Type: Original Research

A Questionnaire based Evaluation of the Awareness among Dental Practitioners on Minimally Invasive Approach for Superficial Enamel Stains

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Abstract

The present survey was conducted to evaluate the awareness among dental practitioners on a minimally invasive approach for treatment of superficial enamel defects.The cross-sectional survey was conducted among 150 dental practitioners in India. Data was obtained by distributing a self designed pretested questionnaire which comprised 20 questions to assess the knowledge of the practitioners on various minimally invasive procedures to treat superficial enamel stains, its incorporation into routine practice and ways to improve their skills. Results were obtained in the form of graphs and percentage. A chi square test was done to determine the association of the responses with the type of practice. The results of the study revealed that a fair number of practitioners were aware of the theoretical aspects of micro and macroabrasion but the clinical incorporation into routine practice is low, 68% did not incorporate the technique in their routine dental practice. The chi square values to check the association between the responses and type of practice were <0.001 which was highly statistically significant. The endodontists had better knowledge about the techniques as compared to the general practitioners and they also incorporated the technique more routinely as compared to the general practitioners.There was a general preference to first opt for a minimally invasive technique but the treatment plan varies from person to person.There is a need for knowledge upgradations and further clinical training through continuing dental education.

Key Words: *Dental Aesthetics; Enamel Discolouration; Macroabrasion; Microabrasion; Minimally Invasive Dentistry*

Introduction

A large number of people who seek dental treatment lay emphasis on the appearance of dentition of particular cosmetic importance is the colour of their teeth. Thus dentistry demands the understanding of elements of tooth colour.

Teeth have a gradation of colours from the gingival margin to the incisal surface and one must understand the science of colour in terms of perception. Since the perception of colour is highly subjective and prone to variation among individuals, the aesthetic aspect of tooth colour becomes difficult to quantify.[1]

The crown of a tooth is formed of enamel, dentin and pulp. Any changes to these structures, alters the light transmitting and reflecting properties of the tooth which further causes an alteration in the outward appearance of the tooth. The incident light and the quantity of reflected light determine the colour of the tooth.[2]

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Discolourations of teeth are broadly classified based on their location as intrinsic or extrinsic. These discolourations may be superficial or may penetrate deep into the dentin. Further, the teeth may either be vital or non vital. Hence, careful assessment and establishing a correct diagnosis of the etiology of discolouration as well as types, extent and the location of discolouration and the status of the adjacent teeth becomes highly essential in formulating an appropriate treatment plan for a good outcome.[3]

A wide variety of management strategies exists ranging from a minimally invasive approach for superficial stains to a more invasive approach such as veneers and crowns when the defects cannot be managed by a more conservative approach. Depending on the clinical scenario, anyone in particular may be the most appropriate. One must always consider adopting a minimally invasive technique before moving on to a more invasive therapy.[4]

Enamel microabrasion and macroabrasion are two such minimally invasive approaches for removal of superficial stains. This can further be accompanied by resin infiltration for a better aesthetic outcome when the case demands.[5]

Hence the present study was conducted with the aim to evaluate the awareness among dental practitioners on a minimally invasive approach for management of superficial enamel stains and defects and to determine ways to reinforce their knowledge and skills for delivering a more proficient treatment. This study was conducted with the following objectives:

1. To evaluate the awareness among dental practitioners on minimally invasive approach for management of superficial enamel stains

2. To determine ways as to how the dental practitioners can upgrade themselves for provision of a more efficient treatment

Materials and Method

The present cross sectional questionnaire based survey was conducted among dental practitioners in India who were selected through block randomization. Lottery method was adopted for the selection of practitioners from each block to ensure a random sampling.[6] The sample size was fixed at 150. The inclusion criteria was set to include the dental practitioners willing to participate in the present survey and giving a written informed consent. The exclusion criteria of the study included those practitioners who were absent on the day of the survey and upto two rounds of follow up. Prior to the start of the study, clearance and permissions were obtained from the Institutional ethics committee (IEC) after the study protocol was sent and reviewed by two blinded reviewers.

Data was collected using a self designed pretested questionnaire that comprised 20 questions which was circulated among the dental practitioners. The questionnaire comprised four sections. Section A comprised questions on demographic details. Section B comprised questions to evaluate the knowledge among dental practitioners regarding micro and macro abrasion technique. Section C comprised questions regarding the practice protocols adopted by dental practitioners for superficial enamel stains. Section D evaluated the need for knowledge upgradation.

The questionnaire was collected upon completion by the primary investigator M.S office excel sheet was used to code and enter the collected data. A chi square test was done to determine the association of the responses with the type of practice. A p value of < 0.05 was considered as statistically significant. Descriptive statistics in the form of frequency and percentage were calculated using Statistical Package for Social Sciences (SPSS, V 2.0, IBM)[7]

Results and Discussion

The demographic details of the present study has revealed that the majority of the participants were females (57.33%) and general practitioners (68.7%) while 31.3% were Endodontists (fig 1). 42.7% of the participants were aware of the indications of microabrasion (fig 2) and 42.7% of the majority knew its advantages. 46.7% of the participants were aware that microabrasion constitutes of a low concentration acid and and an abrasive and 47.3% were aware that microabrasion acts by both abrasive and erosive action and 48.7% knew that hydrochloric acid was used. When asked about the abrasive, 32% said it was silicon carbide and 31.3% said it was aluminum oxide. The contraindications were clearly understood by 48.3% and 38.7% knew what macro reduction was

whereas 43.3% were aware of the abrasion effect. 56.75% participants knew the factors that governed the abrasive and erosive effect. The use of 12 fluted diamond bur for macroabrasion was agreed upon by 38.7%. 42% were aware of the composition of old McInnes solution and 43.3% were aware of its modification. Chi square test done to check the association of the response for knowledge based questions with type of practice gave a p value <0.001 which was highly significant. Since the majority of the endodontists opted for the right answer while the responses of the general practitioner were distributed among the various options which were not correct, it was inferred that the endodontists have better knowledge about the techniques as compared to the general practitioners. However, despite the knowledge, 68% of the participants did not routinely perform the procedure (fig 3). It was observed that the endodontists incorporated techniques like microabrasion, macroabrasion and resin infiltration more routinely in their practice as compared to the general practitioners. The reason for this could be specialised training which is received in the masters program of endodontics. When given clinical scenarios, 42% said that their choice of treatment for white spot lesions would be microabrasion followed by resin infiltration (fig 4). It was observed that it was the endodontists who mainly followed microabrasion and resin infiltration for treatment of white spot lesions as compared to the general practitioners (p<0.001). The response for treatment of localised enamel hypoplasia was veneers as opted by 31.3% respondents (fig 5). It was observed that the vital bleaching was least preferred by the endodontists for treatment of localised enamel hypoplasia while veneers was the most preferred whereas, the general practitioner did use vital bleaching more often than the endodontists and their choice of treatment was distributed among other options as well such as full veneer crowns, veneers and microabrasion (p value 0.024).

There was a general need for knowledge upgradation as agreed upon by 84% (fig 6) and they felt that seminars, symposiums and workshops were excellent ways to do so.

The results of the study has revealed that a fair number of practitioners are aware of the theoretical aspects of micro and macroabrasion but the clinical incorporation into routine practice is low. There is a general preference to first opt for a minimally invasive technique, the treatment plan varies from person to person. The study also highlighted the need to reinforce the knowledge.

Previously our team had conducted numerous clinical trials [8–10] and in vitro studies [11–15] and reviewed various aspects of endodontics and conservative dentistry [16–19] over the past five years. Now we are focusing on epidemiological surveys. The idea for this survey stemmed from the current interest in our community on minimally invasive dentistry.

Enamel microabrasion was first performed by Kane in 1926 for the removal of fluorosis white spots using 36% hydrochloric acid.[20] It was Croll et al in 1986 who recommended the use of 18% hydrochloric acid along with an abrasive due to the hazards of higher concentration of the acid.[21]

The current recommendations are the use of low concentration of HCl along with silicon carbide as an abrasive. Prema compound and Opalsture are some of the commercially available products.[20]

Dental fluorosis is the most common indication among others such as correction of surface irregularities, localized enamel hypoplasia and mineralized white stains. However, the procedure is restricted to surface defects that do not extend to more than 0.5mm into enamel.[22]

The mechanism of action of microabrasion is both erosive and abrasive. Microabrasion causes changes in the optical characteristics of enamel surfaces which is termed as an abrasion effect. Mineralized tissue gets compacted within the organic areas due to simultaneous abrasion and acid erosion of the enamel prisms, replacing the outer layer of prism rich enamel with a densely compacted prism- free region. Microabrasion along with being a conservative procedure, leaves behind a lustrous, shiny and glass-like surface of the enamel. This reflects and refracts light differently, thus helping to camouflage the remaining subsurface stains. Further, saliva helps in augmenting these optical properties.[23,24]

Studies have shown that the potential erosive and abrasive effect depends on several parameters such as type, concentration and pH of acid, abrasive medium,

time duration and force of application and the mode of application.[25]

The contraindications for microabrasion include stains involving the dentin and deeper than 0.5mm, deficient lip seal, tetracycline stains.[26]

The effectiveness and the advantages of the technique have been well documented.[27]Sundfeld et al has reported that 5 to 10 applications of micro abrasive system results in loss of 25 to 100 um of enamel, well in the acceptable range.[20] Bertoldo et al has reported that microabrasion with 6.6% hydrochloric acid and silica results in incorporation of chloride ions and silica into the enamel.[28] Chloride ions are associated with enamel rehardening and silica compound is a bioactive material that induces a new apatite layer on the acid etched enamel.[29,30,31]

Several studies have reported the lasting and stable aesthetic results of microabrasion technique. Price et al showed that enamel microabrasion could remove stains from within the outermost layer of the tooth enamel, thereby improving the appearance of teeth.[32] Yetkinet et al has shown that infiltration and microabrasion treatments were capable of diminishing the whitish appearance of white spot lesions.[33] Castro et al showed that enamel microabrasion combined with at home tooth bleaching effectively reduced staining in case of mild to severe fluorosis.[34]

Macroabrasion is the technique used when the stains are deeper (>0.4mm and no more than quarter the thickness of enamel). The technique utilizes a 12-fluted round diamond fissure bur in high speed handpiece with water irrigation.[35]

In cases where micro and macro abrasion does not produce the desired results, one can supplement it with the use of bleaching. bonding composite resin on the labial surface or resin infiltration.

Resin infiltration technique uses a low viscosity resin with high surface tension and low contact angle with the enamel as well as a refractive index similar to enamel. It is mainly indicated for white spot lesions, such as those caused by orthodontic brackets. [36–39]

McInnes solution is a bleaching agent that contains 1ml of 36% hydrochloric acid, 1ml of 30% hydrogen peroxide and 0.2ml of anaesthetic ether. Later the solution was modified to replace HCl with 20% sodium hydroxide (NaOH).[40]

Only when these techniques fail to give the desired results, should one opt for a more invasive alternative such as veneers or crowns. [41]

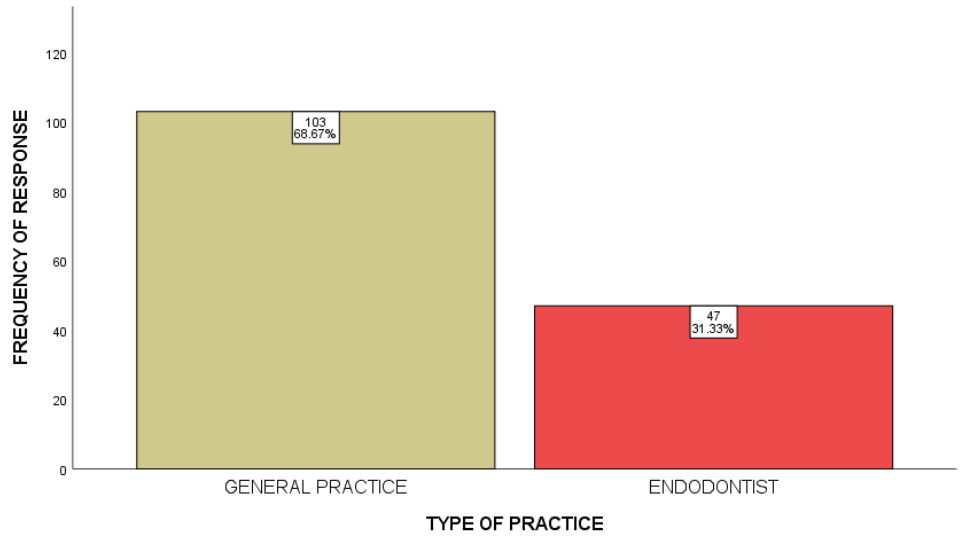

Fig 1: Distribution of sample based on type of practice. The X axis represents the type of practice and the Y axis represents the count. Yellow represents general practitioners and red represents endodontists. The number of general practitioners was higher than the number of endodontists.

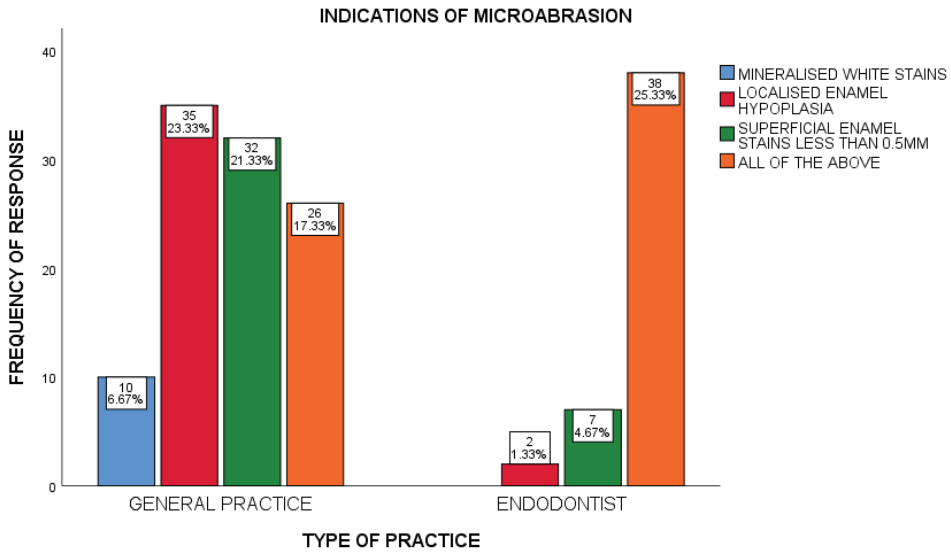

Fig 2:Distribution of responses based on type of practice for awareness of indications of microabrasion. X axis represents the type of practice and Y axis represents the count of the responses. Blue represents responses to mineralised white stains, red represents responses to localised enamel hypoplasia, green represents responses to superficial enamel stains less than 0.5mm and orange represents responses to all of the above. Chi square test done to check the association of the response with type of practice gave a chi square value of 42.761 and a p value <0.001 which was highly significant. Since the majority of the endodontists opted for the right answer while the responses of the general practitioner were distributed among the various options , it was inferred that the endodontists have better awareness about the indications of microabrasion as compared to the general practitioners.

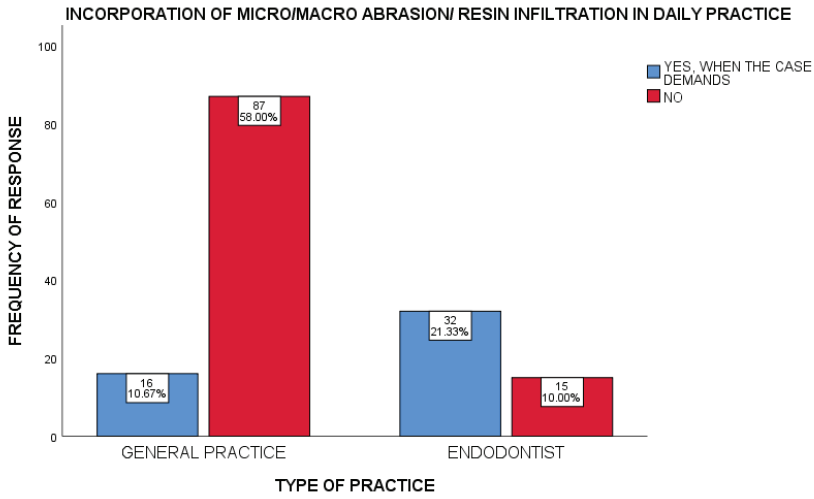

Fig 3: Distribution of responses based on type of practice for the incorporation of micro/macro abrasion technique in their routine practice. X axis represents the type of practice and Y axis represents the count of the responses. Blue represents responses to yes when the case demands and red represents responses to no. Chi square test done to check the association of the response with type of practice gave a chi square value of 40.959 and a p value <0.001 which was highly significant. Of the total number of endodontists who took part in the survey, very few responded to not incorporating the techniques in their practice while of the total number of general practitioners who took part in the survey, the majority responded to not incorporating the techniques in their routine practice. Thus it was observed that the endodontists incorporated techniques like microabrasion, macroabrasion and resin infiltration more routinely in their practice as compared to the general practitioners.

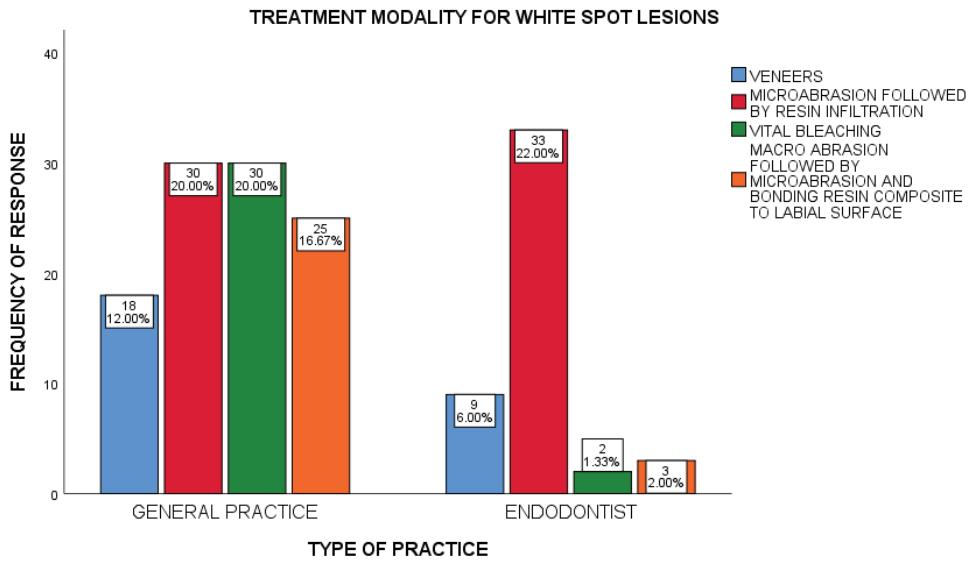

Fig 4: Distribution of responses based on type of practice for choice of treatment modality for white spot lesions. X axis represents the type of practice and Y axis represents the count of the responses. Blue represents responses to veneers, red represents responses to microabrasion followed by resin infiltration, green represents responses to vital bleaching and orange represents responses to macroabrasion followed by microabrasion and bonding resin composite to the labial surface. Chi square test done to check the association of the response with type of practice gave a chi square value of 27.912 and a p value <0.001 which was highly significant. Thus it was observed that the endodontists mainly followed microabrasion and resin infiltration for treatment of white spot lesions as compared to the general practitioners whose choice of treatment was distributed among the various options.

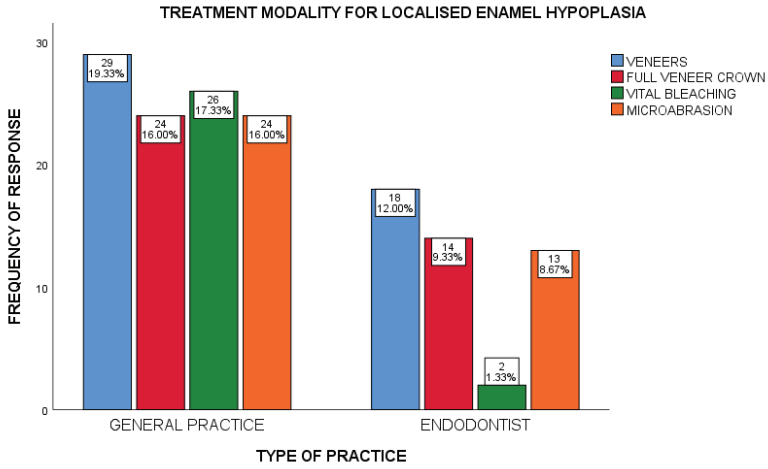

Fig 5: Distribution of responses based on type of practice for choice of treatment modality for white spot lesions. X axis represents the type of practice and Y axis represents the count of the responses. Blue represents responses to veneers, red represents responses to full veneer crowns, green represents vital bleaching and orange represents responses to microabrasion. Chi square test done to check the association of the response with type of practice gave a chi square value of 9.462 and a p value 0.024 which was statistically significant. Thus it was observed that the vital bleaching was least preferred by the endodontists for treatment of localised enamel hypoplasia while veneers was the most preferred whereas, the general practitioner did use vital bleaching more often than the endodontists and their choice of treatment was distributed among other options as well.

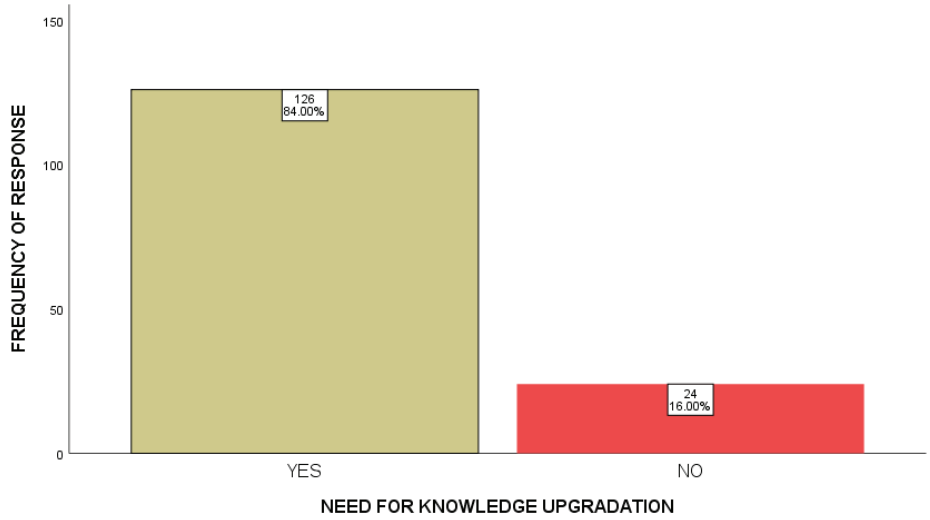

Fig 6: Distribution of responses for the need of knowledge upgradation. X axis represents the need and Y axis represents the count of the responses. Yellow represents yes and red represents no. Hence it can be inferred that the majority of the participants feel there is a need for knowledge upgradation.

Conclusion

Dental aesthetics is becoming one of the leading reasons that patients now attend a dental practice. Accumulating evidence is suggestive of the fact that enamel microabrasion and macroabrasion are effective and efficient for producing aesthetic improvements. These procedures are safe, conservative and atraumatic. The results of the study revealed that a fair number of practitioners were aware of the theoretical aspects of micro and macroabrasion but the clinical incorporation into routine practice is low, Further, it was observed that the endodontists possessed better knowledge which they were able to more frequently incorporate in their routine practice as compared to the general practitioners. However, there is a need for knowledge and skill upgradation. The implementation of these techniques into dental practice warrants further training through continuing dental education.

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