ORIGINAL ARTICLE
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UDC: 616.314-057.875::37.018.7
DOI: https://doi.org/10.2298/VSP210325084M

# Isolation with rubber dam: knowledge, training, and attitudes of final year dental students

## Izolacija radnog polja upotrebom koferdama: znanje, veštine i stavovi studenata završne godine stomatologije

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**Abstract**

**Background/Aim.** Good undergraduate education is necessary to overcome the reluctance of dentists to use the rubber dam (RD). The aim of the study was to assess dental students' knowledge, training skills, attitudes, and opinions concerning the use of RD in order to isolate an operation field. **Methods.** A 34-item original questionnaire was distributed to 130 final-year students of the Faculty of Dental Medicine, University of Belgrade. The questions were divided into four segments: general information, RD-related knowledge and training skills, opinions and attitudes regarding the use of RD, and opinions on the intended future use of RD. **Results.** All students confirmed that they had theoretical lessons about RD and that its advantages were pointed out. During practical courses, 34% of students observed RD placement and 10% of them placed RD on their own or with assistance. Most (88%) of the students did not feel capable of using RD on their own. Less than half of the students (38%) believed that adequate isolation of the operating field is possible without RD. Sixty-four percent of students considered that RD was not uncomfortable for the patients. More than half of the students were willing to use RD in their future practice. Almost all of them planned to gain additional postgraduate training with RD. **Conclusion.** Students have solid theoretical knowledge about RD; they are aware of its importance and have a positive attitude toward RD use. However, their practical training and skills are poor and insufficient for independent RD use in order to isolate an operation field.

**Key words:**
**education; health knowledge, attitudes; practice; rubber dams; students, dental; survey and questionnaires.**

**Apstrakt**

**Uvod/Cilj.** Osnovni preduslov za prevazilaženje odbojnosti stomatologa prema upotrebi koferdama jeste kvalitetno obrazovanje, stečeno tokom osnovnih studija. Cilj rada bio je da se procene znanje, veštine, obučenost za rad, stavovi i mišljenje studenata u vezi sa upotrebom koferdama u izolaciji radnog polja. **Metode.** Ukupno 130 studenata završne godine Stomatološkog fakulteta popunjavalo je originalni upitnik od 34 pitanja, koja su bila podeljena u četiri segmenta: opšte informacije, znanje i obučenost za rad sa koferdamom, mišljenja i stavovi o upotrebi koferdama i mišljenja o korišćenju koferdama u budućem radu. **Rezultati.** Svi studenti su potvrdili da su imali teorijsku nastavu o izolaciji radnog polja koferdamom i da im je ukazano na njegove prednosti. Tokom praktičnih vežbi, 34% studenata je posmatralo postavljanje koferdama, dok je njih 10% samostalno postavilo koferdam. Većina (88%) studenata se nije osećala sposobnim da samostalno koristi koferdam. Manje od polovine (38%) studenata verovalo je u mogućnost odgovarajuće izolacije radnog polja i bez upotrebe koferdama. Da koferdam nije neprijatan za pacijente smatralo je 64% studenata. Više od polovine studenata bilo je spremno da koristi koferdam u svom budućem radu. Skoro svi studenti planirali su dodatno obučavanje za rad sa koferdamom posle završetka osnovnih studija. **Zaključak.** Studenti imaju solidno teorijsko znanje o upotrebi koferdama, svesni su njegovog značaja i imaju pozitivan stav prema njegovoj upotrebi. Njihova praktična obuka i veštine nedovoljne su i ne omogućavaju im da u cilju izolacije radnog polja samostalno postave koferdam.

**Ključne reči:**
**obrazovanje; zdravlje, znanje, stavovi, praksa; koferdam; studenti stomatologije; ankete i upitnici.**

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## Introduction

The use of the rubber dam (RD) is universally acknowledged as an ideal method for performing dental treatments completely free of saliva and represents the crucial element for achieving an absolutely dry operating field [1–3]. It also provides retraction and protection of the soft tissues, better visibility and aseptic conditions of the operating field, reduction of infectious pathogens in the aerosol, and prevention of aspiration or ingestion of instruments or irrigants [4–7]. Dental practitioners are encouraged and required to use RD in their daily practice, as RD is considered an essential factor that significantly influences the success and durability of dental treatments [8–10].

Despite scientific evidence and official recommendations [11, 12], dentists seem reluctant to use RD, as many recent studies report a fairly low overall rate of RD usage [13–16]. The most common reasons reported for its underuse were inconvenience and difficulty in use, insufficient and inadequate training, prolonged time of treatment, cost of equipment, as well as the assumption that patients would not accept it [6, 13, 14, 17]. Interestingly, these obstacles were usually cited by dentists who did not use RD regularly [13, 18].

Among irregular RD users, the factors found to influence the decision to use RD included the type of treatment, material selection, and region of the mouth requiring treatment. Endodontic treatments are most frequently performed under RD [14, 17, 19]. Regarding restorative treatments, RD was more often used for composite than amalgam restorations, for treatment of posterior than of anterior teeth, and in the lower compared to the upper jaw [14, 17, 19].

Qualifying school [13] and graduate training intensity [20] also affect RD use. It was shown that recently graduated and younger dentists used RD more frequently than their older colleagues [21]. Moreover, there was a clear discrepancy in what dentists are taught in dental schools regarding RD use and how they practice using it after graduation [16]. Even final-year dental students believed their use of RD would decrease once they left school and began working in independent practice [22]. Previous studies reported students' insufficient theoretical knowledge about the importance of RD [23, 24], and possible negative perceptions associated with RD use [22, 25].

There is a general agreement that acquiring knowledge and skills for the proper use of RD should be a fundamental part of education in dental schools. Giving students a good theoretical background and allowing them to acquire manual dexterity during their studies should give them the confidence to use RD in the future. To the best of the authors' knowledge, there are no scientific data on the prevalence of RD use among Serbian dentists, nor are there data on whether and how RD is taught in dental schools. Therefore, the aim of the study was to assess knowledge and training skills, as well as attitudes and opinions towards the use of RD among the final, fifth-year dental students attending the Faculty of Dental Medicine, University of Belgrade, Serbia.

## Methods

A 34-item original questionnaire, designed by the authors for the purpose of the study, was distributed to 130 fifth-year students of the largest public dental school in Serbia, the Faculty of Dental Medicine, University of Belgrade. The questionnaire included "open" and "closed" questions, divided into four segments: (1) general information regarding the students' attendance at practical and theoretical courses; (2) RD-related knowledge and training skills; (3) opinions and attitudes regarding the use of RD; (4) opinions on the intended future use of RD in their independent practice. The study protocol for this observational cross-section study was approved by the Ethics Committee of the Faculty of Dental Medicine, University of Belgrade, (no. 36/24, 23.10.2020). Students were allowed to decline participation in the study. All completed questionnaires were collected anonymously.

Descriptive analyses of the data gathered from the questionnaires were performed using the statistical program IBM SPSS for Mac (Version 21.0 Chicago, IL, USA).

## Results

Out of 130 distributed questionnaires, 108 were adequately completed and returned and were included in the study (response rate of 83.08%).

### *General information*

All (100%) students reported they were attending all practical courses regularly. Regarding theoretical classes, 44 (41%) students were regular attendants, while the rest (64, 59%) of them attended theoretical courses irregularly.

### *Knowledge and practical skills*

All (44) students who regularly attended theoretical courses reported that they were taught about RD in classes and that the advantages of RD over relative isolation with cotton rolls and saliva ejectors were pointed out. Out of them, 21 (48%) considered that the topic was covered in detail, 18 (41%) students reported that it was covered superficially, and 5 (11%) of them claimed that the topic was only mentioned. Figure 1 shows the distribution of responses regarding subjects that had theoretical lessons about RD obtained only from the students who regularly attended theoretical courses.

During practical courses, 37 (34%) students observed RD placement, and 11 (10%) placed RD on their own or with the teacher's assistance. Nine students placed RD only once, while two students placed RD twice in different practical courses. In total, RD has been placed 14 times – five times in restorative dentistry, five times in pediatric dentistry, and four times in endodontics.

Ninety-five (88%) students answered that theoretical and practical training obtained during their studies was not sufficient for them to use RD on their own. A little more than half of them (56 students, 52%) have searched for more information about RD, mainly on the Internet.

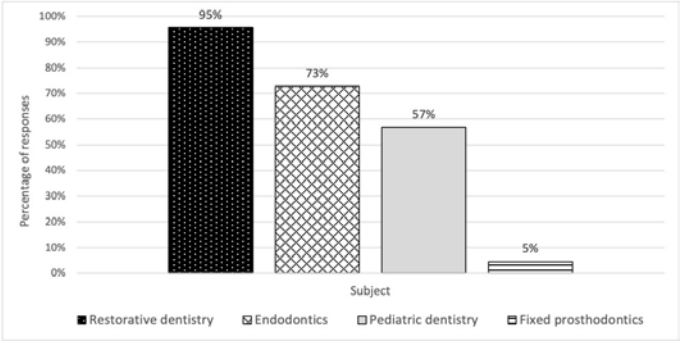



**Fig. 1 – Distribution of students' responses regarding the subjects that had theoretical lessons about the rubber dam (only responses obtained from 44 students that regularly attended theoretical courses were taken into consideration).**

*Opinions and attitudes*

The overview of the responses to "yes/no" questions related to the students' opinions and attitudes toward the use of RD is presented in Table 1.

The majority (55%) of students thought that RD use would decrease the duration of the treatment, while others (28%) thought it would increase or have no influence (17%) on the duration of the treatment.

When asked to express their opinion on the benefits of RD use, 64% considered it beneficial for dental interventions in both the upper and lower jaw, while the remaining students (36%) thought it was more beneficial for interventions in the lower jaw. Sixty-two percent of students agreed that it is equally important for the treatment of anterior and posterior teeth, whereas 38% thought it was more useful for posterior teeth. Half (50%) of the students reported that RD was useful for both composite and amalgam restorations, while 42% considered it useful only for composite restorations.

Figure 2 shows the students' opinions about the most difficult step during the RD application.

**Table 1**

**The responses to "yes/no" questions related to the students' opinions and attitudes toward the use of the rubber dam**

| Question | Answer | |
|---|---|---|
| | yes n (%) | no n (%) |
| Do you think it is necessary to provide students with basic knowledge and practical training on the use of the rubber dam during their undergraduate studies? | 105 (97) | 3 (3) |
| Do you think that achieving adequate isolation of the operating field for either endodontic or restorative procedures is possible without the use of the rubber dam? | 41 (38) | 67 (62) |
| Do you think that the rubber dam has certain advantages compared to the isolation with cotton rolls and saliva ejectors? | 108 (100) | 0 (0) |
| Do you think that the success of the endodontic treatment is higher if the operating field is isolated with the rubber dam than with cotton rolls and saliva ejectors? | 102 (94) | 6 (6) |
| Do you think that rubber dam placement is a difficult and complicated procedure? | 35 (32) | 73 (68) |
| Do you think that rubber dam placement is more difficult than other procedures you regularly perform as part of your practical classes? | 38 (35) | 70 (65) |
| Do you think that the help of a dental assistant is necessary for rubber dam placement? | 55 (51) | 53 (49) |
| Do you think that dental treatment is less comfortable for patients if the rubber dam is used? | 39 (36) | 69 (64) |
| Do you think that significant financial resources are required for the rubber dam purchase? | 36 (33) | 72 (67) |

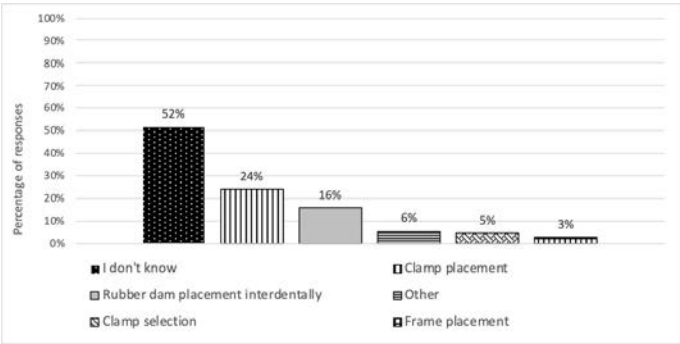



**Fig. 2 – Distribution of students' responses on the most difficult step during the rubber dam application.**

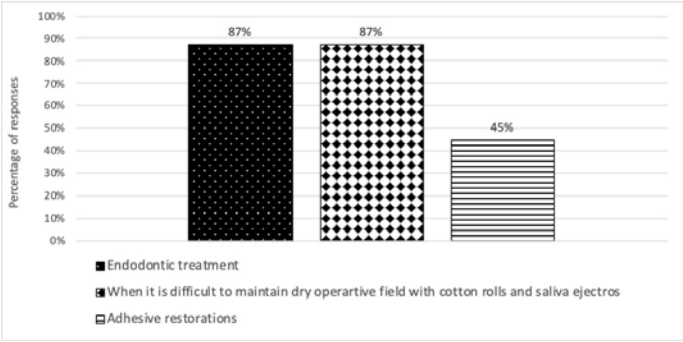



**Fig. 3 – Students' responses regarding the type of operative procedure they would use the rubber dam for.**

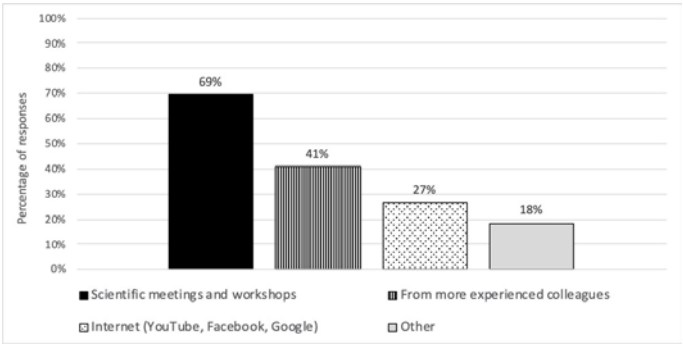



**Fig. 4 – Students' responses regarding the plans for the postgraduate training in rubber dam placement.**

*Opinions on the intended future use*

The majority (64%) of students reported they were willing to use RD in their future practice; 27% would decide whether to use RD or not, depending on the type of operative procedure or the situation they encounter (Figure 3); 9% of the students did not plan to use it at all. Almost all (84%) of them planned to gain additional postgraduate training in different ways (Figure 4).

## Discussion

Although teaching students about RD has been part of dental school training for decades, there is worldwide scientific evidence showing its limited use among dental professionals [13, 14, 20, 26–28]. The most important measure proposed to overcome the reluctance of dentists to use RD is better undergraduate education and training [15]. Investigations among dental students, using questionnaires as a research instrument, are often conducted as a helpful tool to identify their knowledge and perceptions of RD, as well as to reveal potential problems in the educational process [22–25, 29].

In the present study, all students who regularly attended theoretical courses confirmed that they learned about RD and its advantages during lectures. Apart from restorative dentistry and endodontics, attention to RD was also given in pediatric dentistry lessons, indicating the necessity of using RD in pediatric patients as well. However, more than half of the participants have never observed or performed RD placement during clinical training. This discrepancy between what is taught and how clinical procedures are being performed may be confusing for future dentists. Considering the almost complete lack of practical training, it is not surprising that almost 90% of students did not believe they were capable of using RD on their own. All of the mentioned facts could explain RD's underuse in independent practice after graduation from dental school.

Various results could be found in the literature concerning the students' use of RD on adult patients. In Saudi Arabia, dental students used RD almost always [29], while in Ireland and the UK, the majority of students used RD occasionally [22]. When it comes to pediatric patients, more consistent findings were reported – RD was used rarely or never [22, 25, 29]. Interestingly, in the present study, almost an equal number of students placed RD during restorative dentistry, endodontics, and pediatric dentistry practical courses.

One of the segments that should be covered in dental schools is the legal aspect of RD placement. In case when RD isolation is not performed and an endodontic instrument is inhaled by the patient, a medicolegal aspect of negligence is impossible to defend [30]. Patient safety during dental treatment is essential from the practitioner's as well as the patient's point of view. Although it does not happen very often, there are some reports of inhaling and ingesting endodontic instruments during root canal treatment performed without RD isolation [31, 32].

The present study shows that, despite little experience with RD, all students seemed to be certain about the necessity of acquiring knowledge and skills for RD use during their studies. They were convinced that RD isolation has ad-

vantages compared to cotton rolls and saliva ejectors and that the success of endodontic treatment depends on RD use. However, around 40% of students still believed that adequate isolation of the operating field for either restorative or endodontic procedures is possible without the use of RD. These results support earlier findings, but it should be noted that significant differences existed between the schools when more than one school was investigated [22, 23, 25, 29]. Furthermore, various factors, such as clinical procedure, choice of material being placed, and the jaw in which treatment is performed, were found to influence the use of RD [14, 17, 19, 22, 25]. In this study, more than half of the participants believed that RD was beneficial for both the upper and lower jaw, anterior and posterior teeth, and composite and amalgam restorations.

Considering that one of the frequent reasons mentioned for RD underuse is its difficult application, around 70% of the students did not think it was a difficult and complicated procedure, nor that it was more difficult than other procedures they regularly perform. That is in contrast to the results of other studies [22, 23, 25, 29], probably because the students who participated in the present study observed the procedure but did not perform RD placement by themselves. Consequently, the vast majority of students were not sure about the most difficult step during RD placement. The second most frequent response was clamp placement, similar to a previous study that reported clamp selection and its adaptation as the most complicated step for students [25]. Conversely, in another research, most students were confident regarding which clamp to use, but the most cited difficulty in RD appliance was tight contacts [23]. Moreover, students had divided opinions on whether assistance was required for RD placement. In another study, students generally believed that assistance was not necessary for RD application [25], while Imbery and Carrico [28] reported that students particularly struggled with RD placement when they were working alone and that they preferred if the assistant was available.

There is a common belief among students [23, 25, 29] and dentists [6, 13, 14, 17] that patients have negative attitudes toward RD. In the present study, around 65% of students considered that the application of RD did not make dental procedures less comfortable for the patients, which is in line with the results reported by Mala et al. [22]. When patients were asked, the majority of them had a positive experience with RD and preferred it to be used at their next appointment [33–35]. RD was even acceptable to pediatric dental patients [36].

The students involved in the present research were not particularly worried about the time needed for RD application. Less than 30% of students thought that placing RD would increase the time of treatment, which is opposite to the opinions of the students from another research [25]. It was proved that it takes only 4 to 5 min [23, 33, 34] for students to apply RD and even less time for the dentists. Probably, calculating the time that would subsequently be saved throughout the procedure performed with RD, most of the students in this research considered that the overall time of the procedure would be shorter.

The financial aspect, i.e., the fact that the cost of the equipment and the treatment increase, is one of the widely discussed factors that might influence the use of RD [6, 13, 14, 17]. However, it is obvious that a technique with clear infection control has benefits, and medico-legal implications should not be excluded due to cost [14]. That was confirmed by a study where no respondent referred to cost as a reason for not using RD [17]. While most of the students in this study thought that RD purchase does not require significant financial resources, it could be assumed that finances would have a more significant impact on their attitude once they start working in the independent private practice.

Even though only a small number of students used RD during their studies, the encouraging fact is that around 60% of them plan to use it regularly in their future work, suggesting their positive attitude and commitment to its use. As expected [14, 17, 19, 22, 25], among those who intend to use RD only for certain clinical procedures, endodontic treatment would be the one that, in their opinion, requires RD application. Another anticipated situation that could potentially urge them to use RD is when it is difficult to maintain the operative field dry with cotton rolls and saliva ejectors. Nevertheless, final-year dental students that participated in this study did not feel they were sufficiently trained to use RD on their own in the future, as almost all of them plan to gain additional postgraduate training, mainly through scientific meetings and workshops and from more experienced colleagues.

## Conclusion

Based on the results of this study, it could be concluded that students have solid theoretical knowledge about RD, are aware of its importance, and have a positive attitude and enthusiasm toward RD use. On the other hand, their practical training and skills are poor and seem to be insufficient for independent RD use. It is necessary to dedicate more attention to RD isolation techniques throughout undergraduate practical courses so that dental students can implement acquired knowledge and skills in their practice after graduating. To avoid confusion among students, teachers in dental schools should be consistent and eliminate the discrepancy between how they perform dental procedures in the clinic and what they teach in the classroom.

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Received on March 25, 2021
Revised on May 15, 2021
Accepted on September 9, 2021
Online First September 2021