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Lip prints – an aid in sex identification

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Abstract

Background: The grooves existing on human lips are exclusive to every individual and can be used to determine individuality. Lip prints are regular lines and fissures in the arrangements of wrinkles and grooves present in the zone of transition of human lip, between the inner labial mucosa and outer skin, examination of which is recognized as cheiloscopy. Cheiloscopy is a forensic investigation technique that deals with the identification of human based on the lip prints.

Method: The present descriptive cross-sectional study was conducted in Nobel Medical College and Teaching Hospital, Biratnagar, Nepal. The data were collected by performing cheiloscopic collection. Participants included students of Bachelor of Dental Surgery in the college who agreed. Exclusion criteria were deformity, infection of the lips. Ethical approval was obtained. The lip prints were analyzed according to Suzuki and Tsuchihashi classification. Statistical analysis was carried out by using SPSS 20, descriptive statistics like mean and percentage were analyzed. The X^2 test was used to compare types of prints and gender. A $p<0.05$ was considered statistically significant.

Result: There were total of 103 participants, age ranging from 18 to 25 years. Type 1 prints were common, and Type 3 least common. Type 2 lip print was more in males and Type 1 in females. The difference in various types of lip prints between male and female was not statistically significant.

Conclusion: The study showed that lip print is unique, Type 1 is common, and more males have Type 2 pattern. The sex of the person can be foretold on the basis of patterns present in prints.

Keywords: Cheiloscopy, Finger Prints, Lip Prints, Rugoscopy

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Introduction

The finger print is a reliable means of human identification.[1] It has distinctive patterns, and is permanent.[2] Cheiloscopy is a method of identification of individual based on characteristic patterns of lines over red part of lips.[3] It is a forensic investigative technique for identification of individual.[4] Lip stick prints are It is visible with naked eyes but latent prints require especial techniques.[5]

Dr. Santoz in 1960 proposed use of lip characteristics and formulated simple classification system for personal identification.[6] In Hungary during 1961 first research in lip prints was carried out in Europe and lip traces was proven for criminalistics identification.[7]

In 1981 lip print was reported as a special technique for individual identification, and in 1990 a research on 1500 persons for period of 5 years elaborated its practical usage.[8] Cheiloscopy was first described by Fischer in 1902.[9] Tsuchihashi Y pointed out the wrinkles and grooves present over reddish part and zone of transition of human lips.[10,11] Suzuki and Tsuchihashi's lip prints classification is commonly used for recording lip patterns.[12] Studies related to demographic and racial origin are important for confirming identification.[13] This study aimed to analyze uniqueness of lip print patterns, and its prevalence in males and females.

Method

A descriptive cross-sectional study was conducted in Nobel Medical College and Teaching Hospital (NMCTH), Biratnagar, Nepal, from 20 December 2023 to June 2024. The data were collected by performing cheiloscopic collection. Study participants comprised of selected students of dental science program NMCTH. Ethical Approval was obtained from the Institutional Research Committee of NMCTH.

Convenience sampling method was used to select samples that meet the inclusion and exclusion criteria for the study. Inclusion criteria were, young adults without any disease related to lips, with normal lip mucosa and willing to participate in the study. Exclusion criteria were, subjects having any gross congenital deformities of lips (e.g., cleft lip), inflammation, allergic to the lip stick.

The lip print of each subject was obtained and its pattern was analyzed according to Suzuki and Tsuchihashi classification. Data for this research was collected by Oral visual examination of lip prints. All the subjects were informed in their local language and a written consent was obtained.

Dark shaded lip stick (red/brown) was applied by the research personnel with a single stroke, evenly on the vermillion border. The participants were asked to rub both the lips to spread the applied lip stick. First lip impression was made on the strip of cellophane tape cut with scissors for appropriate size. Tape was then stick to white thin bond paper to serve as the permanent record. Participants were provided with sanitary tissues to wipe the lip sticks.

Lip prints were divided into four quadrants by employing the dental formula generally used. The lip prints were studied by the help of a magnifying lens to analyze quadrant-wise distribution, denoting the Type according to Suzuki's classification, Figure 1.

The impression of lip prints on the bond paper was used to analyze lip prints. The lip prints in all the quadrants were studied by single observer. Statistical analysis was carried out by using Statistical Package for Social Sciences (SPSS). Descriptive statistics like mean and percentage were noted, a Chi square test was applied to compare the prints between males and females. A $p<0.05$ was considered statistically significant.

Result

A total of 103 subjects were included in the study, consisting of 45 male and 58 female subjects, with age range of 18 to 25 years. Males were 43.69 % and females were 56.31%.

Gender wise, the Type 1 lip prints were present in majority of males and Type II in females. The difference in various Types of lip prints between male and female were not statistically significant (p=0.202), Table 1.

Among 5 Types of lip prints, Type 2 was in 41(39.80%), followed by Type 1 in 38(36.89%), and least Type 3 least common seen in 5(4.85%), Table 2. All participants provided red lip stick lip print, Figure 2.

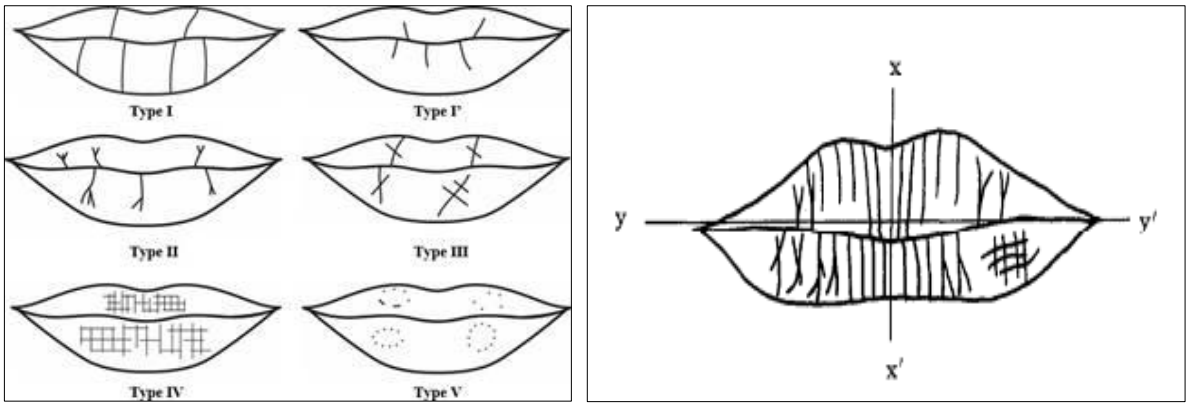

Figure 1. (A) Lip prints were categorized Type I to V, (B) four quadrants analysis of lip print by intersecting vertical and horizontal lines, adopted from Tsuchihashi[11]

Figure 2. Present study; red color lipstick prints for analysis

Table1. Comparison of different lip prints Types among male and female subjects, (n=103)

Lip print Type	Male (45)	Female (58)	p-value
I	18	20	
II	13	28	
III	03	02	0.202*
IV	07	03	
V	04	05	

*Chi square test

Table 2. Demonstrates Frequency of different lip prints, (n=103)

Lip print Type	n	%
I	38	36.89
II	41	39.81
III	05	04.85
IV	10	09.71
V	09	08.74

Discussion

The commonest lip pattern found in present study was Type 1 in male subjects while in females' Type 2 pattern was more common.

Cheiloscopy is an upcoming tool in crime analysis. Although finger prints and DNA identification is most widely used, additional tools like cheiloscopy can be used for identification. Lip prints are valuable in forensic investigation and personal identification. Personal identification is necessary for unknown person in assassination, suicide, and road side accident, mass disaster like natural calamities, and for living individual who are missing or frauds individuals.[5] Lip prints are considered an important form of transfer evidence, analogous to finger prints. Lip prints are usually left at crime scenes and can provide a direct link to the suspect.

Recently, lipsticks have been developed that do not leave noticeable mark after contact with surfaces such as glass, clothing or cigarette. These lip prints are characterized by their lastingness and are, thus referred to as persistent lip prints. Although invisible, lip prints can be lifted using materials as aluminum powder and magnetic powder.[13]

Cheiloscopy, a scientific study of lip prints has captured the mind of many detectives; but it still remains a forensic work in progress, and needs standardized protocols to categorize the collection and categorization of the distinctively patterned grooves, furrows, and wrinkles that comprise a human lip print. Studies regarding its use as evidence for personal identification and criminal investigation in forensic is very few.[14]

In present study the commonest lip pattern was Type 1 in males while in females Type 2 pattern was more common. This is in accordance with other.[5,15] Type 2 pattern was most prevalent in both males and females in present study, similar to other studies from India and China.[16]

However, other studies in India showed Type 3 as predominant.[17-19] These variations could be due ethnicity and racial differences of the different study groups. Demographic variations also play a vital role. Thus, additional studies on lip prints involving a larger sample size in different population groups will be useful.

In the case of fingerprints, efficient equipment and databases have been built for detection over time for recording and matching at the crime scene. Similar, comparable work and investment in methodologies and workforces will help in accelerating the application of lip prints in forensic science.

For now, the limitations of this technique is that it is not frequently used in routine civil and criminal litigations. Preservation of the collected sample is subject to change due to various physiological and pathological conditions of the lip, such as angular cheilitis, mucocele, and various inflammatory reactions.

Conclusion

In this study we found that lip print is unique. Type 1 print is common, and more males have Type 2 pattern. Lip prints are can be a promising tool for identification in crime detection procedures as substance of evidence.

Author contribution

Concept and design- SR, TK; Literature review- SR, TK; Data collection- SR; Data analysis- TK; Draft- SR; Revision- AT; Final manuscript and accountability- All.

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Conflict of interest

None

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Supplementary material

The data and supplementary material that support the findings of this study are available from the corresponding author upon reasonable request.

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