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Attitudes of Dental Faculty Students Towards Rubber-Dam Usage in Endodontic Treatments

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Research Article

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ABSTRACT

Objectives: This cross-sectional study was conducted to evaluate the knowledge, frequency of use, reasons for use, difficulties encountered, and post-graduation usage expectations of fourth- and fifth-year dental students in Turkey regarding the use of rubber-dam in endodontic treatments.

Materials and Methods: 1,089 dental students voluntarily participated in a survey-based study after providing informed consent via an online form. The survey consisted of multiple-choice and Likert-scale questions designed to collect demographic information, assess knowledge and the frequency of rubber dam use, determine reasons for use, evaluate encountered difficulties, and measure post-graduation usage expectations. Data were statistically analyzed using SPSS 22.0. Frequency and percentage distributions were calculated, and Fisher's Exact and Pearson Chi-Square tests were used for inter-group comparisons ($\alpha = 0.05$).

Results: The study revealed that the vast majority of students are aware of the necessity of rubber dam for both dentists and patients, and that they trust this method and feel comfortable with it. Most students (75%) have received formal rubber dam training (p = 0.697). The findings also showed that use frequency varies by tooth group, with molars used more frequently than anterior and premolars. Stress levels during application were higher for molars due to technical difficulties. Students showed a higher preference for rubber dam use after access cavity preparation compared to the preoperative stage (p < 0.05). The main difficulties mentioned were taking periapical radiographs and treating teeth with extensive substance loss (p < 0.05).

Conclusions: The high post-graduation usage expectation (77.1%) reflects a positive outlook toward the adoption of contemporary endodontic practices. To support wider adoption, dental curricula should standardize and strengthen both theoretical and practical training in rubber-dam techniques.

Keywords: Dental education, dental students, endodontics, rubber-dam

Diş Hekimliği Fakültesi Öğrencilerinin Endodontik Tedavilerde Rubber-Dam Kullanimina Yönelik Tutumlari

Araştırma Makalesi

Süreç

Geliş: 22/02/2026
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ÖZ

Amaç: Bu kesitsel çalışma, Türkiye'deki dördüncü ve beşinci sınıf diş hekimliği öğrencilerinin endodontik tedavilerde rubber-dam kullanımıyla ilgili bilgilerini, kullanım sıklıklarını, kullanım nedenlerini, karşılaştıkları zorlukları ve mezuniyet sonrası kullanım beklentilerini değerlendirmek amacıyla yapılmıştır.

Gereç ve Yöntemler: 1.089 diş hekimliği fakültesi öğrencisi, çevrimiçi bir form aracılığıyla bilgilendirilmiş onam verdikten sonra anket tabanlı bir çalışmaya gönüllü olarak katıldı. Anket, demografik bilgileri toplamak, rubber-dam kullanımıyla ilgili bilgi ve kullanım sıklığını değerlendirmek, kullanım nedenlerini belirlemek, karşılaşılan zorlukları değerlendirmek ve mezuniyet sonrası kullanım beklentilerini ölçmek için tasarlanmış çoktan seçmeli ve Likert ölçeği sorularından oluşuyordu. Veriler SPSS 22.0 kullanılarak istatistiksel olarak analiz edildi. Sıklık ve yüzde dağılımları hesaplandı ve gruplar arası karşılaştırmalar için Fisher's Exact ve Pearson Ki-Kare testleri kullanıldı ($\alpha = 0.05$).

Bulgular: Çalışma, öğrencilerin büyük çoğunluğunun hem diş hekimleri hem de hastalar için rubber-dam gerekliliğinin farkında olduğunu, bu yönteme güvendiklerini ve rahat hissettiklerini ortaya koydu. Öğrencilerin çoğu (%75) rubber-dam eğitimi almıştır (p = 0,697). Bulgular ayrıca, kullanım sıklığının diş grubuna göre değiştiğini, azı dişlerinin ön ve küçük azı dişlerine göre daha sık kullanıldığını gösterdi. Teknik zorluklar nedeniyle, uygulama sırasında stres seviyesi azı dişlerinde daha yüksekti. Öğrenciler, tedavi öncesi aşamaya kıyasla, giriş kavitesi hazırlığından sonra rubber-dam kullanımı konusunda daha yüksek bir tercih gösterdiler (p < 0,05). Bahsedilen başlıca zorluklar, periapikal radyografilerin çekilmesi ve aşırı madde kaybı olan dişlerin tedavisiydi (p < 0,05).

Sonuçlar: Mezuniyet sonrası yüksek kullanım beklentisi (%77,1), çağdaş endodontik uygulamaların benimsenmesine yönelik olumlu bir bakış açısını yansıtmaktadır. Daha geniş çapta benimsenmesini desteklemek için, diş hekimliği müfredatları rubber-dam teknikleri konusunda hem teorik hem de pratik eğitimi standartlaştırmalı ve güçlendirmelidir.

Anahtar Kelimeler: Diş hekimliği eğitimi, diş hekimliği öğrencileri, endodonti, lastik dam

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Introduction

The concept of isolating teeth for root canal treatment (RCT) was first introduced 150 years ago[1] and the rubber-dam remains the ideal tool for dental isolation during various dental procedures. There are various advantages of using a rubber-dam for dentists and patients during RCT. When properly applied, the rubber-dam isolates the tooth,

which facilitates the treatment, prevents aspiration or ingestion of instruments, solutions, and restorative materials, reduces cross-infection and protects soft tissues from accidental injury. It also improves focus and enhances visual acuity. By preventing patient speech, spitting, or mouth closure, the rubber-dam shortens treatment time and prevents contamination of the working area.[2] This, in turn, facilitates the debridement and irrigation of the working area, prevents saliva contamination, and thus provides an aseptic environment.[3,4]

The European Society of Endodontology's 2006 guidelines state that all stages of RCT should be performed with rubber-dam isolation.[3] These guidelines emphasize the importance of rubber-dam usage in endodontic practice and the necessity for proper training. Moreover, survey studies are considered a valid research method for evaluating students' knowledge and attitudes toward the use of rubber-dam.[5-7] Despite this, studies show low usage rates among general practitioners worldwide.[8-12] The reasons for this include perceived time consumption, patient discomfort, inadequate training and experience, difficulty of use, the cost of materials and equipment, and low treatment fees.[9,12,13] However, research indicates that patients are generally comfortable with the use of rubber-dam and even prefer them in future treatments.[14] A dentist's positive attitude and experience with the technique can influence patient acceptance.

Endodontic treatments are typically performed under rubber-dam isolation.[9,15] While its use is well-established in endodontics, the frequency of rubber-dam application for restorative treatments varies, being more common for posterior teeth than for anterior teeth, and more often in the mandible than in the maxilla.[5,9,15] Dental education plays a crucial role in shaping attitudes toward the use of rubber-dam.[5,16] A 2014 survey, for instance, showed that 75% of participants considered a rubber dam mandatory during RCT.[17] For this reason, surveys among dental students are crucial for understanding their perceptions and attitudes, which helps in outlining the future dental workforce.[5-7,16]

Previous studies have not specifically investigated at which stage of the treatment students prefer to use a rubber-dam. This survey aims to evaluate the knowledge, frequency of use, reasons for use, difficulties encountered, and post-graduation usage expectations of 4th- and 5th-year dental students in Turkey regarding the use of rubber dams in endodontic treatments. The null hypothesis of this study is that the academic year of dental students (fourth versus fifth year) is not significantly associated with their knowledge, frequency of use, reasons for use, encountered challenges, or future expectations regarding rubber dam isolation in endodontics.

Materials and Methods

This cross-sectional descriptive study was approved by the Bursa Uludağ University Health Research Ethics Committee on February 24, 2025, with decision number 47-2025-493/4-15.

The survey questions were distributed via email and online platforms to a total of 1,106 4th and 5th-year students from various dental faculties in Turkey during the 2024-2025 academic year, and they were asked to respond confidentially. A total of 1,089 students who voluntarily participated and provided informed consent via the online form were included in the study. The survey questions were prepared based on previous.[6, 14] A web-based survey with 15 questions was prepared using Google Forms (Alphabet, USA). The survey consisted of multiple-choice and Likert scale questions to assess students' demographic information (university, class level, and gender), knowledge and frequency of rubber-dam use in endodontic treatments, reasons for use, difficulties encountered, and post-graduation usage expectations. The responses of six students who failed to complete the survey were excluded from the analysis.

A post hoc power analysis was conducted using G*Power software (v3.1.9) to evaluate the statistical power of the study. For the chi-square analysis comparing two independent groups (fourth- and fifth-year dental students) on 5-point Likert-scale responses, the degrees of freedom (df) were set to 4. Based on data collected from 1,089 participants, an alpha significance level of $\alpha = 0.05$, and a large effect size ($w = 0.69$) derived from a previous study,[14] the statistical power was calculated to be greater than 0.99.

Statistical Analysis

The collected survey data were analyzed using the statistical analysis program SPSS 22.0 (IBM, USA). Frequency and percentage distributions were calculated for the demographic data and students' responses regarding the use of rubber-dam. The attitudes of students were evaluated, with a separate focus on their frequency of rubber-dam use, stress levels, and preferences for using it at different stages of endodontic treatment. The study also assessed the difficulties they encountered during rubber-dam application and their expectations regarding its use post-graduation. In addition to descriptive statistics, Fisher's Exact and Pearson Chi-Square tests were used to compare the classes. The results were evaluated at a significance level of $p < 0.05$.

Results

A total of 1,106 students were invited to participate in the survey. The participation rate was 98.4%, with 1,089 students responding. Of the 1,083 students who completed the survey, 412 (38.04%) were male, and 671 (61.96%) were female. The sample was nearly equally distributed between academic years, with 554 (51.2%) fourth-year students and 529 (48.8%) fifth-year students (Figure 1). The answers regarding rubber-dam training and its necessity are presented in Table 1. A large majority of students (75%) stated that they had received rubber-dam training. However, 17.08% of students in both classes answered 'Partially'. A large majority of students (over 90%) believe that the rubber-dam is necessary for both the dentist and the patient. The number of students who answered 'No' is very low (approximately 1%). The results of the Chi-square tests showed no statistically significant

difference between 4th-year and 5th-year students for all questions examined in Table 1 ($p > 0.05$).

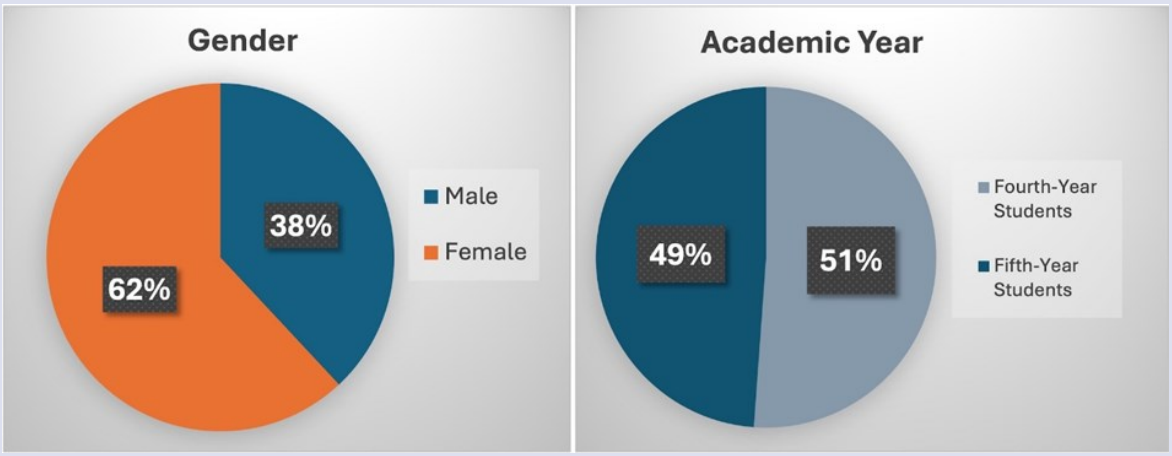


Figure 1. Demographic distribution of the participating students by gender and academic year.

Table 1. Opinions on rubber-dam training and necessity (n, class percentage)

Questions	Answer	4th-year students	5th-year students	Total	Chi-square (χ^2), p value
Have you received rubber-dam training?	Yes	421 (76%)	391 (73.91%)	812 (75%)	$\chi^2 = 0.723$ p = 0.697
	No	41 (7.4%)	45 (8.51%)	86 (7.94%)	
	Partially	92 (16.61%)	93 (17.58%)	185 (17.08%)	
Is it necessary for the dentist?	Yes	502 (90.61%)	494 (93.38%)	996 (91.97%)	$\chi^2 = 2.832$ p = 0.243
	No	4 (0.72%)	3 (0.57%)	7 (0.65%)	
	Partially	48 (8.66%)	32 (6.05%)	80 (7.39%)	
Is it necessary for the patient?	Yes	502 (90.61%)	490 (92.63%)	992 (91.59%)	$\chi^2 = 1.543$ p = 0.462
	No	8 (1.44%)	5 (0.94%)	13 (1.2%)	
	Partially	44 (7.94%)	34 (6.43%)	78 (7.2%)	
I feel safe and comfortable	Yes	515 (92.96%)	498 (94.14%)	1013 (93.54%)	$\chi^2 = 1.767$ p = 0.413
	No	5 (0.9%)	7 (1.32%)	12 (1.11%)	
	Partially	34 (6.14%)	24 (4.54%)	58 (5.36%)	

In the answers evaluating the frequency of rubber-dam use for different tooth groups (Table 2), the differences in preference for molar teeth were statistically significant between the classes ($p = 0.046$), while no significant difference was observed for anterior and premolar teeth ($p > 0.05$). Additionally, 4th and 5th-year students had a higher frequency of use for molar teeth, while the rate of non-preference was higher for anterior teeth.

Table 3 presents data on the stress levels of students during the application of rubber-dam. There is a statistically significant difference in stress levels experienced during rubber-dam application among different tooth groups. It was observed that 4th- and 5th-year students experienced higher stress levels 'Frequently' and 'Always' with molar teeth. Fifth-year students experienced a statistically significantly lower stress level for anterior teeth ($p = 0.005$).

Table 2. Students' rubber-dam usage frequencies in different tooth groups in clinical routines (n, class percentage)

Tooth group	Rubber-dam usage preference	4th-year students	5th-year students	Total	Chi-square (χ^2), p value
Anterior	Do not prefer	54 (9.75%)	65 (12.29%)	119 (11%)	$\chi^2 = 3.905$ p = 0.419
	Rarely prefer	64 (11.55%)	57 (10.78%)	121 (11.17%)	
	Sometimes prefer	99 (17.87%)	83 (15.69%)	182 (16.8%)	
	Frequently prefer	160 (28.88%)	139 (26.28%)	299 (27.61%)	
	Always prefer	177 (31.95%)	185 (34.97%)	362 (33.43%)	
Premolar	Do not prefer	34 (6.14%)	28 (5.29%)	62 (5.72%)	$\chi^2 = 3.925$ p = 0.416
	Rarely prefer	46 (8.3%)	34 (6.43%)	80 (7.39%)	
	Sometimes prefer	92 (16.61%)	93 (17.58%)	185 (17.08%)	
	Frequently prefer	179 (32.31%)	156 (29.49%)	335 (30.93%)	
	Always prefer	203 (36.64%)	218 (41.21%)	421 (38.87%)	
Molar*	Do not prefer*	33 (5.96%)	18 (3.40%)	51 (4.71%)	$\chi^2 = 9.7$ p = 0.046*
	Rarely prefer*	36 (6.5%)	20 (3.78%)	56 (5.17%)	
	Sometimes prefer	71 (12.82%)	79 (14.93%)	150 (13.85%)	
	Frequently prefer	186 (33.57%)	175 (33.08%)	361 (33.33%)	
	Always prefer	228 (41.16%)	237 (44.80%)	465 (42.94%)	

Table 3. Students' stress levels experienced during rubber-dam application in different tooth groups (n, class percentage)

Tooth group	Stress level	4th-year students	5th-year students	Total	Chi-square (χ^2), p value
Anterior*	Never*	114 (20.58%)	150 (28.36%)	264 (24.38%)	
	Rarely	175 (31.59%)	180 (34.03%)	355 (32.78%)	$\chi^2 = 14.983$
	Sometimes*	196 (35.38%)	138 (26.09%)	334 (30.84%)	$p = 0.005$*
	Frequently	47 (8.48%)	42 (7.94%)	89 (8.22%)	
	Always	22 (3.97%)	19 (3.59%)	41 (3.79%)	
Premolar	Never	104 (18.77%)	121 (22.87%)	225 (20.78%)	$\chi^2 = 5.032$
	Rarely	179 (32.31%)	182 (34.4%)	361 (33.33%)	$p = 0.284$
	Sometimes	197 (35.56%)	160 (30.25%)	357 (32.96%)	
	Frequently	52 (9.39%)	46 (8.69%)	98 (9.05%)	
	Always	22 (3.97%)	20 (3.78%)	42 (3.88%)	
Molar	Never	82 (14.8%)	80 (15.12%)	162 (14.96%)	$\chi^2 = 1.142$
	Rarely	150 (27.08%)	141 (26.65%)	291 (26.87%)	$p = 0.888$
	Sometimes	205 (37%)	192 (36.29%)	397 (36.66%)	
	Frequently	82 (14.8%)	88 (16.63%)	170 (15.7%)	
	Always	35 (6.32%)	28 (5.29%)	63 (5.82%)	

For all tooth groups and both classes, statistically significant differences were found in students' preferences for using a rubber-dam either before or after the access cavity was prepared (Table 4, $p < 0.05$). Specifically, the 'I do not prefer' rate was higher at the 'Before Access Cavity' stage, whereas there was a higher preference for its use at the 'After Access Cavity' and 'Restorative Stage after RCT' stages (Table 4). Furthermore, there was no statistically significant difference in students' preferences for all tooth groups at the 'Restorative Stage after RCT' ($p > 0.05$).

It was found that the class level did not create a statistically significant difference in the perception of certain difficulties encountered during rubber-dam application (Table 5, $p > 0.05$). This may suggest that the nature or frequency of the perceived difficulties does not change much with increased experience (from 4th to 5th year). However, it was found that there were significant differences in students' perceptions of different difficulty areas (taking periapical radiographs and teeth with extensive substance loss), and these differences were statistically significant ($\chi^2 = 697.55$, $p < 0.001$).

For post-graduation expectations, a large majority of students (77.1%) answered 'I would frequently prefer it' or 'I would always prefer it' (Table 6). The rates of not preferring to use a rubber-dam after graduation were quite low in both the 4th and 5th grades (0.4% and 1.1%, respectively). The Chi-square test result showed that there was no statistically significant difference between the post-graduation rubber-dam usage preferences of 4th and 5th-year students ($p = 0.471$).

Table 4. Students' preferences for rubber-dam usage at different stages of endodontic treatment (n, class percentage)

Tooth group	Usage preference	Before access cavity			After access cavity			Restorative stage after RCT		
		4th-year students	5th-year students	Chi-square (χ^2) p value	4th-year students	5th-year students	Chi-square (χ^2) p value	4th-year students	5th-year students	Chi-square (χ^2) p value
Anterior	Never	188 (33.94)	220 (41.59)*	$\chi^2 = 9.841$	105 (18.95)	92 (17.39)	$\chi^2 = 9.687$	116 (20.94)	122 (23.06)	$\chi^2 = 1.645$
	Rarely	92 (16.61)	91 (17.20)	$p = 0.043$*	102 (18.41)	67 (12.67)*	$p = 0.046$*	103 (18.59)	87 (16.45)	$p = 0.801$
	Sometimes	86 (15.52)	80 (15.12)		85 (15.34)	77 (14.56)		136 (24.55)	123 (23.25)	
	Frequently	101 (18.23)	75 (14.18)		135 (24.37)	153 (28.92)		130 (23.47)	131 (24.76)	
	Always	87 (15.70)	63 (11.91)		127 (22.92)	140 (26.47)		69 (12.45)	66 (12.48)	
Premolar	Never	172 (31.05)	210 (39.70)*	$\chi^2 = 11.849$	99 (17.87)	82 (15.50)	$\chi^2 = 11.444$	109 (19.67)	102 (19.28)	$\chi^2 = 0.16$
	Rarely	89 (16.07)	88 (16.63)	$p = 0.019$*	104 (18.77)	68 (12.85) *	$p = 0.022$*	94 (16.97)	92 (17.39)	$p = 0.997$
	Sometimes	98 (17.69)	88 (16.63)		85 (15.34)	78 (14.74)		149 (26.90)	139 (26.28)	
	Frequently	103 (18.59)	78 (14.74)		135 (24.37)	161 (30.43)*		134 (24.19)	132 (24.95)	
	Always	92 (16.61)	65 (12.29)*		131 (23.65)	140 (26.47)		68 (12.27)	64 (12.10)	
Molar	Never	166 (29.96)	202 (38.19)*	$\chi^2 = 12.676$	97 (17.51)	83 (15.69)	$\chi^2 = 15.046$	107 (19.31)	97 (18.34)	$\chi^2 = 0.757$
	Rarely	81 (14.62)	90 (17.01)	$p = 0.013$*	105 (18.95)	60 (11.34)*	$p = 0.005$*	94 (16.97)	86 (16.26)	$p = 0.944$
	Sometimes	99 (17.87)	81 (15.31)		81 (14.62)	82 (15.50)		141 (25.45)	143 (27.03)	
	Frequently	115 (20.76)	85 (16.07)*		135 (24.37)	159 (30.06)*		140 (25.27)	139 (26.28)	
	Always	93 (16.79)	71 (13.42)		136 (24.55)	145 (27.41)		72 (12.99)	64 (12.10)	

**Shows a statistical difference ($p < 0.05$).*

Discussion

Although rubber-dam education is part of the dental curriculum, its use remains limited among dentists worldwide.[8,10-12,15,17] Questionnaire-based surveys are frequently used to assess dental students' knowledge and perceptions of the rubber-dam, as well as to identify potential issues in the training process.[5-7] The results of our study provide a comprehensive assessment of fourth- and fifth-year dental students' attitudes toward the use of rubber dams in endodontic treatment in Turkey. The findings strongly indicate that the vast majority of students (over 91%) are aware of the necessity of rubber-dam for both the patient and the dentist. Furthermore, a significant portion of the students (93.5%) stated that they feel safe

and comfortable with this method. This indicates that with adequate training and practice, students develop a positive attitude toward this important procedure. Based on the findings of this study, the null hypothesis was partially rejected. While there was no significant association between the students' academic year and their general knowledge, perceived difficulties, or post-graduation expectations regarding rubber dam isolation ($p > 0.05$), statistically significant differences were observed between fourth- and fifth-year students concerning the frequency of use for molar teeth, stress levels associated with anterior teeth, and preferences for rubber-dam usage at different stages of endodontic treatment ($p < 0.05$).

Table 5. Difficulties encountered during rubber-dam usage (n, class percentage)

Difficulties	Answer	4th-year students	5th-year students	Total	Chi-square (χ^2), p value
Difficulties in cavity preparation	Yes	107 (20%)	124 (24.31%)	231 (22.14%)	$\chi^2 = 5.439$
	No	258 (48.22%)	211 (41.37%)	469 (44.97%)	$p = 0.066$
	Partially	170 (31.78%)	175 (34.31%)	345 (33.06%)	
Difficulty in proper placement of rubber sheet	Yes	218 (40.75%)	195 (38.24%)	413 (39.58%)	$\chi^2 = 0.501$
	No	125 (23.36%)	124 24.32%)	249 (23.89%)	$p = 0.778$
	Partially	202 (37.76%)	195 (38.13%)	397 (38.07%)	
Patient discomfort	Yes	222 (41.50%)	189 (37.06%)	411 (39.40%)	$\chi^2 = 1.84$
	No	109 (20.37%)	112 (21.96%)	221 (21.18%)	$p = 0.399$
	Partially	212 (39.63%)	212 (41.39%)	424 (40.61%)	
Instrument and material management	Yes	82 (15.33%)	74 (14.51%)	156 (14.96%)	$\chi^2 = 0.251$
	No	305 (56.98%)	284 (56.13%)	589 (56.49%)	$p = 0.822$
	Partially	150 (28.02%)	148 (29.25%)	298 (28.56%)	
Taking periapical radiography*	Yes	350 (65.68%)	356 (70.47%)	706 (68.04%)	$\chi^2 = 2.321$
	No	65 (12.19%)	50 (9.90%)	115 (11.08%)	$p = 0.313$
	Partially	128 (24.02%)	114 (22.58%)	242 (23.29%)	
Time	Yes	197 (36.95%)	205 (40.59%)	402 (38.77%)	$\chi^2 = 3.452$
	No	155 (29.00%)	158 (31.29%)	313 (30.19%)	$p = 0.178$
	Partially	186 (34.87%)	150 (29.70%)	336 (32.40%)	
Clamp selection	Yes	180 (33.77%)	157 (30.73%)	337 (32.27%)	$\chi^2 = 2.753$
	No	142 (26.63%)	159 (31.06%)	301 (28.84%)	$p = 0.252$
	Partially	221 (39.63%)	203 (39.75%)	424 (40.61%)	
Cost	Yes	121 (22.55%)	101 (19.73%)	222 (21.14%)	$\chi^2 = 2.712$
	No	254 (47.30%)	230 (44.97%)	484 (46.09%)	$p = 0.258$
	Partially	162 (30.17%)	176 (34.39%)	338 (32.19%)	
Teeth with extensive substance loss*	Yes	412 (76.96%)	416 (80.31%)	828 (78.63%)	$\chi^2 = 3.652$
	No	35 (6.54%)	22 (4.24%)	57 (5.41%)	$p = 0.161$
	Partially	101 (18.79%)	86 (16.59%)	187 (17.76%)	

**Shows a statistical difference ($p < 0.05$).*

Table 6. Post-graduation thoughts on rubber-dam usage (n, class percentage)

	4th-year students	5th-year students	Total	Chi-square (χ^2), p value
Never	2 (0.4%)	6 (1.1%)	8 (0.7%)	$\chi^2 = 3.547$
Rarely	12 (2.2%)	7 (1.3%)	19 (1.8%)	$p = 0.471$
Sometimes	113 (20.4%)	108 (20.4%)	221 (20.4%)	
Frequently	300 (54.2%)	280 (52.9%)	580 (53.6%)	
Always	127 (22.9%)	128 (24.2%)	255 (23.5%)	

Nalcı et al.[6] reported that a significant portion of students (60%) reported having received rubber-dam training, which is a positive indicator consistent with our previous findings. However, the fact that approximately 40% of students have still received only partial training or no training at all may indicate a lack of standardization and scope in dental education.[9] Interestingly, students' academic class levels did not statistically significantly affect their perceptions of the necessity of the rubber-dam for the dentist and patient, their self-reported training, or their feelings of confidence during the procedure. This finding suggests that students' fundamental perceptions and educational experiences regarding the rubber-dam are formed early and do not change substantially in later years.

In a 2008 survey conducted in the USA, the reported frequency of rubber-dam use among general dentists was 58%.[9] Similarly, in other countries, the preference for using a rubber dam in clinical practice has been reported among graduated dentists at rates of 57.8% in Saudi Arabia, 34.3% in Egypt, and 22.4% in Syria.[16] However, a study by Kaptan et al.[10] in Turkey reported that 91.9% of post-graduation dentists did not prefer to use a rubber dam. This result suggests a decline in rubber-dam usage after graduation, despite its frequent use during dental school. Furthermore, other studies from Turkey have shown varied usage rates, with 23.6% of students using a rubber-dam for every patient, according to Nalcı et al.[6] and 49.9% according to Gök et al.[18] The data from our study reveal that the frequency of rubber-dam use varies

significantly depending on the tooth group. Consistent with the perceived importance of isolation for posterior teeth, the highest rate of 'I would always prefer it' was for molars (42.94%). These rates for anterior (33.43%) and premolar (38.87%) teeth further suggest that the use of rubber-dams is increasingly being adopted by students.

When assessing the stress levels associated with rubber-dam application, it was observed that reports of infrequent stress experience were more frequent for anterior and premolar teeth than for molars. This finding is consistent with the expectation that the technical difficulties of isolating molar teeth may cause stress. Furthermore, the generally low stress levels among students indicate that they adapt and gain confidence as they gain experience.

It has been determined that students' preferences for rubber dam use vary significantly across all tooth groups and academic classes, depending on the treatment stage. The observed trend indicates that the rubber-dam is used less frequently before the access cavity is prepared, with a significant increase in its use after this stage. Most students are aware of the necessity of rubber-dam and prefer its use, especially after the access cavity has been opened and during the restoration stage. This may indicate that some students experience difficulty with the initial placement of the rubber-dam. Considering the critical importance of asepsis and moisture control,[13] its use should be encouraged at all stages. A survey of dental students revealed that 68.6% of students reported an increased desire to use rubber-dam due to the COVID-19 pandemic,[6] highlighting increased awareness of the importance of isolation in the context of public health. In addition, students' awareness of the primary purpose of using a rubber dam—which is infection control and ensuring aseptic working conditions—may not be sufficiently developed, and this is an area that requires further education and support.

Although the usage rates were slightly lower at the restorative stage (after RCT) compared to the post-access cavity stage, they remained higher than the pre-access cavity stage. This finding is consistent with the study by Falacho et al.[19] which demonstrated that rubber dam isolation significantly affects the bonding strength to tooth enamel. The continued preference for rubber-dam at this stage thus suggests that a significant portion of students are aware of the critical importance of isolation for successful adhesive restorations.

The primary difficulties encountered during rubber-dam application were identified as 'difficulty in taking periapical radiographs' and 'teeth with extensive substance loss.' These challenges are consistent with findings from previous surveys of students,[6,7] underscoring the need to address them for the widespread adoption of rubber-dam. Educational programs and clinical practices should therefore focus on these specific areas where students struggle the most.[5] Consistent with Madarati[16] who emphasized the emphasis on undergraduate education by, it is recommended that simulation and clinical applications be encouraged to provide students with experience in diverse clinical cases.

The strong expectation of using a rubber-dam after graduation (53.6% 'I would frequently prefer it' and 23.5% 'I would always prefer it') indicates a generally favorable attitude toward its use in post-graduation practice. These findings are consistent with other studies that have shown recent graduates and younger dentists use rubber-dam more frequently than their older colleagues.[5,7,8,11] Additionally, the rates of 'I do not prefer it' or 'I rarely prefer it' are below 2.5% in total, indicating that students view the rubber-dam as a crucial tool in their professional careers. The lack of a statistically significant difference between the classes reveals that students' intentions for future clinical practice do not vary significantly based on their academic level. This demonstrates that both classes have adopted modern endodontic approaches and better understand the importance of isolation.

This study is limited to fourth- and fifth-year students from a specific number of dental schools, which may affect the generalizability of the results to all dental students or graduates. Due to the survey method's dependence, the data is derived from students' self-reported attitudes. Additionally, the tooth groups were not separated by arch (maxillary or mandibular), which offers the opportunity for future research to shed light on students' preferences for various regional tooth groups.

Conclusions

Within the scope of this study, dental students generally demonstrate a positive attitude toward the use of rubber-dam in endodontic treatments. Most students are aware of the necessity of rubber-dam and prefer its use, especially after the access cavity has been opened and during the restoration stage. High expectations for its use after graduation indicate that this positive trend will continue. However, to ensure widespread adoption of the rubber-dam, the scope of theoretical and practical training on application techniques in dental school curricula should be expanded and standardized. In conclusion, these positive attitudes should be supported and the challenges encountered should be addressed so that the use of rubber-dam can become more widespread in future clinical practice.

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Conflicts of Interest Statement

The authors declare no conflict of interest.

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