ACCIDENTAL FINDINGS OF ORAL PIGMENTATION, ITS CLINICAL PRESENTATION AND ASSOCIATION WITH SOME RISK FACTORS

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ABSTRACT
Background: The diagnosis of oral pigmentation is challenging. Oral pigmentation can be physiological or pathological, endogenous, or exogenous. It can be presented as black, brown, white, and red in color.
Objectives: This study aims to determine the prevalence and frequency of oral pigmentation and the factors causing these changes. The correlation between history (demographic data, habits, medical history) and clinical presentation (color, site, nature) of oral pigmentation will be calculated.
Materials and Methods: A questionnaire and clinical examination is to be administered. First to predict the incidence of oral pigmentation as Accidental finding and then corresponding to the data, different types of oral pigmentation and color changes of oral mucosa are examined.
Results: The Demographic feature of our study reveals that out of 300 sample candidates with 217 (72.3%) males and 83 (27.7%) females. 15.3% individuals from both genders belonged to the 14-25 years age group. The maximum number of candidates fell into the 26–35-year age group with 24%. 23.3% reported a history of smoking from all age groups whilst 7.3% referred to pan chewing.
Conclusion: The data provided enlightens our knowledge of oral pigmentations, especially accidental findings when a patient is presented with another dental disease. Although some of the lesions were innocuous yet the dentist should be able to recognize the lesion for a Differential Diagnosis and should refer the patient to a specialist for further investigation and treatment before a lesion may become malignant

Keywords: pigmentation, oral mucosa, history, risk factor, clinical features, differential diagnosis

INTRODUCTION

Oral pigmentation is a change of physiological color of normal mucosa due to deposition of one or more pigments like melanin, hemosiderin, drug related pigmentation, hyper parakeratosis because of various mucosal lesions or condition[1,2]. So, these changes should be identified by the dentist on oral examination on regular basis whether it's a presenting complaint or not. Oral pigmentation can be physiological or pathological condition[3]. Normal physiological color of oral mucosa confines from pale pink in light-complexion people; mixed pink and brown coloration in whitish-complexion people to brown to black in dark-complexion people[4,5]. Oral pigmentation is divided into pigmented, white, red pigmentation based on Color Atlas of Common Oral diseases.[6]

Pigmented lesion can be black or brown due to either increase in melanin production or increase in melanocytes[7] trigger by mucosal irritation due to smoking, betel nut chewing, infection, endocrinal changes, trauma (cheek biting), medication.[8] It can be racial which is physiological and the most common type of pigmentation or pathological like smoker's melanosis, hairy tongue, amalgam tattoo, melanotic macule, drug related discoloration. Red pigmentation is mostly focal pigmentation and happens due to two main reasons. Firstly, contact stomatitis, denture stomatitis, geographic tongue, and mucosal burns lead to atrophic epithelium because of increased vascularization in lamina propria, reduced degree of keratinization and reduction in number of epithelial cells. Secondly, due to breakdown of hemoglobin into bilirubin, biliverdin, ferritin and hemosiderin and its deposition into epithelium, dilation of veins results in petechiae, hemangioma and varicosities.[2,9,10] White pigmentation caused by many ways such as hyper parakeratosis, abnormal production of keratin, decrease blood flow to lamina propria and deposition of candida or fungal hyphae on the surface of oral mucosa which gives whitish appearance to oral mucosa. It Includes Linea alba, traumatic white lesion, lichen planus, tobacco pouch keratosis, nicotine stomatitis, Fordyce's granules[11,12].

Oral pigmentation is a vast spectrum and very few studies have been done on it and mainly oral pigmentation merges with mucosal lesions. Age, gender, socioeconomic status, and skin complexion can fluctuate the prevalence of oral pigmentation.[13] Certain risk factors for instance smoking, betel nuts like pan, gutkha chewing, medication, denture wearer and systemic diseases greatly contributes to oral pigmentation and increases its severity.
In Pakistan, limited data is available on oral pigmentation and public show little concern about it until they presented with complain either due to pain or esthetic reasons.

The aim of this study is to observe the physiological/ pathological pigmented changes in oral mucosa in patients attending the outdoor patient department of CMH Lahore. This information may help to determine the epidemiology and severity of oral pigmentation as well as guide about factors that assist in oral pigmentation.

Objectives
- Prevalence of pigmented lesion presentation and accidental findings.
- Determine how the tentative risk factors of oral pigmentation present clinically, an aid in differential diagnosis on clinical grounds.
- Distribution of various types of oral pigmentation.

MATERIAL AND METHODS
Study design: Observational study.
Study setting: CMH Lahore Medical College & Institute of Dentistry
Target population: Patients attending Oral Diagnosis & Radiology Department on daily basis in a time frame of January 2023 to June 2023.
Sampling Technique: Convenient Sampling technique

Sample size calculation.

$$Sample\ Size = \frac{(Z_{1-\alpha/2})^2\ S.D.^2}{d^2}$$

Where;

$$Z_{1-\alpha/2} = 1.96$$

-      value of d above corresponds to approx. 5% error.
-      The value of S.D. is taken from previous studies.

Min Sample Size (error = d = 2 mm corresponding to approx. 5%)[7]
S.D. = 8.21

$$Sample\ Size = \frac{(1.96)^2\ (8.21)^2}{5^2}$$

Minimum Sample Size = 284[14]

Sample selection:
Patients attending the Oral Diagnosis & Radiology Department of the Institute of Dentistry CMH Lahore Medical College. Every patient attending the Oral Diagnosis & Radiology Department has an equal chance of being selected.

Research tools:
Performa (questionnaire) to be filed by investigator.

Data collection
All the participants will be provided with a lot of information about the purpose and methodology of research and printed questionnaires will be filled in. This questionnaire will have some demographic questions like gender, age, socioeconomic status, and skin complexion. Some habits like smoking, betel nut chewing and pan gutka will be included and the history of any systemic diseases or current medications will be taken. This will be followed by clinical examination.[7] Clinical examination will be performed by a qualified dental surgeon who are a part of this research project using a sterilized mouth mirror with adequate infection control using gloves while patient will be seated on the dental unit. This examination will be conducted in daytime because of proper light and to ensure that participants are in good mood and energy for optimal cooperation.[9] If any kind of pigmented lesion is found on any site of oral mucosa, it will be recorded in accordance with the following protocols.
What was the color of that pigmentation? (Black, brown, red, white, others)[6]
What was the nature of that pigmentation? (focal/diffuse, unilateral/bilateral)
What was the site of pigmentation.
1=Upper and lower lips
2=Buccal mucosa
3=Gingiva and teeth
4=Floor of the mouth and ventral tongue
5=Dorsal tongue
6=Hard palate
7= Soft palate)[15]
And at the end, differential diagnosis will be made based on clinical examination with reference to color atlas of common oral diseases.[6]

Data analysis
The data will be entered in a software (Microsoft Excel Sheets) and will be analysed using Statistical Package for Social Sciences (SPSS) version 23. Descriptive statistics: Chi square, frequencies and distribution test will be assisted to analysis the data statistically.

RESULTS

The Demographic feature of our study reveals that out of 300 sample candidates with 217 (72.3%) males and 83 (27.7%) females as shown in table 1, 15.3% individuals from both genders belonged to 14-25 years age group. The maximum number of candidates fell into the 26–35-year age group with 24%. Consequently, minimum number of candidates were observed in 65-year-old and above age group with 10.7% respectively. (Table 1)

Incidentally, when referring to oral pigmentation, pan chewing and smoking are two parameters which cannot be ignored. In our study, 23.3% reported a history of smoking from all age groups whilst 7.3% referred to pan chewing in their history. The denture wearers due to tooth loss may or may not be attributed to pigmentation were only 7% from our study cohort. (Table 2)

Site in the oral cavity is an important aspect linking the pigmentation with the origin of the lesion. The maximum number of lesions was observed on the Buccal Mucosa with 38.3% followed by 12.3% incorporating Buccal Mucosa, Gingiva, and teeth. Gingiva and teeth alone stood at 9.3% while Dorsal Tongue constituted 5.7% of the cases. Most of the cases depicted less than one percent of the cases whilst only one individual lesion covered all major oral cavity sites. (Table 3)

There was a weak association between age groups and site of the lesion ($p= 0.027$) however there was a strong association between the site of the lesion and smoking ($p=0.000$)

The most notable finding pertaining to the color of the lesion accounted for 33.3% as black and 22.7% as white lesion amongst the study sample (Table 4)

Table. 1: Gender-wise Distribution

Gender	Frequency	Percentage
Male	217	72.3%
Female	83	27.7%
Total	300	100 %

Table. 2: Age-wise Distribution

Age (Years)	Frequency	Percentage
14-25	46	15.3%
26-35	72	24 %
35-45	66	22 %
46-55	47	15.7 %
56-65	37	12.3 %
65 onwards	32	10.7 %
Total	300	100 %

Table 3: Frequency of smokers and non-smokers

Smoking	Frequency	Percentage
Yes	70	23.3 %
No	230	76.7 %
Total	300	100 %

Table 4: Frequency of pan chewers and non-pan chewers

Pan Chewing	Frequency	Percentage
Yes	23	7.7 %
No	277	92.3 %
Total	300	100 %

Table 5: Frequency of denture and non-denture wearer

Denture Wearer		
Yes	21	7 %
No	279	93 %
Total	300	100 %

Table 6: Frequency according to site

Site	Frequency	Percentage
Upper & Lower Lip	3	1 %
Upper & Lower Lip, Buccal Mucosa	11	3.7 %
Upper & Lower Lip, Buccal Mucosa, Gingiva & Teeth	4	1.3 %
Upper & Lower Lip, Buccal Mucosa, Gingiva & Teeth, Dorsal Tongue	1	0.3 %
Upper & Lower Lip, Buccal Mucosa, Gingiva & Teeth, Hard Palate	4	1.3 %
Upper & Lower Lip, Buccal Mucosa, Gingiva & Teeth, Hard Palate, Dorsal Tongue	1	0.3 %
Upper & Lower Lip, Buccal Mucosa, Dorsal Tongue	1	0.3 %
Upper & Lower Lip, Buccal Mucosa, Hard Palate	2	0.7 %
Upper & Lower Lip, Gingiva & Teeth	1	0.3 %
Buccal Mucosa	115	38.3%
Buccal Mucosa, Gingiva and Teeth, Hard Palate, Soft Palate	1	0.3 %
Buccal Mucosa, Gingiva & Teeth	37	12.3 %
Buccal Mucosa, Gingiva & Teeth, Hard Palate	1	0.3 %
Buccal Mucosa, Gingiva & Teeth, Hard Palate, Soft palate	2	0.7 %
Buccal Mucosa, Gingiva & teeth, Floor of the Mouth & Ventral Tongue, Dorsal Tongue	2	0.7 %
Buccal Mucosa, Gingiva & teeth, Dorsal Tongue	2	0.7 %
Buccal Mucosa, Gingiva & teeth, Dorsal tongue, hard palate	1	0.3 %
Buccal Mucosa, Gingiva & Teeth, Hard Palate	2	0.7 %
Buccal Mucosa, Gingiva & Teeth, Hard Palate, soft palate	1	0.3 %
Buccal Mucosa, Gingiva & Teeth, soft palate	3	1 %
Buccal Mucosa, floor of the mouth & ventral tongue	6	2 %
Buccal Mucosa, floor of the mouth & ventral tongue, dorsal tongue	1	0.3 %
Buccal Mucosa, floor of the mouth & ventral tongue, hard palate	1	0.3 %
Buccal Mucosa, Dorsal Tongue	13	4.3 %
Buccal Mucosa, hard palate	5	1.7 %
Buccal Mucosa, soft palate	1	0.3 %
Buccal Mucosa, floor of the mouth & ventral tongue	1	0.3 %
Buccal Mucosal, dorsal tongue	1	0.3 %
Buccal Mucosa, hard palate	1	0.3
Gingiva & teeth	28	9.3 %
Gingiva & teeth, floor of the mouth & ventral tongue,	3	1 %
Gingiva & teeth, dorsal tongue,	3	1 %
Gingiva & teeth, hard palate	2	0.7 %
Floor of the mouth & ventral tongue,	10	3.3 %
Floor of the mouth & ventral tongue, dorsal tongue	3	1 %
Dorsal tongue	17	5.7 %
Dorsal tongue, soft palate	1	0.3 %
Hard palate	6	2 %
Hard palate, soft palate	1	0.3 %
Soft palate	1	0.3 %
Total	300	100 %

Table 7: Frequency according to colour

Colour	Frequency	Percentages
Black	100	33.3%
Black & Brown	1	0.3 %
Black & white	3	1 %
Black, brown	2	0.7 %
Black, white	2	0.7 %
Black, blue	3	1 %
Black, brown	26	8.6 %
Black, brown, red, white	2	0.7 %
Black, brown, white	5	1.7 %
Black, purple	3	1 %

Black, red	4	1.3 %
Black, red, white	1	0.3 %
Black, red puple	2	0.6 %
Black, white	17	5.6 %
Black, red brown	2	0.7 %
Black, red, blue	1	0.3 %
Blue	4	1.3 %
Blue green	1	0.3 %
Brown	15	5 %
Brown, black	2	0.7 %
Brown, blue	2	0.7 %
Brown, white	3	1 %
Purple	2	0.7 %
Red	13	4.3 %
Red purple	1	0.3 %
Red, white	1	0.3 %
Red, blue	2	0.7 %
Red purple	1	0.3 %
Red, white	7	2.3 %
White	68	22.7 %
White, grey	1	0.3 %
White, blue	1	0.3 %
White, brown	1	0.3 %
Total	300	100 %

DISCUSSION

One important aspect that our study mentioned was of the prevalence of smoking in our study cohort, our study revealed the prevalence of 23.3% which is less than a study conducted in faculty of Dentistry, Kuwait dental University and from 12 dental centers within Kuwait City [3,16,17] however the studies conducted in the Kuwait city had a larger sample size in comparison with our study[3,16,17]. Another notable feature our study depicted was pan chalia which is far more prevalence in Indian subcontinent than any other country[18].

Patients having less awareness and knowledge about harmful effects of smoking and oral and general health resort to smoking or tobacco chewing, this initially starts off as social or peer pressure eventually leading to one pack (20 cigarettes) per day. Most of the patients visiting Oral Diagnosis and Radiology Department resort to information Bias by eliminating the smoking history.[3,18] (Table 2) Once the association between oral health diseases and smoking is established, majority of patient consider quitting smoking and pan chalia/betel nut[18] This creates an exceptional opportunity for the general dentists to impart oral health education and oral health promotion to the masses.

The classification of pigmentation according to site is an important aspect for the general dentist as well as for the specialist. The dental practitioner and the specialist should have the necessary knowledge about the type, nature, and severity of the lesion. In our study, black lesion accounted for 33% of the study sample which is contrary to the results shown in other studies [3,16-19]. This may be attributed to their lifestyle, behavioral and Socioeconomic conditions [3,16-19]. Most of the lesions presented were on the Buccal Mucosa (38.3%) followed by Buccal Mucosa, Gingiva, and teeth with 12.3%. This can be linked to trauma (bite) or mechanical friction consistently damaging the aforementioned sites. Other sites were also involved, this requires a thorough intra oral examination by the dentist or a specialist. A patient may have more than one lesion incorporating more sites therefore the need of the hour is to a step-by-step examination procedure with regular periodic checkups.[3,17]

Opportunistic screening of high-risk individuals will go a long way in detecting oral cancer and precancer at a relatively early stage. For the dentists to fully contribute to improvement of early detection, they must perform thorough examinations. Repeatedly training oneself to
scrutinize the entire oral mucosa in a systematic fashion reduces the chance of missing any lesion.

CONCLUSION
The results of the study provide necessary information about the oral mucosal lesions presented to the Oral Diagnosis and Radiology Department of CMH Lahore Medical College and Institute of Dentistry for necessary treatment. The data provided enlighten our knowledge of oral pigmentations especially accidental findings when a patients presented with another dental disease. Although some of the lesions were innocuous yet the dentist should be able to recognize the lesion for a Differential Diagnosis and should refer the patient to a specialist for further investigation and treatment before a lesion may become malignant. Efforts to increase patient awareness of smoking and pan betel nut cessation is of utmost importance for the patient and a dentist should be able to education the patients or the masses. The study covers the accidental finding at a small scale and a larger nation-wide survey of oral lesion is the need of the hour.

Ethical Considerations
The patients will be informed about the purpose of research and verbal consent will be taken after briefing the whole process of questioning and oral examination. The information gathered will remain confidential and anonymous, no discrimination will be made except for inclusion and exclusion criteria. If a patient doesn't agree to participate in the study, there will be no effect on proceedings in his/her treatment. Institutional Review Board

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Questionnaire
RESEARCH: Accidental Findings of Oral Pigmentation, its Clinical Presentation and association with some Risk Factors

Informed consent

We are conducting an experimental, clinical non-interventional research on the color changes of oral mucosa and its relation to the history, this is to informyouthatyouwouldnot be harmedand yourinformationwouldbeconfidential, pleaseensure the verbalconsent to participate in this project on your own will, I will be asking you some questions and will be looking at inside of your mouth.

Mark the box using a tick ✅ according to the patient presentation

	YES	NO
Pigmented lesion present		
Was it a presenting complaint?		
Patient was aware of it?		

BIODATA
Mark the option with which patient is presented

Gender	(male/female)
Age	
Socioeconomic status	(high/low)
Skin complexion	(Fair/wheatish/dark)

HISTORY
Mark the option with which patient is presented with
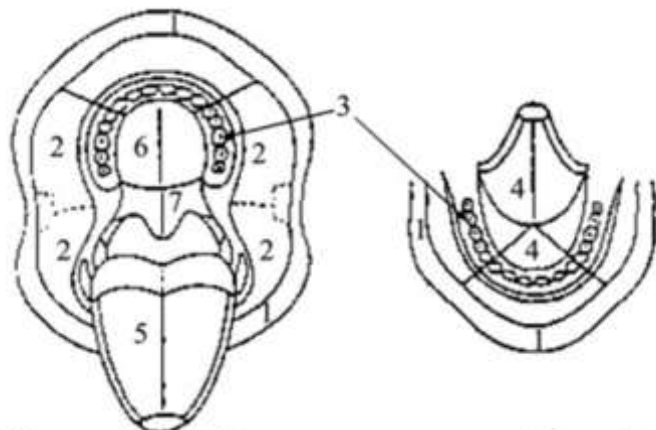
Smoking	(yes/no)
Betel nuts i.e., pan, gutka chewing	(yes/no)
Systemic diseases	
Medication	
Denture bearer	(yes/no)

CLINICAL EXAMINATION

Mark the color, nature and location of pigmentation

COLOR		BLACK		BROWN		RED		WHITE		OTHERS	
FOCAL				DIFFUSE							
UNILATERAL				BILATERAL							

1- Upper and lower lips
2- Buccal mucosa
3- Gingivae and teeth
4- Floor of the mouth and ventral tongue
5- Dorsal tongue
6- Hard palate
7- Soft palate

Write any peculiar finding (if present) in the box below.

Oral pigmented lesion

BLACK		RED		WHITE		OTHERES	

Physiological		Geographic tongue		Linea alba		Candidiasis	
Hairy tongue		petechia		Traumatic white lesion		Ranula	
Amalgam tattoo		Mucosal burns		Lichen planus			
Melanotic macule		Denture stomatitis		Tobacco pouch keratosis			
Metal pigmentation		Contact stomatitis		Nicotine stomatitis			
Drug related discoloration		Varicosities		Fordyce's granules			
Smokers malanosis		Hemangioma					

Department of Ethical Review Board
CMH Lahore Medical College
Lahore Cantt
No 166 /ERB /CMH/LMC
Dated: 01-03-2023

To: Dr. Fareed Ahmed

CMH Lahore Medical College & Institute of Dentistry

Subject: **Ethical Approval**

This is in response to your request for ethical approval of your research proposal titled **"Accidental Findings of Oral Pigmentation, its Clinical Presentation and association with some Risk Factors"** The Board has evaluated your proposal.

You are requested to address all the comments listed below and re-submit your application within 02 weeks.

1. Study design is not specific
2. P- value is missing

Prof. Dr. M. Ashraf Ch

Chairman
Ethical Review Board (ERB)