EVALUATION OF MARGINAL DISCOLOURATION IN CLASS 3 COMPOSITE RESTORATION

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Abstract

Background: Composite restorations are commonly used in both anterior and posterior teeth as an aesthetic restorative material. To serve as a long-term aesthetic restorative material, composite resin should preserve its colour and polish. Discoloration of these composite restorations can be caused by a variety of internal and external factors.
Aim: The aim of this study was to assess the marginal discolouration in class 3 composite restoration.
Materials and Methods: This was a descriptive study, where all the patients data was collected by reviewing patients records and analysing the data of 86000 patients reported from June 2019 to February 2021 from the Dental Information Archiving Software, Saveetha Dental college and hospitals , Chennai . Data was collected and tabulated ,statistical analysis was done by SPSS – IBM .
Results: From the statistical analysis it was found that ,72% of the subjects presented with absence of marginal discolouration and the rest 28% of the subjects presented with marginal discolouration.Marginal discolouration was most commonly seen among 27-30 years of age (40.85%) with equal gender distribution. The most commonly associated tooth was upper central and lateral incisors.
Conclusion: A dental office can experience discoloration of a composite restoration. In many circumstances, a second polishing procedure can significantly lighten and brighten the restoration. If not, the palatal outline of the current restoration can be used to do a less complete retreatment. In the retreatment, it's sometimes advisable to perform another color mock-up and choose the lightest alternative.

Keywords: marginal discoloration, composite restoration, surfaces , innovative.

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1. Introduction

Composite restorations are commonly used in both anterior and posterior teeth as an aesthetic restorative material. To serve as a long-term aesthetic restorative material, composite resin should preserve its colour and polish. Discoloration of these composite restorations can be caused by a variety of internal and external factors. Although the quality of composite resin restorations has improved in recent years as a result of new material science techniques, composite resin discolouration remains a critical long-term clinical issue.

Color stability refers to a dental material's ability to maintain its original colour. The mouth cavity is in a constantly changing environment. The colour stability of an aesthetic material can be harmed by the presence of bacteria, saliva, and frequent consumption of colourful foods (chromatogens). Color stability of aesthetic dental materials, on the other hand, is sometimes overlooked in favour of other physical and mechanical attributes when making a decision. Furthermore, the clinician's access to a wide range of information adds to the difficulty of making an informed decision. This study provides in-depth analysis of various factors that influence colour stability.

Extrinsic or intrinsic discoloration of light-cured composite resins has been found in a number of investigations. Color changes can be the consequence of intrinsic discoloration caused by physicochemical reactions in the deep areas of the repair or extrinsic discoloration caused by plaque and stain accumulation. The staining agent, surface roughness, contact time with or immersion in colouring environments, and the type of composite resin utilised all influence colour changes. Previous colour stability research has revealed that liquids like coffee, tea, red wine, and cola can stain composite resins to variable degrees.

The susceptibility to extrinsic staining is directly influenced by the structure of the resin matrix and the properties of the filler particles. The staining susceptibility might be explained by the resin matrix's composition, and it could also be linked to the size of the filler particles. The conversion rate and chemical properties of the resin matrix influence its stain affinity, with the water sorption rate being particularly relevant. Our team has extensive knowledge and research experience that has translate into high quality publications (1–10))

The aim of this study was to assess the marginal discolouration in class 3 composite restoration.

2. Materials and Methods

The current study is a comparative and descriptive study which is performed in a university setting where all the patient data from June 2019 to February 2021 was collected, reviewed and analysed. The ethical approval was obtained from the Institutional Ethical Committee(ethical approval number : SDC/SIHEC/2020/DIASDATA/0619-0320). The data of patients who underwent composite restorations was collected, cross verified with photographs and were compiled for statistical analysis on SPSS Software. The sampling bias is minimised by incorporating random sampling methods. There was high internal validity and low external validity in our study.

Inclusion criteria

1. Patients who had class 3 dental caries
2. Patients who underwent class 3 composite restoration for the same
3. Patients of all age groups between 18-30 years

Exclusion criteria

1. Composite restorations other than class 3 cavity
2. Improper & incomplete data

SPSS (statistical package for social studies) version 23.0 (IBM corporation) was used for data entry and descriptive statistics. The Chi-squared test used to compare groups ($P< 0.05$) was considered significant.

3. Results

From the statistical analysis it was found that 72% of the subjects reported with absence of marginal discoloration and the rest 28% of the subjects reported with presence of marginal discoloration. Marginal discoloration was most commonly seen among 27-30 years of age (40.85%).and it was absent among 18-26 years of age with equal gender distribution (13.95%). The most commonly affected tooth with marginal discolouration was upper central incisors (7.74%) followed by lateral incisors (4.12%) and canines (1.37%). Mesial surfaces of the tooth were most frequently associated with marginal discoloration than distal surfaces (20.42%), predominantly presented with brown colour pigmentation than black colour pigmentation(76.79%) with higher prevalence of rough surface texture (40.18%) than pitted and smooth surface texture.

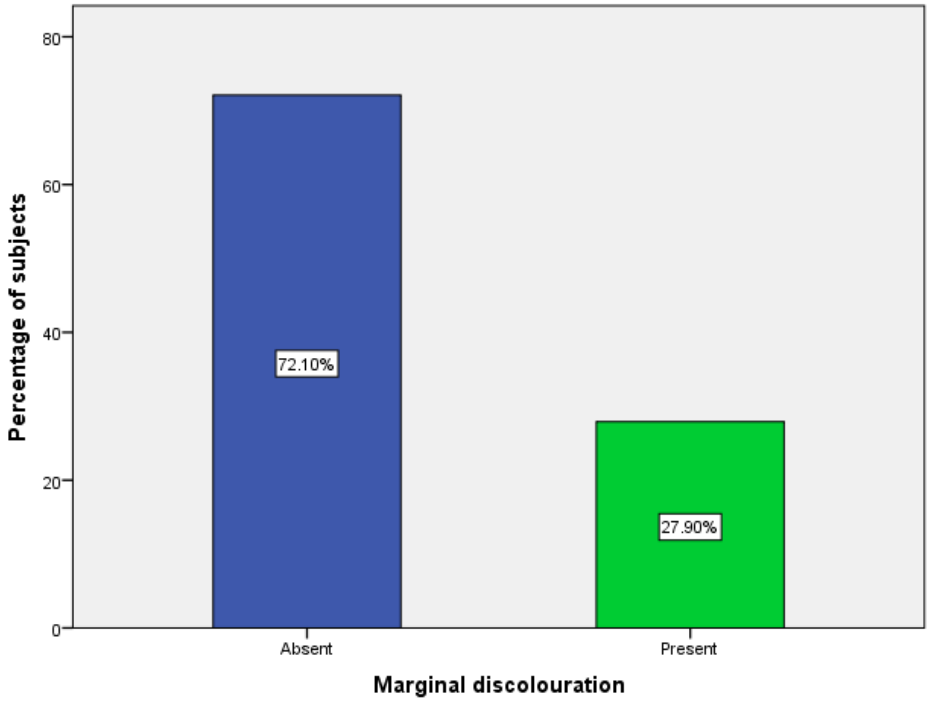

Figure 1 : Bar graph shows the Prevalence of marginal discoloration in class 3 composite restoration. The x axis represents the presence and absence of marginal discoloration and the y axis represents the percentage of subjects . The blue colour represents the absence of marginal discolouration and the green colour represents the presence of marginal discolouration. 72% of the subjects presented with absence of marginal discolouration and the rest 28% of the subjects presented with presence of marginal discolouration.

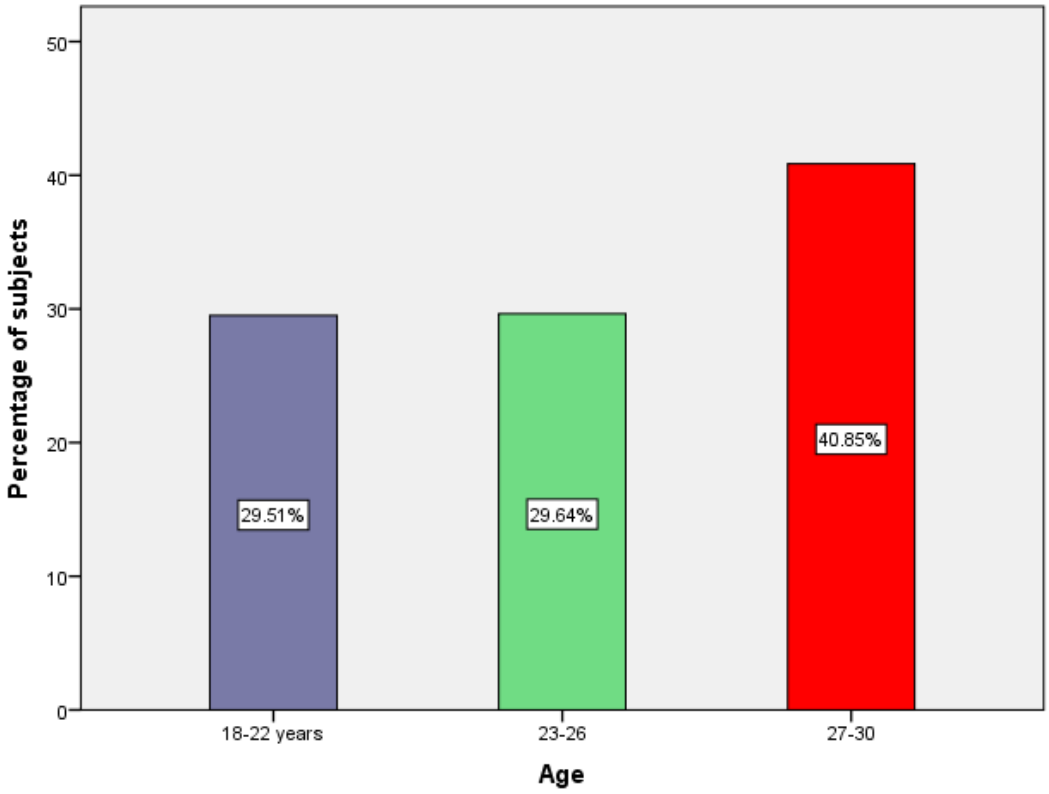

Figure 2: Bar graph shows the Prevalence of marginal discoloration in class 3 composite restoration among different age groups . The x axis represents the age groups of the patients with marginal discolouration and the y axis represents the percentage of subjects with marginal discolouration .The violet colour represents the age group between 18-22 years and green colour represents 23-26 years and red colour represents 27-30 years of age. The most commonly involved age group with marginal discoloration was 27-30years of age (40.85%) followed by 18-22 years of age (29.51%)and the least group was between 23-26 years of age.(29.64%)

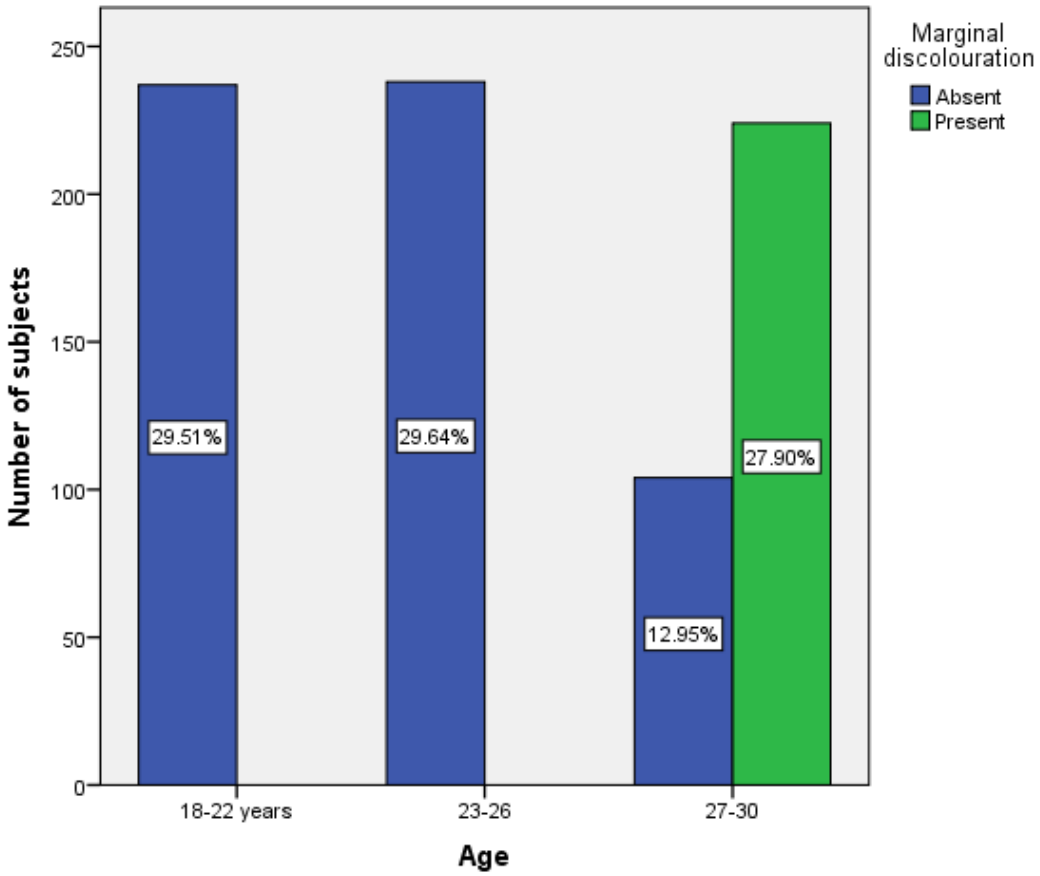

Figure 3: Bar graph shows the association between the age and marginal discolouration observed in the study. The x axis depicts the age groups of the patients presented with marginal discoloration and the y axis represents the number of subjects. The blue colour represents absence of marginal discolouration and green colour represents presence of marginal discolouration. The individuals above 27 years of age were presented with marginal discolouration (27.90%) and there was no marginal discoloration seen below 26 years of age .

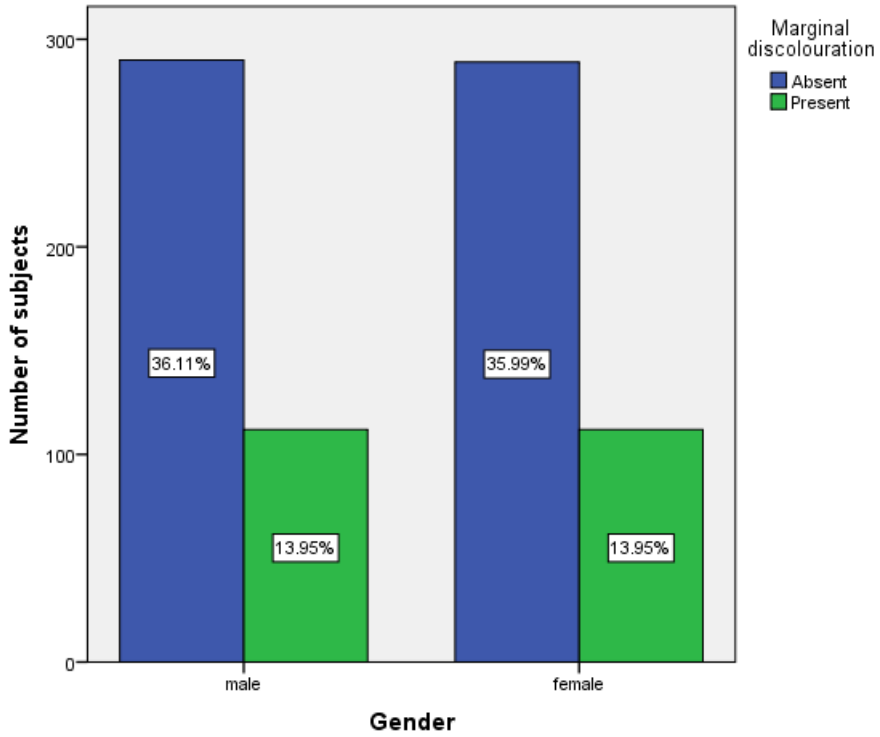

Figure 4: Bar graph shows the association between the gender and marginal discolouration observed in the study. . The x axis denotes the gender of the patients with marginal discoloration and the y axis represents the number of subjects. The blue colour represents absence of marginal discolouration and green colour represents presence of marginal discolouration. Both males and females was affected with marginal discolouration, there was no gender predilection (13.95%)

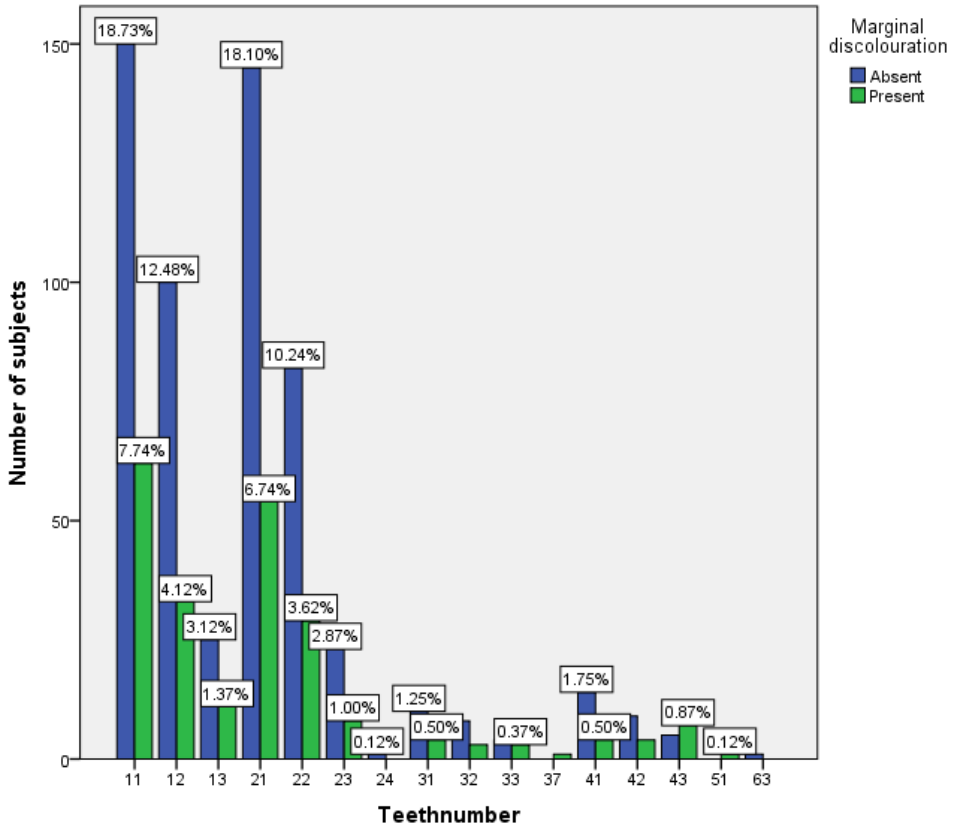

Figure 5: Bar graph shows the association between the tooth number and marginal discolouration observed in the study. The x axis denotes the teeth number of the patients with marginal discoloration and the y axis represents the number of subjects. Marginal discolouration was most commonly seen in upper central incisors (7.74%) followed by lateral incisors (4.12%) and canines (1.37%).

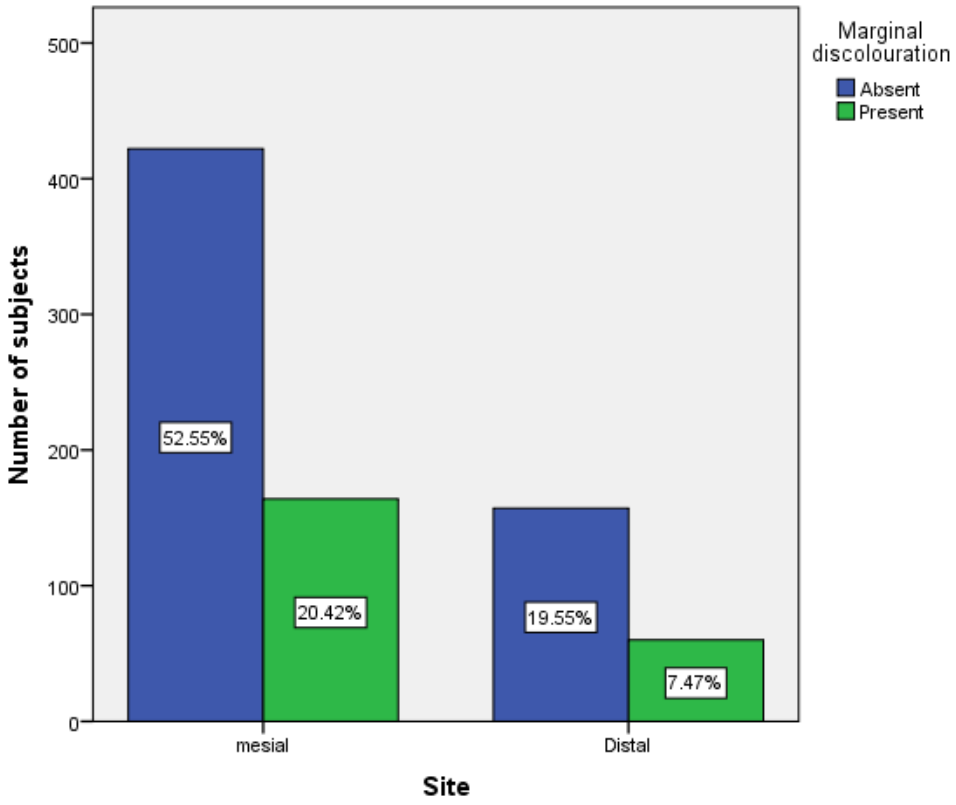

Figure 6: Bar graph shows the most commonly associated sites of marginal discoloration in class 3 composite restoration . The x axis represents the site of marginal discoloration and the y axis represents the number of subjects. Marginal discoloration was most commonly seen in the mesial surface of the tooth than the distal surface of tooth(20.42%).

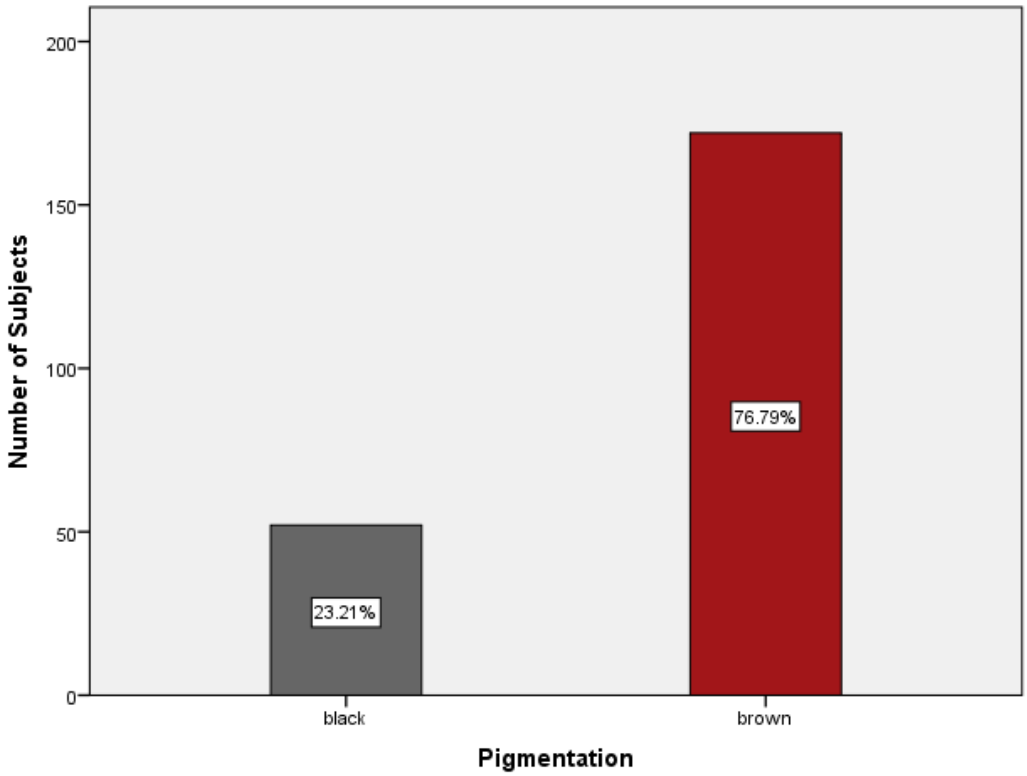

Figure 7: Bar graph shows the Prevalence of marginal discoloration in class 3 composite restoration and associated pigmentation. The x axis represents the pigmentation and the y axis represents the number of subjects . The grey colour represents the black marginal discolouration and Brown colour represents brown discolouration. Brown colour pigmentation was found to be more prevalent than black colour discolouration (76.79%).

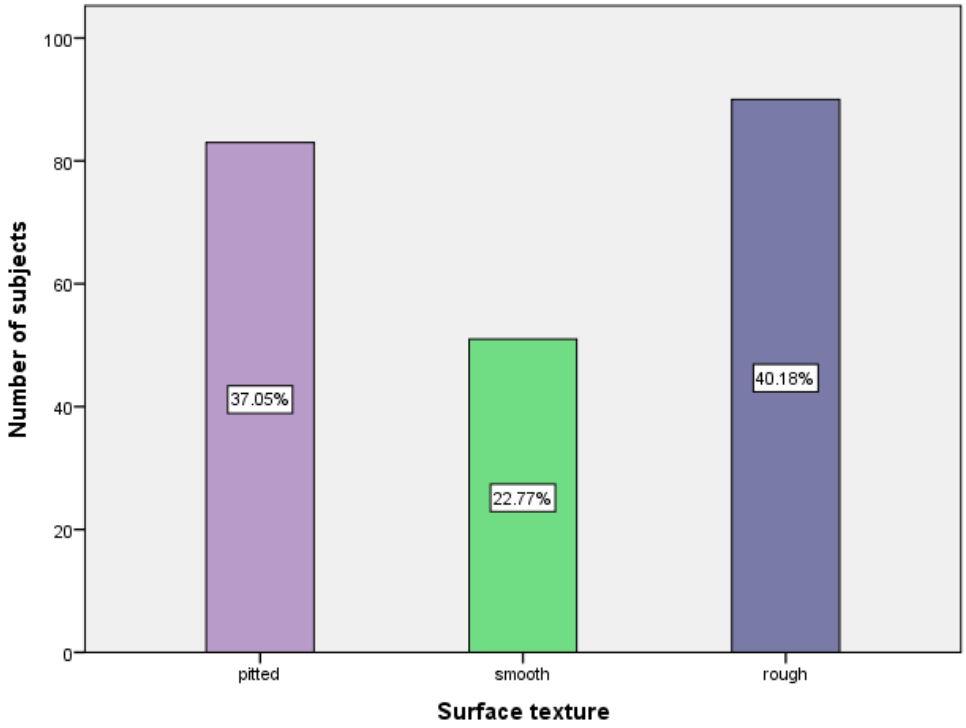

Figure 8 : Bar graph shows the Prevalence of surface texture of marginal discoloration in class 3 composite restoration The x axis represents the surface texture of marginal discoloration and the y axis represents the number of subjects. The green colour represents smooth surface texture, blue colour represents rough surface texture. Purple colour represents pitted marginal discolouration. Rough Surface texture showed more prevalence (40.18%) than pitted and smooth surface texture.

4. Discussion

To the best of our knowledge, this is the first study to clinically measure the marginal discoloration in a composite resin restoration.In the current study nearly 28% of the subjects presented with marginal discolouration (Figure1) .Figure 2 showed prevalence of marginal discolouration in class 3 composite restoration among different age groups is more prevalent in 27-30 years of age (28%) and it is less prevalent among the age groups below 25 [Figure 2 and 3]. The study conducted by Owens et al, 2013 revealed that older patients are more prevalent than young patients(11) . Lubisich EB reported that patients of 30 years of age were found to have more class 3 dental caries and were restored with composite when compared to individuals less than 20 years of age (12)which showed similar results in relation to our study.

From Figure 4 , this study shows equal gender distribution for marginal discoloration The findings from the previous study done by Allan et al , reported that more carious teeth were observed in female subjects in both primary and permanent dentition than in male subjects was not in agreement with the findings of present study(13). Johnson reviewed several studies presenting data about the gender predisposition of caries and revealed that most of the researchers attribute it to the early eruption of teeth in females than in the males(14). These early erupted teeth, exposed to risk factors for initiation and progression of dental caries, are responsible for the occurrence of dental caries. Hence, it is logical to assume that the female subject's teeth would decay more than the teeth of the male subjects of the same age but the discoloration was found to be the same among different genders.There was no gender prediction for marginal discoloration.

Figure 5 shows the most commonly associated tooth with marginal discoloration was found to be upper central incisors. Previous studies on colour stability revealed that liquids like coffee, tea, red wine, and cola can stain composite resins to variable degrees(15). From figure 6, it is evident that the mesial aspect was found to be more prevalent than distal aspect in class 3 marginal discoloration. According to Lubisich EB, the class 3 composite marginal discoloration in the mesial aspect of the tooth was found to be higher than the distal composite marginal discolouration.The contrast results obtained from the study conducted by Alshahrani et al , showed that more caries were observed on distal surfaces of central and lateral incisors and premolars than on other surfaces, except those of maxillary central and lateral

incisors.The reason for this phenomenon could be a combination of complicated surface morphology and difficult access for effective oral hygiene.(16)

Figure7 shows the most commonly associated pigmentation in marginal discoloration. Brown colour pigmentation was found to be more common than black colour pigmentation. Figure 8 shows the most commonly associated surface texture in marginal discolouration. The result shows rough surfaces were found more than pitted and smooth surfaces. Similarly the study conducted by Dimova et al , shows rough surfaces of restorative materials tend to accumulate more plaque and absorb more water and food colorants. Smoothly finished restorations on the other hand show better color stability. Surface roughness of resins is due to irregularly arranged inorganic filler particles and hence get easily stained by mechanical adsorption(17). It has been proposed that the light-polymerized provisional restorative materials have higher roughness because of larger filler particles and pits resulting in more colorant particle deposition.
The limitations of our study include a very small sample size and cannot be generalised to a larger population.

5. Conclusion

A dental office can experience discoloration of a composite restoration. In many circumstances, a second polishing procedure can significantly lighten and brighten the restoration. If not, the palatal outline of the current restoration can be used to do a less complete retreatment. In the retreatment, it's sometimes advisable to perform another colour mock-up and choose the lightest alternative.

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Conflict Of Interest:
None declared

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