

ORIGINAL ARTICLE

Knowledge, Attitude and Practice of Undergraduate Dental Students Towards The Use of Rubber Dam During Various Dental Procedures

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ABSTRACT

Though the rubber dam has many advantages and recommendations and is extensively taught in most dental colleges, the use of rubber dam is still ignored. Undergraduate dental students are the future generation of dental practitioners. Rubber dam application training during dental graduation plays an important role in inculcating its implementation by future general dentists. It is critical to understand students' attitudes toward the use of rubber dam because this will influence the trends in their future dental practice. Hence, the dental schools must periodically evaluate the attitude of learners during clinical training. Very few studies conducted on understanding students' attitudes toward the use of rubber dam in Saudi Arabia and there is no available study comparing attitude, knowledge and practice among students studying at different levels from the same institution. Hence, the present study intended to evaluate and compare the attitude of undergraduate dental students studying at different levels of clinical years in a private dental college towards the use of rubber dam during various dental procedures along with emphasis on evaluation of its prospective application after their graduation in general dentistry practice. A structured questionnaire based survey was conducted among students in different clinical years of dentistry program and the responses were calculated and compared between the study groups by Chi-square test with level of significance set at $p \leq 0.05$. The present survey has shown very positive results regarding the undergraduate students' confidence and training for placing a rubber dam for adult patients while performing root canal treatment, restorative procedures and post core procedures. When compared between the students of different years, the confidence and training of higher level students was much better compared to lower level students. A good number of students are willing to continue using rubber dam in their future clinical practice after their graduation.

Keywords: Attitude, Practice, Knowledge, Dental students, Rubber dam

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INTRODUCTION

Dr. Sanford Christie Barnum introduced the rubber dam system to the globe in 1864; since then, it has undergone many changes, and it is now an essential aspect of dental procedures [1]. Rubber dams are used all around the world to help with operative area isolation, aseptic field provision, infection control,

and prevention of swallowing or aspiration of dental equipment and/or materials. It also helps the operator protect soft tissue while providing comfort to the patients. The operator efficiency increases as the rubber dam minimizes the patient conversation during treatment and the need for frequent rinsing [2-4]. Furthermore, it reduces the cross contamination of the working area and provides barrier against the spread of infection [5]. Rubber dam is recommended during various dental treatment procedures. To provide high-standard care, many societies like European Society of Endodontology [6] and British Society of Pediatric Dentistry [7] recommend the use of rubber dam during many dental procedures. Furthermore, from a medicolegal standpoint, it is critical to utilize rubber dam to prevent malpractices, failing to do so could result in serious consequences [8].

Though the rubber dam has many advantages and recommendations and is extensively taught in most dental colleges, the use of rubber dam is still ignored, as rightly stated by Ireland in 1962 that, "Probably no other technique, treatment or instrument used in dentistry is so universally accepted and advocated by the recognized authorities and so ignored by the practicing dentists" [9].

Undergraduate dental students are the future generation of dental practitioners. Rubber dam application training during dental graduation plays an important role in inculcating its implementation by future general dentists. It is critical to understand students' attitudes toward the use of rubber dam because this will influence the trends in their future dental practice. Hence, the dental schools must periodically evaluate the attitude of learners during clinical training.

To our knowledge, very few studies have been conducted on understanding undergraduate dentistry students' attitudes toward the use of rubber dam in Saudi Arabia till now. Also, there is no available study comparing the attitude, knowledge and practice among students studying at different levels from the same institution. Hence, the purpose of the present study was to evaluate and compare the attitude of undergraduate dental students studying at different levels of clinical years in a private dental college of Jeddah, Saudi Arabia towards the use of rubber dam in clinics along with emphasis on evaluation of its prospective application after their graduation in general dentistry practice.

MATERIAL AND METHODS

A structured questionnaire of 14 questions was developed after extensive literature review and expert discussion and opinion from subject experts of Department of Conservative Dental sciences, Ibn Sina National College, Jeddah.

The questionnaire included "open" and "closed" questions, which were divided into four segments: 1) general information regarding the age, gender and year/ level of under graduation (2) rubber dam-related knowledge and training skills (3) opinions and attitudes towards the use of rubber dam for a range of clinical procedures (4) opinions on the intended future use of rubber dam in their independent practice and their willingness to gain knowledge about rubber dam through training/ CDE programs. They were also asked as to what would be the reason if at all for them to not use rubber dam during clinical practice after graduation.

The sample size is determined using random sample with 95 % confidence interval and 0.05% marginal error, for around 200 students at various levels of dentistry program, ISNC, Jeddah. 143 students were only needed, however all the 227 students (4th year, 5th year, 6th year and Interns) were allowed to participate in the study. The questionnaire was put through pilot testing with a random sample of 20 interns and reliability was up to 0.7, which was found satisfactory for conducting the study. These 20 questionnaires were not included in the final study.

The printed questionnaire form was distributed to all 227 students in clinical years of dentistry program with consent form after approval from the ethical committee of Ibn Sina National College, Jeddah. The survey was conducted in the beginning of the second semester allowing the students to have an experience of rubber dam in respective year/level for one semester before attempting the survey. All students were informed that participation in the survey was optional with due respect to their anonymity. Completed questionnaires were submitted by all the students as none declined to participate, hence the response rate was 100%.

After collection of responses from the students, questionnaires were coded and data entered and analysed using Statistical Package for the Social Sciences (SPSS) Version 26 for descriptive analysis and mean standard deviation. The percentage for responses were calculated and compared between the four study groups by Chi-square test to find the significance of study parameters on categorical scale between two or more groups with the level of significance set at $p \leq 0.05$.

RESULTS

The questionnaire was distributed to 227 students from 4th year, 5th year, 6th year and Interns of dentistry program, ISNC, Jeddah. In this study, majority of the students were in the age group of 21-25(78%).The response rate was 100% as the completed questionnaire was returned by all participants (n = 227).

Table 1: Perception of study participants toward the use of rubber dam

Variables	Fourth year	Fifth year	Sixth year	Internship	X ² - Value	p- Value
Do you believe that the use of rubber dam (wherever indicated) should be the standard of care in Dentistry?						
Yes	34 (15)	55 (94.8)	49 (98)	42 (49.4)	69.640	0.000
No	0 (0.0)	3 (5.2)	1 (2)	43 (50.6)		
Do you think you have been given adequate training regarding rubber dam placement for various dental procedures?						
Yes	3 (8.8)	56 (96.6)	49 (98.0)	75 (88.2)	121.590	0.00
No	31 (91.2)	2 (3.4)	1 (2.0)	10 (11.8)		
Do you believe rubber dam enables clearer access & provides an aseptic working environment when placing restorations?						
Yes	30 (88.2)	56 (96.6)	49 (98.0)	77 (90.6)	5.206	0.157
No	4 (11.8)	2 (3.4)	1 (2.0)	8 (9.4)		
Do you think rubber dam should be compulsory before starting endodontic treatment?						
Yes	32 (94.1)	56 (96.6)	47 (94.0)	76 (89.4)	2.928	0.405
No	2 (5.9)	2 (3.4)	3 (6.0)	9 (10.6)		
During endodontic treatment of teeth with extensive tissue loss						
I don't use rubber dam	5 (14.7)	35 (60.3)	11 (22.0)	43 (50.6)	32.462	0.00
I perform a restoration (pre-endodontic build up) so that I can place the rubber dam.	29 (85.3)	23 (39.7)	39 (78.0)	42 (49.4)		
During endodontic treatment of teeth does the rubber dam makes radiographic procedure difficult?						
Yes	30 (88.2)	55 (94.8)	40 (80.0)	55 (64.7)	21.213	0.000
No	4 (11.8)	3 (5.2)	10 (20.0)	30 (35.3)		
Do you think rubber dam should be compulsory for post and core placement procedures?						
Yes	18 (52.9)	55 (94.8)	19 (38.0)	71 (83.5)	55.157	0.000
No	16 (47.1)	3 (5.2)	31 (62.0)	14 (16.5)		
Do you use rubber dam in pediatric patients?						
Yes	10 (29.4)	54 (93.1)	5 (10.0)	52 (61.2)	84.493	0.000
No	24 (70.6)	4 (6.9)	45 (90.0)	33 (38.8)		
Does application of rubber dam extend the treatment procedure time?						
Yes	29 (85.3)	56 (96.6)	31 (62.0)	59 (69.4)	15.608	0.00
No	5 (14.7)	2 (3.4)	19 (38.0)	26 (30.6)		
Rubber dam is more necessary while working in the						
Mandible	0 (0.0)	33 (56.9)	21 (42.0)	36 (42.4)	24.776	0.00
Maxilla	0 (0.0)	3 (5.2)	0 (0.0)	10 (11.8)		
Both	34 (100.0)	22 (37.9)	29 (58.0)	39 (45.9)		
Do you need assistance for placement of the rubber dam or can you place it by yourself?						
Can place by myself	1 (2.9)	47 (81.0)	28 (56.0)	68 (80.0)	55.164	0.00
Need assistance	33 (97.1)	11 (19.0)	22 (44.0)	17 (20.0)		
Total	34 (100.0)	58 (100.0)	50 (100.0)	85 (100.0)		

Table 1 illustrate the perception of study participants towards use of rubber dam. Of the total 227 students who responded to this study, 34 (14.9 %) were 4th year students, 58 (25.5 %) were 5th year students, 50 (22.02 %) were 6th year students and 85 (37.44 %) were interns.About 79.3% of students agreed that the use of rubber dam (wherever indicated) should be the standard of care in dentistry and 80.6% students agreed that they have been given adequate training regarding rubber dam placement for various dental procedures. However,91.2% students from the fourth BDS think that they have not been given adequate training regarding rubber dam placement. 93.4%students from all the years believed that rubber dam enables clearer access & provides an aseptic working environment when placing restorations. Of 93% students agreed that rubber dam should be compulsory before starting endodontic

treatment. 58.6% students intended to use rubber dam during endodontic treatment of teeth with extensive tissue loss after doing a pre-endodontic build up, while 41.4% students said that for teeth with extensive tissue loss, they would not use a rubber dam. However, 79.3% of students think that the rubber dam makes radiographic procedure difficult during endodontic treatment of teeth. About 71.8% of students think that rubber dam should be compulsory for post and core placement procedures and only 53.3% said they would prefer to use rubber dam in paediatric patients. About 77.1% students said that application of rubber dam extended the treatment procedure time and 63.4% students indicated that they can place the rubber dam by themselves without any assistance and 36.6% of them said they need assistance during rubber dam placement. About half of the students (54.6%) agreed that rubber dam must be used in both the jaws, while 39.6% said it is more necessary while working on mandibular teeth than on maxillary teeth (5.7%). Majority of students (66.1%) indicated that following graduation they would use the rubber dam during all procedures indicated and 5.3% said they would never use it. Of the remaining students 21.1% of them intended to use it only during root canal treatment and 7.5% intended to use it only during restorative procedures. The students who said that they will not use rubber dam during their clinical practice mentioned the reasons given below.

My training was not adequate	25.6%
Use of cotton rolls & Suction are sufficient for all dental procedures	15.9%
The patients does not like it	21.1%
Too time consuming to place rubber dam	35.7%

However, 80.6% of the students were willing to gain knowledge about rubber dam through training/ CDE programs during or after graduation (Table 2):

Table 2: Perception of participants toward graduate program in term of rubber dam use

Variables	Fourth year	Fifth year	Sixth year	Internship	X ² Value	p-Value
Following graduation:						
I will use the rubber dam during all procedures indicated	9 (26.5)	45 (77.6)	29 (58.0)	67 (78.8)	52.934	0.000
I will use it only during restorative procedures	5 (14.7)	6 (10.3)	0 (0.0)	6 (7.1)		
I will use it only during root canal treatment	16 (47.1)	5 (8.6)	20 (40.0)	7 (8.2)		
I will never use it	4 (11.8)	2 (3.4)	1 (2.0)	5 (5.9)		
If I do not use rubber dam during clinical practice, it is because						
My training was not adequate	12 (35.3)	21 (36.2)	1 (2.0)	24 (28.2)	131.215	0.00
Use of cotton rolls & Suction are sufficient for all dental procedures	1 (2.9)	24 (41.4)	0 (0.0)	11 (12.9)		
The patients does not like it	13 (38.2)	4 (6.9)	2 (4.0)	29 (34.1)		
Too time consuming	7 (20.6)	9 (15.5)	45 (90.0)	20 (23.5)		
Other	1 (2.9)	0 (0.0)	2 (4.0)	1 (1.2)		
During or after graduation are you willing to gain knowledge about rubber dam through training/ CDE programs?						
Yes	31 (91.2)	53 (91.4)	41 (82.0)	58 (68.2)	15.126	0.002
No	3 (8.8)	5 (8.6)	9 (18.0)	27 (31.8)		
Total	34 (100.0)	58 (100.0)	50 (100.0)	85 (100.0)		

DISCUSSION

Rubber dam has numerous benefits and is recommended during various dental treatment procedures. Routine placement of rubber dam is considered as the standard of care by professional organizations.^{6, 7} In our present study majority of our students 180(79%) of all the clinical years from fourth year through internship levels believed that use of rubber dam should be the standard of care in dentistry which was a

very encouraging response as in some countries like Belgium, only a very minor proportion (3.4%) believed rubber dam to be a standard procedure [10].

There was a positive correlation between academic years and sex with around 178(78%) females and 49(22%) male students. This statistically significant difference can be correlated with many studies in Saudi Arabia that are showing evidence that more females are taking up dental profession because of the career options for women are limited mainly to education and medicine until recently and also the male students in Saudi Arabia usually prefer to study abroad whereas females are obliged to stay in their native by tradition or for marriage [11, 12]. Hence, more female students are studying dentistry in Saudi Arabia without need to travel or being away from their families, as the Kingdom providing with more advanced undergraduate and postgraduate education in dental specialties recently [13].

When the students from all levels were asked if they have been given adequate training for rubber dam placement for various dental procedures, around 183(80.6%) of total students responded positively. This result was equivalent to the results in a study by Abuzenda in which 80.9% of the students gave positive response [14] whereas in a study by Al-Haj Ali and Al-Mohaimeed at College of Dentistry, Qassim University only 64.6% agreed to adequate training [15] and in a study conducted by Tanalp *et al* in 2 dental schools of Istanbul the response was 78% [8]. When the responses were compared between the different levels of students, only 8.8% of the 4th year students responded that their training was adequate. Whereas 5th year, 6th year students and interns were satisfied to a greater extent in regards to their training for rubber dam placement with responses of 96.6%, 98% and 88.2% respectively. The main reason for this was that the clinical training for the rubber dam placement begins for the undergraduate students at the level of 4th year and at the time of the survey these students have experienced rubber dam placement for only one semester hence they felt their training is inadequate. However, as they progress with upcoming semester and higher years/levels of under graduation in the institution these students will be trained with more clinical exposures and feel more confident with rubber dam placement similar to the present students in higher levels.

Around 212 (80.6%) of the students in our study agreed that the rubber dam enables clearer access when placing restorations, which was comparable to the responses from the study conducted by Abuzenda¹⁴ and Mala *et al* [2]. Also, rubber dam was believed to provide an aseptic working environment by same 80.6% students as compared to 60.3% of students in a study by Akbar *et al* on students of College of Dentistry, Aljouf university Saudi Arabia¹⁶ and 45.3% by Abuzenda [14].

Majority of the students 211(93%) from all different years agreed that the rubber dam should be compulsory before starting endodontic treatment and there was no statistically significant difference between the groups ($p > 0.05$). This finding was similar to the results from reports by Mala *et al* [2] and Ahmad IA [17], but much better compared to other studies conducted by Shashirekha³ and Al-Abdulwahhab, *et al* [18].

Around 163 (71%) of the students agreed that the rubber dam should be compulsory for post and core placement procedures. This was a very encouraging response compared to the results in a study conducted by Yoshida *et al* showing only 45% of the dentists using rubber dam during core placement.¹⁹ In this survey we tried to understand the training and practice of our students and their attitude towards the use of rubber dam placement in the procedures other than restorative and endodontic treatments. There are very less studies evaluating the effect of coronal leakage during post placement in root canal treated teeth without the use of rubber dam. The studies show a significantly higher success rate of root canal-treated teeth when the rubber dam was used during post placement [20]. However it is very commonly noted that both dentists and dental students place restorations and/or post in an endodontically treated tooth without using rubber dam after performing root canal treatment in an aseptic technique following all the protocols. Hence this part of the survey helped us to understand a very important aspect of the rubber dam training in the institution in prosthodontic area which is not evaluated in many studies. When compared between the groups, there was positive correlation between different year students ($P < 0.05$), where in around 95% of 5th years and 83.5% interns responded positively whereas only 52.9% of fourth years and 38% of 6th year students responded positively. The main reason for the fourth year students' responses was that they are not experienced clinically in this aspect at their level but for the sixth year students reason could be they have to select a comprehensive case comprising of three branches of restorative endodontic, prosthodontic treatment and has to be completed irrespective of the difficulty of the case or procedures. Hence, the rubber dam placement for post and core in their clinical cases are taken on case to case basis and less emphasis given to its use in each and every case. However, these findings were better than the study done by Goldfein *et al* where only 14% students used rubber dam during post and core placement [20].

Around 121(53.3%) of the students said they would prefer to use rubber dam in pediatric patients. These findings are very good compared to other studies by Shashirekha [3], Tanalp *et al* [8] and Mala *et al* [2] which showed only 15.4%, 11% and 32% positive responses respectively. The main reason for not using rubber dam in paediatric patients can be attributed to the poor cooperation and anxious behaviour of children. Majority of dentists using rubber dam regularly do not use it when treating children. This issue needs to be addressed from a pedodontic point of view since the incidence of instrument aspiration is highest among paediatric patients. However, when compared between the groups there was a statistically significant response by 5th year students, where around 93% agreed that they use rubber dam in paediatric patients, this can be mainly attributed to the emphasis and encouragement for rubber dam use by teaching faculty of this year, which must be considered as a leading example for faculties of other groups to be followed in the future years of their teaching.

In our survey the question whether during endodontic treatment of teeth with extensive tissue loss the students perform a pre-endodontic build up in order to place the rubber dam, around 133(58.6%) of them answered positively which was very encouraging response as compared to a study by Tanalp *et al* where only 23% students mentioned that they perform pre-endodontic build up in their cases. However, when compared between the groups, positive responses by 4th and 6th year students was statistically significant as compared to 5th year and internship students where in more number of students did not use rubber dam during extensive loss. The main reason in this situation maybe because less clinical experience of 5th year students since they perform simple endodontic cases as this will be their first clinical training in endodontics. There was comparatively less response by interns for pre-endodontic build up as compared may indicate the flexibility of the instructors in such cases during internship as they have rotations in multiple hospitals. Though very good response from 4th years suggest very good teaching and training in their preclinical endodontic course which will impact positively in their upcoming clinical training years. Also a result showing good practice from 6th year students are encouraging and are attributed to the emphasis and encouragement of rubber dam use with pre-endodontic build up by teaching faculty of this year.

Most students felt 180(79%) that rubber dam makes radiographic procedures difficult to perform was similar to studies conducted by Abuzenda (87%) [14], Akbar *et al* (76%) [16], Tanalp *et al* (88.4%) [8] and Khathoon and Raj (83%) [21] on students and general dentist populations. When compared between the groups of different years, the responses were statistically significant with 4th and 5th year students finding it more difficult. However the difficulty decreased comparatively in 6th year and internship students owing to their higher levels proving their better practice and improved experience.

In the present study, 175(77%) of the students reported that rubber dam placement extends the time for treatment. These results were comparable to the findings by Al-Haj Ali and Al-Mohaimed¹⁵ and Tanalp *et al* [8] in their study where in 77.9% and 87.8% of the students reported that that rubber dam increases the treatment time respectively. Whereas in a study by Abuzenda 61.8% students agreed that rubber dam placement extends the time for treatment which was comparatively better than our study. Comparison between the groups showed statistically significant responses where majority of 4th and 5th year students reported rubber dam extends treatment time and the number of students reporting the same were less comparatively from 6th year and internship. This was very interesting finding as it showed that with in initial phase of training students find difficulty in placing rubber dam but more training and experience with the system placement time is decreased significantly [14].

When the students were asked about the necessity of rubber dam placement while working in the mandible, maxilla or both, around 124 (54.6%) students reported to be used in both the jaws. This finding was similar to findings of the study by Abuzenda where half the students agreed to use of rubber dam in both jaws [14]. Around 39.6% of the students in our study reported that rubber dam is only necessary in mandible which was almost similar to study by Abuzenda [14] but against findings of Khathoon and Raj [21] where in around 95% of dentists agreed the rubber dam placement is necessary in mandible, this could be also because in this study both jaws option was not provided in the questionnaire.

In this study around 144(63.4%) students answered that they can place the rubber dam without assistance which was a much better response as compared to other studies [14, 21]. There was an interesting positive correlation when the groups were compared wherein around 97% of 4th year students responded that they need assistance as compared to other years. This can be attributed to the lack of their training and experience as they are in their initial phases of clinical training of rubber dam placement. However there was significantly greater number of students from other higher levels who could place rubber dam on their own without the assistance.

It was very encouraging finding that around 150 (66%) of the students agreed to use rubber dam during all the indicated procedures following their graduation which was comparatively much higher as compared to the studies by Tanalp et al (25%), [8] Khathoon and Raj (24%) [21] and Akbar et al (37%) [16]. However, the numbers were lesser compared to study by Abuzenda (85.5%).¹⁴When compared between the years, significantly higher response was found by interns (78.8%) and least was found by 4th year students (26.5%) since they are still in initial phases of training. This finding signifies importance of the undergraduate training and experience that affects the attitude of the future practitioners in choosing the rubber dam in their routine dental practice [22].

When the students were asked to mention the reason as to why they may not be using rubber dam in their future clinical practice, majority of the students 81 (35.7%) mentioned it is too time consuming. When compared between the groups there was significant difference between the groups. 4th (35%) and 5th year (36%) students understandingly responded that if they do not use rubber dam in their clinical practice it is because of inadequate training. This finding correlates with their stage of initial training years, lack of experience and skill which they will be able to achieve as they progress to higher levels of the institute [22].

Around 90% of 6th year students felt the rubber dam was too time consuming however around 98% of them accepted that their training was adequate. Around 34.1 % of interns felt that the patients don't like it. However, majority of the studies show that this is not correct as many patients prefer rubber dam. These both findings signified the reports by various studies that the negative perception of patients' dislike towards rubber dam may be attributed strongly to the practitioner's attitude, experience and their level of skill [10].

When the students were asked if they are willing to gain knowledge about rubber dam through training/CDE programs during or after graduation 183(80.6%) responded positively. This was a very positive and encouraging response by our students which was similar to the findings in a study byCsinszka K-IAet al.²⁴ When compared between the groups, majority of the students from 4th, 5thand 6th year were more interested in gaining knowledge on rubber dam through training programs as compared to interns of the institution.

LIMITATION

The main limitation of this study is that we restricted our study only to the rubber dam isolation and other forms of isolation were not queried. Because rubber dam isolation is the best and most effective method of isolation as compared to other forms of isolation and is considered to be the standard of care since it not only isolates but also protects against instrument/material aspiration. Also the effectiveness of other types of isolation of the operating field for various dental procedures has not been established.

CONCLUSION

The present survey has shown very positive results regarding our undergraduate students' confidence and training for placing a rubber dam for adult patients while performing root canal treatment, restorative procedures and post core procedures. When compared between the students of different years, the confidence and training of higher level students was much better compared to lower level students. However, in case of pediatric patients and teeth with extensive tissue loss the rubber dam use is significantly less. Hence more training is recommended in these areas at all levels. A good number of students are willing to continue using rubber dam in their future clinical practice after their graduation. This result emphasized the fact that better undergraduate education is the most effective measure to increase its usage in dental practice. There was a high willingness observed to gain knowledge about rubber dam through training/CDE programs during or after their graduation.

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