
Evaluation of etiology of discoloration, site of discoloured tooth and outcomes of different techniques used for vital tooth bleaching- a retrospective analysis

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Abstract: Smile is a curve that sets everything straight but a healthy smile needs good dental care. The appearance of the dentition is paramount to a large population seeking dental treatment and often the first evidence of variation from normal in human dentition is an observable difference in the color of the teeth. A thorough knowledge of the etiology of tooth staining is of prime importance to dental practitioners in order to reach a correct diagnosis. The purpose of this study was to assess the etiology, discoloured surfaces and outcomes of different techniques in terms of patient satisfaction for the management of vital bleaching. A total of 31 case sheets were retrospectively analysed from the university database. It was found that Fluorosis was the most prevalent etiology in about 74.19%, Conventional technique was the most prevalent technique in about 83.87% and Upper anteriors were the most prevalent affected area in about 70.97%. It was also found that in both 16-25 yrs and 26-45 yrs age groups, fluorosis was the most prevalent etiology. In 46+ yrs, both fluorosis and stains were equally prevalent, p value-0.102 (p>0.05). It was found that fluorosis was the prevalent etiology in both males (64.52%) and females (9.68%), p-value: 0.395 (p>0.05). For all sites, conventional technique is the most preferred technique, p-value: 0.751 (p>0.05). The outcome for both Conventional and Power bleach techniques had prevalence of satisfaction, p-value: 0.342 (p>0.05). Within the limitations of the study, we conclude that fluorosis was the most prevalent etiology for vital tooth discoloration. The discoloration of vital teeth was commonly presented in the upper anterior area followed by both upper and lower anteriors. Outcomes for conventional technique were more satisfactory than thermocatalytic.

Keywords: Aesthetics, Tooth discoloration, Vital Bleaching, innovative technique

INTRODUCTION

Awareness and demand for aesthetic smiles has grown amongst the population over the last few years. Tooth discoloration is a common dental finding which is associated with clinical and aesthetic problems (Ahmed, 2017). Discoloured teeth especially in the anterior region are a considerable cosmetic impairment.

Tooth discoloration varies in various aspects such as etiology, appearance, localization, severity and also adhesion to tooth structure. Detailed clinical examination and details of the patient's oral hygiene practices, dietary habits, and history of exposure to chemicals, trauma, and infection are essential to reach a final diagnosis.

The causes for tooth discoloration can be classified according to the location of the stains, either as extrinsic or intrinsic (Hattab, Qudeimat and Al-Rimawi, 1999), (Sulieman, 2005). Extrinsic discoloration lies on the tooth surface or within the acquired pellicle. The intrinsic discoloration occurs when the chromogens are deposited within the bulk of the tooth, which maybe of local or systemic origin (Vogel, 1975). Commonly, two agents such as fluoride and tetracycline when ingested during amelogenesis have long been recognized as predisposing factors in intrinsic staining (Dean, Trendley Dean and McKay, 1939), (Bevelander, Rolle and Cohlan, 1961).

There are various invasive therapies that have been used to correct the discoloration of teeth such as crowning or the placement of veneers but whitening of teeth using a bleaching technique is a non invasive alternative which also conserves dental hard tissue (Attin *et al.*, 2003). Vital teeth are whitened by nightguard vital bleaching technique (NGVB) utilizing carbamide peroxide gels which acts as the bleaching medium (Fasanaro, 1992), Haywood (Haywood, 1992), EBSCO host (EBSCO host | 38506309 | *Endodontic therapy in a postirradiated child: Review of the literature and report of a case*, no date). On the other hand, whitening of root filled teeth is carried out by internal whitening treatment (walking bleach technique) (Weisman, 1968), Geurtsen (Geurtsen and Vernieks, 1986; Vernieks and Geurtsen, 1986), Arens (Arens, 1989)

The invasive intervention either partial restorations such laminate veneers or full-coverage dental restorations may be used to treat generalized intrinsic tooth discoloration for which bleaching may not be indicated or where the esthetic results of bleaching fail to meet the patient's expectations (Cutbirth, 1992), Crispin (Crispin, 1997), Walls (Walls, Steele and Wassell, 2002).

Previously numerous clinical trials (Jyothi *et al.*, 2017), Duraisamy (Duraisamy *et al.*, 2019), Ganapathy (Ganapathy, 2016), systematic reviews (Ariga *et al.*, 2018), Ganapathy (Ganapathy, Kannan and Venugopalan, 2017), Ganapathy (Ganapathy, Kannan and Venugopalan, 2017; Kannan and Venugopalan, 2018), reviews (Selvan and Ganapathy, 2016)6, Subasree (Subasree, Murthykumar and Dhanraj, 2016), Vijayalakshmi (Vijayalakshmi and Ganapathy, 2016), in vitro studies (Jain, Ranganathan and Ganapathy, 2017), Ajay (Ajay *et al.*, 2017), case reports (Ashok *et al.*, 2014; Ajay *et al.*, 2017), Ashok (Ashok *et al.*, 2014; Venugopalan *et al.*, 2014) and surveys (Ashok and Suvitha, 2016), Ashok (Ashok and Suvitha, 2016; Basha, Ganapathy and Venugopalan, 2018) have been conducted in Saveetha dental college over the past few years. Now, we are carrying out many such researches with our huge university database.

Our department is passionate about research we have published numerous high quality articles in this domain over the past years (Abraham *et al.*, 2005; Devaki, Sathivel and Balaji Raghavendran, 2009; Neelakantan *et al.*, 2010, 2015; Arja *et al.*, 2013; Ramshankar *et al.*, 2014; Sumathi *et al.*, 2014; Surapaneni and Jainu, 2014; Surapaneni, Priya and Mallika, 2014; Ramamoorthi, Nivedhitha and Divyanand, 2015; Manivannan *et al.*, 2017; Ezhilarasan, 2018; Ezhilarasan, Sokal and Najimi, 2018; J *et al.*, 2018; Ravindiran and Praveenkumar, 2018; Malli Sureshbabu *et al.*, 2019; Mehta *et al.*, 2019; Krishnaswamy *et al.*, 2020; Samuel, Acharya and Rao, 2020; Sathish and Karthick, 2020)

The aim of this study was to retrospectively assess the etiology, discoloured surfaces and outcomes of different techniques used for vital bleaching.

MATERIALS AND METHODS

Study Setting: The study was conducted with the approval of the Institutional Ethics Committee [SDC/SIHEC/2020/DIASDATA/0619-0320]. The study consisted of one reviewer, one assessor and one guide

Study Design: The study was designed to include all dental patients of the ages 16-68 years who are undergoing treatment for bleaching of discoloured vital teeth. The patients who did not fall into this inclusion criteria were excluded.

Sampling Technique: The study was based on a non probability consecutive sampling method. To minimise sampling bias, all case sheets of patients who are undergoing treatment bleaching of discoloured vital teeth were reviewed and included. The internal and external validity of the sample selected and all the samples are selected based on a simple random sample.

Data Collection and Tabulation: Data Collection was done using the patient database with the timeframe work 01 June 2019 and 31 March 2020. About 31 case sheets were reviewed and those fitting under the inclusion criteria were included. Cross verification of data for errors and measures are taken to minimise sampling bias all data were included. The inclusion criteria was all the patients who are undergoing bleaching treatment for discoloured vital teeth. The exclusion criteria was patients with systemic disorders. Data was downloaded from DIAS and imported to Excel, Tabulation was done. The values were tabulated and analysed.

Statistical Analysis: Descriptive statistics was used to evaluate the prevalence of etiology of discoloration, discoloured teeth and outcomes of different techniques in vital tooth bleaching. Chi-Square test was performed and the p value was determined to evaluate the significance of the variables it was used to evaluate. The association between gender, age and etiology of discoloured vital teeth, between discoloured site and technique used and in between technique used and its outcome were evaluated and statistics were carried using SPSS Software version 23.0 by IBM. The results were obtained in the form of graphs and tables.

RESULTS & DISCUSSION

Retrospective analysis of etiology, area concerned and various techniques used was done for patients who were opting for vital bleaching. A total of 31 sheets were analysed and data for which was extracted from the university database. In the present study, fluorosis was the most prevalent etiology for vital tooth discoloration. As the people are concerned about their aesthetic smile, the discoloured vital teeth in the upper anterior area followed by both upper and lower anteriors were more approached for bleaching treatment. The conventional technique was most commonly used followed by power bleach. The prevalent etiology for the age group 16-25 yrs was Fluorosis followed by Stains. In the 26-45 yrs age group, Fluorosis followed by Aesthetics was prevalent. Whereas, in the 46+ yrs age group, Fluorosis and Aesthetics were equally prevalent.

In Females, Fluorosis followed by Aesthetics was maximum found. Whereas for Males, Fluorosis followed by Stains was prevalent. While observing the frequency distribution of techniques used in various areas of jaw, in upper anteriors, Conventional technique was most commonly used. For lower anteriors, Conventional followed by Power bleach was used. For both upper & lower anteriors and upper anteriors & premolars, conventional technique was most prevalent.

Power bleach had the most satisfactory results in 100%, but this cannot be made conclusive as the sample is very less for this group and might show positive results accordingly. Outcomes for conventional technique were more satisfactory than thermocatalytic.

Tooth discolouration history from patient record provides useful information regarding the etiology. In the management of patients with tooth discolouration, knowledge of mechanism of tooth discolouration is valuable in the decision-making process for treatment (Watts and Addy, 2001).

The factors responsible for extrinsic tooth discolouration may be attributed to diet, oral hygiene, Habits, Medications, Occupation and environment and factors responsible for intrinsic tooth discolouration may be considered as 1) Pre-eruptive such as metabolic disorders, disturbance of tooth germ, genetic disorder, medication , environmental 2)Post-eruptive causes such as dental conditions, pulpal causes , dental materials

Treatment of tooth discoloration is based on identification of etiology and implementation of the required therapy. Scaling and polishing of teeth using prophylactic paste applied with a rotating rubber cup helps in removal of extrinsic stains. Discolouration of teeth caused by dental caries or dental materials require the removal of caries /restorative materials followed by proper restoration of the tooth.

Dental restorations such as crowns and laminate veneers are mostly used to treat generalized teeth discoloration where bleaching therapy is not indicated or when the outcome of bleaching therapy fails to meet the patient's expectations about esthetics. The various situational factors such as age and treatment factors such as techniques can modify the outcome of the bleaching procedure.

Bleaching is considered safe for the dental pulp. Fugaro et al. evaluated the histological changes in the dental pulp after night guard vital bleaching with a 10% carbamide peroxide gel. The findings indicated that the mild histological changes sometimes observed after bleaching tend to resolve within two weeks after treatment, and they have no effect on the overall health of the pulp tissue (Fugaro *et al.*, 2004).

In the present study, It was found that fluorosis contributed to about 74.2% of the prevalent etiology. Also, fluorosis was the most common etiology amongst both males and females followed by stains and aesthetic reasons. These results highlight the exposure to higher concentrations of fluoride in our drinking water and other sources & should be reduced which are the cause of endemic dental mottling. Fluorosis is a common disorder in Saudi Arabia (Akpata, Fakiha and Khan, 1997), especially in rural areas, where drinking water contains high levels of fluoride.

The upper anterior (UA) area was almost always being treated with bleaching, thereby, explaining aesthetic reasons followed by bleaching in both upper and lower anteriors. It was observed that conventional technique was most commonly used and had the highest levels of satisfactory results amongst patients.

CONCLUSION

Within the limitations of the study, we conclude that fluorosis was the most prevalent etiology for vital tooth discolouration. Discoloration of the upper anterior tooth was reported more often. The conventional technique was most commonly used followed by power bleach. Outcomes for conventional technique were more satisfactory than thermocatalytic technique for the management of vital tooth discoloration.

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AUTHOR CONTRIBUTION

First author (Dr.Madhura Deshmukh) performed the analysis and interpretation and wrote the manuscript. Second author (Dr.Nabeel Ahmed) contributed to conception, data design, analysis, interpretation and critically revised the manuscript. Both the authors have discussed results and revised the manuscript.

Conflict of interest: The authors declare no conflict of interest, financial or otherwise.

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TABLES AND FIGURES:

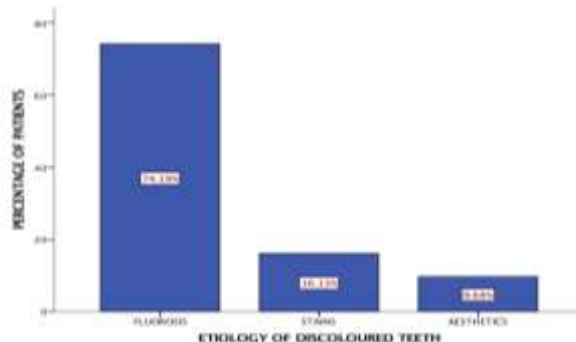


Fig.1: Bar graph depicting the distribution of various etiologies of tooth discoloration prior to bleaching of vital teeth. X axis represents different etiologies of discoloured vital teeth, Y axis represents the percentage of the population. It shows that Fluorosis is the most prevalent etiology in about 74.19%, followed by Stains in 16.13% and least Aesthetic reasons in the 9.68% population.

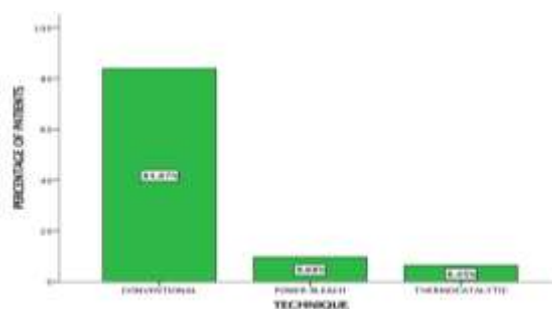


Fig.2: Bar graph depicts distribution of various techniques used for tooth discoloration prior to bleaching of vital teeth. X axis represents different techniques used in bleaching and the Y axis represents the percentage of population. It shows that Conventional is the most preferred technique in about 83.87%, followed by Power Bleach in 9.68% and least Thermocatalytic in 6.45% population.

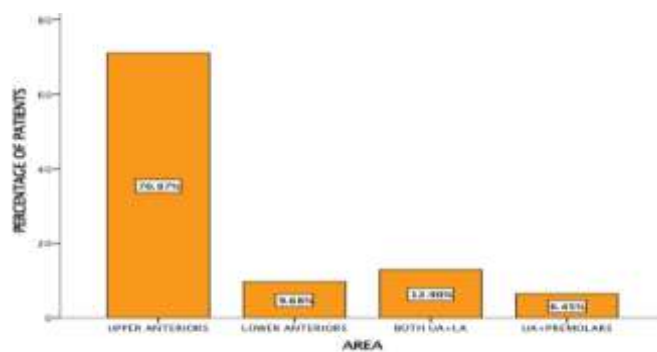


Fig.3: Bar graph depicting the distribution of various sites of tooth discoloration prior to bleaching of vital teeth. X axis represents different areas of discoloured teeth and Y axis represents the percentage of the population. It shows that Upper anteriors presented with discoloration in about 70.97%, followed by both upper and lower anteriors in 12.90%, then lower anteriors in 9.68% and least upper anteriors with premolars in 6.45% population.

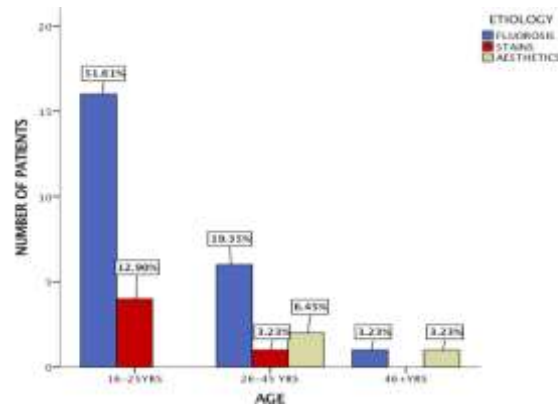


Fig.4: Bar graph depicts the distribution of etiologies of discoloured vital teeth prior to bleaching and its association with age. X axis represents age groups, Y axis represents number of population. It shows in both 16-25 yrs and 26-45 yrs, fluorosis was the most prevalent etiology. In 46+ yrs, both fluorosis and stains were equally prevalent. Chi Square test [(Pearson's Chi-square value: 7.726, df : 4 , p-value: 0.102 (p>0.05))] was done showing no association of initial shade and age making them statistically not significant.

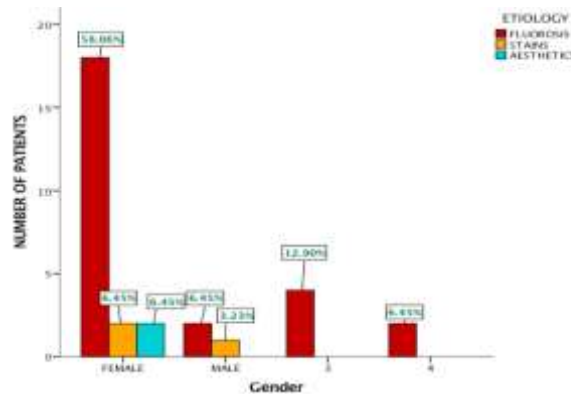


Fig.5: Bar graph depicts the distribution of etiologies of discoloured vital teeth prior to bleaching and its association with gender. X axis represents gender, Y axis represents number of population. It shows that in both Males and Females, Fluorosis is the most prevalent etiology. Chi Square test [(Pearson's Chi-square value: 1.855, df : 2 , p-value: 0.395 (p>0.05))] was done showing no association of initial shade and gender making them statistically not significant.

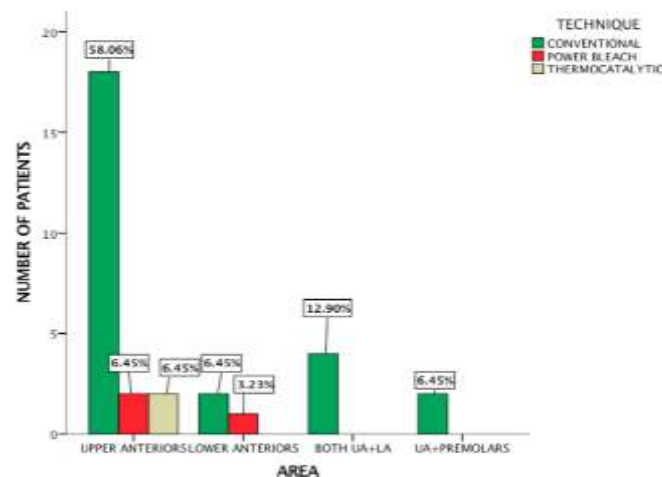


Fig.6: Bar graph depicts techniques used for vital teeth bleaching and its association with site. X axis represents sites, Y axis represents number of population. It shows that in all sites, conventional technique is the most preferred technique. Chi Square test [(Pearson's Chi-square value: 3.444, df : 6, p-value: 0.751 (p>0.05))] was done showing no association of initial shade and site making them statistically not significant.

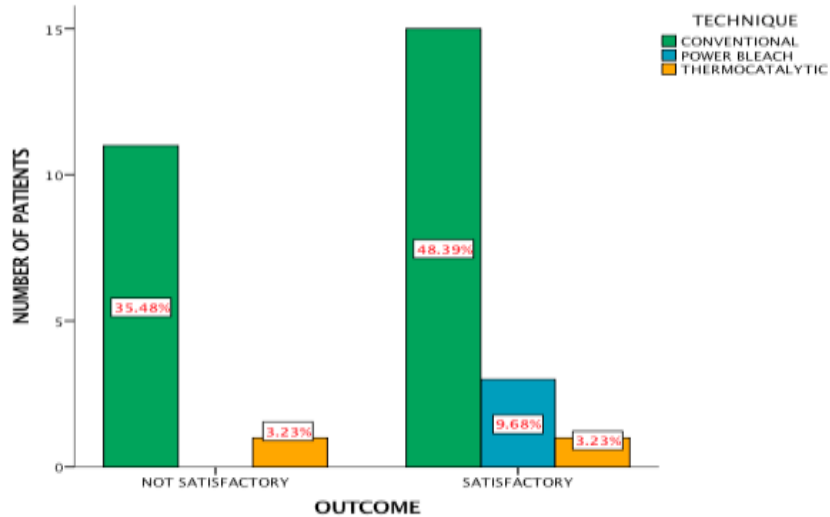


Fig.7: Bar graph depicts the techniques used for vital teeth bleaching and its association with outcome. X axis represents outcome, Y axis represents number of population. It shows that the outcome for both Conventional and Power bleach technique was satisfactory. Chi Square test [(Pearson's Chi-square value: 2.144, df: 2, p-value: 0.342(p>0.05))] was done showing no association of technique and outcome making them statistically not significant.