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KNOWLEDGE, ATTITUDE, PRACTICE AND CLINICAL BEHAVIOUR TOWARDS MINIMALLY INVASIVE DENTISTRY AMONG DENTAL INTERNS IN PUNE CITY: A CROSS-SECTIONAL STUDY

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ABSTRACT

Background: Minimally Invasive Dentistry (MID) is the most modern approach for the management of dental caries. There is limited evidence that whether the familiarity with MID principles imbibed through the curriculum is translated into clinical decision-making and practice. This study was conducted to assess the knowledge, attitude, practice and behaviour of dental interns towards MID. **Methods:** A cross-sectional survey was conducted in the year 2015 for a period of 3 months among 260 dental interns of 3 dental colleges, Pune city using a self-administered validated questionnaire. In addition to the demographic profile, 28 questions focused on knowledge, attitude, practice and behaviour towards MID. The data was analysed using descriptive statistics, Chi-Square test to compare proportion of correct answers and Spearman's rank correlation to assess relation between knowledge, attitude, practice and their clinical decision behaviour scores. **Results:** A total of 256 questionnaires were found to be legible with an overall response rate of 98.4%. The mean scores for knowledge (4.19 ± 1.2), attitude (6.60 ± 2.02), practice (22.59 ± 3.83), and clinical decision behaviour (2.88 ± 1.21) showed that these interns had adequate knowledge and a positive attitude toward MID. The mean clinical behaviour score showed a significant correlation with knowledge and practice and even between knowledge and attitude. **Conclusion:** Though majority of dental interns had inadequate knowledge but they showed a positive attitude towards MID which, to some extent influenced their clinical decision making behaviour and its practical application.

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INTRODUCTION

The practice of dentistry has benefited from new technologies, the development of adhesive restorative materials, and more comprehensive knowledge of cariology (Khijmatgar S and Balagopal S, 2016). The paradigm shift that is presently occurring in dental practice is likely a result of these developments (Gaskin C *et al*, 2010). Preservation of a healthy set of natural teeth for each patient should be the objective of every dentist (Murdoch-Kinch CA and Mclean ME, 2003). Caries prevention and early detection, now a primary focus, have become an important part of dental practice, paving way for the concept of minimally invasive dentistry (MID) (Mount GJ and Ngo H, 2000).

MID is a treatment philosophy based on a refined model of dental care that consists of accurate caries diagnosis; classification of the caries severity using radiographs and other tools; assessment of individual caries risk; arresting active lesions; remineralizing and monitoring cavitated arrested lesions; placement of restorations in teeth with cavitated lesions

using minimal cavity designs; and assessing disease management. Its most important principle is to delay operative intervention "until the disease is controlled and operative intervention has become essential because of cavitation, patient discomfort, unacceptable form or function, or poor esthetics." MID is sometimes called preservative dentistry, conservative dentistry, or minimally invasive dentistry (Tyas M *et al*, 2000).

A strong decision making is needed to analyze the patients at risk and then treat them appropriately with the available cost effective conservative procedures. Decision making in dentistry is complex. The decisions that dentists make are often based on their knowledge from training experiences and a combination of personal, patient, and practice factors (Gupta G *et al*, 2015). The treatment philosophy a dentist adopts is most likely a result of dental school training practice experience, and continuing education (Gaskin C *et al*, 2010).

It is the need of the hour in dental schools to encompass the concepts of early detection of caries, prevention and minimal intervention. The structure and content of undergraduate dental

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curriculum should be based on the current trends and knowledge about the preventive care and principles of management of caries (Ehsan S *et al*, 2015). One year internship period is very important in the dental curriculum as after that the dental undergraduate students are going to be recognized as future dentists. The lessons of analyzing patients at risk, dental counseling of the patients, decision making, practical use of appropriate conservative techniques is been incorporated in them in this one year of training period.

Despite the trends toward conservative dental treatment, little is known about the familiarity of these concepts among the dental interns as well as translation of knowledge on MID acquired during their training period into practice or clinical decision making process. This study was therefore aimed to assess the knowledge, attitude, practices and clinical decision behaviours of dental interns of Pune city, India.

METHODS

A cross-sectional questionnaire-based survey was conducted among dental interns of all the dental colleges in Pune city, India for a period of 3 months. The reporting of the study is in accordance to the Strengthening The Reporting of Observational Studies in Epidemiology (STROBE) guidelines. The study protocol was reviewed by the Ethical Committee of institutional review board, and ethical clearance was granted. The necessary permission were obtained from the authorities of the 3 dental colleges in Pune city.

A pilot study was conducted to check for the face and content validity of the developed questionnaire as well as to test its reliability and to derive the sample size. The questions were framed after thorough review of the literature and with the help of four experts the questions were reviewed for content validity. Cronbach's coefficient was found to be 0.82, which showed a good internal reliability of the questionnaire. The external reliability was established by test - retest method, among forty dental interns selected for pilot study who were not included in the main study.

The sample size was determined by using single proportion formula ($n = [Z \alpha / 2]^2 p [1-p] / d^2$) at 95% confidence interval, where, $Z \alpha / 2 = 1.96$, $p = 21\%$ prevalence of knowledge of MID from the pilot survey and $d = 5\%$ of marginal error was taken. By substituting the values in the formula, minimum sample size obtained was 255 which was rounded off as 260 dental interns.

A total of 260 dental interns who gave written informed consent were selected by convenience sampling from the three dental colleges. The interns present on the day of the study were included. The questionnaire was administered to the interns in the various departments where they were posted and was collected immediately.

The data related to MID was collected using self-administered, close ended, structured questionnaire. Apart from the demographic profile the questionnaire consisted of four sections with seven questions on knowledge, ten questions on attitude, seven questions on the practice and four questions on clinical decision behaviour.

The questions on knowledge were based on multiple choice questions. Each correct answer was awarded 1 mark while incorrect answer was awarded 0 marks. Scores were based on the number of correct answers given for the knowledge questions. Those who scored more than 75% (≥ 5 correct answers out of 7) were considered as having adequate knowledge while score less than 75% (< 5 correct answers) corresponded to inadequate knowledge (Nimbalkar G *et al*, 2016)

The 10 questions on attitude were based on Likert scale. Strongly agree and agree was awarded 1 mark while uncertain, disagree and strongly disagree was awarded 0 mark for all attitude based questions except for 3 questions based on sealant, diet counselling and use of sharp explorer in the section which were reverse scored with strongly disagree and disagree having 1 mark and uncertain, agree and strongly agree having 0 mark. Scores were based on the number of answers indicating positive attitude of the students. Those who scored more than 60% (≥ 6 correct answers out of 10) were considered as having positive attitude while score less than 60% (< 6 correct answers) corresponded to negative attitude (Nickell G, 1998)

The seven questions on practice were marked as score 4, 3, 2, 1 and 0 for always, often, sometimes, rarely and unawareness about the treatment option respectively where the maximum score was 28 and minimum to be 0, and the four questions on clinical decision making behaviour were awarded 1 mark for the right clinical decision making behaviour.

Statistical analysis was performed using IBM Statistical Package for Social Sciences (Statistics for Windows, Version 21.0. Armonk, NY: IBM Corp.). The descriptive summary statistics included percentages, means and standard deviations. Chi-Square test for proportion was used to compare the proportion of correct answers. Spearman's rank correlation assessed the relation between the variables knowledge, attitude, practice and their clinical decision behaviour. A $p \leq 0.05$ was considered as significant for all statistical analyses.

RESULTS

A total of 256 questionnaires that were completely filled were analysed corresponding to a response rate of 98.4%. The age of the respondents ranged from 21 to 25 years (mean 22.25 ± 1.16 years). Of the 256 dental interns, 103 (40.2%) were males, and 153 (59.8%) were females. The majority (89.5%) of the dental interns were aware of MID through their BDS curriculum. Knowledge, attitude, practice and clinical decision behaviour scores were calculated separately.

Most of the dental interns correctly selected the responses to each question on Knowledge, [Table 1]. However the response to the question of components of MID and for type of Glass Ionomer Cement is used in ART was elicited wrong responses from 216 (84.4%) and 162 (63.3%) of the dental interns respectively. The mean knowledge score of the dental interns was 4.19 ± 1.2 , with only 108 (42.2%) interns having adequate knowledge scores based on the scoring system.

Table 1 Distribution of dental interns according to their knowledge score of MID

Sr. No	Questions	Correct	Incorrect	Chi square	p- value
1.	MID stands for?	229 (89.5)	27 (10.5)	159.39	0.000*
2.	MID include all except	40 (15.6)	216 (84.4)	121.00	0.000*
3.	ART stands for?	248 (96.9)	8 (3.1)	225.00	0.000*
4.	PRR is?	120 (46.9)	136 (53.1)	126.33	0.000*
5.	Type of Glass Ionomer Cement is used in ART?	94 (36.7)	162 (63.3)	18.06	0.000*
6.	White spot lesions should be treated by?	173 (67.6)	83 (32.4)	306.9	0.000*
7.	Latest caries detection techniques?	171 (66.8)	85 (33.2)	28.8	0.000*

* p<0.05

The attitude of the dental interns toward MID was positive with 207 (80.5%) in agreement with the benefits of application of MID procedures and concepts with mean attitude score of 6.60±2.02. However, only 108 (42.2%) of the dental interns exercised the option of “agree” and “strongly agree” to use Amorphous Calcium Phosphate as effective technique for the treatment of caries in primary and permanent teeth[Table 2].

Table 2 Distribution of dental interns according to their attitude towards MID

Sr. No	Statements	Strongly Agree n (%)	Agree n (%)	Unsure n (%)	Disagree n (%)	Strongly Disagree n (%)	Chi square	p- value
1.	G.V. Black’s “extension for prevention” is still relevant in certain clinical situations.	43(16.8)	128(50)	29(11.3)	48(18.8)	8(3.1)	28.8	0.000*
2.	The use of adhesive restorative materials reduces the size of restorations.	64 (25)	120 (46.9)	47 (18.4)	24 (9.4)	1 (0.4)	49.00	0.000*
3.	Sealants are not effective in prevention of pit and fissure caries	14 (5.5)	24 (9.4)	41 (16)	151 (59)	26 (10.2)	126.5	0.000*
4.	Used of closed sandwich technique is an appropriate technique for children and adults	27 (10.5)	140 (54.7)	61 (23.8)	17 (6.6)	11 (4.3)	23.76	0.000*
5.	Diet counseling is recommended only for high caries risk patients	15 (5.9)	51 (19.9)	18 (7.0)	136 (53.1)	36 (14.1)	60.06	0.000*
6.	Sharp explorer should be used for caries detection	62 (24.2)	101 (39.5)	37 (14.5)	22 (8.6)	34 (13.3)	19.14	0.000*
	Effective technique for the treatment of caries in primary and permanent teeth?							
a.	ART	49 (19.1)	167 (65.2)	36 (14.1)	2 (0.8)	2 (0.8)	121.00	
b.	Sandwich Technique	64 (25)	162 (63.3)	20 (7.8)	2 (0.8)	8 (3.1)	150.06	0.000*
c.	Remineralization with Fluoride	55 (21.5)	159 (62.1)	29 (11.3)	1 (0.4)	12 (4.7)	115.56	0.000*
7.	d. Amorphous Calcium Phosphate	22 (8.6)	86 (33.6)	46 (18.0)	7 (2.7)	95 (37.1)	6.25	0.012*

* p<0.05

Table 3 Distribution of dental interns according to practice of MID

Sr. No	Procedures	Always (80-100%) n (%)	Often (40-79%) n (%)	Sometime (10-39%) n (%)	Rarely (0-9%) n (%)	I don't know about the treatment n (%)
1.	Remineralize non-cavitated carious lesions	48 (18.8)	64 (25)	39 (15.2)	79 (30.9)	26 (10.2)
2.	Topical fluoride application	52 (20.3)	87 (34.0)	87 (34.0)	19 (7.4)	11 (4.3)
3.	Prescribe chlorhexidine for caries control	62 (24.2)	76 (29.7)	71 (27.7)	45 (17.6)	2 (0.8)
4.	Seal adjacent pits and fissures with a sealant after Composite restorations	50 (19.5)	78 (30.5)	82 (32.0)	36 (14.1)	10 (3.9)
5.	Repair defective restorations instead of Replacement	30 (11.7)	73 (28.5)	66 (25.8)	75 (29.3)	12 (4.7)
6.	Atraumatic Restorative Treatment	32 (12.5)	74 (28.9)	74 (28.9)	61 (23.8)	15 (5.9)
7.	Sandwich technique	38 (14.8)	103 (40.2)	71 (27.7)	33 (12.9)	11 (4.3)

* p<0.05

The results for each of the seven sub-questions of practice behaviours related to MID performed are presented in Table 3. The sub-questions regarding practice behaviour with the greatest percentage of dental interns selected “always or most of the time” was the use of topical fluoride 139 (54.3%) and prescribing chlorhexidine for caries control 138 (53.9%). Based on the scoring system the mean practice score was 22.59±3.83.

The mean score for clinical decision making behaviour was 2.88±1.21 with majority of students choosing correct treatment options for the given case scenario, [Table 4]. Statistically significant positive but low correlation was seen between knowledge-attitude scores (r = 0.228), knowledge-clinical behaviour decision scores (r = 0.19) and between practice scores and clinical behaviour decision scores (r = 0.16).

DISCUSSION

Minimal intervention dentistry is the most modern approach for the management of dental caries. This shift from intervention to prevention is still in the course of being integrated in a systematic and comprehensive manner in the dental practice (Suma G *et al*, 2017). A dental practitioners clinical treatment decisions can be influenced by their knowledge and attitudes toward care alternatives (Gupta G *et al*, 2015). In this study, only 108 (42.2%) the dental interns had adequate knowledge regarding MID procedures with a mean score of 4.19±1.2.

In a study done in Riyadh and AlKharj it was observed that more than half (51.5%) of the respondents either had no knowledge or only possessed a little knowledge about MID (Shah A *et al*, 2016). This might be due to their little familiarity and use of MID when they were pursuing their postings in public health dentistry, paediatric dentistry and restorative dentistry.

Table 4 Distribution of dental interns according to their clinical decision behaviour towards MID

Sr. No	Clinical Condition	Correct n (%)	Incorrect n (%)	Chi square	p- value
1.	A 32-year-old, high caries risk patient comes to you with a vital, asymptomatic upper left central incisor with caries involving enamel and dentine. Treatment of choice according to you:	212 (82.8)	44 (17.2)	110.25	0.000*
2.	A 22-year-old, low caries risk patient comes to you with a vital, asymptomatic lower right first molar having initial, white spot, non-cavitated carious lesion, on the buccal surface. Treatment of choice according to you:	205 (80.1)	51 (19.9)	92.64	0.000*
3.	A 38-year-old, low caries risk patient for whom aesthetics is not a concern comes to you with an intact, non-carious, anterior facial composite restoration placed one year ago which is stained at cavo-surface margin. Treatment of choice according to you:	121 (47.3)	135 (52.7)	0.766	0.382
4.	A 23-year-old, high caries risk patient with poor oral hygiene come to you with a proximal carious lesion in the middle third of enamel as found on routine radiographic assessment in upper left premolar. Treatment of choice according to you:	201 (78.5)	55 (21.5)	83.26	0.000*

* $p < 0.05$

The results were in contrast to the study of Brazilian dental professionals (with <5 years after graduation) where majority had adequate knowledge about MID procedures (Katz C *et al*, 2013). Also, a modest level of knowledge regarding MID was observed among Bangalore dental interns (Gupta G *et al*, 2015) and dental professionals (Suma G *et al*, 2013).

Students' attitude toward caries prevention can have a bearing on their training and consequently the approach toward preventive services that they are likely to provide in their future practices (Gupta G *et al*, 2015). An overall positive attitude (6.60±2.02) toward MID was observed by most of the interns which was similar to the two Indian studies conducted among dental interns (Gupta G *et al*, 2015) and dental professionals (Suma G *et al*, 2013). Most of the dental interns in this study had a positive attitude toward the use of adhesive restorative materials in reducing the size of restorations that is in agreement with another Indian study conducted among dental students (Agrawal R *et al*, 2014). This positive attitude among the dental students may be because they believe in 'prevention for preservation' by using the minimally invasive techniques.

As time passes, it is generally seen that there is gradual decline in knowledge of preventive dental care among dentists (Agrawal R *et al*, 2014). Among the MID procedures, the demineralization of teeth with topical fluoride application and prescribing chlorhexidine for caries control were either "always" or "most often" performed by 54.3% and 53.9% of the dental interns in this study respectively. Similarly in the study on Mongolian 5th year dental students (Tsevenjav B *et al*, 2003) 42% practiced topical fluoride application 'atleast quite often' and also in the study of US dental surgeons (Pakdaman A *et al*, 2010), Indian dental interns (Gupta G *et al*, 2015) and dental professionals (Suma G *et al*, 2013) topical fluoride was most often practiced among all other MID procedures.

Knowledge of a health behaviour considered to be beneficial, however, does not automatically mean that this behaviour will be followed (Gupta G *et al*, 2015). Majority of the interns gave correct answers for clinical decisions requiring preventive treatment. In contrast to this study, more than 50% of the Brazilian (Traebert J *et al*, 2005) and 77% Iranian dentist (Ghasemi H *et al*, 2008) choose to restore a caries lesion confined to enamel. This might be because dental interns in our study showed positive attitude towards MID which translated in clinical decision making and practising minimally intervention procedures.

The dental intern's knowledge was correlated with their attitude and clinical decision behaviours whereas practice was correlated with the clinical decision behaviours of MID which was similar to the study conducted among Indian dental interns (Gupta G *et al*, 2015). However, in the Mongolian students practice of preventive procedures was strongly correlated with knowledge.^[15] This discrepancy seems to reflect that either there may be little appreciation of dental preventive methods among the dental interns or the practice is limited by some other factors, for instance curriculum related, which calls for improvement (Gupta G *et al*, 2015).

The results of this study could have been confounded due to social desirability bias as observed in questionnaire studies. In an attempt to limit this effect, the name of the institute, and the dental interns who participated in the study were not recorded so as to have unbiased responses. The other limitation was that dental interns work within the framework of institutional policies and guidance of faculty members. Faculty and clinical environment of the dental college have a great influence on how students choose their materials or concepts in their future practices. Therefore, the attitudes of faculty members and institutional policy could have a bearing on the opinion and decisions expressed by the dental interns in this study.

CONCLUSION

The treatment a dental interns adopts is most likely a result of the dental school training practice experience. Though majority of dental interns had inadequate knowledge but they showed a positive attitude towards MID which, to some extent influenced their clinical decision making behaviour and its practical application. In light of this study it is suggested that, a comprehensive practical training guided by the current principles of MID should be designed and implemented to improve present caries management educational program.

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