CLINICAL FEATURES OF GINGIVAL HYPERPIGMENTATION IN VIETNAMESE OUTPATIENTS

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ABSTRACT

Background: *Gingival esthetics was considered one of the most significant aspects of aesthetic smiles, especially in those with gingival hyperpigmentation. Understanding the features, distribution, and causes impacting gingival pigmentation was critical for developing an effective treatment plan.* ***Objectives****: The prevalence of gingival hyperpigmentation in outpatients at Can Tho University of Medicine and Pharmacy Hospital; the association between gingival hyperpigmentation and age, gender, smoking status, and skin color.* ***Material and Methods:*** *Descriptive cross-sectional method; convenience sampling.* ***Results:*** *In a total of 100 outpatients, the rate of gingival hyperpigmentation was 53%, of which 40% had mild gingival hyperpigmentation according to DOPI (grade 1), 13% had moderate gingival hyperpigmentation (grade 2), and 13% had heavy gingival hyperpigmentation disease (grade 3). The study collected 3/6 groups of gingival melanin hyperpigmentation according to Ponnaiyan's classification. Of all the hyperpigmentation groups according to Hedin's classification, the hyperpigmentation group forming a long continuous ribbon accounted for a high proportion (45% in the maxilla, 40% in the mandible). The rates of gingival hyperpigmentation in the group of 40-year-old patients and the others were 48.8% and 75%, respectively.* ***Conclusion:*** *There was a statistically significant relationship between gingival melanin pigmentation and skin color. The percentage of melanin pigmentation was higher in those with dark skin. There were no differences in the ratios for age, gender, or smoking status.*

Keywords: *gingival hyperpigmentation, DOPI, Ponnaiyan, Hedin.*

I. INTRODUCTION

The gingiva is the most commonly pigmented in oral cavity tissue, and it is due to the accumulation of melanin granules synthesized by melanocytes [1][2][3][4]. The most common pigmentations affecting the protective gingiva are melanocytic pigmentation, caused by an excess of melanin deposition in the basal and suprabasal layers of the epithelium [5][6].

The developed gingival hyperpigmentation classification system provides a reasonable and scientific framework, becoming the tool to help clinicians prioritize and organize patient treatment needs [7]. Based on the requirements of a reliable index of gingival hyperpigmentation, we referred to 3 popular indexes: DOPI, Ponnaiyan's, and Hedin's. These above indicators assess the grade of hyperpigmentation, the position of the pigmented anatomical area present at the gingival, and their hyperpigmented morphology.

Gingival hyperpigmentation is a cosmetic concern for many people, particularly those with high smile lines and gummy smiles. Understanding the characteristics, distribution, and factors influencing gingival pigmentation is critical for developing a rational treatment strategy. There is no direct correlation between the etiology of melanin and regions, ages, or genders [8]. Due to the lack of studies on gingival hyperpigmentation in Can Tho and the country, the research was done to provide knowledge about gingival hyperpigmentation to the outpatients. As well as the scarcity of literature on gingival melanin pigmentation in Can Tho city, this study was conducted to provide an overview of the knowledge related to the melanin pigment, gingival melanin pigmentation, clinical characteristics, and related factors on patients who visited the clinic at the Department of Odonto-Stomatology, Can Tho University of Medicine and Pharmacy. The topic is conducted with the following objectives: The prevalence of gingival hyperpigmentation in outpatients at Can Tho University of Medicine and Pharmacy Hospital; the association of gingival hyperpigmentation and ages, genders, smoking status, and skin color.

II. MATERIALS AND METHODS

2.1. Study population

The study population consisted of 100 outpatients, who came to the clinic of the Department of Odonto-Stomatology, Can Tho University of Medicine and Pharmacy Hospital, Can Tho city, Vietnam.

2.1.1. Inclusion criteria

Individuals who attended the dental clinic for examination and treatment at the CTUMP Hospital volunteered to participate in the study.

2.1.2. Exclusion criteria

- Patients who have experienced delayed healing or pathological hyperpigmentation due to systemic diseases, or periodontitis in the past; Individuals have gingival tattoos.
- Patients had not taken any pigmentation medication for six months prior to the intervention or had ceased taking it.

2.2. Study methods

A cross-sectional study descriptive design was applied. The evaluation team has 2 participants to assess the patient's gingival hyperpigmentation.

2.2.1. The indicators of gingival hyperpigmentation:

2.2.1.1. Dummett-Gupta Oral Pigmentation Index (DOPI): [7]

The DOPI evaluation gives the total melanin pigmentations detected on clinical examination of the different oral cavity tissues a numerical compositional value. It is determined by dividing the total number of unit spaces in the arch by the sum of the given estimations of pigmentation and based on the scale below:

• 0= No clinical pigmentation (pink-colored gingiva)

• 1= Mild clinical pigmentation (mild light brown color)

• 2= Moderate clinical pigmentation (medium brown or mixed pink and brown color)

• 3= Heavy clinical pigmentation (deep brown or bluish black color)

The numerical estimations in the maxillary arch are added together after ratings are given, then divided by 32. The evaluation made by DOPI for the maxillary arch is the resultant number. Similarly, the mandibular arch is managed.

The DOPI assessment is scaled according to the following designations:

• 0= No clinical pigmentation of the gingiva

• 0.031-0.97= Mild gingival pigmentation

• 1.0-1.9= Medium gingival pigmentation

• 2.0-3.0= Heavy gingival pigmentation

2.2.1.2. Hedin's classification - Smokers' melanosis: [7], [9]–[11]

The investigation's goal was to determine the frequency and extension of melanin pigmentation, which was discovered to be localized to the attached gingiva, in order to study the localization of the pigmentation, as well as its relationship to smoking:

• Degree 0= No pigmentation

• Degree I= One or two solitary unit(s) of pigmentation in papillary gingiva without the formation of a continuous ribbon between solitary units

• Degree II= More than three units of pigmentation in papillary gingiva without the formation of a continuous ribbon

• Degree III= One or more short continuous ribbons of pigmentation

• Degree IV= One continuous ribbon including the entire area between canines

2.2.1.3. Ponnaiyan's Classification of gingival pigmentation pattern: [11]

To assess distribution patterns of pigmentation, a categorization system characterizing the patterns of anatomic distribution of gingival pigmentation was developed based on the examination of the individuals.

Based on the evaluation of the subjects, six categories were defined:

• Class I: pigmentation in the attached gingiva only

• Class II: pigmentation in the attached gingiva & interdental papilla

• Class III: diffuse pigmentation involving all parts of the gingiva

• Class IV: pigmentation in marginal gingiva only

• Class V: pigmentation in interdental papilla only

• Class VI: pigmentation in marginal gingiva & interdental papilla

2.2.2. Skin color

The skin color was assessed in the lower third of the arm (area not exposed to sunlight) by visual examination using Felix Von Luschan's chromatic scale. The shade was

evaluated in natural daylight [5]. Skin color is separated into two groups: light skin (values ranging from 1 to 18) and dark skin (values ranging from 19 to 36).

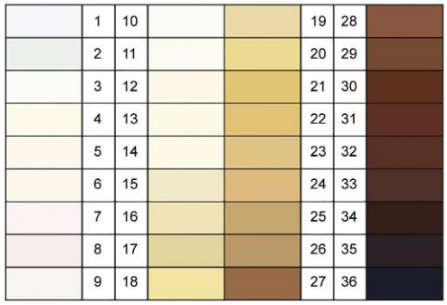

Figure 1. Felix Von Luschan's chromatic scale [5]

2.2.3. Ages

The researcher separated the analyzed age groups into two groups: < 40-year-old and >= 40-year-old in order to enhance the predicted frequency and make the Chi-square value more credible.

2.3. Statistical analyses

All data were entered in Excel and processed and analyzed using SPSS 18.0. Chi-square test to find the association between gingival hyperpigmentation and genders, ages, skin color, and smoking status.

2.4. Ethics approval

Patients received a thorough description of the trial, had the option to decline enrollment, and were free to stop taking part at any time. The patient was not harmed by the trial, nor was the patient's gingiva affected.

III. RESULTS

In this study, 100 patients were examined, among which 44 (44%) were males, and 56 (56%) were females. They were separated into 2 main groups of age, and the participants were categorized into different gender, age groups, skin colors, and smoking statuses of clinical patients.

According to Felix's skin color chart, the skin color of 100 Vietnamese outpatients was recorded in the following ranges according to the scale.

Table 1. Prevalent distribution of pigmentation according to the skin color of patients

Distribution of hyperpigmentation	Skin color ranges		Total	P value
	1-18	19-36	N (%)	
	N (%)	N (%)		
No pigmentation	46 (50.5)	1 (11,1)	47 (47)	0.034
Pigmentation	45 (49.5)	8 (88,9)	53 (53)	
Total	**91 (100)**	**9 (100)**	**100 (100)**	

There was a statistically significant relationship between gingival hyperpigmentation and skin color ($p = 0.034 < 0.05$). The prevalence of hyperpigmentation was higher in the dark-skinned group.

Table 2. The prevalence of distribution of pigmented gingiva according to gender

			Dummett-Gupta Oral Pigmentation Index			Total
			0	I	II	
Genders	Males	N	17	19	8	**44**
		%	38.6	43.2	18.2	**100.0**
	Females	N	30	21	5	**56**
		%	53.6	37.5	8.9	**100.0**
Total		N	47	40	13	**100**
		%	47.0	40.0	13.0	**100.0**

In this study, we recorded the rate of pigmentation as 53%, of which 40% was mild pigmentation according to DOPI (grade 1), 13% was moderate pigmentation (grade 2) and was not recorded as heavy pigmentation (grade 3).

Table 3. Prevalence of distribution of gingival pigmentation according to the gender of patients

Distribution of hyperpigmentation		Genders		Total	χ^2	P value
		Males	Females	N (%)		
		N (%)	N (%)			
DOPI Classification	0	17 (38.6)	30 (53.6)	47 (91.2)	2.991	0.224
	I	19 (43.2)	21 (37.5)	40 (80.7)		
	II	8 (18.2)	5 (8.9)	13 (27.1)		
	III	0 (0)	0 (0)	0 (0)		
Total		**44 (100)**	**56 (100)**	**100 (100)**		

The degree of gingival melanin pigmentation is not different in men and women (χ^2=2.991, p = 0.224>0.005).

Table 4. Prevalence of distribution of pigmentation according to group ages of patients

Distribution of hyperpigmentation		Age groups of patients		Total	χ^2	P value
		<40	≥ 40	N (%)		
		N (%)	N (%)			
DOPI Classification	0	43 (51.2)	4 (25)	47 (91.2)	3.703	0.157
	I	31 (36.9)	9 (56.2)	40 (80.7)		
	II	10 (11.9)	3 (18.8)	13 (27.1)		
	III	0 (0)	0 (0)	0 (0)		
Total		**84 (100)**	**16 (100)**	**100 (100)**		

The Chi-square test showed that the difference in gingival hyperpigmentation between individuals aged 40 and under and those aged 40 and over was not statistically significant (χ^2=3.703, p=0.157).



Figure 2. *No pigmentation* ***Figure 3.*** *DOPI grade I* ***Figure 4.*** *DOPI grade 2*

Table 5. The rate of gingival melanin pigmentation according to Hedin's classification

Class / **Location**	**Maxillary**	**Mandibular**
	N (%)	**N (%)**
0= No pigmentation	49 (49)	52 (52)
I= Isolated- only 1 or 2 pigmented interdental papillae	1 (1)	5 (5)
II= More 3 pigmented units, no create a continuous ribbon	1 (1)	0 (0)
III= One or numerous short continuous ribbons	4 (4)	3 (3)
IV= Long continuous ribbon	45 (45)	40 (40)
Total	**100 (100)**	**100 (100)**

The study recorded all groups of pigmented morphology according to Hedin's classification. In cases with hyperpigmentation, the group forming a long continuous ribbon accounted for the highest proportion. 13% of research participants showed pigmented morphology of the maxilla and mandible that differed





Fig 5*. Degree 0* ***Fig 6****. Degree I* ***Fig 7****. Degree II* ***Fig 8****. Degree III* ***Fig 9****. Degree IV*

Table 6. The frequency of the Distribution of gingival hyperpigmentation according to Ponnaiyan's Classification

Distribution of gingival hyperpigmentation	**Maxillary**	**Mandibular**
	N (%)	**N (%)**
No pigmentation (Class 0)	49 (49)	52 (52)
Pigmentation in the attached gingiva only (Class I)	32 (32)	29 (29)
Pigmentation in attached gingiva and interdental papilla (Class II)	18 (18)	18 (18)
Diffuse pigmentation involving all parts of gingiva (Class III)	1 (1)	1 (1)
Pigmentation in marginal gingiva only (Class IV)	0 (0)	0 (0)
Pigmentation in interdental papilla only (Class V)	0 (0)	0 (0)
Pigmentation in marginal gingiva & interdental papilla (Class VI)	0 (0)	0 (0)
Total	**100 (100)**	**100 (100)**

Recording 3 groups/6 groups with gingival melanin pigmentation according to Ponnaiyan's classification. Class 1 accounted for the highest proportion, followed by the group class 2, and finally class 3. There 92% of subjects with the same pigmented condition in the maxillary and mandibular according to Ponnaiyan's classification.

Figure 10. Class I

Figure 11. Class II

Figure 12. Class III

Table 7. Prevalence of distribution of pigmentation according to the smoking status of patients

Distribution of hyperpigmentation	**Smoking status**		**Total**	**P value**
	Non-smokers	**Smokers**	**N (%)**	
	N (%)	**N (%)**		
No pigmentation	46 (50)	1 (12.5)	47 (47)	0.063
Pigmentation	46 (50)	7 (87.5)	53 (53)	
Total	92 (100)	8 (100)	100 (100)	

There was no difference in the rate of gingival melanin pigmentation between smokers and non-smokers in this study (p=0.063>0.05).

IV. DISCUSSION

4.1. Characteristics of gingival pigmentation in this study

The study recorded that the rate of gingival hyperpigmentation was 53% with 100 random subjects (44 men, 56 women). This rate is 18% higher than the rate surveyed in an Asian country like Japan of 18% [12]; but lower than that found in the study by Hedin that investigated the hyperpigmentation ratio in a group of Thailand and Malaysian people was 79%. The prevalence of hyperpigmentation in males in the study was 61.4%, and in females, the lower rate was 46.4%. This is also consistent with the Hedins study, in which the ratio was higher in males. According to Ponnaiyan's classification, class I accounted for the highest proportion (32% in the maxillary, 29% in the mandibular), The study of Rakhewar et al. surveying the population of India recorded the highest frequency of pigmentation was class II [13]. Ponnaiyan also showed more in class II [11]. Janiani et al., to evaluate the gingival hyperpigmentation in different age groups in the Indian population recorded. In young adults, pigmented gingiva was only in the attached gingival, marginal gingiva, or papillae gingival. This study recorded all groups of Hedin's classification. The group of pigmented forming a long continuous sequence (degree IV) accounts for the highest proportion. The research by Hedin in Sweden recorded the highest percentage of groups with more than 3 pigment units (degree II), not forming a continuous sequence.

4.2. Correlation between gingival hyperpigmentation and the factors

The study showed that the degree of gingival hyperpigmentation was not different in both genders. This result was consistent with many studies such as the study of Rakhewar et al. [13]. There was a statistically significant relationship between gingival hyperpigmentation and skin color; this rate was higher than in the people with dark skin color group. This result was the same as many previous studies, with the darker skin color being the higher the percentage of gingival hyperpigmentation, the heavier the level. No

difference existed between the gingival hyperpigmentation ratios among smokers and non-smokers in this study.

V. CONCLUSIONS

The degree of gingival melanin pigmentation is not different in men and women. The difference in gingival melanin pigmentation between the 40-year-old and the >=40-year-old groups was not statistically significant. The rate of gingival hyperpigmentation is higher in people with dark skin color. There was no difference in chromosomal ratios between smokers and non-smokers in this study. There was a statistically significant relationship between gingival hyperpigmentation and skin color.

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