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### Efficacy of lip prints for determination of sex and inter observer variability

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#### ABSTRACT

*To find out the potential for determination of sex of an individual from the configuration of lip prints. This study was conducted on 80 patients from Jaipur Dental College, Jaipur, 40 males and 40 females, aged between 20 and 30 years. It was a blind folded study carried out by two investigators. Lipstick (bright red color and non glossy was used), Cellophane tape, Scissors, White bond paper, Foldable magnifying lens. After evaluating 80 patients by two examiner. Overall accuracy by first examiner was found to be 70 % (Out of 80 patients 56 were diagnosed correctly), While the second examiner had an accuracy rate of 73.75 % (Out of 80 patients 59 were diagnosed correctly). The results were subjected to statistical analysis.*

**Key words:** Lip prints, Cheiloscopy, Sex determination

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#### INTRODUCTION

In forensic identification, the mouth allows for a myriad of possibilities. The grooves present on the human lips are unique to each person and can be used to determine identity. The study of these grooves or furrows present on the red part or the vermilion border of the human lips is known as cheiloscopy[1]. These grooves are also called as sulci labiorum ruborum[2]. The use of lip prints is not so popular but exists as a methodology in forensic science. Studying in depth and establishing further facts and truth in lip print will certainly help us, as useful evidence in forensic science [3]. R. Fischer was the first to describe it in 1902[4]. Edmond Locard was one of the France's greatest criminologists who first recommended the use of lip print in personal identification and criminalization [5]; hence the objective of this study was to find out the potential for determination of sex of an individual from the configuration of lip prints.

## MATERIALS AND METHODS

This study was conducted on 80 patients from Jaipur Dental College, Jaipur, 40 males and 40 females, aged between 20 and 30. First lipstick was evenly applied over the lips (Figure 1), then impression was made on a strip of cellophane tape on glued portion (Figure 2). These impressions were stuck over white bond paper, these impressions served as permanent record; finally impressions were visualized under magnifying lens. The lines and furrows present, their length, branching and combinations were noted. Lip prints obtained were coded, keeping in account the name and sex of the respective individuals. At the time of analysis the sex of the print was not disclosed. The patients with normal lip anatomy, without any trauma, congenital malformation and infectious study were included in the study.



Figure 1. Shows even application of lipstick on patient's lip

Suzuki. K and Tsuchihashi Y Classification [6]

Table 1 – Tsuchihashi Y CLASSIFICATION

Type	Clear cut vertical grooves that run across the entire lips
Type I'	Similar to type 1, but do not cover the entire lip
Type II	Branched grooves (branching Y shaped pattern)
Type III	Criss-cross pattern, reticular grooves
Type IV	Undetermined



**Figure 2. Shows Lipstick impression made on cellophane strip**

### **Sex of individual was determined as**

**Table 2 – Association of lip patterns and gender**

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

### **Points taken in consideration**

1. Middle part of upper and lower lip was taken into account.
2. Determination of the pattern depends on numerical superiority of properties of the lines of the study area.
3. The results were verified from the coded data collected at the beginning of the study.
4. Using Tsuchihashi Y study on interpretation of lip print by first examiner out of 80 patients 56 patients ( 29 males and 27 females) were diagnosed correctly and by second examiner out of 80 patients 59 patients (31 males and 28 females) were diagnosed correctly.
5. In this study, participants in the range of 20-30 years were selected. So as to rule out chance of error in the interpretation of the sex of an individual related to specific age.

## **RESULTS AND DISCUSSION**

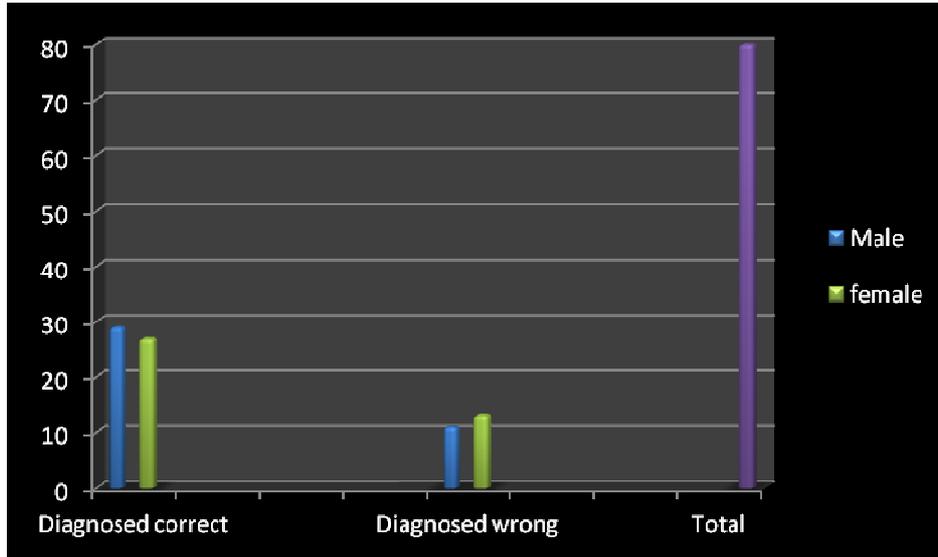
**Table 3. Accuracy of Gender Determination by first examiner among 40 males**

Age group	Diagnosed correct	Diagnosed wrong	Percentage
20-30	29	11	72.5 %

**Table 4. Accuracy of Gender Determination by first examiner among 40 females**

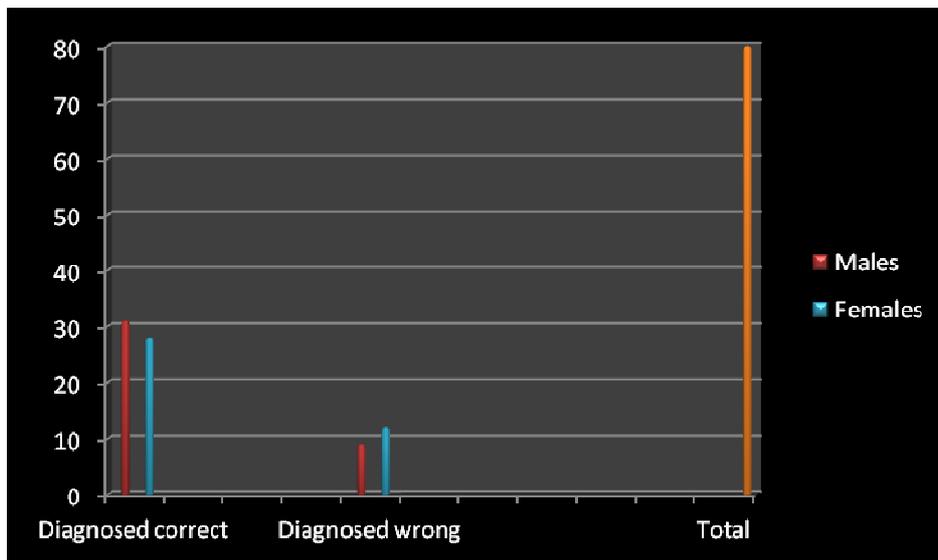
Age group	Diagnosed correct	Diagnosed wrong	Percentage
20-30	27	13	67.5%

**Overall accuracy of gender determination by first examiner**



**Graph 1. Shows overall diagnostic accuracy of first examiner in both males and females.**

**Overall accuracy of gender determination by Second examiner**



**Graph 2. Shows overall diagnostic accuracy of second examiner in both males and females.**

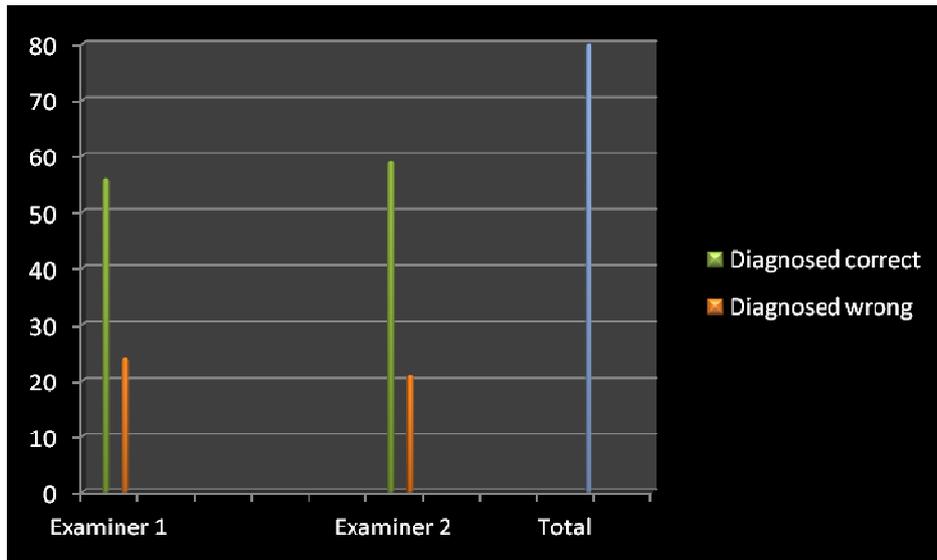
**Table 5. Accuracy of gender determination by second examiner among 40 males**

Age group	Diagnosed correct	Diagnosed wrong	Percentage
20-30	31	9	77.5 %

**Table 6. Accuracy of Gender Determination by second examiner among 40 females**

Age group	Diagnosed correct	Diagnosed wrong	Percentage
20-30	28	12	70%

**Overall Accuracy of Cheiloscopy in sex determination**



**Graph 3. Shows overall accuracy of Cheiloscopy by both examiner in sex determination**

Using Tsuchihashi Y study on interpretation of lip print pattern, sex determination was correctly diagnosed in 29 males and 27 females by first examiner and in 31 males and 28 females by second examiner. Most predominant pattern taking both upper lip and lower lip together was type III (50%) in males and females both. In males the predominant type was found to be Type III (66%) In females all the patterns type I, Type I' and Type II were commonly noted by both examiners. After seeing the study outcome we can say that lip prints are useful in sex determination, these are the important form of transfer evidence. Lipsticks which leave no trace after contact with surface Characterized by their permanence and referred as persistent lip prints. It was found in a study by Sonal-Nayak that type I and Type I' pattern were found to be dominant in females while type III and type IV were found dominant in males [7]. In another study by Vahanwala Parekh it was shown that all four quadrants having same type were predominantly seen in female subjects. [8] Male subjects showed presence of different patterns in a single individual. [9] In this study we labeled a particular pattern on the basis of numerical superiority of types and lines present (Vertical, intersected, branched or reticular). If more than 1 pattern predominates it is typed as undetermined. In the present study Type I, Type I' and type II patterns were predominant in females Type III pattern was predominant in males. It was also observed that no lip prints matched each other.

## CONCLUSION

Any process that possesses the possibility of assisting the forensic field in identifying a suspect should be pursued and, if discovered pertinent, utilized in the act of criminal investigations and legal proceedings. The use of lip prints falls into this category and because they have been proved reliable and trustworthy to link a suspect to a crime, more emphasis should be given to this field. Lip print analysis is a process that provides both qualitative and quantitative results thus its application in the forensic field should be widely accepted by both law enforcement and the legal professionals. Unlike fingerprints, unanimity still does not exist between investigators to accept cheiloscopy as a method of human identification [10]. A series of forensic odontological studies on the morphology of the lips and the pattern produced when they are impressed on to a variety of surfaces forms a worthy additional weapon for personal identification. [11] If the sex of an individual is known it is easy to short list the array of suspects with motives of crime. Present study beholds the potential for determination of sex. Though the results obtained in the study does not prove to be infallible method. It does seem to promise to go one step further closer to the truth. Lip prints are promising a supplementary tool along with other modes to recognize the sex of an individual but it has some limitations. Thus Forensic odontologists need to approach bite marks with certain degree of skepticism and continuously acknowledge their limitations. [12]

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