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Original Research Article

Evaluation of Prevalence and Severity of Gingival Pigmentation and its Correlation with Skin Complexion

Manaswini Eaturi [1], Krishnajaneya Reddy[2], Haritha Avula[3], Vijayalakshmi Bolla[4], Ashank mishra[5], Sai Krishna H.V.N[6]

[1]Assistant professor, Department of periodontics, Meghna Institute of Dental Sciences, Nizamabad Mallaram, Telangana India.

[2]Professor and Head of the Department, Department of periodontics, Sri Sai College of Dental Surgery, Kothrepally, Vikarabad, Hyderabad, Telangana, India.

[3]Professor and Head of the Department, Department of periodontics, Bhaskara Dental College, Moinabad Ranga Reddy, Hyderabad, Telangana India.

[4]Associate professor, Department of periodontics, SVS Institute of Dental Sciences, Mahbubnagar, Telangana India.

[5]Assistant professor, Department of periodontics, Sri Sai College of Dental Surgery, Vikarabad, Hyderabad, Telangana, India.

[6]Assistant professor, Department of Public health dentistry, Meghna Meghna Institute of Dental Sciences, Nizamabad Mallaram, Telangana India.

***Corresponding author**
Dr. E. Manaswini
Email: manu29_7@yahoo.co.in

Abstract: The aim of the study is to evaluate the prevalence, severity, distribution of gingival pigmentation, influence of age and gender on pigmentation, and to correlate the colour of the gingiva with facial skin complexion. 500 systemically healthy subjects were included in the study and were divided into five groups with 100 in each group: <6 months (I), 6 months to 5 years (II), 5 to 15 years (III), 15 to 35 years (IV) and 35 to 55 years (V). All the subjects facial complexion was recorded using the Fitzpatrick scale. Severity of the gingival pigmentation was recorded using Dummett- Gupta Oral Pigmentation index and distribution was recorded using de Krom Oral Pigmentation Chart. Gingival pigmentation was found in all the subjects of the observed sample. Mandible has shown significantly more gingival pigmentation than maxilla, anterior more than posterior, labial more than lingual. There was a statistically significant increase in the gingival pigmentation from group I to III and decrease from group III to IV and no difference between group IV and V. In all the groups' significant correlation was found between gingival pigmentation and facial skin complexion. This study supports the impression that there is an influence of advancing age on gingival pigmentation and a strong relationship exists between facial skin colour and gingival pigmentation.
Keywords: Gingival pigmentation**;** Facial complexion**;** Fitzpatrick scale**;** Dummett- Gupta Oral Pigmentation index

INTRODUCTION

Oral pigmentation is a relatively common condition that may involve any part of the oral cavity. The gingiva is the most frequently pigmented intra-oral tissue and is most readily seen, described as coral pink and "the colour of healthy gingiva varies from pale pink to bluish purple. Colour primarily depends on the intensity of the melanogenesis, degree of epithelial cornification, depth of epithelialisation, arrangement of gingival vascularity and the fibrous nature of the underlying connective tissue pigmentation [1].

The prevalence rate of gingival pigmentation is diverse according to race and country. Physiologic oral pigmentation is not limited to any one race, it is a common characteristic of the darker races [2]. Previous studies have shown that gingival pigmentation is manifested as generalized pigmentation with variable prevalence in different ethnic groups [1, 3-7].

The intensity and distribution of pigmentation of the oral mucosa is variable, not only between races, but also between different individuals of same race and within different areas of the same mouth. Physiologic pigmentation is probably genetically determined, but as Dummett [2] suggested the degree of pigmentation is partially related to mechanical, chemical, and physical stimulation. The variation is related to differences in the activity of melanocytes.

Pigmentation of gingiva in young children was reported to be variable; Dummett [2] observed it as early as within 3 hours after birth. On the contrary, Prinz [8] reported that pigmentation did not appear in children and was clinically visible only after puberty. With the increase of age, gingival pigmentation was found to be decreased with the age whereas it increased in lips, cheeks and palate [9]. There was no significant correlation found in the gingival pigmentation between males and females [10-13].

The pigmentation of the oral tissues is comparable to the pigmentation of the skin. Human skin colour is one of the most conspicuous human polytypic variations. Edwards and Duntley [14] found that variation in human skin colour is mainly due to the presence of four pigments, namely, melanin, haemoglobin, carotene and melanoid. In addition to this, effect produced by the scattering of light from the skin surface is also involved in giving a particular skin colour to the person. There is a great similarity between the histologic structure of the skin and that of the gingiva, which is one of the more accessible and usually one of the more heavily pigmented of the oral tissues.

Few studies had shown the relation between gingival pigmentation and facial skin complexion [2, 3, 7, 13, 15]. Dummett[2]has shown positive correlation between facial skin complexion and DOPI estimate, the amount of variance explained precludes the clinical use of facial skin complexion to predict gingival pigmentation.

The nature, distribution and association with evolution of gingival pigmentation have been a matter of controversy with diverse opinions reported in literature. The objectives of the present study were to evaluate the prevalence, severity, extent and distribution of gingival pigmentation in different age groups, and in various anatomical locations, to correlate the colour of the gingiva with skin complexion, to study differences if any, in gingival pigmentation between males and females, to evaluate the influence of advancing age on gingival pigmentation.

MATERIALS AND METHODS

The present epidemiological cross-sectional study for the evaluation and prevalence of gingival pigmentation comprised of 500systemically healthy subjects of age group newborns to 55 years. Patients attending out-patient Department of Oral Medicine and Radiology, students and faculty of Sri Sai College of Dental Surgery, Vikarabad and new borns from Pediatric and Obstetric departments of hospitals in and around Vikarabad were included in the study. The study protocol was approved by Ethical Committee of Sri Sai College of Dental Surgery, Vikarabad and informed consent was obtained from all the participants or the parents of children. Subjects who were pregnant, patients with oral pathologies which cause/affect pigmentation (hyper or hypopigmentation), patients under medications which influence pigmentation, systemic diseases which influence pigmentation, habits (smoking, use of pan, gutkha or placement of other substances), iatrogenically induced gingival pigmentation (amalgam tattoo, cultural tattooing), patients with gingivitis (MGI > 2) and periodontitis were excluded from the study.

The subjects were divided into 5 groups (100 subjects in each group) taking the age as the criteria as: Group I - 0 to 6 months, Group II -6 months to 5 years, Group III - 5 to 15 years, Group IV - 15 to 35 years, Group V - 35 to 55 years.

Facial skin complexion was measured with the help of Fitzpatrick [16] scale skin shade system which is based on 36 opaque glass tiles (Von Luschans [17] scale) which includes very fair to black (Figure 1). The skin colour was selected at the malar region of the face.

The severity of the gingival pigmentation was recorded using Dimmit- Gupta Oral Pigmentation Index [1] (DOPI). 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)

Extent and distribution of the gingival pigmentation was recorded according to the de Krom's Oral Pigmentation Chart [18] (Figure 2).

The extent and distribution of the gingival pigmentation was recorded by means of diagrammatic representation which is a specially designed diagram, by shading the marginal, papillary and attached gingival areas.

Facial photographs of each subject were taken in natural day light and intraoral photographs were taken for documentation. A questionnaire regarding esthetic concern was asked to adolescents and adults, about the awareness of their pigmented gums.

Statistical analysis was done using (SPSS version 17.0) independent sample t-test for intragroup comparison of mean DOPI scores, repeated ANOVA with post-hoc test for intergroup comparison of mean DOPI scores and Spearman correlation coefficient test

to find the correlation between DOPI scores and facial skin complexion.

RESULTS

The present epidemiological study included subjects aged between newborns to 55 years (mean age 15.91±16.61), of which 253 were males (50.6%) and 247 were females (49.4%) (Table 1) (Figure 3). Results are mentioned under facial complexion, Dummett-Gupta Oral Pigmentation Index [1], de Krom [18] Oral Pigmentation Chart.

Facial complexion:

Subjects were classified according to facial complexion (Fitzpatrick [16] scale) into 6 types: very fair, fair, light brown, moderate brown, dark brown and black, of which 159 (31.8%) were moderate brown, 291 (58.2%) were dark brown and 50 (10%) were of black complexion. (Table 1) (Figure 4, 5 and 9)

Dummett-Gupta Oral Pigmentation Index [1]

All the subjects in the study (100%) showed gingival pigmentation which ranged from mild to heavy. DOPI inference revealed, 323 (64.6%) with medium gingival pigmentation and 177 (35.4%) with heavy gingival pigmentation (Table 1) (Figure 6).

Gingival pigmentation is observed more in the mandible than maxilla, anterior compared to posterior region and labially than lingually in all the groups (Table 2) (Figure 7). Intragroup comparison of mean Dummett index scores between males and females were statistically not significant in all the groups (Table 3) (Figure 8 and 10). From group I to III there is statistically significant increase in gingival pigmentation scores. Group III to IV there is a statistical significant decrease in overall Dummett index scores.

Intergroup comparison of mean DOPI scores in moderate brown complexion subjects revealed statistical significant increase from group I to III, but there was no significant difference between group III and IV. In dark brown and black complexion subjects there was statistical significant increase from group I to III, followed by decrease from group III to IV, but there was no significant difference between IV and V (Table 2) (Figure 11 and 12).

Correlation of Facial complexion and Dummett index scores:

Correlation of facial complexion with gingival pigmentation Dummett inference scores in each group revealed statistically significant correlation (Table 4 and 5)(Figure 9 and 10).

Distribution of gingival pigmentation by de Krom [18] Oral Pigmentation Chart

Distribution of pigmentation was categorized as C1 to C6 (category 1 to 6). In each group pigmentation of subjects was mostly C1 type followed by C4, C5 and C2 type. No subjects were seen with C3 and C6 type of distribution (Table 6) (Figure 13). In group IV and V, 30% of the moderate brown complexion and 60% of dark brown complexion subjects expressed their esthetic concern over heavy pigmented gingiva.

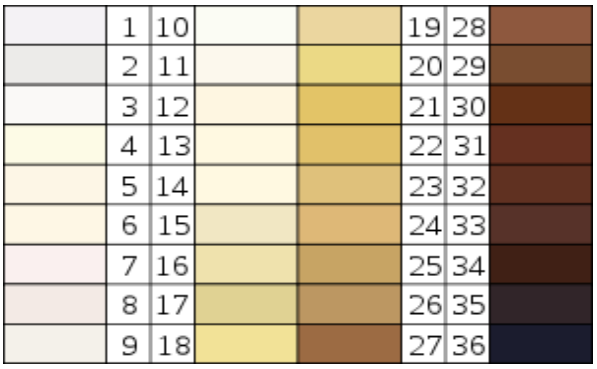

Fig-1: Von Luschans scale

Skin type score	Fitzpatrick skin type	Skin colour
1-5	I	White/Very fair
6-10	II	Fair
11-15	III	Light brown
16-21	IV	Moderate brown
22-28	V	Dark brown
29-36	VI	Black

Fitzpatrick scale

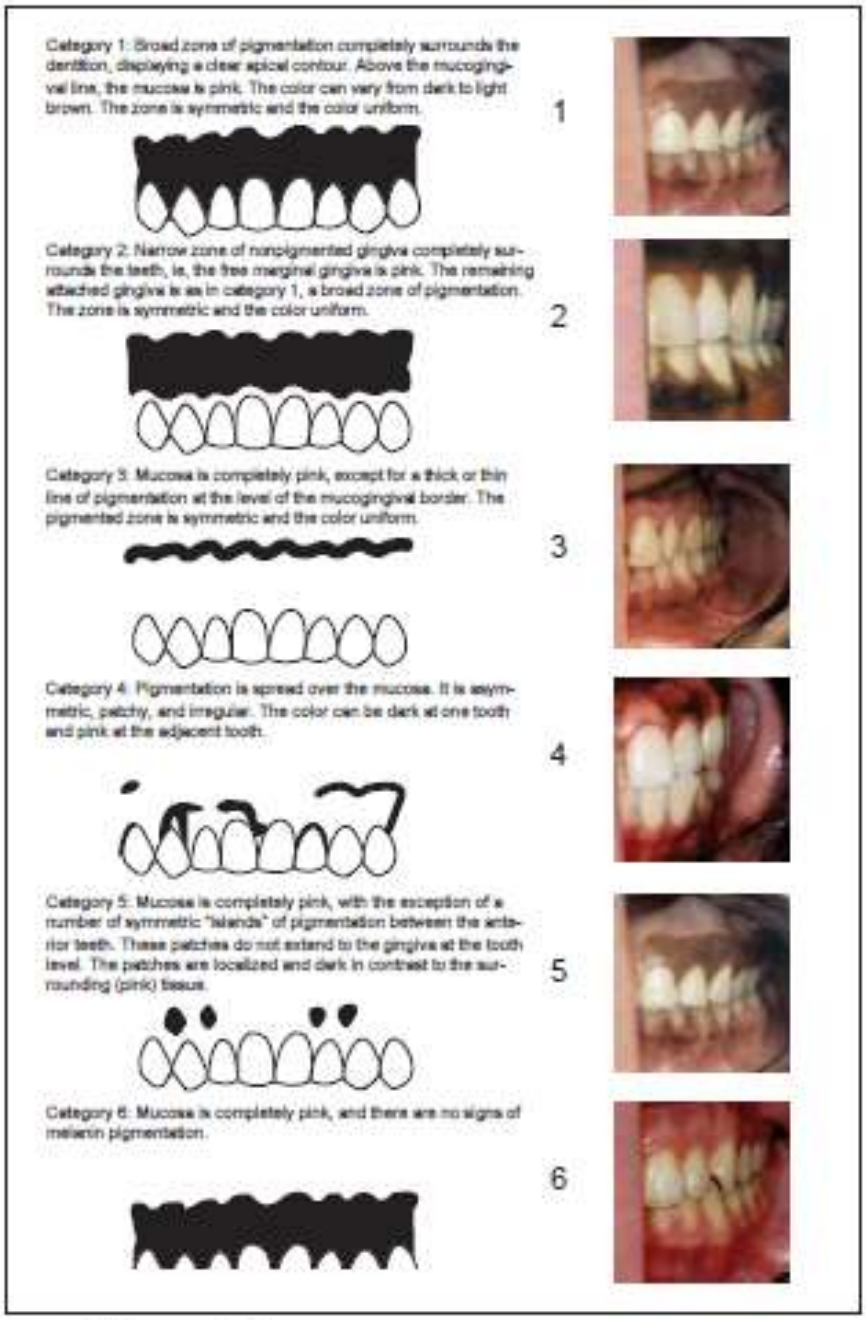

Fig-2: Oral Pigmentation Chart

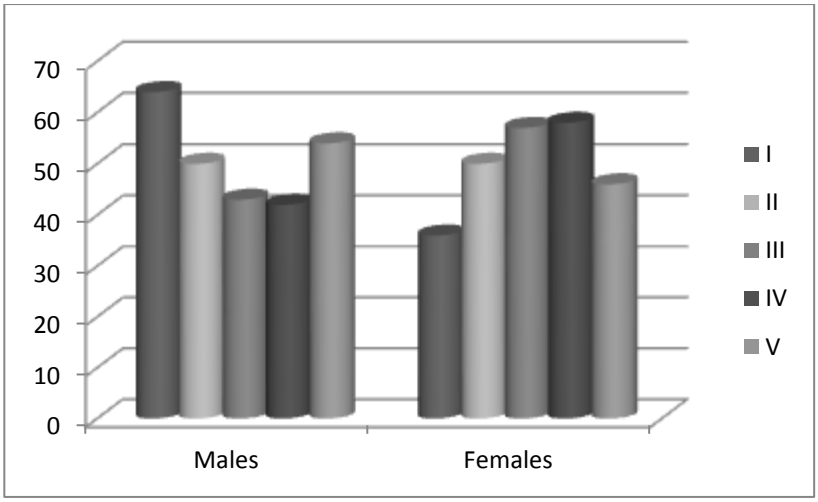

Fig-3: (Graph 1): Distribution of subjects by age and gender among five groups

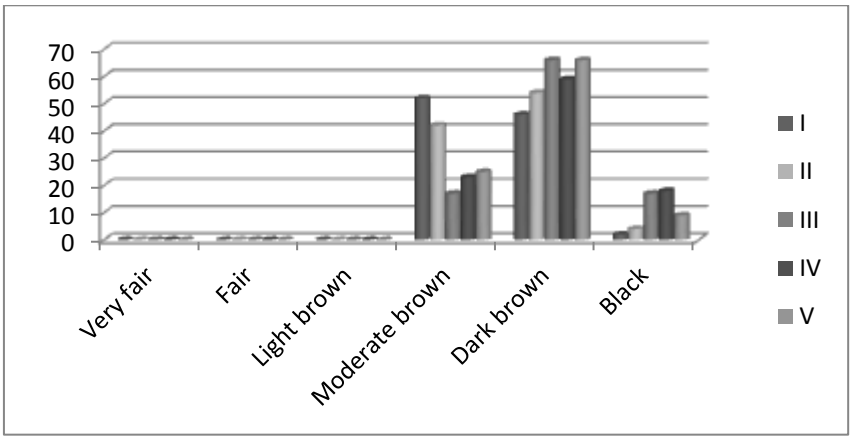

Fig-4: (Graph 2): Distribution of subjects by facial complexion among 5 groups

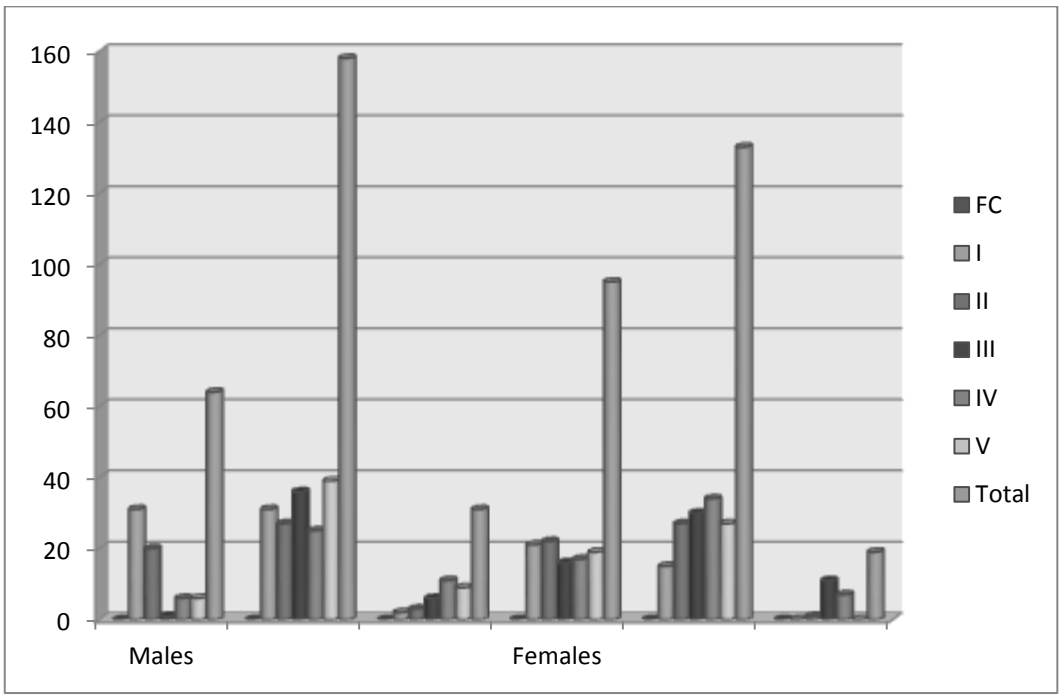

Fig-5: (Graph 3): Distribution of subjects with different facial complexion in males and females in 5 groups

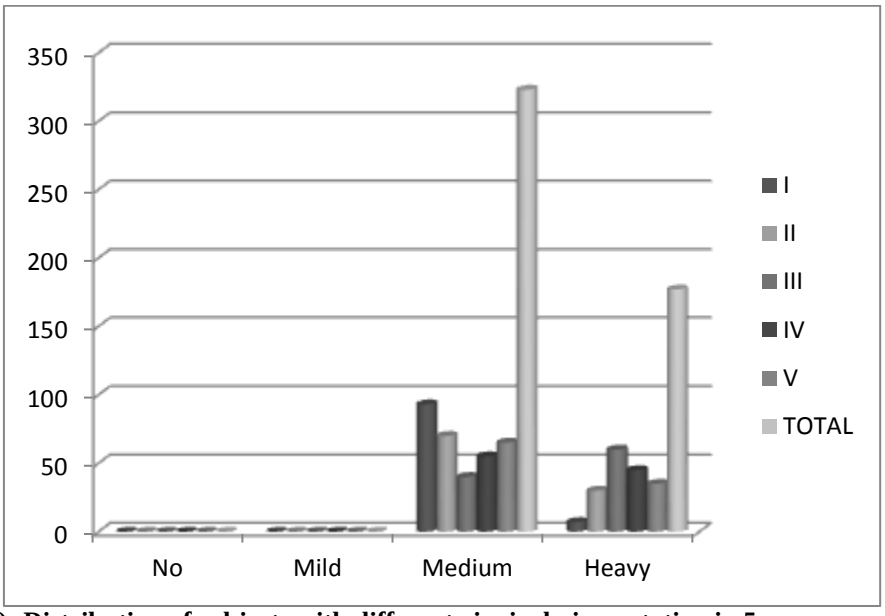

Fig-6: (Graph 4): Distribution of subjects with different gingival pigmentation in 5 groups according to DOPI

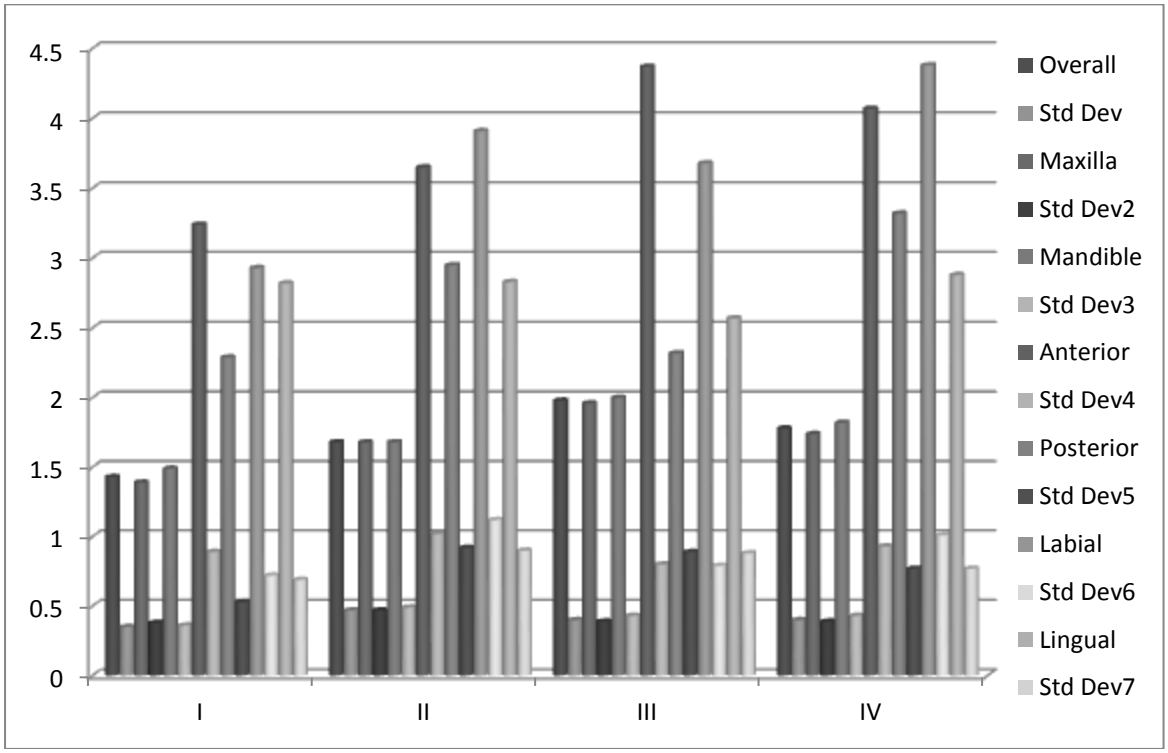

Fig-7: (Graph 5): Intragroup comparison of DOPI scores using independent sample t-test

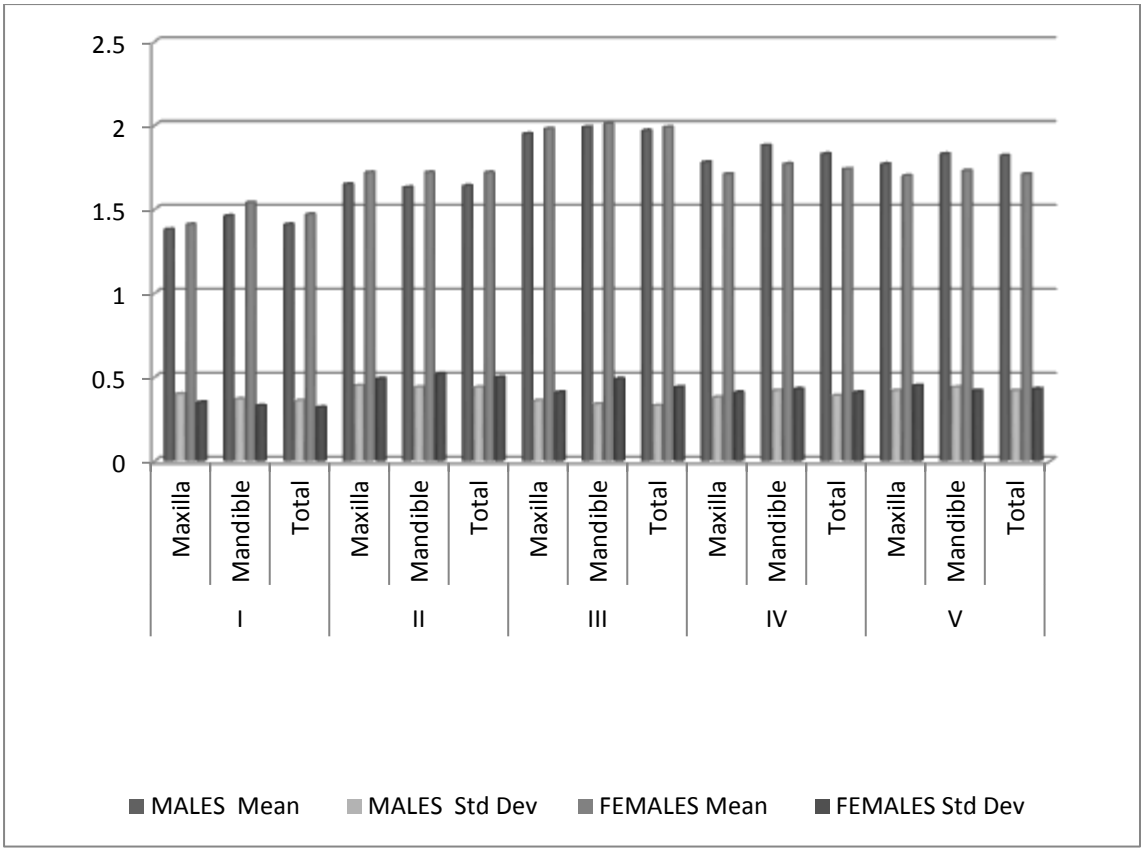

Fig-8 (Graph 6): Intragroup comparison of mean DOPI scores between males and females using independent sample t-test

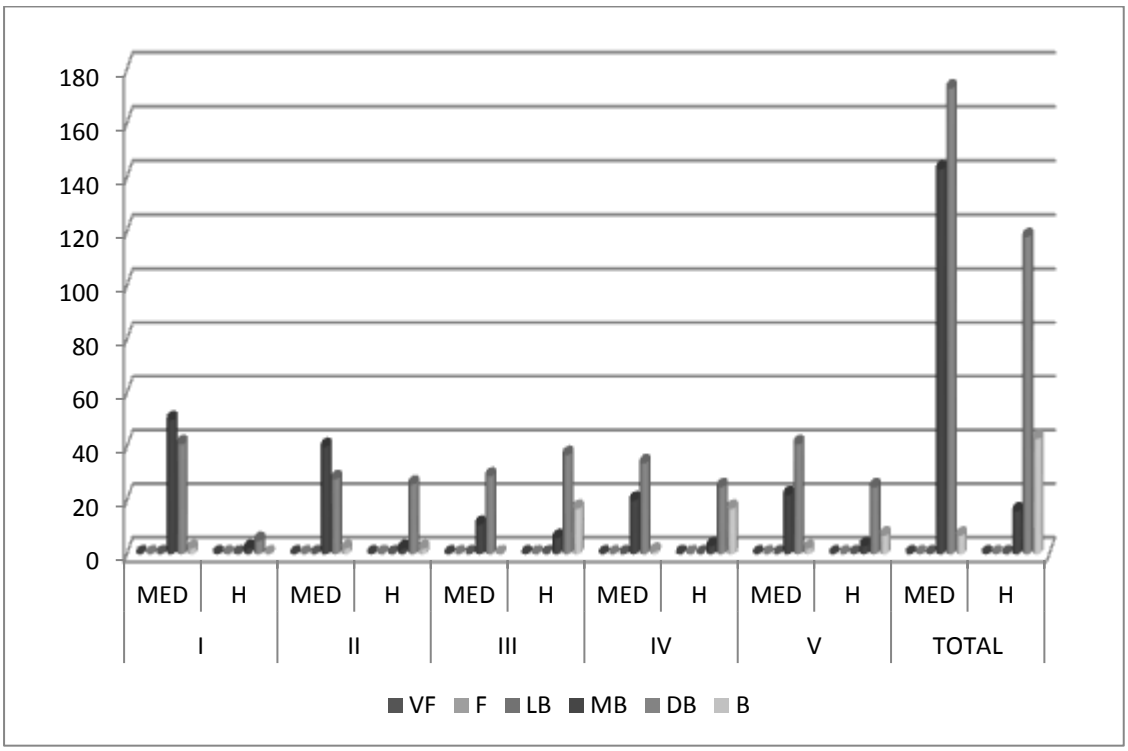

Fig-9: (Graph 7): Distribution of subjects according to DOPI and facial complexion in 5 groups

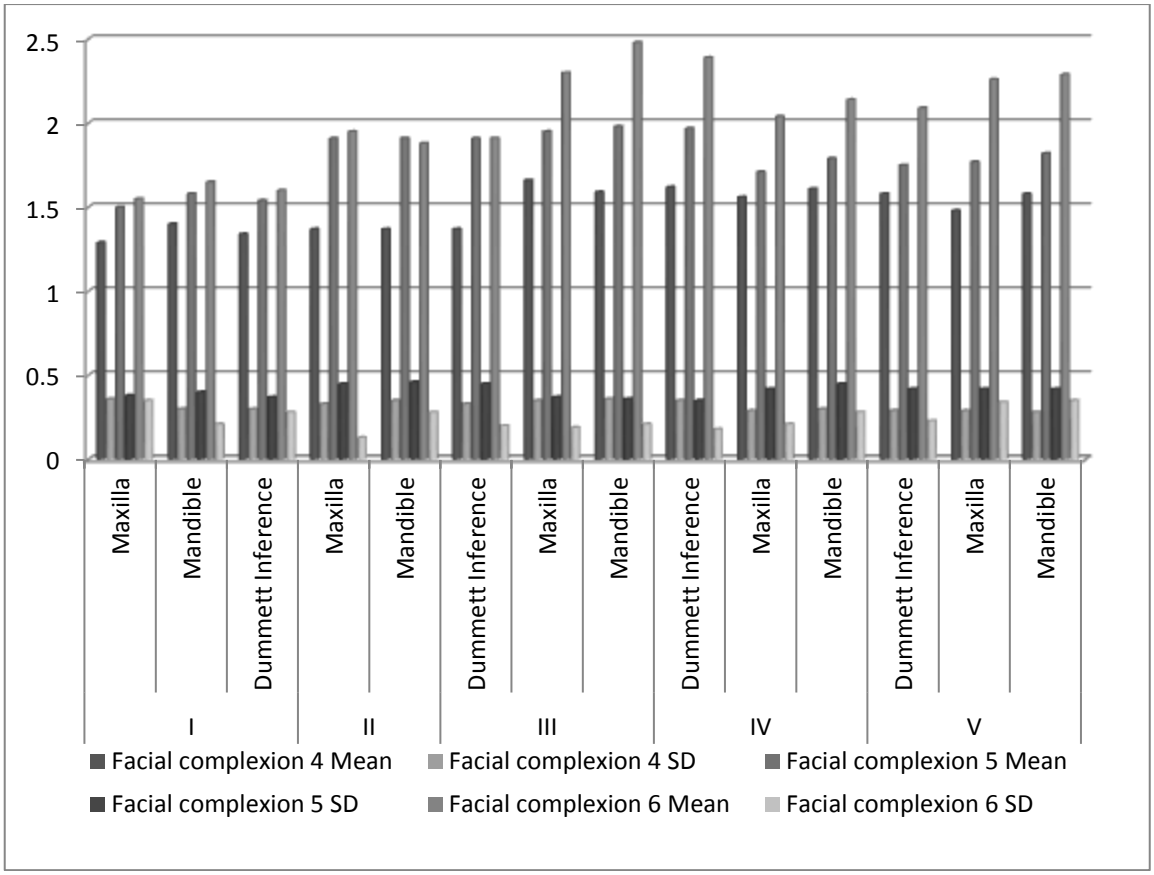

Fig-10: (Graph 8): Intragroup comparison of mean DOPI scores according to facial complexion using repeated ANOVA with post-hoc Games Howell test

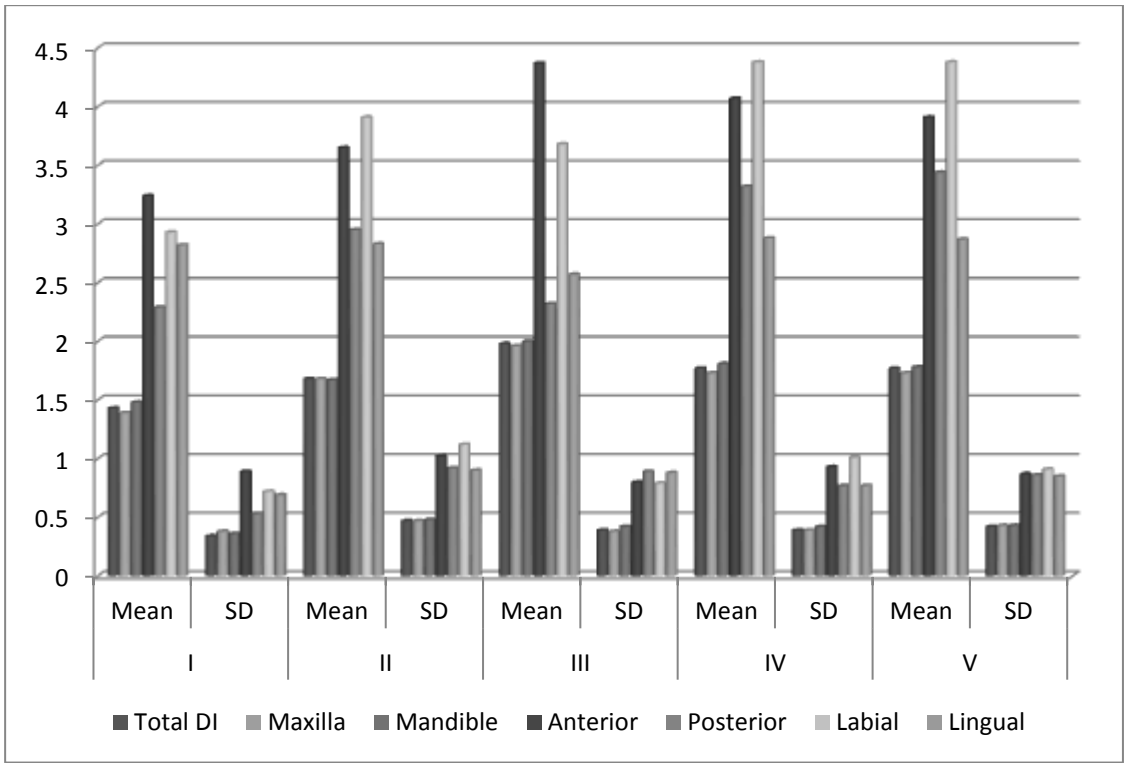

Fig-11: (Graph 9): Intergroup comparison of mean DOPI scores using repeated ANOVA

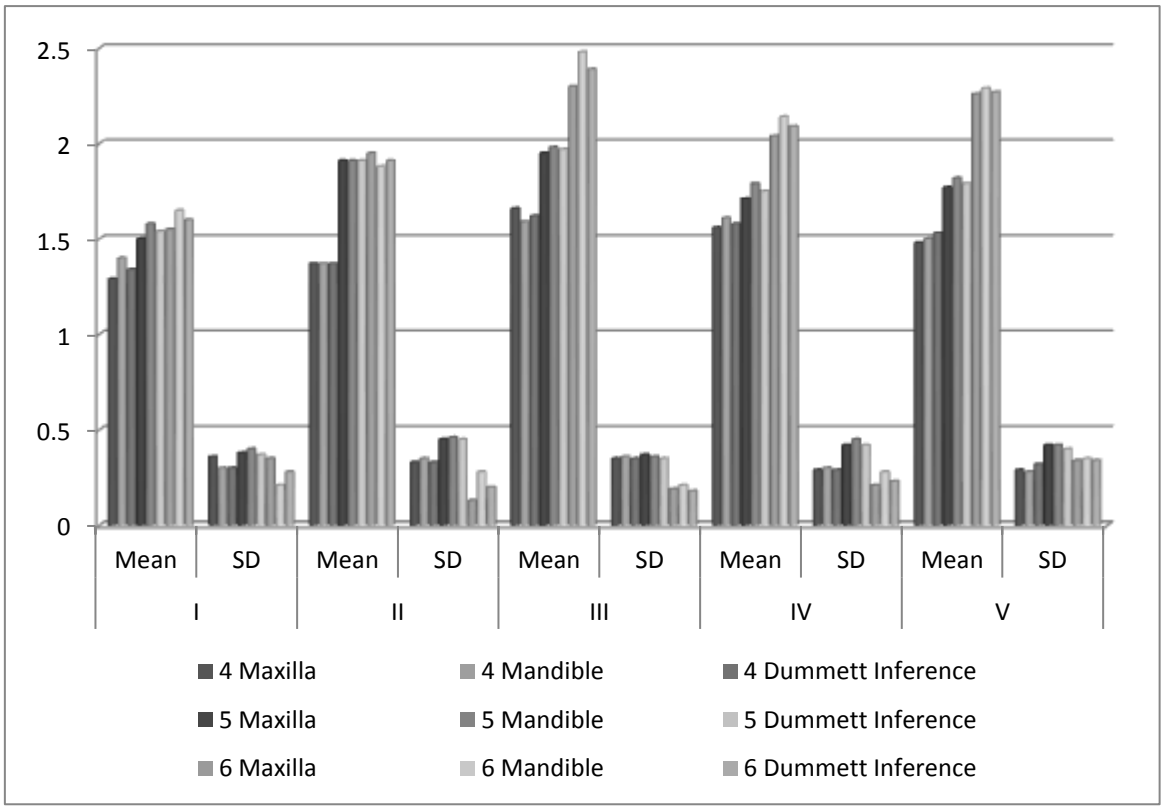

Fig-12: (Graph 10): Intergroup comparison of mean DOPI scores according to facial complexion using repeated ANOVA with post-hoc Games Howell test

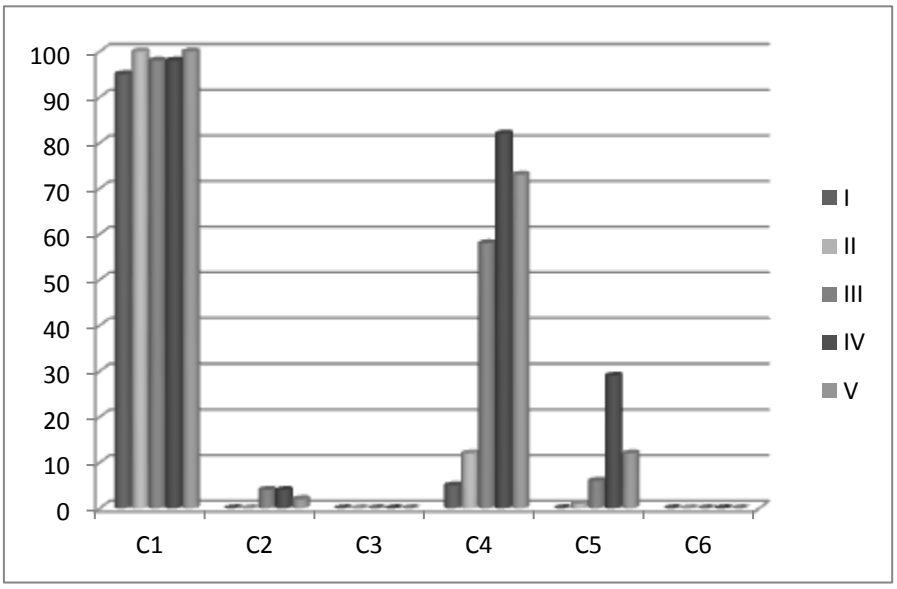

Fig-13: (Graph 11): Distribution of gingival pigmentation according to de Krom index among 5 groups

Table-1: Distribution of subjects by age, gender, facial complexion and different gingival pigmentation among five groups

	I (N=100) (< 6 months)	**II (N=100)** (6 months-5 years)	**III (N=100)** (5-15 years)	**IV (N=100)** (15-35 years)	**V (N=100)** (35-55 years)	**Total (N=500)**
Mean age	0.19±0.16	2.5±1.52	10.9±10.5	23.4±4.40	42.3±6.34	15.91±16.61
Males	64	50	43	42	54	253 (50.6%)
Females	36	50	57	58	46	247 (49.4%)
Moderate brown	52	42	17	23	25	159(31.8%)
Dark brown	46	54	66	59	66	291(58.2%)
Black	2	4	17	18	9	50(10%)
Medium GP	93	70	40	55	65	323(64.6%)
Heavy GP	7	30	60	45	35	177(35.4%)
Overall Prevalence	100%	100%	100%	100%	100%	100%

Table-2: Intragroup comparison of DOPI scores using Independent sample t-test

Groups	**Overall DOPI score**	**Maxilla DOPI score**	**Mandible DOPI score**	**p-value (Maxilla and Mandible)**	**Anterior DOPI score**	**Posterior DOPI score**	**p-value**	**Labial DOPI score**	**Lingual DOPI score**	**p-value**
I (N=100)	1.43±0.35	1.39±0.38	1.49±0.36	<0.001*	3.24±0.89	2.29±0.53	<0.001*	2.93±0.72	2.82±0.69	<0.001*
II (N=100)	1.68±0.47	1.68±0.47	1.68±0.49	0.652	3.65±1.02	2.95±0.92	<0.001*	3.91±1.12	2.83±0.90	<0.001*
III (N=100)	1.98±0.40	1.96±0.39	2.00±0.43	0.064	4.37±0.80	2.32±0.89	<0.001*	3.68±0.79	2.57±0.88	<0.001*
IV (N=100)	1.78±0.40	1.74±0.39	1.82±0.43	<0.001*	4.07±0.93	3.32±0.77	<0.001*	4.38±1.01	2.88±0.77	<0.001*
V (N=100)	1.77±0.42	1.74±0.43	1.78±0.43	0.013*	3.91±0.87	3.44±0.86	<0.001*	4.38±0.91	2.87±0.85	<0.001*

P-value-≤0.05* – statistically significant; DOPI – Dummett-Gupta Oral Pigmentation index

Table-3: Intragroup comparison of mean DOPI scores between males and females using independent sample t-Test

Group		**Sex**		**p-value**
		Males	**Females**	
		Mean±SD	**Mean±SD**	
I (N=100)	Maxilla	1.38±0.40	1.41±0.35	0.791
	Mandible	1.46±0.37	1.54±0.33	0.268
	Total	1.41±0.36	1.47±0.32	0.410
II (N=100)	Maxilla	1.65±0.45	1.72±0.49	0.425
	Mandible	1.63±0.44	1.72±0.52	0.346
	Total	1.64±0.44	1.72±0.50	0.379
III (N=100)	Maxilla	1.95±0.36	1.98±0.41	0.713
	Mandible	1.99±0.34	2.01±0.49	0.882
	Total	1.97±0.33	1.99±0.44	0.79
IV (N=100)	Maxilla	1.78±0.38	1.71±0.41	0.360
	Mandible	1.88±0.42	1.77±0.43	0.225
	Total	1.83±0.39	1.74±0.41	0.271
V (N=100)	Maxilla	1.77±0.42	1.70±0.45	0.434
	Mandible	1.83±0.44	1.73±0.42	0.261
	Total	1.82±0.42	1.71±0.43	0.175

p-value ≤ 0.05 is statistically significant

Table-4: Correlation between DOPI and facial complexion in each group using Spearman correlation coefficient test

Group			Facial complexion
I (N=100)	Dummett Inference	Spearman's rho Correlation Coefficient	0.312
		p-value	0.002*
		N	100
II (N=100)	Dummett Inference	Spearman's rho Correlation Coefficient	0.572
		p-value	<0.001*
		N	100
III (N=100)	Dummett Inference	Spearman's rho Correlation Coefficient	0.564
		p-value	<0.001*
		N	100
IV (N=100)	Dummett Inference	Spearman's rho Correlation Coefficient	0.441
		p-value	<0.001*
		N	100
V (N=100)	Dummett Inference	Spearman's rho Correlation Coefficient	0.433
		p-value	<0.001*
		N	100

p-value- ≤0.05* – statistically significant

Table-5: Intragroup comparison of mean DOPI scores according to facial complexion using repeated ANOVA with post-hoc Games Howell test

Group		Facial complexion			p-value	Post-hoc test
		4	5	6		
		Mean±SD	Mean±SD	Mean±SD		
I (N=100)	Maxilla	1.29± 0.36	1.50±0.38	1.55±0.35	**0.026**	**5>4**
	Mandible	1.40±0.30	1.58±0.40	1.65±0.21	**0.028**	**5>4**
	Dummett Inference	1.34±0.30	1.54±0.37	1.60±0.28	**0.011**	**5>4**
II (N=100)	Maxilla	1.37±0.33	1.91±0.45	1.95±0.13	**<0.001**	**5,6>4**
	Mandible	1.37±0.35	1.91±0.46	1.88±0.28	**<0.001**	**5>4**
	Dummett Inference	1.37±0.33	1.91±0.45	1.91±0.20	**<0.001**	**5,6>4**
III (N=100)	Maxilla	1.66±0.35	1.95±0.37	2.30±0.19	**<0.001**	**6>5>4**
	Mandible	1.59±0.36	1.98±0.36	2.48±0.21	**<0.001**	**6>5>4**
	Dummett Inference	1.62±0.35	1.97±0.35	2.39±0.18	**<0.001**	**6>5>4**
IV (N=100)	Maxilla	1.56±0.29	1.71±0.42	2.04±0.21	**<0.001**	**6>4,5**
	Mandible	1.61±0.30	1.79±0.45	2.14±0.28	**<0.001**	**6>4,5**
	Dummett Inference	1.58±0.29	1.75±0.42	2.09±0.23	**<0.001**	**6>4,5**
V (N=100)	Maxilla	1.48±0.29	1.77±0.42	2.26±0.34	**<0.001**	**6>5>4**
	Mandible	1.50±0.28	1.82±0.42	2.29±0.35	**<0.001**	**6>5>4**
	Dummett Inference	1.53±0.32	1.79±0.40	2.27±0.34	**<0.001**	**6>5>4**

4- Moderate brown, 5- Dark brown, 6- Black

Table-6: Distribution of gingival pigmentation according to de Krom index among 5 groups

Group	C1	C2	C3	C4	C5	C6
I (N=100)	95	0	0	5	0	0
II (N=100)	100	0	0	12	1	0
III (N=100)	98	4	0	58	6	0
IV (N=100)	98	4	0	82	29	0
V (N=100)	100	2	0	73	12	0

C- Category

DISCUSSION

Gingival pigmentation has assumed an important role in perio/esthetics and plays a pivotal role in restorative dentistry especially prosthodontics. A recent modification of definition of mucogingival surgery to periodontal plastic surgery includes removal of pigmentation and voluminous research and reports are available with reference to alteration or elimination of gingival pigmentation for cosmetic reasons. To provide a rational basis for clinical situations, an understanding of the evolution and distribution of gingival pigmentation becomes necessary. The present epidemiological cross sectional study was aimed at resolving some of the clinical aspects of gingival pigmentation and study the possible correlation with skin complexion.

In the present study, Dummett-Gupta Oral Pigmentation index [1] was used to evaluate the pigmentation of the gingiva. Advantage of using Dummett-Gupta Oral Pigmentation index is, it gives a composite numerical value to total gingival melanin pigmentation. It is used as a clinical tool in estimating the quantitative occurrence of gingival pigmentation and is used as an epidemiologic tool in estimating how widespread gingival pigmentation is and in comparing the amounts of pigmentation occurring in various oral tissues including gingiva. In the present study subjects within the age group of newborns to 55 years were selected to assess the influence of advancing age on gingival pigmentation. These subjects were divided into 5 groups taking age as the criteria. The rational for this age grouping was related to physiologic growth changes, transition from deciduous to permanent dentition, concomitant changes in oral hygiene and dietary practices.

Prevalence of gingival pigmentation and racial difference:

In the present study, 100 % prevalence of gingival pigmentation was observed in all the groups. The high prevalence of gingival pigmentation in South Indian population may be due to ethnic and genetics factors. The prevalence of 100 % gingival pigmentation in the present study is nearly in accordance with earlier reported studies in Indian races, Joshi and Udhani [19] (100%), Kamat [20] (90%), Pal [21] (90.14%) and Hedin and Axell [22] (96%).

Physiologic gingival pigmentation is a characteristic of the darker races although it is not limited to any one race. Studies by Monash [23], Dummett [2], in Negroes reported 95% and 92.3% prevalence of gingival pigmentation. Van Wyk [24] in South African Bantu tribals reported 98.4% prevalence of gingival pigmentation. Dummett *et al* [25] in African-Americans found >90% of prevalence.

Hedin and Axell [26] found 91% prevalence of gingival pigmentation in Malays, 70% of Thais and 74% of Chinese subjects in Malaysia. Kuroda *et al* [27] reported around 50% prevalence of gingival pigmentation in Japanese school children. Steigmann [11] in Yeminite Jews found 50% prevalence of gingival pigmentation. Gingival pigmentation was observed in 12.5% of white, 70.4% of yellow and 93.2% of black Brazilian children. Fry and Almeyda [28] found 5% in the Caucasoids in Britain. The above studies signify the influence of race (which reflects skin colour) and ethnic background on gingival pigmentation.

Gingival pigmentation and gender:

In the present study, severity of gingival pigmentation between males and females was statistically not significant and denotes any lack of association between gender and gingival pigmentation. This lack of association is in accordance with the findings of Joshi and Udhani [19], Pal [21] in Indian ethnic population, and other studies by Reade [10], Bolden *et al* [29], Steigmann [11] and Gorsky *et al* [12]. Oluwole *et al* [13]. Contrasting with the present study results, Hedin and Axell [26] found more pigmentation in males than females in Chinese population.

Gingival pigmentation in infants

The present study observed gingival pigmentation in all the 100 infants (< 6 months) and is contrary to the report of Prinz [8] who asserted that physiologic pigmentation did not appear in children and

was clinically visible only after puberty. This anomaly is difficult to explain and the circumstances and nature of subjects in Prinz's study are not accessible for scrutiny at this juncture. Further, Prinz study was done in White population. Dummett [2] reported the presence of pigmentation in new borns as early as 3 hours after birth. Suffice it to say that gingival pigmentation is seen from early infancy and the present observations are in consonance with majority of the published data.

The high prevalence reported in the present study compared to other studies viz Dummett [2], Steigmann [11], Amir *et al*. [30] could be due to the influence of ethnic background on gingival pigmentation. The latter studies included a mixture of fair and dark complexioned population.

Gingival pigmentation and anatomical locations:

In the present study, observation about the distribution of melanin pigment in different locations of gingiva revealed greater pigmentation in mandible than maxillary arch, anterior than posterior and labial than lingual. These findings are in accordance with the findings of Raut *et al*. [31], Pal [21]. Dummett [32], Dummett [2], Monash [23], Steigmann [11], Eleuterio [33], Hedin [22] reported greater pigmentation in the anterior than posterior, labial than lingual. Lesser amount of exposure of the lingual and posterior regions of the mouth to the effects of light, variations in temperature, and the irritating influences of dust particles, etc could be responsible for the lesser amount of pigmentation.

Influence of age on pigmentation:

The present study had shown an increase in pigmentation in children of South Indian population from newborns to 15 years of age and this observation is in accordance with Steinmann [11] who showed an increase up to 18 years. Monash [23] reported increasing pigmentation during first few years of life in Blacks and which was complete by the end of the second decade of life. Kuroda *et al* [27] in Japanese children reported an increase of gingival pigmentation up to 6 years. Gorski *et al* [12] showed no significant change with age which is contradictory to the present study and this might be due to their exclusion of subjects less than 18 years. The increase in the severity of pigmentation from newborn to adulthood (i.e. 0-6 months to 15 years) might be due to physiological growth changes and hormonal changes during pubertal age.

Gingival pigmentation and Facial complexion:

In the present study facial complexion was recorded using Fitzpatrick [16] scale which includes 6 skin types: very fair, fair, light brown, modere brown, dark brown and black. Advantages of Fitzpatrick [16] scale are that it is a standard for self-assessment of skin colour, is widely accepted, useful tool in cosmetic dermatology.

The present study showed positive correlation between gingival pigmentation and facial skin complexion and these findings are in accordance with reports of Kamat [20], Raut *et al* [31], Joshi and Udhani [19], Boghani and Manchandia [34], Pal [21], in Indian population and other studies by Monash [23], Dummett *et al* [2], Steigmann et al. [11], Dummett *et al* [25], Zimmerman *et al* [35], Oluwole *et al* [13]. In contrary Studies by Dummett [32], Kamat [20] have not shown correlation between gingival pigmentation and facial skin complexion.

In the present study most of the moderate brown subjects were having medium gingival pigmentation while dark brown and black subjects were having heavy gingival pigmentation. As pigmentation of the gingiva is constantly associated with pigmentation of the skin due to similarity between histological structure of the skin and the gingiva, it might be the probable reason for heavy pigmentation in dark complexion people. In general, individuals with fair skin will not demonstrate overt tissue pigmentation, although comparable numbers of melanocytes are present within their gingival epithelium. The melanocytes are generally inactive or hypoactive in such individuals.

Distribution of pigmentation:

In the present study distribution of gingival pigmentation was recorded using de Krom [18] oral pigmentation chart which includes 6 categories of distribution of pigmentation. Advantage of using the index is that, it can be used to assess the pattern of pigmentation and compare the symmetry of pigmentation on both left and right quadrants and it is used to determine the diversity in pigmentation distribution and not the diversity in the colour.

In the present study, broad zone of gingival pigmentation was mostly seen followed by asymmetric patchy and irregular type, pink gingiva with symmetric islands of pigmentation, and broad zone of pigmented attached gingiva with non-pigmented marginal gingiva. Dummett [2] found in few Negro subjects marginal gingiva is devoid of pigmentation and it is believed that lack of pigmentation is characteristic of Negroes. Such an observation was seen in negligible subjects of the present study.

De Krom *et al* [18] in their study in non-Caucasians found asymmetric patchy and irregular type of gingival pigmentation as most common and pink gingiva with symmetric islands of pigmentation as the least common type. In the present study symmetric bilateral distribution of pigmentation was observed and similar

finding was also observed in Monash's [23] study in Negroes.

For completely edentulous and partially edentulous patients for designing dentures, de Krom [18] Oral pigmentation Chart may be a useful adjunct for both clinician and dental technician. The chart will facilitate discussion with patients regarding the original distribution of mucosal pigmentation of the acrylic resin parts of the prosthesis.

Gingival pigmentation and esthetic concern:

In the present study most of the moderate brown complexion and dark brown complexion adolescents and adults expressed their esthetic concern over heavy pigmented gingiva. Although the pigmentation of the gingiva is physiologic and does not present a medical problem, people at large do not appreciate dark-coloured gingiva, and there is an increasing awareness of the problem and requests for depigmentation are ever increasing. Ginwalla *et al* [36] described the broad black zone of pigmentation on the gingiva as "unsightly" and suggested its removal. A survey made by Dummett [37] to explore personal attitude towards gingival pigmentation showed that pink gum is much sought after and to be the ideal one.

CONCLUSION:

The results of the study indicate that gingival pigmentation was found in 100% of the study sample and this signifies the influence of ethnicity and genetics on pigmentation. Influence of advancing age on gingival pigmentation revealed increase of severity of pigmentation from newborns to 15 years. Significant correlation exists between facial skin complexion and gingival pigmentation.

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