

## EVALUATION AND COMPARISON OF VARIOUS METHODS OF LIP PRINTS IN GENDER DETERMINATION AND ITS STABILITY OVER A PERIOD OF TIME

Aparna. B<sup>\*1</sup>, Ahmed Mujib B.R<sup>2</sup>, Rashmi Naik<sup>3</sup>, Shruthi. K Patil<sup>4</sup>, Arun Kumar. N<sup>5</sup>.

<sup>\*1</sup> Post Graduate Student, Department of Oral Pathology and Microbiology, Bapuji Dental College and Hospital, Davangere, Karnataka, India.

<sup>2</sup> Professor and Head of the Department, Department Of Oral Pathology and Microbiology, Bapuji Dental College and Hospital, Davangere, Karnataka, India.

<sup>3</sup> Reader, Department of Oral Pathology and Microbiology, Bapuji Dental College And Hospital, Davangere, Karnataka, India.

<sup>4</sup> Reader, Department of Oral Pathology and Microbiology, Bapuji Dental College And Hospital, Davangere, Karnataka, India.

<sup>5</sup> PhD Biostatistician, Bapuji Dental College And Hospital, Davangere, Karnataka, India.

### ABSTRACT

**Context:** Gender identification is one of the most important aspects in the forensic science. It is based on scientific principles involving dental records, fingerprints and DNA comparisons. Sometimes, it becomes necessary to apply easy techniques like cheiloscopy. The wrinkles and grooves on the labial mucosa form a characteristic pattern called lip prints, the study of which is referred to as cheiloscopy.

**Aim:** The present study was done to evaluate the accuracy of various methods of lip prints in gender determination and its stability over a period of time.

**Subjects and Methods:** It consists of 80 healthy individuals (40 males and 40 females) in the age group of 18 to 25 years. Lip prints were taken by lipstick, latent and digital photography methods. Data was collected by two observers at 0 month and 6 months to assess their stability in gender determination.

**Statistical Analysis Used:** Chi-square test was used.

**Results:** The results obtained showed an accuracy of 0% and 57.5% by observer I, 30% and 67.5% by observer II at 0 and 6<sup>th</sup> month in gender determination. The measurement of agreement in stability of lip prints was found to be 27.8% by observer II. It was found that digital photography being the accurate method followed by lipstick and latent methods.

**Conclusion:** This study revealed that lip prints can be used for determining the gender of an individual.

**KEY WORDS:** Cheiloscopy, forensic identification, lip prints, gender determination.

**Address for Correspondence:** Dr. Aparna. B, Post Graduate Student, Department of Oral Pathology and Microbiology, Bapuji Dental College and Hospital, Davangere- 577004, Karnataka, India. Tel phone No: 7892783252 E-Mail: [aparnalalitha@gmail.com](mailto:aparnalalitha@gmail.com)

Access this Article online	Journal Information
<b>Quick Response code</b>  DOI: 10.16965/ijar.2018.146	<b>International Journal of Anatomy and Research</b> ICV for 2016 90.30 ISSN (E) 2321-4287   ISSN (P) 2321-8967 <a href="https://www.ijmhr.org/ijar.htm">https://www.ijmhr.org/ijar.htm</a> DOI-Prefix: <a href="https://dx.doi.org/10.16965/ijar">https://dx.doi.org/10.16965/ijar</a> 
	<b>Article Information</b> Received: 14 Feb 2018 Peer Review: 14 Feb 2018 Revised: None Accepted: 07 Mar 2018 Published (O): 05 Apr 2018 Published (P): 05 Apr 2018

### INTRODUCTION

The responsibility of a dental surgeon to

mankind is not only to serve in examination, investigation, diagnosis, and treatment of oral and

oro-facial lesions of local origin, but also in other community services and legal matters. Dental surgeon has an active role in various purposes of forensic dentistry like age and gender determination, identification of unknown deceased person, analyzing bite marks as evidence, giving evidence in child abuse etc [1].

Even though DNA and fingerprints are the time tested methods, these evidences are not always available at the investigation sites. Awareness of the modern techniques of crime detection has alerted the criminals for taking sufficient precautions like the use of gloves. In such circumstances, the identification of criminals using accurate methods like fingerprint analysis fails to establish a positive identity. The investigators can rely on Cheiloscropy as supportive evidence in specific investigations. The study of the patterns produced by the lip prints and their application is called as Cheiloscropy [2].

Lip prints are considered unique to an individual and analogous to fingerprints. Lip prints are uniform throughout life and shows presence or absence of person at crime scene. It is being used for identifying number of persons involved, their nature, gender and also the type of crime committed during the time of crime [3].

A variety of methods are available in the literature, such as latent lip print method, photographing the lips, taking the prints directly onto paper (without using cellophane tape), and obtaining three-dimensional casts of the lips [4].

At the 6th week of intrauterine life, the lip prints can already be identified, and it has been proved that lip prints are unchangeable and will recover even after trauma or diseases affecting the lips like herpes [5].

Sufficient scientific literature is not available in gender determination using cheiloscropy. This study was done to evaluate the accuracy of various methods of lip prints in gender determination and their stability over a period of time.

## **SUBJECTS AND METHODS**

The study comprised of 80 healthy individuals (40 males and 40 females) in the age group of 18 to 25 years. Lip prints were taken by lipstick method, latent method and digital photography method [1,6].

The Institutional Ethics Committee approval was taken for the study. After explaining about the study to the subjects, an informed consent was obtained. Lipstick was applied in a single motion, evenly on the lips. The subject was asked to gently rub his/her lips together to spread the lipstick evenly. A strip of cellophane tape, 10cm long was cut with scissors. The subject was asked to relax the lips and to keep the mouth stationary and closed during the procedure. The glued portion of the cellophane tape was applied on the upper and lower lips together. It was held in place, applying gentle and even pressure for a few seconds. Then the tape was carefully lifted from the lips, avoiding any smudging of the print. This strip of cellophane tape was attached to a piece of white bond paper. The print was subsequently visualized with the use of a magnifying lens.

For the development of latent lip prints the lips were gently pressed together against a glass slab for 3-4 seconds. The print formed on the glass slab will be developed by sprinkling the black fingerprint powder with feather brush composed of charcoal and graphite. The excess powder was removed and the print was transferred to a white bond sheet with the help of a 2-inch-wide cellophane tape. The print was subsequently visualized with the use of a magnifying lens [6].

Digital photography was used, as the mobile nature of the human lips can affect the accuracy of the lip print impressions even with slight variations in the strength or the direction of the pressure applied.

The subject was made to stand erect with the head positioned in Frankfurt plane. From a fixed distance, lips of the subjects in 'natural condition' (without the application of lipstick, lip fillers, lip gloss or any other cosmetic product) will be photographed twice using a digital camera (CANON ZOOM LENS 14x IS,5.0-70.0mm )by placing it on a tripod at a height of 5.5 feet.

This method is relatively easier as there is no physical contact with the subjects in terms of application of lip gloss or lipstick, which can be quite laborious and unhygienic.

Lip prints obtained from the three methods were divided into four quadrants namely A, B, C, and

D moving clockwise, starting from the left side of the upper lip to the left side of the lower lip. Quadrants are manually classified by two observers independently, to compare the accuracy of lip print in gender determination and also to assess the inter- and intra-observer agreement of the observations.

Lip prints were classified based on the classification proposed by Suzuki and Tsuchihashi in 1970, which is the most widely used classification in literature [7].

The procedure for recording the prints, classification and same method of examination was repeated for the same individuals after 6 months to assess the stability of lip prints. The older photographs were compared with the recent ones by the same observers.

**Fig. 1:** Photograph of Materials used in the study.



**Fig. 2:** Photograph of application of glued portion of cellophane tape.



**Fig. 3:** Photograph of lipstick print.



**Fig. 4:** Photograph of dusting of black fingerprint powder.



**Fig. 5:** Photograph of image of latent lip print.



**Fig. 6:** Photograph of lip print by digital photography.



## RESULTS

In the present study, for qualitative data, Chi square test was used as a test of significance. Kappa (K) value was calculated to check the inter-observer and intra-observer agreement strength.

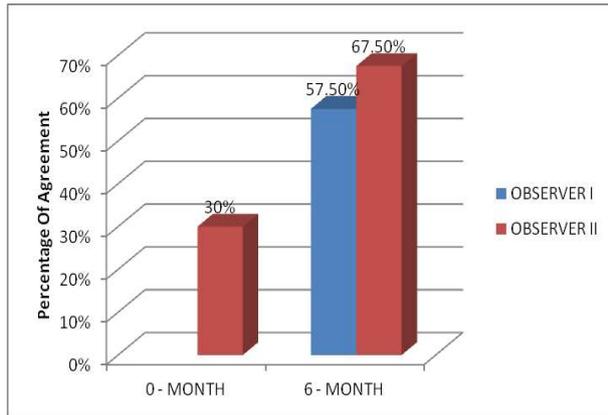
Graph 1 describes during 0 month, the measurements of agreement in gender determination based on kappa value by the Observer I was about 0% and by the Observer II were about 30 %.

Graph 2 describes after 6 months duration, the measurement of agreement in gender determination based on kappa value by the Observer I was about 67.5% and by Observer II was about 57.5%.

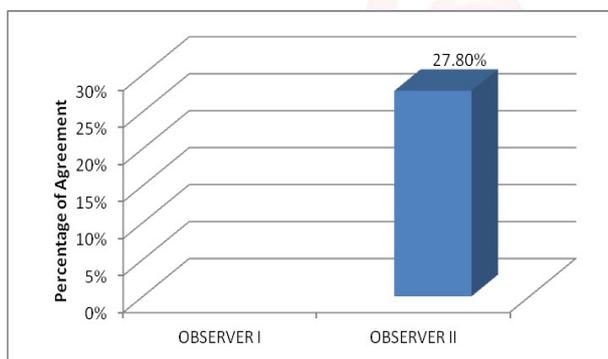
The measurement of agreement of the stability after 6 months by Observer I was 0% and by Observer II was 27.8%.

Graph 3 describes about considering the digital photography method as a standard method for gender determination, the measurement of agreement in gender determination by lipstick method with photo method was 95.40%, 95.90%, 100% and 97.50% during 0 month and 82.40 %,85.50%,87.30%,92.20% during 6 month in quadrants A,B,C,D by Observer I. The measurement of agreement in gender determination by latent method with photo method could not be established during 0 month and 6 month by Observer I.

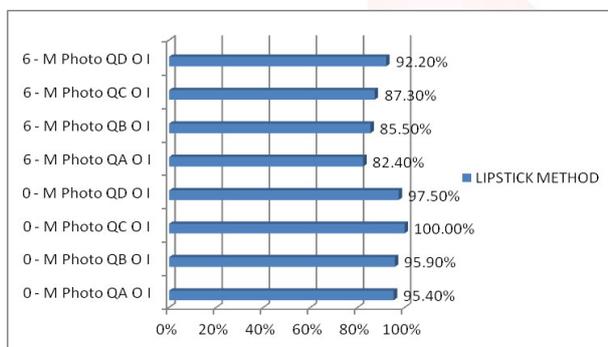
**Graph 1:** Agreement in Gender Determination- I & II Observers during 0 and 6<sup>th</sup> Month.



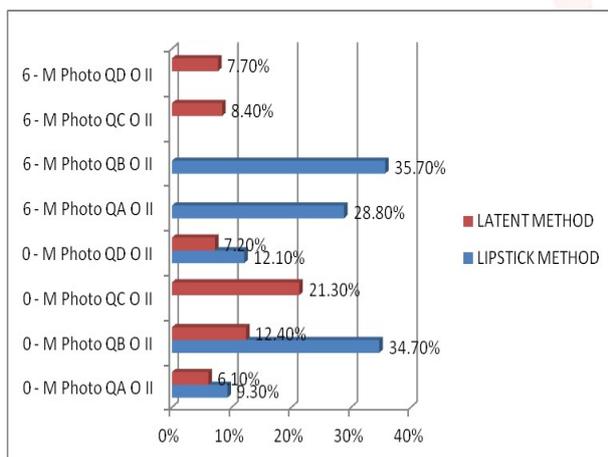
**Graph 2:** Agreement of Stability - I & II Observers after 6 months.



**Graph 3:** Agreement of Lipstick Method and latent method with Photo Method –I Observer in all Quadrants during 0 month and 6 month.



**Graph 4:** Agreement of Lipstick Method and Latent Method with Photo Method –II Observer in all Quadrants during 0 month and 6 month.



Graph 4 describes the measurement of agreement in gender determination by lipstick method with photo method was 9.30%, 34.70%, 0% and 12.10% during 0 month and 28.80%, 35.70%, 0% and 0% during 6 month in quadrants A,B,C,D by Observer II. The measurement of agreement in gender determination by latent method with photo method was 6.10%, 12.40%, and 21.30%, 7.20% during 0 month and 0%, 0%, 8.40% and 7.70% during 6 month in quadrants A,B,C,D by Observer II.

There was significant intra and inter observer agreements between the two methods based on kappa value in all the quadrants by both observers during 0 month and 6 months respectively.

Statistically significant inter-observer and intra-observer agreement was observed in assessing the morphologic pattern of the lips in all the four quadrants by both the observers. The calculated kappa values showed that the measurement of agreement in gender determination between both the observers was 'good' to 'very good'.

## DISCUSSION

Forensic science is defined as the application of scientific methods and techniques to matters under investigation by a court of law. Forensic science in a broad sense deals with criminal investigations by identification of the body, cause, and manner of death, etc. Identification of gender of an individual plays a significant role in the forensic investigation [8].

Dental, fingerprint and DNA comparisons are probably the most common techniques used in this context, allowing fast and secure identification processes. However, in certain circumstances related to the scene of the crime, these techniques might be unavailable, so there is still an increasing need for reliable alternative methods of establishing gender [9].

The grooves which appear on the red part of human lips are unique and use to determine the identity of person. The study of these grooves or furrows present at the region of transition of exterior skin and inner skin and inner labial mucosa is known as cheiloscopy [10].

In the present study, for recording the lip prints, three methods were used. These include the lipstick method, latent method and digital

photography method. The study was done by two observers during 0 month and a period of 6 months to assess the stability of lip prints in gender determination after 6 months.

A total of 80 healthy individuals, lip print patterns were studied. During 0 month, the measurement of agreement in gender determination based on kappa value by the Observer I was about 0% and by the Observer II was about 30%.

After 6 months duration, the measurement of agreement in gender determination based on kappa value by the Observer I was about 67.5% and by Observer II was about 57.5%.

The measurement of agreement of the stability of lip prints in gender determination after 6 months by Observer I was 0% and by Observer II was 27.8%.

The results obtained from the present study can be correlated with the study done by Randhava et.al in 2011. The study showed about 84.9 % were correctly identified as females and 65.9 % were correctly identified as males. The strength of agreement in gender determination was 76 % and there was very highly significant difference for the patterns between males and females.

The present study showed significant difference between lip print patterns in males and females in all quadrants individually as well as combined. The results are in accordance with the results obtained by Kumar et al. in the Pondicherry population, Vats et al (2012) and Diwedi et al (2013) in Kerala and Manipuri populations.

Statistically significant inter-observer and intra-observer agreement was observed in assessing the morphologic pattern of the lips in all the four quadrants by both the observers. The calculated Kappa values showed that the measurement of agreement in gender determination between both the observers was 'good' to 'very good'.

The lip prints of the individuals in the present study remained unchanged even after 6 months, which is practically useful in a criminal search where the unchanged pattern even for short period would be helpful. These findings are in accordance with the results of Tsuchihashi [7], 1970 who studied the lip prints of the same individuals every month for three years to see

whether the lip prints are permanent or not. None showed any change throughout this period.

In this study, comparison of the three procedures was done in order to assess the accuracy of each procedure in gender determination. It was found that digital photography being the accurate method in gender determination followed by lipstick and latent methods.

## CONCLUSION

Further studies on similar grounds considering different populations should be done in order to create a comprehensive database so that the hidden potential of various methods of lip prints as important source of information in gender determination can be utilized optimally.

**Conflicts of Interests: None**

## REFERENCES

- [1]. Devi A, Astekar M, Kumar V, Kaur P The study of inheritance analysis and evaluation of lip prints in individuals. *J Forensic Dent Sci* 2015; 7(1):49-53.
- [2]. Prabhu RV, Dinkar A, Prabhu V Digital method for lip print analysis: A New approach. *J Forensic Dent Sci*. 2013; 5(2): 96–105.
- [3]. Xu EX, Osman K, Hamzah SPA, Hamzah NH Lip Prints in Sex and Race Determination *Journal Sains Kesihatan Malaysia* 2012;10 (1): 29-33.
- [4]. Sharanasha RB, Penumatsa NV Correlation of lip prints and lip competence in children. *J Pharm Bioallied Sci*. 2015; 7(2):580–582.
- [5]. Yang JN, Raj JD. Postmortem identification in forensic odontology. *Int J Forensic Odontol* 2017; 2(1):27-29.
- [6]. Dwivedi N, Agarwal A, Kashyap B, Raj V, Chandra S. Latent lip print development and its role in suspect identification. *J Forensic Dent Sci* 2013; 5(1):22-27.
- [7]. Randhawa K, Narang RS, Arora PC. Study of the effect of age changes on lip print pattern and its reliability in sex determination. *J Forensic Odontostomatol* 2011; 29(2):45-51.
- [8]. Kesarwani P, Choudhary A. Establishing Role of Cheiloscopy in Person Identification and Sex Determination. *Indian J Dent Oral Health*. 2017; 1(1):1-4.
- [9]. Narmatha V, Jayabal Efficacy of Cheiloscopy in Gender Determination – A Digital Approach. *Third Asia Pacific Conference on Advanced Research*. 2016; 1(1):502-508.
- [10]. Shikshita K, Kumar SR and Mahesh S Cheiloscopy: Frequency of Pattern in different Quadrant in females. *Research J Forensic Sci* 2015; 3(4):1-9.

---

**How to cite this article:** Aparna. B, Ahmed Mujib B.R, Rashmi Naik, Shruthi. K Patil, Arun Kumar. N. EVALUATION AND COMPARISON OF VARIOUS METHODS OF LIP PRINTS IN GENDER DETERMINATION AND ITS STABILITY OVER A PERIOD OF TIME. *Int J Anat Res* 2018;6(2.1):5167-5171. DOI: 10.16965/ijar.2018.146