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Cheiloscopy: The Study of Lip Prints in Sex Identification between Indian and Malaysian Population

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Abstract

Background: The study of lip prints, is commonly applied in forensic odontology and it is known as cheiloscopy. The term cheiloscopy was derived from Greek words, in which "cheilos" means lip and "scopy" means to examine. In general, cheiloscopy is define as a method of identifying an individual based on the arrangement of lines seen on the red part of the lips or a science dealing with the various line appearing on the red part of the lips. The pattern of wrinkles and grooves that are present on the lips has distinct characteristic features of an individual which are almost similar to the fingerprints. It also will not change throughout the life. Therefore, it can be used for personal identification and sex determination.

Aim: To investigate lip print pattern in males and females and to evaluate them between Malaysian and Indian population.

Materials and Method: There were 40 participants of both gender. 20 of them are from the Malaysian population and another 20 people are from the Indian population. Each participant was instructed to clean their lips with a clean white cloth, before taking the lip print. This was followed by the application of dark coloured lip stick on lips by using the lip stick applicator. Cellophane tape was used to take the negative impression of the lip pattern. The glued portion of the cellophane tape was placed on the lips by giving a light pressure beginning from the centre of the lips till the corner of the mouth. Then, the impression was transferred to a clean white paper and seen under the magnifying glass.

Results: Type I lip pattern was commonly seen in Indian population, followed by type III, II and IV. Whereas for Malaysian population, type III was most common followed by type I, II and IV. There was significant difference between both population. In this study, it showed that type I was the most common lip print pattern seen in both Indian and Malaysian population for females. Whereas for male, type III was more common in Malaysian population, and both type III and IV were more common in Indian population.

Conclusion: There was no significant difference in both population according the general distribution of lip print pattern. There was no correlation or similarity of lip print patterns between each participants in both population. Thus, cheiloscopy can be used for sex determination and also personal identification.

Keywords: *Lip prints, Cheiloscopy, Malaysian population and Indian population*

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Introduction

Each of every human beings is very unique, as each of the individuals have different personality along with their facial and body features. These special features can be used to distinguish one individual from another. Generally, fingerprints and DNA coding are commonly used in personal identification especially in the forensic field, as this information can be easily obtained and

different for each individual. This is also similar to the lip prints. The pattern of wrinkles and grooves that are present on the lips has distinct characteristic features of an individual which almost similar to the fingerprints [1]. It also will not change throughout the life [2] . Even though, inflammation, trauma or disease like herpes may occur, there is possibility for the pattern on the lips to recover to normal pattern [3].

In fact, smoking and age factors also does not influence the alteration or changes of lip pattern [4]. Therefore, it can be used for personal identification and sex determination. However, under certain circumstances like genetic deformities, surgical marks or maybe due to their occupation like blowing musical instruments [5], alteration on the lip patterns may occur. It is also similar to fingerprints which can be loss due to works or injury to the finger. Thus, it may be a disadvantagein certain cases and in those cases under unavoidable circumstances, where other alternative like DNA is required for further investigations.

The study of lip prints, is commonly applied in forensic odontology and it is known as cheiloscopy. The term cheiloscopy was derived from Greek words, in which "cheilos" means lip and "scopy" means to examine [6]. In general, cheiloscopy is define as a method of identifying an individual based on the arrangement of lines seen on the red part of the lips or a science dealing with the various lines appearing on the red part of the lips [7,8]. This involves the examination of the normal lines and fissures in the forms of wrinkles and grooves present in the transition area in between the inner labial mucosa and the outer skin of the lips [9]. The wrinkles and grooves that form on lip, contribute to different type of lip patterns, which differs for each individual.

In a crime scene investigation, a study of lip prints is very useful as they can be used for crime analysis and can be used to identify and rule out the suspect of the crime. Even the sex of the suspect can be analysed and determined. The lip prints evidence obtained from the crime scene should be preserved and the lip prints of suspects should be obtained to ruled out the criminal. For personal identification, cheiloscopy is useful as the lip prints may have been preserve in photograph, which can be applied in individual identification. This proves that Cheiloscopy has an equivalent value for personal identification and sex determination in forensic similar to other types of forensic evidences [10]. Therefore, this study was conducted to investigate lip print pattern in males and females and to study between Malaysian and Indian population.

Materials and Method

The study was conducted based on Indian and Malaysian populations of both populations with the average age values of 19 to 22 years old. There were 40 participants involved in this study, in which 20 of them are of Indian population and remaining 20 participants are Malaysian population of both sex. Consents of individuals were obtained for this study. During this study, the lips of the participants should be free from any injuries or deformities which may alter the lip print patterns during the study. Cracked or chapped lip also should not be seen on the lip of the participants, as it may result to distortion of lip print pattern. Therefore, the lip should be smooth with no other irregularities seen on the lips

Each participants was instructed to clean their lips with a clean white cloth, before taking the lip print. This was followed by the application of dark coloured lip stick on the participants lips by using the lip stick applicator for a smooth and a proper coverage of the lips. Cellophane tape was used to take the negative impression of the lip pattern. The glued portion of the cellophane tape was placed on the lips by giving a light pressure beginning from the centre of the lips till the corner of the mouth. Then, the impression was transferred to a clean white paper and seen under the magnifying glass. The lip prints obtained were kept, with respect to name and sex of the participants in each population. Each lip print impression was recorded and analysed for the sex determination and comparison between Indian and Malaysian population.

The classification of lip pattern was analysed according to the classification of lines on lips which was proposed by Suzuki and Tsuchibashi in 1970 [11,12]. They were divided into six types based on the shape and grooves presence on the lips. The lips were examined based on the majority of lines or grooves seen on the entire part of the lips.

- Type I: Clear-cut vertical grooves or line that run across the entire lips.

- Type I': Straight groove that disappear half way into the lip, instead of covering the entire part of lip or similar to type I, but do not cover the entire lip.

- Type II: Grooves that fork in their course or branched grooves (branching Y -shaped pattern).
- Type III: Criss-cross pattern or intersected grooves
- Type IV: Reticular grooves.
- Type V: Grooves that do not fall into any of the categories and cannot be differentiated morphologically (Undetermined).

Next, for the sex of the individuals other types of classification was used, which was introduced by Vahanwala et al [13,14]. The sex determination based on the lip prints was done as followed. The results were tabulated and analysed.

- Type I, I' pattern dominant: Female
- Type I and II patterns are dominant: Female
- Type III pattern present: Male
- Type IV showing varied patterns: Male

Results

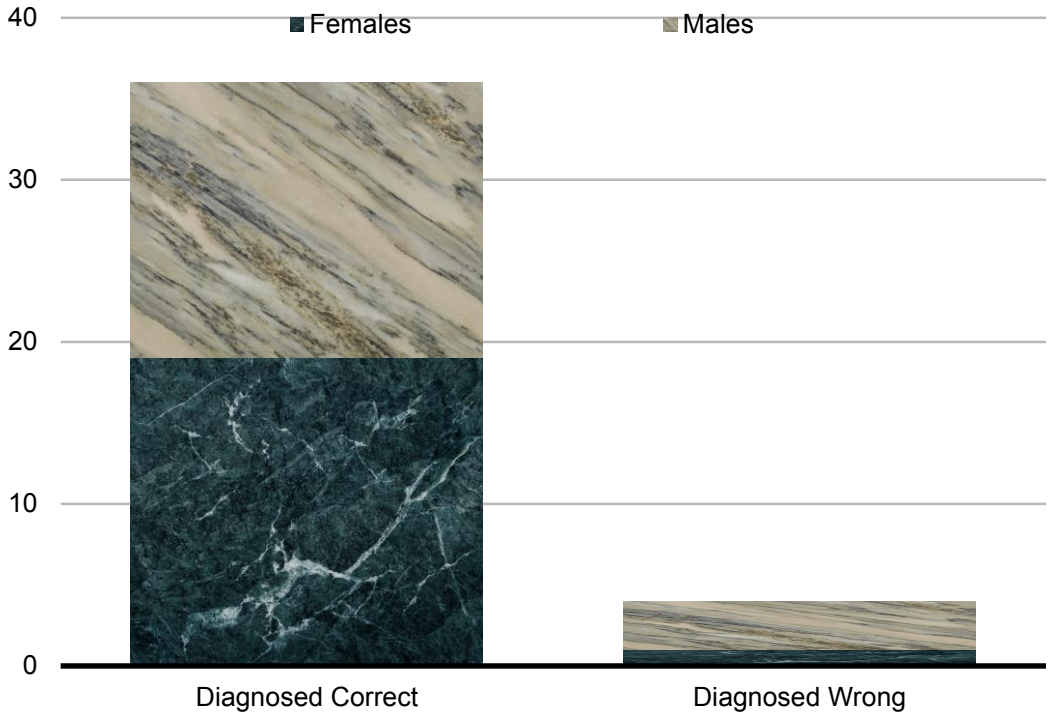
The study revealed that there were no two lip prints matched or identical with each other, which approved the uniqueness and differentiation of lip print of each individual. Based on the Table 1, type I (40%) lip pattern was commonly seen in Indian population, followed by type III (25%), II (20%) and IV (15%). Whereas for Malaysian population, type III (40%) was most common followed by type I (35%), II (20%) and IV (5%). There was significant difference between both populations.

According to Vahanwala et al classification of lip print pattern, sex determination was done in general for both population. It was found that 19 individuals were correctly diagnosed as females (Type 1 and 2) and 17 individuals were correctly identified as males (type 3 and 4), based on the lip prints obtained. Only one participant was misdiagnosed as females and three participants were wrongly identified as males, as shown in Graph 1. This proved that type I and type II of lip prints were common in females, while type III and IV were common in males.

Table 1: Comparison of Lip Print Pattern between Indian Population and Malaysian Population

		Types of Lip Print Pattern		
Population	**Variable**	**N**	**Mean**	**SD**
Indian	**Type I**	8 (40%)	4.00	4.24
	Type II	4 (20%)	2.00	0.00
	Type III	5 (25%)	2.50	2.12
	Type IV	3 (15%)	1.50	2.12
Malaysian	**Type I**	7 (35%)	3.50	2.12
	Type II	4 (20%)	3.50	0.71
	Type III	8 (40%)	4.00	4.24
	Type IV	1 (5%)	0.50	0.71

(N: Number, SD: Standard Deviation, Chi-square test: 1.0)



Graph 1: Application of Cheiloscopy in gender determination

Next, based on Table 2, it showed the classification of lip print pattern based on sex of each populations. It showed that type III (70%) was more common in Malaysian population, while in Indian population both type III (40%) and IV (30%) were more common. However for females type I was the most common lip print pattern seen in both Indian (70%) and Malaysian (50%) population. Although, there was no significant difference in sex identification for both populations, the use of lip print pattern in sex determination was proven and can be applied for any situation where lip print pattern is available and can be used. There was also no significance difference based on the distribution of lip print pattern of both populations.

Table 2: Classification Lip Print Pattern based on Gender

		Types of lip patterns			
Population	**Gender**	**Type I**	**Type II**	**Type III**	**Type IV**
Indian	Female	7 (70%)	2 (20%)	1 (10%)	0 (0%)
	Male	1 (10%)	2 (20%)	4 (40%)	3 (30%)
Malaysian	Female	5 (50%)	4 (40%)	1 (10%)	0 (0%)
	Male	2 (20%)	0 (0%)	7 (70%)	1 (10%)

Discussion

Lip prints are considered to be one of important tools for personal identification as well as sex determination, as it has an equal value as the finger prints. In some cases it also can be used for finger prints or bite prints replacement or as supportive evidence. This study was carried out based on the cheiloscopy method, to describe the diversity of lip print patterns and its application in sex determination. Through the application of lip print

classification by Suzuki and Tsuchibashi as the standard classification, the results obtained showed compliance based on proposed groups by them. However, in general the lip print pattern was not focusing on a single type or group, but it is a combination of different types [15], which made the lip pattern appear different and unique for each person.

On top of that, the way the lip muscles relax to produce a particular pattern also give uniqueness to the lip print, as stated by Sivapathasundharam et al in 2001 [16,17]. Even for twins, although their lip print pattern may appear similar, but they are not exactly identical to each other [18]. Therefore, lip print can be used for personal identification, and even can be used to differentiate people in different populations.

In a crime scene, lip prints are usually found and can be easily collected as evidence for crime analysis. If the lip prints are invisible, it can be visualised by making impression over the pattern by using different type of powder like aluminium powder to give a clear visibility of the lip print. However, a lipstick print is more visible and can be easily traceable. This type of lip print shows distinct features and is difficult to be removed. Thus, they are known to be the persistent lip prints [19].

In addition to this, presence of minor salivary glands and sebaceous glands at the vermilion borders and edges of lip, along with hair follicles and sweat glands in between also will lead to secretion of oils and mosturization, which result to formation of latent lip print. This will enhance the formation of lip print pattern on objects such as glasses [20]. Hence, lip print pattern can be acknowledged for personal identification and also sex determination.

In this study, it showed that type I was the most common lip print pattern seen in both Indian and Malaysian population for females. Whereas for male, type III was more common in Malaysian population, and both type III and IV were more common in Indian population. The results obtained in our study was found similar with studies of Vahanwala et al [13], Preethi et al [19] and Shilpa et al [21]. However, the result obtained was opposite with the study done by Kiran et al [14], as they stated that type II pattern was common in both males and females, which was also obtained from study by Deepa et al [15]. There, were no lip print pattern similar or identical with each other observed in the study. This was also proven in another study.

Conclusion

In conclusion, type I was the most common lip print pattern seen in both Indian and Malaysian population for females. Whereas for male, type III was more common in Malaysian population, and both type III and IV were more common in Indian population. There was no significant difference in both population according the general distribution of lip print pattern. There was no correlation or similarity of lip print patterns between each participant in both population.

Ethical Clearance: The lip prints results were obtained with individuals consent from students of Saveetha Dental College, Saveetha University Chennai, India

Source of Funding- Self

Conflict of Interest - Nil

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