and follow-up of women about dose injections are more reminiscent than men. These results were consistent with Heravi[20] and Jabbayan[25] and showed that women tended to be more sensitive than men about follow-up dosing. Also, the results showed that among the sampled samples, 53 samples during their education were with a needle stick, which had no relation in terms of needle stick with the gender of individuals. The study of Asgharian and Sharifi stated that the rate of men's needle stick was higher than that of women. Their study noted that the reason for this difference could be the inability of the male gender to perform practical and therapeutic activities.[4, 19] The results of this study showed no significant relationship between age, BMI, and anti-hepatitis B anti-hepatitis B titration. These findings were similar to the results of the study of Izad Panah, Asgharnian, and Sharifi.[4, 19, 21]

Also, the results of this study showed that there is no significant relationship between smoking and anti-hepatitis B titration. However, unlike the results of our research of Habibian and et al., non-smokers compared with smokers and women had higher antibody compared to men.[25] The results of data analysis showed that there is a significant relationship between the frequency of samples in antibody titration and the gender of individuals. These results coincided with the studies of Izad Panah and et al. and Zad Fattah and et al.[21, 26] Also, the results of this study showed that there is a significant relationship between anti-hepatitis B titration with the time of vaccination, in analyzing the relationship between anti-hepatitis B titration in the individuals studied and the timing of the vaccine. In the study of Heravi and Zad Fattah, there was no significant relationship between age, gender, and serum anti-HBs level.[20, 26] Results showed that there is a substantial relationship between anti-hepatitis B titration with needle stick in samples. However, there was no significant relationship between the rate of anti-hepatitis B titration and the dose received from the vaccine and blood transfusion. In the study of Moezi et al., there was a significant relationship between the time of last vaccination and active titration, but in other factors, this relationship was not meaningful. In a study by Bagheri et al., anti-hepatitis B in dental students in Guilan in 2010, the antibody titration against hepatitis B had a right level in dental students of Guilan University of Medical Sciences. However, after six years in the same community, the results of our study showed that 47% had a protective antibody, 32% of the samples, in the low-protection group. In 21 of the cases, the anti-hepatitis B titration was less than 10 mIU/ml. This reduction in hepatitis B protection is highly considered and should have followed.[22] The study results and the comparison with the present study indicate that due to the expansion of global health and the improvement of community health, there are still dangers of this disease, which is considered a severe problem.

5. Conclusion

This study showed that, even though all dental students participating in this study received the hepatitis B vaccine, but a relatively high percentage of them had no enough immune status for this disease. Therefore, it suggested taking appropriate measures to ensure safety in this group.

Conflict of Interest

The authors declared that there is no conflict of interest.

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