

# Study and Comparison of Lip Print for Sex Determination and Permanency over a time period employing Three Methods: Lipstick, Latent, and Digital Photography in North Bihar Population

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## ABSTRACT

**Background:** This study was conducted for Comparison of Lip Print for Sex Determination and Permanency over a time period employing Three Methods: Lipstick, Latent, and Digital Photography in North Bihar Population.

**Material and Methods:** An observational cross-sectional study was designed to include 50 males and 50 females in the age group of 10 – 60 years with healthy labial mucosa. Lip prints were recorded using the lipstick method, the latent lip print method, and the digital method from every study participant thrice at intervals of 6 months. The data was computed and compared using appropriate statistical analysis.

**Results:** There was no significant difference in the lip print recordings by the lipstick method, latent lip print method, and digital method at any point of time. Further, there was no difference in the lip prints over a period of one year, recorded thrice at intervals of 6 months, using any of the three recording methods.

**Conclusion:** Lip prints are permanent and do not change over time. Moreover, the threr methods of recording lip prints namely the lipstick method, latent lip print method, and digital method are equally efficient at recording lip prints and may be thereby used for sex determination.

**Key words:** Lip prints, cheiloscopy, lipstick method, digital method, latent lip prints, uniqueness of lip prints, permanency of lip prints

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## INTRODUCTION

Forensic science has proven to be an exceptional tool for delivering justice, upholding the law, and protecting human rights. Nevertheless, the field of forensics currently finds itself at a pivotal juncture with medicolegal practices. On one side, forensic science necessitates the validation and accuracy assessment of its methodologies; on the other, legal practices have occasionally accepted or dismissed these methods based solely on historical precedents, often lacking reasonable and experimental validation.<sup>1</sup>

Long before standards for the admissibility of forensic evidence were established, the pattern analysis of fingerprints, bite marks, and bloodstains had significantly evolved. This evolution resulted in the establishment of precedents in cases where these patterns were deemed admissible within the judicial system, despite a lack of sufficient scientific validity.<sup>1</sup> The evidentiary crisis associated with such pattern analysis further raises concerns regarding the reliability of these analyses. A persistent conflict has been observed regarding the admissibility and reliability of bite mark analysis in legal proceedings.<sup>2</sup> Indeed, a summary report indicates that bite marks are among the types of

forensic evidence frequently cited as contributing factors to wrongful convictions.<sup>3</sup>

For an extended period, fingerprint analysis has been a trusted method for identifying both suspects and victims, owing to the permanence and uniqueness of the patterns. However, criminals have become increasingly aware of advancements in fingerprint detection techniques, prompting them to adopt measures such as wearing gloves to evade identification. Additionally, certain dermatological conditions can hinder accurate fingerprint recognition, leading to potential failures and jeopardizing the admissibility of evidence in legal proceedings.<sup>4,5</sup>

Similarly, lip prints are distinctive to each individual and can be easily documented. Given that lip prints are permanent and immutable, their patterns have garnered significant interest from forensic scientists, who advocate for their reliability and admissibility as forensic evidence in the pursuit of justice and individual identification.<sup>6</sup> Lip prints are distinctive patterns of wrinkles and grooves found on the labial mucosa, unique to each individual; even monozygotic twins exhibit variations in their lip prints. These patterns emerge during the sixth week of intrauterine development and are believed to remain constant throughout a person's life, regardless of conditions that may affect the lips, such as herpes.<sup>7,8</sup> The examination of lip print patterns has established a significant role in forensic science, referred to as Cheiloscropy, which focuses on identifying individuals through their lip print patterns. Advancements in scientific understanding regarding lip prints aim to enhance their admissibility and reliability as forensic evidence, leading to various classification and recording methods documented in the literature.<sup>9,10</sup> This study was attempted to compare three renowned methods of recording lip prints namely the lipstick method, latent lip print, and the photographic method for their accuracy. Further, the recorded lip prints were used to determine sex and eventually to propose their reliability in sex determination of individuals. Lastly, the study aimed to deduce the permanence of lip prints to further strengthen the scientific grounds of the concern of their admissibility or reliability as forensic evidence in the court of law.

This research aimed to compare three well-known techniques for recording lip prints: the lipstick method, latent lip print analysis, and the photographic method, focusing on their accuracy. Additionally, the recorded lip prints were utilized to ascertain sex and ultimately to evaluate their reliability in determining the sex of individuals. Finally, the study sought to analyze the permanence of lip prints to reinforce the scientific basis regarding their admissibility and reliability as forensic evidence in a court of law.

**MATERIAL AND METHODS  
RESULTS**

The study comprised of 100 individuals, of which 50 individuals were males and 50 females, fulfilling the inclusion criteria for the study from the population of North Bihar.

**Table 1: Lip print recordings by all the three methods in males and females at three different time intervals**

		Time Interval			
		0 mont hs (T1)	6 mont hs (T2)	12 mont hs (T3)	
<b>Latent Lip Print Method</b>	<b>Males</b>	N	50	50	50
		$\sum X$	101	108	106
		Mean	1.728	1.973	1.854
			1	3	4
		$\sum X^2$	324	355	334
		Std.D ev.	1.541	1.575	1.681
		0	1	3	
	<b>P value</b>	<b>0.9021</b>			
	<b>Females</b>	N	50	50	50
		$\sum X$	97	126	119
		Mean	1.641	2.056	1.788
			2	7	4
		$\sum X^2$	258	383	319
		Std.D ev.	1.541	1.590	1.571
	2	7	8		
<b>P value</b>	<b>0.4146</b>				
<b>Lipstick Method</b>	<b>Males</b>	N	50	50	50
		$\sum X$	124	143	139
		Mean	2.410	1.848	2.041
			3	3	7
		$\sum X^2$	412	305	381
		Std.D ev.	1.253	1.279	1.631
		3	9	8	
	<b>P value</b>	<b>0.7675</b>			
	<b>Females</b>	N	50	50	50
		$\sum X$	119	107	97
		Mean	2.079	1.812	1.677
				3	7
		$\sum X^2$	399	310	268
		Std.D ev.	1.652	1.474	1.317
	2	4	3		
<b>P value</b>	<b>0.5474</b>				
<b>Digital Method</b>	<b>Males</b>	N	50	50	50
		$\sum X$	135	55	59
		Mean	2.218	2.265	2.286
			6	6	9
		$\sum X^2$	407	423	405
		Std.D ev.	1.405	1.503	1.460
	7	5	9		
<b>P value</b>	<b>0.6573</b>				

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	<b>value</b>			
<b>Females</b>	N	50	50	50
	$\sum X$	120	118	114
	Mean	2.0519	2.0178	2
	$\sum X^2$	388	375	379
	Std.D ev.	1.5819	1.5827	1.5898
	<b>P value</b>	<b>0.4547</b>		

**Table 2: Pairwise comparisons of the recordings produced by all the three methods among T1, T2, and T3 in both males and females**

<b>Latent Lip Print method</b>	<b>Males</b>	<b>Pairwise comparisons</b>	HSD <sub>0.05</sub> = 0.7024 HSD <sub>0.01</sub> = 0.8772	Q <sub>0.05</sub> = 3.3436 Q <sub>0.01</sub> = 4.1759
		T1:T2	M <sub>1</sub> = 1.77 M <sub>2</sub> = 1.89	0.11 Q = 0.58 (p = .91309)
		T1:T3	M <sub>1</sub> = 1.77 M <sub>3</sub> = 1.85	0.10 Q = 0.47 (p = .93531)
		T2:T3	M <sub>2</sub> = 1.89 M <sub>3</sub> = 1.87	0.03 Q = 0.07 (p = .99815)
		<b>Females</b>	<b>Pairwise comparisons</b>	HSD <sub>0.05</sub> = 0.6945 HSD <sub>0.01</sub> = 0.8762
	T1:T2	M <sub>1</sub> = 1.66 M <sub>2</sub> = 2.04	0.39 Q = 1.83 (p = .39981)	
	T1:T3	M <sub>1</sub> = 1.6	0.11 Q = 0.50 (p = .93382)	

			6 M <sub>3</sub> = 1.76		
		T2:T3	M <sub>2</sub> = 2.04 M <sub>3</sub> = 1.76	0.27	Q = 1.32 (p = .61407)
<b>Lipstick method</b>	<b>Males</b>	<b>Pairwise comparisons</b>		HSD <sub>0.05</sub> = 0.4865 HSD <sub>0.01</sub> = 0.8352	Q <sub>0.05</sub> = 3.7436 Q <sub>0.01</sub> = 4.2759
		T1:T2	M <sub>1</sub> = 2.31 M <sub>2</sub> = 1.95	0.37	Q = 2.08 (p = .31192)
		T1:T3	M <sub>1</sub> = 2.31 M <sub>3</sub> = 2.05	0.28	Q = 1.49 (p = .55004)
		T2:T3	M <sub>2</sub> = 1.95 M <sub>3</sub> = 2.05	0.10	Q = 0.61 (p = .90843)
	<b>Females</b>	<b>Pairwise comparisons</b>		HSD <sub>0.05</sub> = 0.6385 HSD <sub>0.01</sub> = 0.8791	Q <sub>0.05</sub> = 3.3416 Q <sub>0.01</sub> = 4.1749
	T1:T2	M <sub>1</sub> = 2.07 M <sub>2</sub> = 1.8	0.27	Q = 1.31 (p = .61375)	





commented that sexual dimorphism reflected through the study of lip print patterns showed very high uncertainty. 65 However, on the other hand, Mishra P et al (2022)<sup>16</sup> concluded in their study that lip prints are significantly different in males and females in the population of Bihar as well and thus be used for sex determination.

### CONCLUSION

Lip prints are permanent and do not change over time. Moreover, the three methods of recording lip prints namely the lipstick method, latent lip print method, and digital method are equally efficient at recording lip prints and may be thereby used for sex determination.

### REFERENCES

1. Bell S, Sah S, Albright TD, Gates SJ Jr, Denton MB, Casadevall A. A call for more science in forensic science. *Proc Natl Acad Sci U S A*. 2018 May 1;115(18):4541-4544.
2. Aksu MN, Gobetti JP. The past and present legal weight of bite marks as evidence. *Am J Forensic Med Pathol*. 1996 Jun;17(2):136-40.
3. LaPorte G. Wrongful convictions and DNA exonerations: Understanding the role of forensic science. *NIJ Journal*. 2018 April;279:1-16.
4. Kaur T, Chitara N, Guleria A, Meena R, Siwan D, Rani D, Kaur K, Sharma V, Kanchan T, Krishan K. Development, detection and decipherment of obfuscated fingerprints in humans: Implications for forensic casework. *Naturwissenschaften*. 2023 Dec 4;110(6):55.
5. Alotaibi LA, Alblaies MF, Alghamdi NH, AlNujaidi RY, Alali SA, Menezes RG. Forensic implications of fingerprint verification failure among people with skin diseases. *Med Leg J*. 2022 Jun;90(2):94-97.
6. Sivapathasundharam B, Prakash PA, Sivakumar G. Lip prints (cheiloscopy) *Indian J Dent Res*. 2001;12:234-7, Augustine J, Barpande SR, Tupkari JV. Cheiloscopy as an adjunct to forensic identification: A study of 600 individuals. *J Forensic Odontostomatol*. 2008;26:44-52.
7. Tsuchihashi Y. Studies on personal identification by means of lip prints. *Forensic Sci*. 1974 Jun;3(3):233-48.
8. Sangam MR, K P, Bokan RR, G V, Kaur A, Deka R. Distribution and Uniqueness in the Pattern of Lip Prints. *Cureus*. 2024 Feb 6;16(2):e53692.
9. Williams TR. Lip prints: Another means of identification. *J Forensic Ident*. 1991;41:190-4.
10. Prabhu RV, Dinkar AD, Prabhu VD. Collection of lip prints as a forensic evidence at the crime scene: An insight. *J Oral Health Res*. 2010;1:129-35.
11. Reddy KS. The essentials of forensic medicine and toxicology. 21st ed. Hyderabad: K Suguna publisher; 2005. Identification; pp. 49-84.
12. 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 Jan;5(1):22-7.
13. Ranjan, V, Sunil MK, Kumar R. Study of lip prints: A forensic study. *Journal of Indian Academy of Oral Medicine and Radiology*. 2014;26(1):50-54.
14. Sangam MR, K P, Bokan RR, G V, Kaur A, Deka R. Distribution and Uniqueness in the Pattern of Lip Prints. *Cureus*. 2024 Feb 6;16(2):e53692
15. Franco A. et al. The weak evidence of lip print analysis for sexual dimorphism in forensic dentistry: a systematic literature review and meta-analysis. *Sci Rep* 11, 24192 (2021).
16. Mishra P, Panda A, Dash KC, Kumar H, Bhuyan L, Mahapatra N. A Cheiloscopy Study among Students of Different Regional States in Eastern India: An Institutional Study. *J Pharm Bioallied Sci*. 2022;14(Suppl 1):S616-S620.