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A new attempt in comparision between 3 racial groups in India - based on lip prints (Cheiloscopy)

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Abstract
Background – Establishing a person's identity is very important process in civil and criminal cases. According to literature, very few studies have been conducted in the identification of various race groups by lip print recognition.
Aim – To determine the predominant lip pattern and to compare amongst Kodavas, Keralites, & Tibetans race groups. To evaluate the variation in lip patterns in males and females of each race group.
Method – Lip prints of 600 individuals (each groupcomprised of 200 each) recorded. Analyzed using Adobe Photoshop software C5 & classified according to Tsuchihashi classification. Data were analyzed statistically by chi-square test and z test for proportions.
Results – Type I patterns were predominant in Kodavas, males showed Type IV and females Type I. Type II patterns predominantly seen in Keralans, Type IV in males and Type II in females. Type III patterns predominantly seen in Tibetans, Type V in males and Type III in females.
Conclusion – Potential difference exist in 3 race groups. However studies with larger samples are desired to arrive at a consensus.

Keywords: Kodavas, Keralites, Tibetans, Race identification, Gender identification, cheiloscopy.

1. Introduction
Study of lip prints is Cheiloscopy [1], an essential identification tool in forensic odontology, work on this subject has already elicited useful information, such as lip prints are unique to an individual and can be used to secure the identity of a person, that they remain stable over time [2, 3]. Finger prints, postmortem reports, and of late, DNA fingerprinting, are the other methods in identification of a person in the field of forensic science [4]. Lip prints can be instrumental in identifying a person. It has been verified that, lip prints recover after undergoing physical and environmental alterations [5, 6].

Although lip print identification may appear in the field of literature, there is very little science/research to support methodology for the collection and comparison of lip prints in different race groups in INDIA. Suzuki and Tsuchihashi (1970) classification wasmost accepted [7-10]. Hence the present study is an effort compare the lip print pattern in three different race groups of india (i,e Kerala, Coorg & Tibetan settlement-Bylekuppe) available in the locality.

2. Materials and Method
We recruited 600 subjects, 200 subjects from each group (Kodavas, Tibetan and Keralites), with an age range from > eight years and <50 years. Present study was conducted in Coorg Institue of Dental Science Virajpet, where three differentrace groups were available nearby locality.

Each participant was informed about the study protocol and enrolled in the study, who voluntarily signed an informed consent, after obtaining the institutional ethical committee clearance. All healthy subjects without any active lip infection and inflammation, trauma, also the patients who were not willing and with history of allergy to cosmetics/dye& individuals of three ethnic group with ethnicity proof were enrolled in the study.

Cotton and saline, disposable lip applicator and liner, a dark colored frosted lip-stick (Maybelline no 905), thin bond marble paper (no nine), cellophane tape, and pen for labeling the individual detail were used for the study [11] (Figure 1).

Fig1: Materials used for the present study.

2.1 Imprinting of the Lip Prints

Each participant was made to sit in relaxed position. Lips of the subject thoroughly examined by the one examiner for any deformity, scars/any abnormality. The method described by Sivapathasundharam was followed at this point, by cleaning the upper and lower lips with cotton using normal saline, and then outlined by using a sharp lip liner, lipstick applied with the help of disposable lip applicator uniformly, starting at the midline moving laterally by the same examiner, and then allowed it for drying about two minutes for the uniform spreading [Sivapathasundharam B 2001] (Figure 2).

Fig 2a: Application of lipstick in Kodava race group.

Fig 2b: Application of lipstick in Kerala race group.

Fig 2c: Application of lipstick in Tibetan race group.

Lip prints were recorded by asking each participant to imprint in a relaxed position on white marble paper, where the ethnicity, race and code number was mentioned on the back. Then lip prints were immediately covered by transparent cellophane sheet by the other examiner, to preserve and prevent the distortion. Care was taken to avoid any wrinkles and air bubbles [12] (Figure 3).

Fig 3: Imprinted lip print on white marble bond paper.

2.2 Examination of the Lip Prints

Each Lip prints were scanned using an EPSON image scanner set at a resolution of 600 dpi stored in TIFF (Tagged Image File Format). A horizontal line was drawn joining right and left corner of the lip print to divide upper & lower portions & a vertical line drawn at the center to divide right & left side, each side further divided in to two equal parts, so the each lip print is divided in to eight equal quadrants, four in upper and four in lower part to verify the pattern by using Adobe Photoshop software C5 (Figure 4).
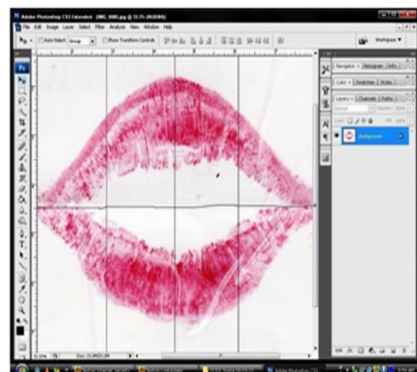

Fig 4: Lip prints divided in to eight compartments, four parts in each lip, under Adobe Photoshop software C5.

2.3 Classification of the Lip Prints

In the present study, Lip prints of each quadrant were classified according to the classification given by Suzuki & Tsuchihashi[7-10] (Figure 5).

Type I: Clear-cut grooves that run across the entire lip.

Type I': Similar to type I, but do not cover the entire lip.

Type II: Branched grooves.

Type III: Intersected grooves.

Type IV: Reticular grooves.

Type V: Grooves that do not fall into any of the above categories and cannot be differentiated morphologically (undetermined).
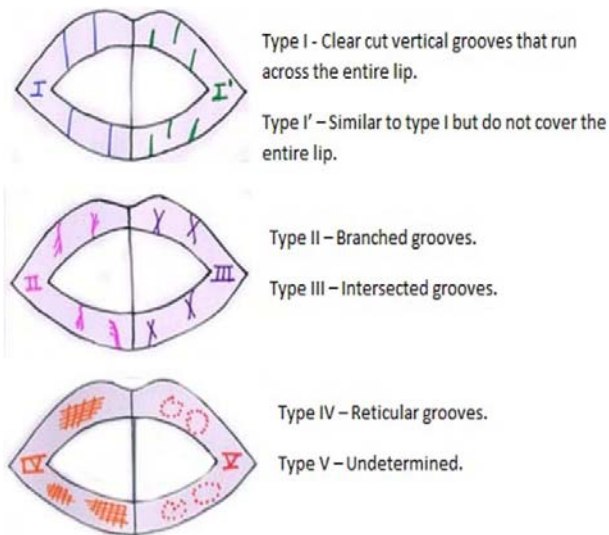

Fig 5: Schematic diagram of various types of lip patterns.

Even though the lines and furrows present on both upper & lower lip, starting from the one corner of the mouth to other corner in eight quadrants, the dominant one was recorded. In case where there were two dominant patterns, first dominant pattern was considered.

The data's were analyzed using *chi-square test* and *z test* for proportions. These tests were used to compare proportions from three independent samples and *p* value $<0.001(x^2)$ and <0.05 (z test) were considered as significant.

3. Results

It has been observed that, no two individuals had similar lip pattern. A detailed observation revealed that each type of lip pattern never occurred singly, but in combination with other types. In the entire study subjects including Kodavas, Keralites and Tibetans race groups, all the eight compartments were evaluated. Type I lip patterns were most predominant with an average of 22.5%, followed by Type IV, III, II, V and I' in a descending order found in the *Kodava* race group. Whereas Type II patterns with an average of 27.5% were most predominant in *Keralites* followed by Type IV, III, I, V and I' in descending order. However it has been found that, Type III patterns were more common with an average of 32% followed by V IV II I and I' in descending order in *Tibetans* race group. Thus the 3 different race groups showed different lip patterns and the difference in between them was statistically significant (p <0.001) (Table 1).

When it is evaluated according the gender in each race groups. In Kodava males Type IV (35%) lip pattern were predominant followed by Type III (30%) as predominant lip pattern, where as females showed predominantly Type I (40%) patterns followed by Type III (19%), when z test was used in the comparison of lip patterns amongst males and females, Type I,

III, IV showed a significant difference (P <0.05) and Type I' II and V were not significant (Table 2).

Whereas Keralite males showed predominantly Type IV (39%) patterns followed by Type III (25%) and in females Type II (45%) followed by Type I (19%). z test applied to compare the lip patterns between males and females showed significant difference (P<0.05) for only Type II and IV lip patterns and Type I, I', III and V were not significant (Table 3).

However, Tibetan males showed predominantly Type V (45%) followed by Type IV (25%) and females showed Predominantly Type III (60%) followed by Type IV (18%). Comparison of lip patterns between males and females using z test showed significant difference (P< 0.05) in Type 1', II, III& V but not in Type I and IV (Table 4).

4. Discussion

Cheiloscopy is an essential identification tool available in forensic odontology. Determination of an individual identity by forensic methodology is warranted in cases of heir-ship, marriage, divorce and rape [13]. With the advent of science and complicated technologies, man has been quite successful in deceiving 'the law'. Hence criminal can be scot free by deceiving the law and misguiding the police as well as investigator. But, 'Truth should prevail as truth'. Human identification has always been of paramount importance to the society. The use of lip prints still exists with some limitations [11].

The lip prints can be used, as they get registered easily even on a steel or glass tumbler, clothing, cutlery, or cigarette butts. If the sex of an individual is known, it is easy to shortlist the array of suspects with motive of the crime [2, 9].

Fischer was the first anthropologist to describe the furrows on the red part of the human lips. France's greatest criminologist Edmond Locard was first to recommend the use of lip prints in as early as 1932 [6, 7]. In the period 1968 to 1971, two Japanese scientists Y Tsuchihashi and T. Suzuki examined 1364 person, based upon their research, the arrangement of lines on the red part of human lips were unique for each human being and they recover after infection/inflammation [6]. However, rendered to correct the pathosis major trauma to lips may lead to scarring pathosis and surgical treatment rendered to correct may affect the size, and shape of the lip thereby, altering the pattern and morphology of grooves [14]. The lips studied in the present study were free from inflammatory disease, trauma, malformation, deformity or scars. However, these abnormalities themselves are identification marks.

Lip pattern neither affected by the deleterious habit like smoking nor by the age [8, 10]. According to literature, some researchers have also worked extensively on lip prints and proved the gender differences along with personal identification.

Different methods have been evolved to trace the lip prints to aid in criminal evaluation, Shilpa *et al.* found difficulty in preservation and smudging of the lip prints in their method with microscopic glass and carbon powder dusting with ostrich brush[3]. Invisible lip prints used and lifted using aluminum and magnetic powder by B Saotarshi *et al.* [15]. The method described by Sivapathasundharam *et al.* was selected for the present study for the ease of obtaining details, accuracy, and the protection & preservation of lip print patterns [12]. Prateek *et al.* used the same method but examined by magnifying lens, found objective errors [16]. We encountered difficulty during sample collection by means of smudging of lip prints in the present study; however these common errors were rectified by using the lipstick with better quality.

In a study between 2 population (Kerala and Manipuri), Anila koneru *et al.* reported that, Type 1 pattern was predominant in Kerala population which is consistent with the present study. They also found no potential difference between two populations [13]; contraryto this, the potential difference does exist amongst three populations in our study. Verghese *et al.* studied lip prints in the Kerala population and found Type IV lip pattern most commonly [14], which was not consistent with our study.

Vahanwala *et al.* proved that, Type I & Type I' patterns dominant in females while Type III & Type IV dominant in males in his study [2]. Similar results were obtained in a study conducted by the authors regarding cheiloscopy [17], we found similar results in Kodavas, Keral on contrast Kerala females showed Type II lip pattern predominantly and Tibetans males showed Type V and Type III in females. Saraswati *et al.* found Type I and I' common in females and Type IV and V in males [18], consistent with Kodavas males and females and Kerala males and Tibetan males, except Kerala females with Type II and Tibetan females with Type III. Whereas Type I, I', and II were most predominant up to 75% in males and 64.5% in females in Marathi population according to Sekhon J *et al.* [19]. Ish Paul, Madhusudan. A.S, *et al.* studied lip prints to evaluate depth of lip patterns in relation to gender, family and blood group, to ascertain whether there is any hereditary pattern in lip prints among families with siblings and twins. It showed that Type I in girls, Type II among both girls and boys, could not find any statistical correlation of lip print with family members and blood groups [20]. Whereas we found different lip patterns in both males and females among the entire race groups which was statistically significant.

5. Conclusion
As our results showed the potential differentiation among three different race groups Kodavas, Keralites and Tibetans, we would like to justify that lip patterns can be used for race differentiation and also in personal identification, will also open up a new field that can contribute extensively to criminal investigation, identification and the establishment of parenthood and also in the studies on human genetics. Lip pattern should be studied in depth with large number of samples in different ethnic groups to establish further facts and truths, which may help in the identification of different race groups in future.

5. Acknowledgement

6. Conflicts of interest
We the authors do not have any conflicts of interests

7. References
1. Preeti S, Susmita S, Rathod V. Cheiloscopy: The study of lip prints in sex identification. J Forensic Dent Sci [PubMed] 2009; 1:24-7.
2. Vahanwala S, Nayak CD, Pagare SS. Study of lip prints as aid to sex determination. J Medico legal Update 2005; 5:93-8.
3. Shilpa P, Paul Ish, Madusudan AS, Gayatri R, Sowmya GVA. study of lip prints in relation to gender family and blood group. Int J Oral Maxillofac pathol 2010; 1:4-7.
4. Satyanarayana NK, Ajay P, Reshma N. Forensic odontology: Cheiloscopy. Hong Kong dent J 2011; 8:25-28.
5. BallJ. The current status of lip prints and their use for identification, J Forensic Odontostomatol [PubMed] 2002; 20:43-6.
6. Augustine J, Barpande SR, Tupkari JV. Chelioscopy as an adjunct to forensic identification: A study of 600 individuals. J Forensic Odontostomotol [PubMed] 2008; 26:44-52.
7. Segui MA, Feucht MM, Pascual F. Persistent lipsticks and their lip prints: new hidden evidence at crime scene. Forensic Sci Int [PubMed] 2000; 112:41-7.
8. Tsuchihashi Y. Studies on personal identification by means of lip prints. Forensic Sci [PubMed] 1974; 3:233-48.
9. Vahanwala SP, Parekh DK. Study of lip prints as an aid to forensic methodology. J Indian Dent Assoc [PubMed] 2000; 71:269-71.
10. Suzuki K, Tsuchihashi Y. Personal identification by means of lip prints, J Forensic Med 1970; 17:52-7.
11. Lip Print Identification Anyone? (on People v. DaviS---III) [cited 2008 Nov 10] Available from: http://forensic-evidence.com.[PubMed]
12. Sivapathasundharam B, Prakash PA, Sivakumar G. Lip prints (chelioscopy). Indian J Dent Res [Pubmed] 2001; 12:234-7.
13. Anila K, Sureka R, Ramesh P. Comparision of lip prints in two different population in India, reflections based on the preliminary examination. J Forensic Dent Sci [PubMed] 2013; 5:11-15.
14. Annie J, Verghese MS, Umesh Babu R. A study on lip print types among the people of Kerala. J Indian Acad Forensic Med. [PubMed] 2009; 32:6-8.
15. Saptarshi B, Arunkumar S, Samir K. Personal identification from lip print features using a statistical model. International Journal of Computer applications. 2012; 55:30-34.
16. Prateek RP, Amruta P. Lip-prints-anaid in identification. A Journal of Forensic Sciences.2011; 1:1-8.
17. Sharma P, Saxena S, Rathod V. Cheiloscopy: The study of lip prints in sex identification. J Forensic Dent Sci 2009; 1:24-7.
18. Saraswati TR, Gauri M, Ranganathan K. Study of lip prints. J Forensic Dent Sci 2009; 1:28-31.
19. Sekhon J, Rajan S, Tripta S, Ishwar T, Singh A jitpal. Most predominating pattern of lip prints in north Indian population. J Indian Acad Forensic Med [PubMed] 2013; 35:362-66.
20. Patel S, Ish P, Madusudan AS, Gayatri R, Sowmya GV. A study of lip prints in relation to gender family and blood group. Int J Oral Maxillofac pathol 2010; 1:4-7.