Correlation of skin color and gingival pigmentation patterns in a group of South Indians in India

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Background: Melanin pigmentation of the gingiva occurs in all ethnicities. Excessive pigmentation is an esthetic concern that has increased awareness about depigmentation procedures. The purpose of the present study was to correlate the skin color and gender with the intensity and distribution of gingival melanin pigmentation in a group of South Indians for treatment strategies.

Method: Two hundred male and female non smoking healthy subjects aged 18-35 years were included. A clinical examination of gingiva was performed to assess the anatomic distribution of gingival pigmentation. The intensity of gingival pigmentation and the phenotype of gingiva were also assessed. Subsequently, the skin color was visually examined and assessed as fair, wheatish, brown, and dark.

Result: Six classes of gingival pigmentation were defined based on the anatomic distribution. Gingival pigmentation was observed as highest in the attached gingiva and interdental papilla (25.4%) and least in the marginal gingiva and interdental papilla (10.2%). The correlation between the skin color and the intensity of pigmentation was statistically significant, with dark skinned subjects having heavy gingival pigmentation. However, no correlation was found between the gender and the phenotype of gingiva with intensity and distribution of pigmentation.

Conclusion: South Indians predominantly have pigmentation in the attached gingiva and interdental papilla and their skin color is positively correlated with the intensity of pigmentation. The incidence of pigmentation does not differ between the sexes. We noted that a majority of the subjects had thick gingival phenotype. Anatomic delineation of gingival pigmentation and their contributory factors may help design treatment strategies in depigmentation procedures.

Keywords: gingival color, gingiva, melanin, pigmentation, skin color, South indians

INTRODUCTION

Melanin is the fundamental pigment that colors the tissues. It appears as early as 3 hours after birth in the oral tissues and is the only sign of pigmentation on the body in some cases. It is a non–hemoglobin-derived pigment formed by the cells called melanocytes, which are dendritic cells of neuroectodermal origin located in the basal and spinous layers of the gingival epithelium. Melanin granules are phagocytosed and contained within other cells of the epithelium and connective tissue, called melanophages or melanophores.
It is generally accepted that pigmented areas are present only when melanin granules synthesized by melanocytes are transferred to keratinocytes. This close relationship between melanocytes and keratinocytes was labeled by Fitzpatrick and Breathnach as the epidermal-melanin unit.

The gingiva is the fibrous mucosa surrounding the teeth that covers the coronal portion of the alveolar process. The gingiva is the most frequently pigmented part of the intra-oral tissue as well as the most readily seen part. Dummet queried the frequently used description of normal gingival as ‘coral pink’ and suggested a more accurate statement of the pattern of normal pigmentation in the following definition. The color of healthy gingiva varies from pale pink to bluish purple. Between these limits of normalcy are a large number of colors which primarily depend on the intensity of the melanogenesis, degree of epithelial cornification, depth of epithelization and the arrangement of gingival vascularity. Color variation may be uniform, unilateral, bilateral, mottled, macular, or blotched. There are two basic color zones in the oral cavities of most people, which comprise the attached and marginal gingiva on one hand and the adjacent alveolar mucosa on the other hand. Studying gingival color using the Munsell color system in dentistry, Ibusuki reported that gingival color varied with the position of the papillary, marginal and attached gingiva. The color of the healthy gingiva is assumed to vary from pale pink and coral pink in Caucasians to brown and blue black areas in Africans or Asians. Indians have a dramatic variation in their skin color more than any other ethnic group. There are all shades ranging from fair to dark which span out over the entire country. It has been observed that there is a gradient from the north to the south of the subcontinent with the North Indians close to European complexions and South Indian closer to sub-Saharan Africans. Whether this skin pigmentation is also evident in the oral cavity in South Indians needs to be investigated.

Melanin hyperpigmentation of gingiva usually does not present as a medical problem, but many patients may consider their black gums to be unaesthetic. This problem is aggravated in patients with a “gummy smile” or excessive gingival display while smiling. Gingival depigmentation is a periodontal plastic surgical procedure whereby the gingival hyperpigmentation is removed or reduced by various techniques. The foremost indication for depigmentation therapy is the demand by a person for improved esthetics. Understanding the distribution of pigmentation will help in devising better treatment strategies. However, the anatomic distribution of gingival pigmentation and its intensity have not been reported in South Indians in previous studies. Thus, the objective of the present study was to assess the distribution of physiologic gingival pigmentation, to establish whether a correlation exists between the skin color and gender with the intensity of physiologic gingival pigmentation and gingival phenotype.

PATIENTS AND METHODS

This correlation investigation study was carried out at the Department of Periodontics, SRM Dental College and Hospital, Chennai, Tamil Nadu, India, for a period of six months. A total of 200 non smoking subjects (100 males and 100 females) who fell within the age group of 18-35 years were included in the present study. An informed consent was obtained from all subjects after explaining the nature of the procedures, the objectives, and possible discomforts and risks of the study to them. The study was approved by ethical committee of SRM University. The inclusion criteria were uniformly pigmented and non-mottled gingivae. The skin color had to be distinctly fair, wheatish, brown and dark which is similar to the criteria adapted by Aina et al. The exclusion criteria were patients with periodontitis or any gingival pathology which might induce color changes, drug or chemical pigmentation, and mottling. Others were chemical skin peeling, albinism and mixed racial skin.

Evaluation of gingival pigmentation and skin color

The method used for the intensity of physiologic gingival pigmentation evaluation in this study was the Dummett-Gupta Oral pigmentation Index (DOPI) (Dummett and Gupta). This index represents the assignment of a composite numerical value to the total melanin pigmentation manifested on clinical examination of various oral tissues. The
criteria are as follows:
0 = Pink tissue (no clinical pigmentation)
1 = Mild, light brown tissue (mild clinical pigmentation)
2 = Medium brown or mixed pink or brown tissue (moderate clinical pigmentation)
3 = Deep brown or blue/black tissue (heavy clinical pigmentation)

The higher the number is, the darker the oral pigmentation. One investigator was calibrated for the examination of the colors after testing for normal color vision and color aptitude using the line test, comparison of observers and of light sources with the use of a color rule. The investigator was also seen to be adapted to daylight because the higher intensity of light available from the day.

Figure 1. Classification of gingival pigmentation pattern in South Indians.
Correlation of skin color and gingival pigmentation patterns

Based on the evaluation of the subjects, a classification scheme describing the patterns of anatomic distribution of gingival pigmentation was formulated. The chart is presented in Figure 1. Six categories were defined. All subjects were subsequently allotted one of the categories. It was observed that pigmentation was more in the attached gingiva and interdental papilla (Class II) and least being in the marginal gingiva and interdental papilla together (Class VI) (Figure 2). There were variations in the skin color and it was observed that the majority of the subjects had wheatish (68%) and fair (67%) complexions with the least being the dark skin color (21%). The correlation of the skin color and the intensity of gingival pigmentation according to Dummett-Gupta Oral pigmentation Index (DOPI) were evaluated and a positive correlation was observed. The skin color was in fact related to the intensity of pigmentation which was highly significant (p value = 0.00). It was observed that fair skinned people had mild gingival pigmentation (18.5%) whereas dark skinned people had heavy pigmentation (10.5%; Figure 3). There was no significant correlation between the gender and distribution of gingival pigmentation (p value = 0.373). The correlation between the gingival phenotype and the intensity of gingival pigmentation was not significant (p value = 0.125); however, it was observed that 68% of the subjects had the thick gingival phenotype.
DISCUSSION

Gingival hyperpigmentation is seen as a genetic trait in some populations, and is more appropriately termed physiologic or racial gingival pigmentation 20. The prevalence of melanin pigmentation in different populations has been reported to vary between 0% to 89% with regard to ethnic factors and smoking habits 21. In the present study, an attempt was made to assess the anatomic distribution of melanin pigmentation in the gingiva and also quantify it in a South Indian population, who have darker skin color owing to more melanin content, and tend to have more oral pigmentation than their counterparts in North and Northeast India. This could be attributed to their genetic traits 11.

The distribution of gingival pigmentation is quite unique in South Indians. In the present study, it was observed that the majority had pigmentation in the attached gingiva and interdental papilla (Class II). This finding is in contrast to a Jewish population study in which the authors found attached gingiva only to be the most common pigmented anatomic division 22 and a South African population in which pigmentation was most frequently seen in the interdental papilla 23. This establishes the fact that there is racial variation in the pigmentation of the gingiva.

Extra oral tissue color, e.g. cheeks, appears to be an indication of the color of the gingiva and mucosa in about 85% of the cases 24,25,26. The color of the gingiva was correlated with facial complexion in the present study which was highly significant. It was observed that dark skinned subjects had heavy gingival pigmentation whereas fair skinned subjects had mild pigmentation. These findings are similar to a previous study on an Indian population which showed that the incidence of the pigmentation of the gingiva increased as the complexion changed to the darker shade 27. It has been observed that in dark complexion people, the reappearance of the pigmentation is more than people with fair complexion after surgical depigmentation. This could be attributed to the increased intrinsic melanogenesis in dark complexion people 28. Thus, the skin color in fact can be a predictor for mucosal and gingival pigmentation.

There was no significant correlation between the distribution pattern of gingival pigmentation and gender in the present study. This finding is similar to previous studies in other races 28-31.

In the present study, the majority of the subjects had the thick phenotype of the gingiva that showed no significant correlation with gingival pigmentation. This finding is in contrast to a previous study done on Indians. This finding could be attributed to the fact that there are ethnic variations even within the same race for gingival phenotype 19,32.

Establishing a chart for the pattern of gingival pigmentation in South Indians will in the future help to choose a specific depigmentation therapy that will harmonize with skin color. This will enhance the esthetic results and the level of patient satisfaction.
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