

RESEARCH

Investigation Of Student Injuries And Post-Injury Behaviors In The First Two Years Of Preclinical Dental Education

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ABSTRACT

Investigation of Student Injuries and Post-Injury Behaviors in the First Two Years of Preclinical Dental Education

Background: The attitudes and behaviors of students after their injuries in preclinical education in the faculties of dentistry are very important in terms of blood-borne diseases and infection risks. For this reason, this study aimed to determine the injuries experienced by dentistry students in preclinical courses in detail and to determine their post-injury behaviors.

Methods: The study was conducted on students who completed their first and second education years. The surveys we prepared were conducted anonymously by sending to the volunteer participants via "Google Forms". In the surveys, we questioned the types of injuries they experienced in the courses; the materials that caused the injury; the number of injuries; the time period of the course and in which preclinical training course the injuries occurred; and their behaviors after injury and their reasons. In the study, information (n) and (%) were given as descriptive statistics of the data. In the analysis of the relationship between two categorical variables, Pearson Chi-Square analysis was applied when the sample size assumption was met, and Fisher's Exact test was applied when the sample size assumption was not met. Analyzes were carried out in IBM SPSS 25 program.

Results: 66% of the students (n=87) stated that they were injured at least once in pre-clinical courses. The most common injuries were cutting-penetrating (72.9%) due to the use of dental spatula and injury from direct fire source (59.4%) in the first-year students. Dental wires (96%) dental explorer (78%) and burning injuries with hot dental wax (64%) resulted in high rates of students who completed the second year. 87.5% of the students who completed their second year stated that they were injured mostly in the preclinical education courses of Prosthodontics. It was found that only 24 % of the students reported all their injuries.

Conclusion: The high injury rates in our study revealed the inability of the students to use cutting-penetrating tools and laboratory materials safely. In addition, their attitudes and behaviors after injuries showed that blood-borne diseases and cross-infection knowledge were insufficient. In order to take precautions in these issues, students must be educated before preclinical courses

KEYWORDS

Bloodborne Pathogens; Dental Education; Occupational injury.

ÖZ

Diş Hekimliği Klinik Öncesi Eğitiminin İlk İki Yılında Öğrenci Yaralanmalarının Araştırılması ve Yaralanma Sonrası Davranışlarının İncelenmesi

Amaç: Diş hekimliği fakülteleri klinik öncesi eğitimlerinde yaralanan öğrencilerin tutum ve davranışları, kan yoluyla bulaşan hastalıklar ve enfeksiyon riskleri açısından oldukça önemlidir. Bu nedenle bu çalışma, diş hekimliği öğrencilerinin klinik öncesi uygulama derslerinde yaşadıkları yaralanmaları ayrıntılı olarak tespit etmeyi ve yaralanma sonrası davranışlarını belirlemeyi amaçlamaktadır.

Gereç ve Yöntemler: Çalışma, birinci ve ikinci eğitim yıllarını tamamlayan öğrencilere yapıldı. Hazırladığımız anketler gönüllü katılımcılara "Google Forms" üzerinden gönderilerek anonim olarak gerçekleştirildi. Anketlerde, uygulama derslerinde yaşanan yaralanma türleri, yaralanmaya neden olan malzemeler, yaralanma sayıları, yaralanma zamanları ve yaralanmaların hangi klinik öncesi eğitim dersinde meydana geldiği, yaralanma sonrası davranışlar ve nedenleri soruldu. Çalışmada verilerin tanımlayıcı istatistikleri olarak (n) ve (%) bilgileri verildi. Örneklem büyüklüğü varsayımı karşılandığında Pearson Ki-Kare karşılanmadığında Fisher's Exact testi uygulanmıştır. Analizler IBM SPSS 25 programında gerçekleştirildi.

Bulgular: Öğrencilerin %66'sı (n:87) klinik öncesi kurslarda en az bir kez yaralandığını belirtmiştir. En sık karşılaşılan yaralanma, birinci sınıf öğrencilerinde spatül kullanımına bağlı batma-kesme (%72,9) ve doğrudan ateş kaynağından yaralanma (%59,4), ikinci sınıf öğrencilerinde kroşe teli (%96), sond (%78) ve sıcak muma bağlı yanma yaralanmaları (%64) olmuştur. İkinci sınıflarda yaralanmaların en fazla (%87,5) protetik diş tedavisi uygulama derslerinde meydana geldiği tespit edilmiştir. Öğrencilerin sadece % 24'ünün, yaralanmalarının tamamını sorumlu öğretim üyesine bildirdiği tespit edilmiştir.

Sonuç: Yüksek yaralanma oranları öğrencilerin kesici-delici aletleri ve laboratuvar malzemelerini güvenle kullanmadığını ortaya koymuştur. Ayrıca yaralanma sonrası tutum ve davranışları, kan yoluyla bulaşan hastalıkların ve çapraz enfeksiyon bilgilerinin yetersiz olduğunu göstermiştir. Öğrencilerin klinik öncesi dersler başlamadan önce eğitilmeleri gerekmektedir.

ANAHTAR KELİMELER

Diş Hekimliği Eğitimi; Kandan geçen patojenler; Meslek yaralanmaları.

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Dentistry is a profession in which injuries due to work accidents occur frequently. These injuries can occur during faculty preclinical training as well as during treatment procedures. Different types of tools and materials used in preclinical training, in addition to those used routinely in clinics, and students' inexperience may cause different types of injuries in preclinical training. In addition, the attitudes and behaviors of students who have not yet started clinical treatments are very important in terms of the risk of infectious diseases and infections.

In dental operations, injuries can often occur due to the small operation area, sudden patient movements, and various cutting and penetrative tools used in the application.¹ It was stated that injury rates per dentist were highest in Pedodontics (0.52/20 days) and Prosthodontics (0.41/20 days) departments and that injury rates per dentist were lowest in Endodontics(0.12/20 days), Orthodontics (0.17/20 days) and Periodontology(0.18/20 days) departments.² In the same study, this rate for general dentists was 0.29/20 days. The annual injury rate per dentist was reported as 3.35 cases.

Dentistry students are a vulnerable group to injury due to their lack of experience and skills.³⁻⁵ In a study in Germany, it was reported that the injector needle injuries of dentistry students were approximately twice as high as those of dentists.⁶ In studies on the sources of injury, it was stated that percutaneous injuries in dental faculties were often due to injector needles.^{1,7} In addition, it was stated that the injury rate due to dental burs was 8-26 %⁸⁻¹⁰ and that the rate of injury due to scaler and curettes was 12 %.^{5,8} In another study, it was concluded that injuries due to metal band, endodontic files and dental burs were the most common type of injury.¹¹ In a study evaluating students according to their years at the faculty, a significantly higher injury rate was found in third-term students compared to fourth-term students.⁵

The World Health Organization reports that 90% of the infections among healthcare workers are due to exposure to blood and body fluids in developing countries.¹² Exposure to infected blood and bodily fluid can lead to transmission of blood-borne pathogens, including Human immunodeficiency virus (HIV), Hepatitis B (HBV), Hepatitis C (HCV), and Treponema Pallidum (TP).^{3,13} There are many published reports on blood exposure in dentistry.^{1,14,15} Students who receive preclinical education should take the same precaution in preclinical injuries, even if they are not in direct contact with infectious substances such as the patient's blood and saliva.¹⁶ The Occupational Safety and Health Administration's (OSHA) Bloodborne Pathogens Standard recognizes human teeth as a potential source of blood-borne pathogens.¹⁷ In a study evaluating sterilization methods applied to human extracted teeth, it was stated that commonly used sodium hypochlorite

sodium hypochlorite solutions (5.25 %) were insufficient and unreliable. This result indicates that more care should be taken in preventing infectious diseases due to injuries in preclinical trainings.¹⁶

Another important issue is that students report their injuries during their preclinical education. When dentistry students do not report their occupational injuries that may be exposed to blood-borne pathogens, they may not be able to take necessary precautions and treatments on time as they should.^{18,19}

Because of the potential for exposure to blood-borne infections during clinical dental education, the consequences of a lack of reporting and adequate follow-up should be carefully evaluated along with infection by dental faculties. In line with this purpose, a survey was conducted with students who received preclinical education in our faculty. Our aim was to investigate the types of injuries of students, their behavior after injury and the reasons for these behaviors. In addition, we aimed to evaluate their attitudes after injuries that they may encounter in the future.

MATERIAL AND METHODS

The students (n=131) who completed their first- and second-year preclinical education in the Faculty of Dentistry at Çanakkale Onsekiz Mart University were surveyed. The students were informed about the content of the survey, and participation was done on a voluntary basis and without asking for their identity information. While the students who completed the first year (n=75) were only questioned about the preclinical education of Prosthodontics, the students who completed the second year (n=56) were asked about the preclinical courses of Endodontics, Restorative dentistry and Prosthodontics.

In the surveys; demographic characteristics, details of injury histories, post-injury attitudes and what protective equipment they used in their practical training were asked. Ethical approval was obtained from Çanakkale Onsekiz Mart University's Clinical Research Ethics Committee with the decision dated 16.07.2020 and numbered 2020-10. In the study, information (n) and (%) were given as descriptive statistics of the data. In the analysis of the relationship between two categorical variables, Pearson Chi-Square analysis was applied when the sample size assumption was met, and Fisher's Exact test was applied when the sample size assumption was not met. Analyzes were carried out in IBM SPSS 25 program.

RESULTS

All of the students (n=131) who completed their 1st and 2nd education years participated in the survey. 58 % of the participants are female (n=76) and 42 % are male (n=55). The age distribution varies between 18 and 24, and the average age is 20.23. 66% of the students (n=87) stated that they were injured at least once in pre-clinical courses. (Table 1)

Table - 1	Grade 1		Grade 2		p
	n	%	n	%	
How many times have you suffered an injury during your preclinical courses?					
Never	38	86.4	6	13.6	.000*
Once	24	80	6	20	
2-5 times	12	25	36	75	
More than 5	1	11.1	8	88.9	

Fisher's Exact test - *p<0.05

61% (n=53) of the injured students did not report this situation. (Table 2)

Table - 2	Grade 1		Grade 2		p
	n	%	n	%	
After being injured...					
I reported all of my injuries.	8	40	12	60	0.171
I've reported some of my injuries.	3	21.4	11	78.6	
I did not report any injuries.	26	49.1	27	50.9	

Fisher's Exact test - *p>0.05

The options "I did not report it because I was not worried." and "I did not need to report it because there was no bleeding after the injury." were selected among the main reasons for both grades. While 86.8 % of the students who stated that they were not injured before stated that they would report the situation to the faculty members in the future, the majority of the other students chose the option "I do not need to report if there is no bleeding after the injury". But grade 2 students stated that they would report possible injuries to the faculty members in the future. (Table 3)

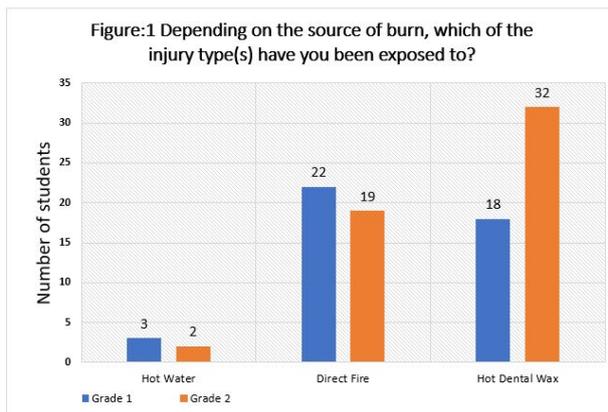
Table - 3	Grade 1		Grade 2	
	n	(%)	n	(%)
I did not report the injuries because...				
I am not worried.	16	(55.1)	15	(39.4)
I was injured with a sterile instrument.	6	(20.6)	7	(18.4)
I did not know what to do.	2	(6.8)	(-)	(0)
I had the hepatitis B virus (HBV) vaccine.	1	(0)	6	(15.7)
I thought the risk of transmission of infectious diseases by pre-clinical injuries was low.	(-)	(0)	1	(2.63)
I didn't have enough time.	3	(10.3)	3	(7.8)
I have knowledge about first aid.	3	(10.3)	2	(5.2)
I did not bleed after the injury.	13	(44.8)	11	(28.9)
I was not injured but if I got injured...				
I report.	33	(86.8)	6	(100)
I will not report if I am injured with a sterile instrument.	1	(2.6)	(-)	(-)
If nothing to worry about, I will not report it.	2	(5.2)	(-)	(-)
I do not report if there is no bleeding after the injury.	13	(34.2)	1	(16)

The distribution of injuries according to courses in second year of faculty preclinical education are Prosthodontics (87.5%), Endodontics (55.3%), Restorative dentistry (14.2%). (Table 4)

Table - 4 Grade 2		
In which pre-clinical courses did injuries frequently occur?	n	(%)
Prosthodontics	49	(87.5)
Endodontics	31	(55.3)
Restorative dentistry	8	(14.2)

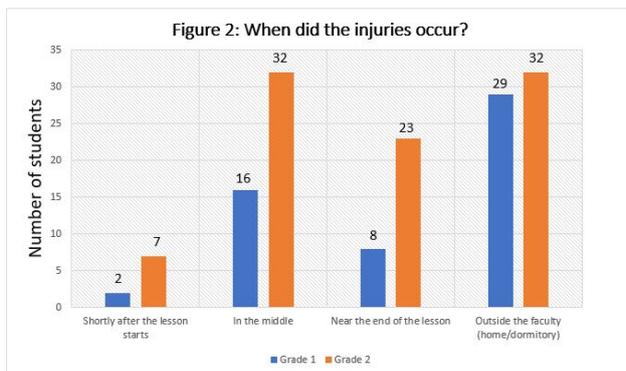
Although there are different questions in the surveys depending on different preclinical courses, some questions are common. A statistically significant relationship was found in the answers to the question 'How many times have you suffered an injury during your preclinical courses?' ($p < 0.05$) It was observed that grade 1 students mostly answered "Never" and "once" and grade 2 students answered "2-5 times" and "more than 5" the most. (Table 1)

No statistically significant relationship was found between the grades and the answers given in the other common questions 'Depending on the source of burn, which of the injury types(s) have you been exposed to?' (Fig 1)



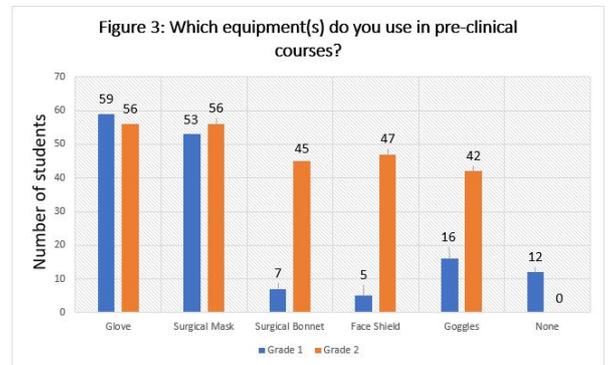
(Fisher's Exact test - p value: 0,203 - * $p > 0,05$)

'When did the injuries occur' (Fig 2) and the questions evaluating post-injury behaviors. ($p > 0.05$) (Table 2)



(Pearson Chi-Square – p value 0,127 - * $p > 0,05$)

A statistically significant relationship was found between the answers given to the question about the use of protective equipment and the grades. ($p < 0.05$) It has been determined that the use of Surgical bonnet, Face shield, Goggles are more common among grade 2 students. (Fig 3)



(Pearson Chi-Square - p value: 0,0001 - * $p < 0,05$)

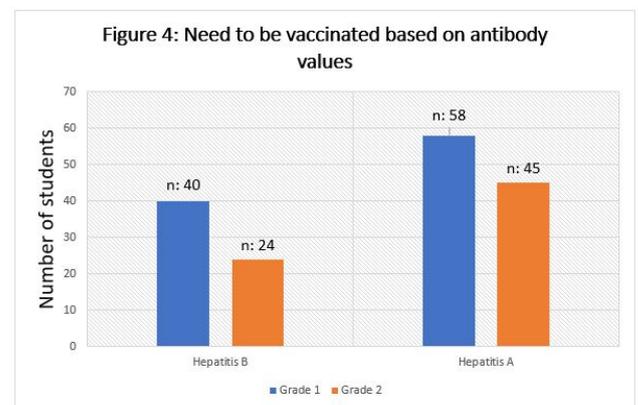
The answers given to the non-common questions in the surveys were evaluated based on the descriptive differences within the group. In dental morphology trainings, injuries due to hand tools (dental spatula etc.) used in scraping soap molds resulted in the highest ratio (72.9%) in grade 1 students. "Injury due to metal wire shaping" resulted in the highest rate (96%) of injury cases that occurred during pre-clinical education in grade 2 students. Also "Dental explorer" has been the most chosen item for handpiece-related injuries in grade 2 students. (Table 5)

Table - 5		
Grade 1		
	n	(%)
During preclinical training ...		
I was injured with hand tools in morphology studies. (Dental spatula etc.)	27	(72.9)
I was injured with a plaster blade during the scraping process.	11	(29.7)
I was injured by the trimmer motor during the plaster trimming / scraping process.	-	(-)
I was injured by a dental bur.	-	(-)
Grade 2		
	n	(%)
I was injured while placing the metal tape between the teeth or fitting into matrix systems.	4	(8)
I was injured with endodontic files.	24	(48)
I was injured by a dental bur.	23	(46)
I was injured by dental metal wire.	48	(96)
I was injured by the trimmer motor during the plaster trimming / scraping process.	-	(-)
I was injured by the syringe needle.	7	(14)
I was injured with a plaster knife.	3	(6)
I was injured with scissors.	-	(-)
Grade 2		
Hand tools that causes injury...	n	(%)
Dental Explorer	39	(78)
Fissure Processor	1	(2)
Carver	-	(-)
Excavator	1	(2)
Dental Tweezer	3	(6)
Cement Spatula	4	(8)

'Soap' was the most marked material with (35.1%) in accidents caused by splashing materials into the eyes for grade 1 students. In the event of accidents that may occur in the form of splashing materials into the eyes, the options have yielded similar results for grade 2 students. (Table 6)

Table - 6		
Grade 1		
Which of the following(s) splashed in your eye during pre-clinical courses?	n	(%)
Plaster	3	(8.1)
Dental wax	6	(16.2)
Soap	13	(35.1)
Grade 2		
	n	(%)
Plaster	6	(12)
Dental wax	-	(-)
Root-canal irrigation solutions	7	(14)
Dental acrylic	6	(12)
Materials used in cement or filling	-	(-)

Hepatitis B and Hepatitis A antibody values were determined by the faculty infection service at the beginning of the academic year, and it was determined that the antibody values were low and they should be vaccinated. (49% Hep. B / 79% Hep. A) (Fig 4)



DISCUSSION

Reporting accidents and injuries that occur during treatments is a very important issue in faculty clinical education and post-graduation professional life. Precautions should be taken to prevent possible major accidents or to prevent the same accidents from happening again. In order for this awareness to be created in their professional lives, the awareness of students on this issue should be increased before clinical practice training at the faculty.^{14, 20}

The number of injuries is higher for grade 2 students in the faculty. It is thought that this situation is caused by the fact that grade 2 students take 3 different preclinical courses while grade 1 students take only one preclinical course. In addition, the increase in cutting-penetrating tools used in the second-year education and the beginning of detailed and challenging procedures in practice courses may also cause this difference. A similar result has been shown in a study stating that accidents occurring in operations performed in the afternoon, when heavy workloads and cutting-penetrating tools are used more, are higher than those experienced in the morning.¹⁵

cause this difference. A similar result has been shown in a study stating that accidents occurring in operations performed in the afternoon, when heavy workloads and cutting-penetrating tools are used more, are higher than those experienced in the morning.¹⁵

In our study, the number of injuries gave results in direct proportion to the material variety that could cause injury and the duration of exposure. In the first-year preclinical courses, in parallel with soap shaping-scraping practices to learn tooth morphology, the material that splashed on the eye most was 'soap' and the most injured reason was 'dental spatula'. In parallel with the prevalence of puncture-type injuries in previous studies, 'dental explorer' injuries in hand tools were the highest among the students who completed their second year. In other materials, dental wires, endodontic files and burs yielded high results as expected.^{11,19} Especially in the second-year preclinical education, while practicing in a smaller area and requiring more technique, the use of sharper and penetrating tools may be the most important reason for the increase of injuries in this process. In our study, the injuries of the students due to injector needles were found at lower rates compared to previous studies.^{7,11,15} This situation may be related to the low frequency of injector use in the second-year preclinical education.

In dental clinical practice and training, the scattering of aerosol and small debris during the study can be a source of infection through mucosal contact.²¹ Especially eyes are one of the most important organs to be protected. Eye injuries have been reported in both preclinical training⁷ and clinical practice.^{5,15} To avoid this situation, protective glasses with solid side shields or alternatively a full face shield should be used.³ Face shield and goggles usage rates of the students who completed their first year in the faculty were found to be low in line with previous studies.²²⁻²⁴ However, the use of protective equipment was higher in grade 2 students compared to grade 1 students. This situation shows that the awareness of grade 2 students about the use of protective equipment is higher.

The results were similar in terms of injury rates between grades depending on the type of burning. However, more than half of the injured students were exposed to different types of burn injury. This situation reveals that fire is used frequently in practical trainings and students are not educated about safe working. Especially in Prosthodontics (hot wax) and in some stages of endodontic treatment (gutta-percha cutting), high-temperature equipment is frequently used. In the literature, a detailed study could not be found depending on the source of burn injury in the preclinical education of students.

The results in the distribution of injuries according to preclinical courses gave results as expected when considering the intensity of the practice training, the

excess of the materials used, the size of the material studied, and the frequency of use of cutting-penetrating tools.¹⁵ This ranking is similar to a recent study.¹⁹

The high rate of injury outside of the faculty is dangerous because first aid after injury cannot be done properly as in the laboratory. The fact that the injury time in the laboratory occurs more frequently in the middle of the course period is that the students start the practice after the demonstration coincides with the middle of the lesson period. In addition, there is no relationship between the two grades in terms of injury times. Injury frequency increases with the inexperience of doing it for the first time, as expected.¹⁵

Student behavior after injury, which is one of the most important objectives of our study, resulted in a similar to other studies.^{11,18} The distribution of the post-injury behaviors of the grade 1 and 2 students was found similar in the evaluation between the survey groups. The "I did not report it because I was not worried" and "I did not report it because there was no bleeding" options were highly marked as the reason for both grades. The National Center for Infectious Diseases estimates that the risk of Human Immunodeficiency Virus (HIV) transmission is 0.3% following an injury from cutters contaminated with HIV-infected blood. They also estimate that there is a 2% risk associated with Hepatitis C Virus (HCV) and 6-30 % (if the affected person is not vaccinated) from patients infected with Hepatitis B Virus (HBV).²⁵ Considering that many students have low HBV and Hepatitis A Virus (HAV) antibody values and that there is a risk of both direct transmission and cross-infection in their preclinical education^{16,17}, the rates of not reporting injuries are worrying. In addition, almost all of the students, who had not yet been injured in preclinical courses, stated that they would report their injuries after possible accidents which they may experience in the future. In this case, although it is not correct to compare the attitudes of the injured and non-injured students, the attitudes of the students who have not yet been injured when the accident occurs should be determined by further studies.

The limitations of the study is that the students participating in the study are in the same faculty and that their number is limited. Also the absence of grade 3 students in our faculty. In the future, it should be planned to expand the study with the participation of different faculty students and to take comprehensive measures if necessary. After the students' injury awareness education, how the results of our current study would change in their clinical education (4th and 5th years) and their professional lives should be investigated with further studies.

CONCLUSION

According to the results of the surveys, the safe use protocols of various sharp-penetrating and other types of tools and materials used in different practice courses should be included in the education programs of the faculties. It should be explained to students that it is mandatory to notify the faculty members of occupational accidents and that injuries caused by these accidents should be recorded by the faculties. Students should not be allowed to practice outside of the laboratory. Before preclinical education starts, students should be directed to vaccination according to HAV and HBV antibody values by the faculty, and students should be educated about infectious diseases and cross-infection.

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