



# Comparison of the Practical and Theoretical Knowledge of the Hepatitis B Virus among Dental Hygiene Students

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**Background:** Hepatitis B is an important public health problem as one of the leading causes of morbidity and mortality. The aim of this study was to compare the theoretical and practical knowledge levels of dental assistant students about Hepatitis B Virus.

**Methods:** The 1st and 2nd grade students of the Oral and Dental Health program were invited to participate in the survey. Out of the 68 invited students, 61 completed the questionnaire. The average ages of the male and female students surveyed were 20.27±1.45 and 19.56±1.16, respectively. A total of 34 questions were asked, of which 15 measured basic theoretical knowledge and 19 assessed basic practical knowledge.

**Results:** There was no statistically significant difference between the students' knowledge for each question according to their sex and grade. When the questionnaire was grouped into basic theoretical and basic practical knowledge levels, both were observed to be high. While the lowest correct answer rate was 35.00% for the questions about practical applications, it was 31.14% for the questions measuring the level of theoretical knowledge. There was no statistically significant difference when the levels of knowledge of 1st and 2nd grade students were compared. Students answered the majority of the questions correctly, and ranged between 71% and 100%.

**Conclusion:** Students' high level of basic theoretical knowledge can be a result of their in-class education on the fundamentals. However, their knowledge about the correct approaches in practical applications indicates the beneficial role of having well-defined criteria and prevention protocols that are required in hospitals and the effectiveness of their environmental orientations.

**Key Words:** Dental hygienists, Hepatitis B virus, Infections

## Introduction

Oral and dental health technicians are dentists in dental clinics and health workers in clinical settings. Clinical workers, such as healthcare workers and interns, are exposed to many infectious contaminations. Dental clinic workers are at risk for infections such as blood-borne hepatitis B virus (HBV), human immunodeficiency virus (HIV), and human papilloma virus (HPV). HBV is a small, double-stranded DNA virus from the Hepadnaviridae family. It can be transmitted mainly through blood, sexual intercourse, and from mother to child during birth. The use

of uncontrolled blood or blood products, medical, or dental interventions with non-sterilized devices, sharing of used injectors and items such as razor blades and toothbrushes, tattooing with non-sterilized tools, and application of body jewelry are also known ways of transmission<sup>1,2</sup>.

Prevention is the most important step in the avoidance of viral hepatitis transmission. Some healthcare workers who work closely with patients may not consider themselves at contamination risk because of the low signs and symptoms in HBV infected cases; this makes awareness about these studies more important. Regular

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and widespread use of infection control measures has significantly reduced the transmission of viral hepatitis among healthcare workers. Progress in the proper storage and disposal of waste is also a promising factor. Furthermore, raising awareness of health personnel on safe invasive procedures and healthcare-related viral hepatitis are the main steps of preventing viral hepatitis transmission. Dental clinic service providers may play an important role in the prevention of HBV; therefore, they should be more familiar with both practical and theoretical knowledge of HBV to prevent contamination in various ways. No comparison has been made between the theoretical knowledge and practical application levels of dentists and dental hygienists in the literature so far. Therefore, the aim of this study was to compare and evaluate the theoretical and practical knowledge levels of dental assistant students about HBV.

## Materials and Methods

The aim of this study was to measure the knowledge level of the students of Oral Dental Health program on HBV. The Oral and Dental Health Program at the School of Health Services in Ankara Yildirim Beyazit University is a 2-year education program, and the survey was conducted on the 1st and 2nd year students in 2019. Before the questionnaire was distributed, the students were given detailed information about the nature and content of the study, and a written consent was obtained from all participants.

The study group of 61 students consisted of 38 (1st grade) and 23 (2nd grade) Oral and Dental Health students. There were 39 (63.93%) female and 22 (36.07%) male participants in the survey. The distribution of students in terms of sex and grade is given in Table 1. The average ages of male and female students surveyed were  $20.27 \pm 1.45$  and  $19.56 \pm 1.16$ , respectively. A questionnaire consisting of 38 questions was applied to evaluate the level of student knowledge about HBV. Questionnaires were written in comprehensible language and were modeled from previous surveys<sup>3)</sup>.

The questionnaire consisted of the following:

1) 4 personal questions about age, grade, sex, and

presence of health personnel in the family

2) 15 theoretical questions about the characteristics of HBV

3) 19 questions examining the practical approach levels of health personnel to HBV

### 1. Statistical analysis

Data were analyzed with IBM SPSS Statistics ver. 23.0 (IBM Corp., Armonk, NY, USA) statistical package. The qualitative data were summarized as frequencies and percentages. Parametric test assumptions for age were tested. The chi-square test was used to assess the sex differences between classes, the correct response rates of each question between classes or sexes, and the difference in levels for the basic theoretical knowledge and practical application knowledge. In some groups, due to the small number of samples, Fisher's exact test was used to make proper assessments. The age values in respect of sex groups were tested by using the Students' t-test. Statistical significance level was set at  $p \leq 0.05$ .

## Results

Ankara Yildirim Beyazit University School of Health Services Oral and Dental Health Program 1st and 2nd year students were invited to participate in the survey. Independent sample t-test shows a significant difference between the sexes in terms of average age ( $p=0.139$ ,  $t=0.042$ ). Statistically significant difference was found when sex distribution was compared between classes ( $\chi^2=0.007$ ;  $p=1.068$ ). The participants consisted of 62.30% ( $n=38$ ) first grade students and 37.70% ( $n=23$ ) second grade students. There was no significant difference between the sexes in terms of answering the questions in the questionnaire. Similarly, when the knowledge levels of 1st and 2nd grade students were compared in Fisher's exact test of independence, there was no statistically significant difference between them ( $p > 0.999$ ). Normality

**Table 1.** The Distribution of the Students by Sex and Grade

Distribution of the students	Male	Female
1st grade	12	26
2nd grade	10	13

**Table 2.** Questionnaire with Correct Answer Rates and Statistical Analysis Values for Assessing the Basic Theoretical Knowledge about Hepatitis Virus

Questionnaire for assessing the basic theoretical knowledge about hepatitis	1st grade correct answer rate	1st grade incorrect answer rate	2nd grade correct answer rate	2nd grade incorrect answer rate	Male correct	Male incorrect	Female correct	Female incorrect	Total correct	Total incorrect	Questions without answer	Statistics values for grade compare ( $\chi^2$ , p)	Statistics values for sex compare ( $\chi^2$ , p)
1) Infection is a local or general localization or germ spread that causes disease in the organism.	37 (60.65)	1 (1.64)	23 (37.70)	0	21 (34.42)	1 (1.64)	39 (63.93)	0	60 (98.36)	1 (1.64)	0	>0.999 <sup>a</sup>	0.361 <sup>a</sup>
2) Hepatitis B is common in our country (Turkey).	34 (56.66)	4 (6.66)	20 (33.33)	2 (3.33)	17 (28.33)	5 (8.33)	37 (61.66)	1 (1.66)	54 (90.00)	6 (10.00)	1 (1.64)	>0.999 <sup>a</sup>	0.21 <sup>a</sup>
3) The AIDS factor is HIV.	37 (60.65)	1 (1.64)	23 (37.70)	0	22 (36.06)	0	38 (62.29)	1 (1.64)	60 (98.36)	1 (1.64)	0	>0.999 <sup>a</sup>	>0.999 <sup>a</sup>
4) Blood, sexual contact, body fluids and secretions are the most important means of transmission of HBV and HIV.	38 (62.29)	0	23 (37.70)	0	22 (36.06)	0	39 (63.93)	0	61 (100)	0	0	-	-
5) HBV incubation time is approximately 50 ~ 80 days.	21 (38.18)	11 (20.00)	19 (34.54)	4 (7.27)	16 (29.09)	4 (7.27)	24 (43.63)	11 (20.00)	40 (72.72)	15 (27.27)	6 (9.83)	0.163 <sup>b</sup>	0.360 <sup>b</sup>
6) HBV is an RNA virus (HBV, a member of the Hepadnaviridae family, a small DNA virus with unusual features).	19 (32.75)	16 (27.58)	20 (34.48)	3 (5.17)	17 (29.31)	3 (5.17)	22 (37.93)	16 (27.58)	39 (67.24)	19 (32.75)	3 (4.91)	0.010 <sup>b</sup>	0.037 <sup>b</sup>
7) There is no difference between a patient with hepatitis B and an infected person with hepatitis B.	12 (19.67)	26 (42.62)	8 (13.11)	15 (24.59)	4 (6.55)	18 (29.50)	16 (26.22)	23 (37.70)	20 (32.78)	41 (67.21)	0	0.796 <sup>b</sup>	0.068 <sup>b</sup>

Table 2. Continued

Questionnaire for assessing the basic theoretical knowledge about hepatitis	1st grade correct answer rate	1st grade incorrect answer rate	2nd grade correct answer rate	2nd grade incorrect answer rate	Male correct	Male incorrect	Female correct	Female incorrect	Total correct	Total incorrect	Questions without answer	Statistics values for grade compare ( $\chi$ , p)	Statistics values for sex compare ( $\chi^2$ , p)
8) HBV is less contagious compared to HIV.	11 (18.03)	27 (44.26)	8 (13.11)	15 (24.59)	5 (8.19)	17 (27.86)	14 (22.95)	25 (40.98)	19 (31.14)	42 (68.86)	0	0.633 <sup>b</sup>	0.286 <sup>b</sup>
9) Hepatitis B vaccine is an active and live vaccine.	30 (51.72)	6 (10.34)	18 (31.03)	4 (6.89)	19 (32.75)	2 (3.44)	29 (50.00)	8 (13.79)	48 (82.75)	10 (17.24)	3 (4.91)	>0.999 <sup>a</sup>	0.301 <sup>b</sup>
10) Positive anti-HBsAg and negative HBsAg indicate that the person is immune.	26 (48.14)	6 (11.11)	22 (40.74)	0	17 (31.48)	3 (5.55)	31 (57.40)	3 (5.55)	48 (88.88)	6 (11.11)	7 (11.47)	0.710 <sup>a</sup>	0.659 <sup>a</sup>
11) Serological tests should be conducted after vaccination for immune control.	36 (62.06)	0	21 (36.20)	1 (1.72)	20 (34.48)	1 (1.72)	37 (54.41)	0	57 (98.27)	1 (1.72)	3 (4.91)	0.379 <sup>a</sup>	0.362 <sup>a</sup>
12) Do you think you have in adequate knowledge about viral hepatitis?	25 (41.66)	12 (20.00)	14 (23.33)	9 (15.00)	15 (25.00)	7 (11.66)	24 (40.00)	14 (23.33)	39 (65.00)	21 (35.00)	1 (1.63)	0.597 <sup>b</sup>	0.694 <sup>b</sup>
13) Do you think symptoms of viral hepatitis appear immediately after infection?	15 (26.31)	19 (33.33)	9 (15.78)	14 (24.56)	11 (19.29)	10 (17.54)	13 (22.80)	23 (40.35)	24 (42.10)	33 (57.89)	4 (6.55)	0.708 <sup>b</sup>	0.230 <sup>b</sup>
14) Patients' liver can be affected from viral hepatitis.	27 (48.21)	7 (12.50)	19 (33.92)	3 (5.35)	18 (32.14)	3 (5.35)	28 (50.00)	7 (12.50)	46 (82.14)	10 (17.85)	5 (8.19)	0.724 <sup>a</sup>	0.727 <sup>a</sup>
15) Viral Hepatitis has several types.	31 (53.44)	4 (6.89)	21 (36.20)	2 (3.44)	18 (31.03)	3 (5.17)	34 (58.62)	3 (5.17)	52 (89.65)	6 (10.34)	3 (4.91)	>0.999 <sup>a</sup>	0.657 <sup>a</sup>

Values are presented as number (%).

HBV: hepatitis B virus, HIV: human immunodeficiency virus, HBsAg: hepatitis B virus surface antigen, -: not available.

<sup>a</sup>Fisher's exact test result value, <sup>b</sup>Pearson's chi-square test result value.

was checked using the Shapiro–Wilk test (male,  $p=0.194$ ; female,  $p=0.001$ ) and Kolmogorov–Smirnov test (male,  $p=0.200$ ; female,  $p<0.001$ ). The tests show that only the male participants' distribution was normal.

The distribution of the questions and answers which are prepared in two different groups to measure the basic theoretical knowledge about hepatitis and the basic hepatitis preventive application knowledge are given in [Tables 2 and 3](#) respectively. Given the overall performance of the students, the correct answer rates of majority of them (53 out of 61) ranged between 71% and 100%. When the questions were grouped as theoretical and basic practical approach knowledge questions, correct answer rates for both were observed to be high. The question with the lowest rate of correct response was the question of “*HBV is less contagious compared to HIV,*” with a correct answer rate of 31.14%. Even though majority of the participants thought that hepatitis B vaccine was an active live vaccine (82.75%), this information did not affect their vaccination rate (68.85%). While 98.36% of the students had accurate information about the transmission of viral hepatitis by blood, only less than half of the respondents (35.00%) correctly answered the question about the transmission of hepatitis virus by saliva.

Although 68.85% of the respondents stated that they had hepatitis B vaccine, most of the students (86.88%) believed that the vaccine would protect them. When the distribution of vaccination was examined by grades, the rate of vaccination was higher in the second grade than in the first grade. Among them, 55.26% of the first-grade students and 91.30% of the second-grade students had hepatitis b vaccine ( $\chi^2=8.678$ ;  $p=0.003$ ).

## Discussion

HBV infections are important public health problems, and health personnel are more likely to encounter these viruses than the normal population<sup>4</sup>. In hospitals, especially hematology-oncology and hemodialysis units, emergency departments, blood centers, operating theaters, and dental clinics, the risk of infection related to the transmission of these viruses is particularly high. Many studies have tried to identify the risk of infection for dental

personnel<sup>5,6</sup>; it is suggested that dental personnel are at greater risk of various viral or bacterial contamination due to physical injuries. Numerous findings support the transmission of hepatitis B from patients to dentists and less frequently from dentists to patients<sup>7-11</sup>. Therefore, health personnel working in the field of dentistry are among the higher risk groups. In invasive procedures, the probability of percutaneous accident is around 5% to 10%<sup>12</sup>. The most common percutaneous injury is one due to needle sticks. This way, the probability of HCV transmission is 4% to 10% and the probability of HBV transmission is 10% to 30%<sup>13</sup>. To tackle this problem, first, the deficiencies in basic education level should be identified and rectified. All personnel should be trained on universal measures to prevent blood-borne infections before they are hired. In addition, all personnel should be investigated for immunity to HBV before starting to work and those who are not immunized should be vaccinated.

When the results of the study were evaluated, the questions that the participants can answer correctly only at rates below 40% were [Table 2](#) questions 7, 8 and [Table 3](#) question 3. Regarding these questions, 42.10% of the students in [Table 2](#) question 13 have misinformation about the immediate appearance of hepatitis B symptoms. Considering that they do not show signs of possible post-infection diseases, their misinformation about this may cause them not to take the necessary measures. In addition, it is important to increase the knowledge about the measures to be taken in the first 24 hours since the lack of information will have a negative effect on taking necessary precautions after the transmission. After a person has been exposed to HBV, appropriate prophylaxis, given as soon as possible, but preferably within 24 hours, can effectively prevent infection. The mainstay of postexposure immunoprophylaxis is hepatitis B vaccine, but in certain circumstances, the addition of Hepatitis B immune globulin will provide increased protection<sup>14,15</sup>.

It was found that dentists do not have enough knowledge about prophylaxis after contact against HBV infection<sup>16</sup>. In a study conducted in Turkey comparing the level of knowledge of viral hepatitis among surgeons and dentists, surgeons were reported to have more information on the subject<sup>16</sup>. It is thought that increasing the level of

**Table 3.** Questionnaire with Correct Answer Rates and Statistical Analysis Values for Assessing the Basic Hepatitis Preventive Application Knowledge about Hepatitis Virus

Questionnaire for assessing the basic hepatitis preventive application knowledge	1st grade correct answer rate	1st grade incorrect answer rate	2nd grade correct answer rate	2nd grade incorrect answer rate	Male correct	Male incorrect	Female correct	Female incorrect	Total correct	Total incorrect	Questions without answer	Statistics for grade compare ( $\chi^2, p$ )	Statistics for sex compare ( $\chi^2, p$ )
1) Hepatitis B and HIV/AIDS infection control methods include disinfection, sterilization, use of masks, gloves, glasses, disposable medical clothing.	37 (60.65)	1 (1.63)	22 (36.06)	1 (1.63)	21 (34.42)	1 (1.63)	38 (62.29)	1 (1.63)	59 (96.72)	2 (3.27)	0	>0.999 <sup>a</sup>	>0.999 <sup>a</sup>
2) Dentists have a role in the spread of Hepatitis B.	35 (57.37)	3 (4.91)	22 (36.06)	1 (1.63)	20 (32.78)	2 (3.27)	37 (60.65)	2 (3.27)	57 (93.44)	4 (6.55)	0	>0.999 <sup>a</sup>	0.615 <sup>a</sup>
3) HBV is not transmitted by saliva.	10 (16.66)	27 (45.00)	11 (18.33)	12 (20.00)	9 (15.00)	13 (21.66)	12 (20.00)	26 (43.33)	21 (35.00)	39 (65.00)	1 (1.63)	0.101 <sup>b</sup>	0.465 <sup>b</sup>
4) Do you know the hepatitis B vaccination program?	28 (46.66)	9 (15.00)	16 (26.66)	7 (11.66)	18 (30.00)	4 (6.66)	26 (43.33)	12 (20.00)	44 (73.33)	16 (26.66)	1 (1.63)	0.603 <sup>b</sup>	0.258 <sup>b</sup>
5) Health personnel should be trained on hepatitis and infectious diseases.	38 (62.29)	0	23 (37.70)	0	22 (36/06)	0	39 (63.93)	0	61 (100)	0	0	-	-
6) The patient contaminated with HBV should be taken as the last patient.	23 (38.98)	13 (22.03)	22 (37.28)	1 (1.69)	18 (30.50)	4 (6.77)	27 (45.76)	10 (16.94)	45 (76.27)	14 (23.72)	2 (3.27)	0.005 <sup>b</sup>	0.440 <sup>b</sup>
7) After the patient treatment procedure, body fluids and blood contact materials should be mixed with medical waste.	24 (40.67)	12 (20.33)	14 (23.72)	9 (15.25)	12 (20.33)	10 (16.94)	26 (44.06)	11 (18.64)	38 (64.40)	21 (35.59)	2 (3.27)	0.650 <sup>b</sup>	0.223 <sup>b</sup>

Table 3. Continued 1

Questionnaire for assessing the basic hepatitis preventive application knowledge	1st grade		2nd grade		2nd grade		Total correct	Total incorrect	Questions without answer	Statistics value for grade compare ( $\chi^2, p$ )	Statistics value for sex compare ( $\chi^2, p$ )
	correct answer rate	incorrect answer rate	correct answer rate	incorrect answer rate	Male correct	Male incorrect					
8) Dental instruments used for patients should be disinfected and sterilized.	38 (62.29)	0	23 (37.70)	0	22 (36.06)	0	39 (63.93)	0	61 (100)	0	-
9) Instruments should be washed immediately after treatment and before autoclaving.	35 (57.37)	3 (4.91)	23 (37.70)	0	20 (32.78)	2 (3.27)	38 (62.29)	1 (1.63)	58 (95.08)	3 (4.91)	0.284 <sup>a</sup>
10) Each patient should be assumed to be at risk for an infectious disease; therefore, it must comply with standard infection control measures.	37 (60.65)	1 (1.63)	23 (37.70)	0	21 (34.42)	1 (1.63)	39 (63.93)	0	60 (98.36)	1 (1.63)	>0.999 <sup>a</sup>
11) All medical personnel working with blood and body fluids should be vaccinated in case of a contact.	38 (62.29)	0	22 (36.06)	1 (1.63)	21 (34.42)	1 (1.63)	39 (63.93)	0	60 (98.36)	1 (1.63)	0.361 <sup>a</sup>
12) Systemic status information of patients with hepatitis should be recorded in the patient file.	34 (55.63)	4 (6.55)	23 (37.70)	0	19 (31.14)	3 (4.91)	38 (62.29)	1 (1.63)	57 (93.44)	4 (6.55)	0.287 <sup>a</sup>
13) Viral hepatitis viruses can be transmitted through contaminated blood.	15 (26.31)	19 (33.33)	9 (15.78)	14 (24.56)	19 (33.33)	2 (3.50)	36 (63.15)	0	55 (96.50)	2 (3.50)	0.518 <sup>a</sup>
14) Do you think that all patients should be treated as if they have viral hepatitis viruses?	36 (60.00)	1 (1.66)	23 (38.33)	0	20 (33.33)	1 (1.66)	39 (65.00)	0	59 (98.33)	1 (1.66)	>0.999 <sup>a</sup>

Table 3. Continued 2

Questionnaire for assessing the basic hepatitis preventive application knowledge	1st grade		2nd grade		2nd grade		2nd grade		Total correct	Total incorrect	Questions without answer	Statistics value for grade compare ( $\chi^2$ , p)	Statistics value for sex compare ( $\chi^2$ , p)
	correct answer rate	incorrect answer rate	correct answer rate	incorrect answer rate	Male correct	Male incorrect	Female correct	Female incorrect					
15) Can viral hepatitis viruses pass from an infected mother to her baby during pregnancy?	32 (55.17)	3 (5.17)	22 (37.93)	1 (1.72)	18 (31.03)	3 (5.17)	36 (62.06)	1 (1.72)	54 (93.10)	4 (6.89)	3 (4.91)	>0.999 <sup>a</sup>	0.130 <sup>a</sup>
16) Have you been vaccinated against hepatitis B?	21 (34.42)	17 (27.86)	21 (34.42)	2 (3.27)	16 (26.22)	6 (9.83)	26 (42.62)	13 (21.31)	42 (68.85)	19 (31.14)	0	0.003 <sup>a</sup>	0.624 <sup>b</sup>
17) Do you think that hepatitis B vaccine will protect you after exposure?	33 (54.09)	5 (8.19)	20 (32.78)	3 (4.91)	20 (32.78)	2 (3.27)	33 (54.09)	6 (9.83)	53 (86.88)	8 (13.11)	0	>0.999 <sup>a</sup>	0.699 <sup>b</sup>
18) I think that the hepatitis B vaccine is very effective in preventing hepatitis B infection if given within 24 hours of exposure.	19 (31.66)	18 (30.00)	15 (25)	8 (13.33)	13 (21.66)	8 (13.33)	21 (35.00)	18 (30.00)	34 (56.66)	26 (43.33)	1 (1.63)	0.292 <sup>b</sup>	0.548 <sup>b</sup>
19) Which of the following measures can be taken to prevent the transmission of hepatitis B infection in dentistry? Wear a pair of gloves Appropriate instrument sterilization.	36 (59.01)	2 (3.27)	22 (36.06)	1 (1.63)	21 (34.42)	1 (1.63)	37 (60.65)	2 (3.27)	58 (95.08)	3 (4.91)	0	>0.999 <sup>a</sup>	>0.999 <sup>a</sup>

Values are presented as number (%).

HIV: human immunodeficiency virus, HBV: hepatitis B virus, -: not available.

<sup>a</sup>Fisher's exact test result value, <sup>b</sup>Pearson's chi-square test result value.



education may increase the accuracy of HBV-related approaches for anyone at risk of contamination in this area. HBV is transmitted through activities that involve percutaneous (puncture through the skin) or mucosal contact with infectious blood or body fluids (e.g., semen, saliva)<sup>17</sup>. Although 100.00% of the students had accurate information about the transmission of viral hepatitis by blood, minimal correct response rate question of the basic hepatitis preventive application knowledge questionnaire was (35.00%) the transmission of hepatitis virus by saliva. While blood contamination is seen as a more established information, reinforcing the knowledge about saliva as an infectious agent is important in eliminating the insufficiency in this subject. After comparing the level of knowledge of 1st and 2nd grade students, there was no statistically significant difference between the classes and majority of the students answered the questions correctly. We think that the reason for this was the 1st grade students took the survey at the end of the year after completing most of the basic theoretical courses.

It is important to establish basic protocols in hospital settings or dental clinics of smaller sizes to prevent contamination during routine clinical procedures or to be able to intervene correctly in emergencies. One of the limitations of this study was that we had to rely on the students' self-assessment as we could not assess the implementation of the practical knowledge of the participants. Therefore, responses may not accurately reflect actual levels of knowledge, attitudes, and behaviors; and therefore, the reported level of practice may be lower than the actual level. Even if the correct answer rates were high, we think that education level and awareness should be increased in specific subjects such as infection control procedures and HBV-specific transmission routes and symptoms.

## Notes

### Conflict of interest

No potential conflict of interest relevant to this article was reported.

### Ethical approval

The study was approved by Ankara Yildirim Beyazit University Ethics Committee (No: 2019-228).

### Author contributions

Conceptualization: Sinan Yasin Ertem. Data acquisition: Sinan Yasin Ertem, Sertac Ozdogan. Formal analysis: Sinan Yasin Ertem, Ayla Ozturk. Funding: Sinan Yasin Ertem, Ozge Akcam. Supervision: Sinan Yasin Ertem. Writing-original draft: Sinan Yasin Ertem. Writing-review & editing: Sinan Yasin Ertem.

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