ORIGINAL ARTICLE

ANNALS OF PUNJAB MEDICAL COLLEGE

Assessing the Relationship between Fingerprints and Lip Prints Patterns with Gender and Blood Group at a Tertiary Care Hospital

Ijaz Aziz[1], Aftab Alam Tanoli[2], Aisha Rasheed[3], Faqir Ullah[4], Nasim Irshad[5], Abdul Samad[6]

1 *Assistant Professor, Department of Forensic Medicine, Mekran Medical College, Turbat Pakistan*
Conceptualization, Data collection, Drafting

2 *Associate Professor, Department of Forensic Medicine, Loralai Medical College, Loralai Pakistan*
Literature review, Study protocol

3 *Assistant Professor, Department of Forensic Medicine & Toxicology, Liaquat University of Medical and Health Sciences, Jamshoro Pakistan*
Data collection

4 *Associate Professor, Department of Forensic Medicine & Toxicology, Northwest School of Medicine, Peshawar Pakistan*
Data analysis and review the paper

5 *Assistant Professor, Department of Forensic Medicine, Army Medical College, Rawalpindi Pakistan*
Concept, design, Edited and approval of final manuscript

6 *Associate Professor, Department of Forensic Medicine & Toxicology, Liaquat University of Medical & Health Sciences, Jamshoro Pakistan*
Performed data analysis and involved in result writing

CORRESPONDING AUTHOR
Dr. Aftab Alam Tanoli
Associate Professor, Department of Forensic Medicine, Loralai Medical College, Loralai Pakistan
Email: drtanoli403@gmail.com

Submitted for Publication: 08-04-2023
Accepted for Publication 17-10-2023

How to Cite: Aziz I, Tanoli AA, Rasheed A, Ullah F, Irshad N, Samad A. Assessing the Relationship between Fingerprints and Lip Prints Patterns with Gender and Blood Group at a Tertiary Care Hospital. APMC 2023;17(4):558-561. **DOI: 10.29054/APMC/2023.1285**

ABSTRACT

Background: Fingerprints and lip prints are unique biometric markers extensively studied in forensic science for individual identification. **Objective:** This study investigates the relationship between fingerprints and lip print patterns concerning gender and blood group characteristics within a tertiary care hospital setting. **Study Design:** Cross-sectional study. **Settings:** Department of Forensic Medicine Loralai Medical College, Loralai Pakistan. **Duration:** From August 2022 to January 2023. **Methods:** Total 150 patients involving the collection of fingerprints and lip prints from participants were enrolled. Gender and blood group information were also recorded. Statistical analysis, including correlation tests and chi-square analysis, was employed to examine associations between biometric patterns and demographic variables. **Results:** The mean age of the sample population was 37.53 years, with a standard deviation of 3.2 years. Approximately 53.33% of the participants were male, while 46.67% were female. Groups A and O each comprised 26.67% of the sample, while group AB accounted for 16.67%. Type II and Type III patterns followed, accounting for 23.33% and 20.00%, respectively, while Type I patterns were least common at 16.67%. In terms of fingerprint types, loops were the most prevalent at 46.67%, followed by whorls at 30.00% and arches at 23.33%. The correlation indicates significant associations between lip prints and fingerprints with gender ($\chi^2 = 7.128$, df = 3, $p < 0.001$*) and between lip prints and fingerprints with blood group ($\chi^2 = 5.454$, df = 3, $p = 0.001$*). These findings suggest that gender and blood group may influence the distribution of lip prints and fingerprints. **Conclusion:** This study demonstrates significant associations between fingerprints, lip prints, gender, and blood group characteristics among individuals at a tertiary care hospital. These findings underscore the potential utility of integrating biometric parameters for enhanced forensic identification and medical diagnostics.

Keywords: *Biometric markers, Blood group, Fingerprints, Forensic science, Gender, Lip prints.*

INTRODUCTION

Fingerprints, characterized by the ridges, furrows, and minutiae on the skin's surface, have long been recognized as a reliable means of identification due to their permanence and distinctiveness. The uniqueness of fingerprints lies in their formation during fetal development and remains unchanged throughout an individual's life, except in cases of injury or certain diseases affecting the skin.[1,2] Forensic experts utilize various classification systems, such as the Henry classification or Automated Fingerprint Identification Systems (AFIS), to categorize and match fingerprints accurately. Similarly, lip prints, also known as cheiloscopy, refer to the distinct patterns formed by the grooves and furrows on the vermilion border of the lips. While lip prints were initially overshadowed by fingerprints in forensic investigations, their significance has gained recognition in recent years.[3,4]

One intriguing aspect of forensic research is the exploration of potential correlations between these

biometric traits and demographic factors such as gender and blood group. Gender differences in fingerprint and lip print patterns have been a subject of interest, with studies suggesting variations in ridge density, pattern types, and overall dimensions between males and females. These differences may stem from hormonal influences during development or genetic predispositions, highlighting the potential of fingerprints and lip prints as markers for gender determination in forensic examinations.[5,6] Furthermore, emerging evidence suggests a possible link between fingerprint/lip print patterns and blood group. While the underlying mechanisms remain to be fully elucidated, preliminary studies have indicated associations between certain fingerprint/lip print characteristics and specific blood groups. For instance, researchers have observed differences in ridge count, pattern complexity, and distribution of lip groove types among individuals with different blood groups. Understanding these associations could have implications for forensic investigations, providing additional insights into the biological uniqueness of individuals and aiding in the identification process.[7,8]

In light of these developments, our study aims to comprehensively review the existing literature on the association between fingerprints and lip prints patterns with gender and blood group. Additionally, we identified gaps in current knowledge and propose avenues for future research to advance our understanding of the intricate relationship between biometric traits and demographic characteristics in forensic science. By examining their associations with gender and blood group, forensic researchers can further harness the potential of these biometric traits in identifying individuals and elucidating the circumstances surrounding criminal incidents.

METHODS

This study was conducted after taking ethical approval from the institutional review board. Current study was conducted at Department of Forensic Medicine Loralai Medical College, Loralai from August 2022 to January 2023. Participant confidentiality and privacy were strictly maintained throughout the study. This study employed a cross-sectional observational design. Participants aged 18 years and above, willing to provide consent for participation with identifiable fingerprints and lip prints as well as with documented blood group information were enrolled. Individuals with hand injuries or conditions affecting fingerprint clarity, lip abnormalities or conditions affecting lip print visibility with incomplete or missing data on fingerprints, lip prints, or blood group were excluded from study. Participants were recruited from various settings such as hospitals, educational institutions, and community centers to ensure representation across different age groups, genders, and blood groups.

Fingerprint patterns were obtained using standard fingerprinting techniques such as ink and paper method or digital fingerprint scanners. The fingerprints were classified according to established classification systems such as Henry Classification or AFIS. Lip prints were obtained by applying lipstick or lip balm to the lips and pressing them against a clean white paper. Lip print patterns were then analyzed and classified. Blood group information was collected through medical records or by performing blood typing tests using standard laboratory procedures. Additional demographic information including age, gender, and relevant medical history was collected through structured interviews or review of medical records.

Statistical analysis was performed using appropriate statistical software (SPSS). Descriptive statistics such as frequencies, means, and standard deviations were calculated to summarize the characteristics of the study population. Inferential statistics including chi-square tests analysis were employed to examine the association between fingerprints and lip prints patterns with gender and blood group.

RESULTS

The mean age of the sample population was 37.53 years, with a standard deviation of 3.2 years. The majority of individuals (40.00%) were aged between 18 to 30 years,. Approximately 53.33% of the participants were male, while 46.67% were female. Blood group distribution in the sample was diverse, with group B being the most prevalent at 30.00%. Groups A and O each comprised 26.67% of the sample, while group AB accounted for 16.67% given in table 2. The distribution of lip print patterns revealed a predominant occurrence of Type IV patterns, constituting 40.00% of the sample. Type II and Type III patterns followed, accounting for 23.33% and 20.00%, respectively, while Type I patterns were least common at 16.67%. In terms of fingerprint types, loops were the most prevalent at 46.67%, followed by whorls at 30.00% and arches at 23.33% as shown in table 3.

Type IV patterns were the most prevalent among both males and females, comprising 42.86% of each group. Among males, Type II and Type III patterns followed at 28.57% and 21.43%, respectively, while among females, Type II and Type III patterns were also at 21.43%. Type I patterns were the least prevalent, constituting 21.43% among males and 14.29% among females give in table 4. Among males, arches and whorls each constituted 25.00%, while among females, whorls were slightly more common at 33.33% compared to arches at 20.00% given in table 5.

The correlation table indicates significant associations between lip prints and fingerprints with gender (χ^2 = 7.128, df = 3, p < 0.001*) and between lip prints and fingerprints with blood group (χ^2 = 5.454, df = 3, p = 0.001*) given in table 6.

Table 1: Age & gender distribution of included patients

Parameters	Age Group	Number (n)	Percentage (%)
Age	Mean age	Mean±Sd	37.53±3.2
	18-30	60	40.00
	31-45	50	33.33
	46-60	30	20.00
	Above 60	10	6.67
Gender	Male	80	53.33
	Female	70	46.67

Table 2: Blood group distribution

Blood Group	Number (n)	Percentage (%)
A	40	26.67
B	45	30.00
AB	25	16.67
O	40	26.67

Table 3: Distribution of lip print patterns

		Number (n)	Percentage (%)
Lip Print Type	Type I (Vertical)	25	16.67
	Type II (Branched)	35	23.33
	Type III (Reticular)	30	20.00
	Type IV (Intersected)	60	40.00
Fingerprint Type	Arch	35	23.33
	Loop	70	46.67
	Whorl	45	30.00

Table 4: Gender-wise distribution of lip print patterns

Gender	Type I (n, %)	Type II (n, %)	Type III (n, %)	Type IV (n, %)
Male	15 (21.43%)	20 (28.57%)	15 (21.43%)	30 (42.86%)
Female	10 (14.29%)	15 (21.43%)	15 (21.43%)	30 (42.86%)

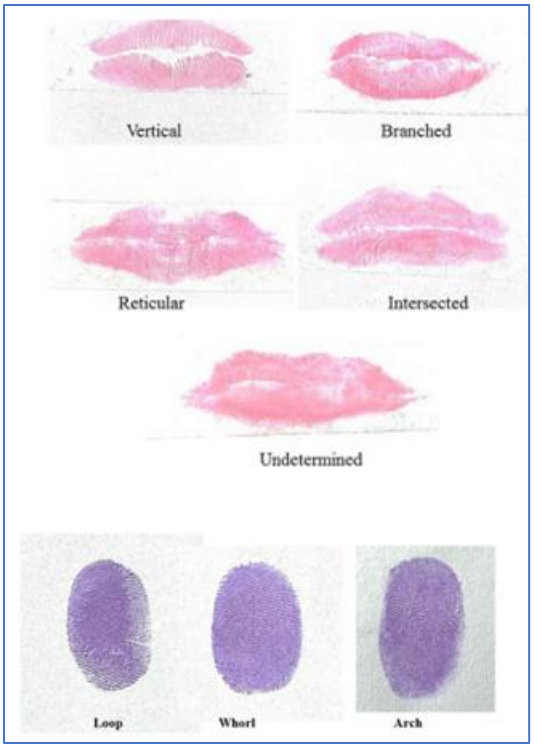
Table 5: Gender-wise distribution of fingerprint print patterns

Gender	Arch (n, %)	Loop (n, %)	Whorl (n, %)
Male	20 (25.00%)	40 (50.00%)	20 (25.00%)
Female	15 (20.00%)	30 (40.00%)	25 (33.33%)

Table 6: Correlation table for lip & fingerprint with blood group and gender on the chi-square values

Group	Chi-square value	Degrees of Freedom (df)	p-value
Lip & Fingerprints with Gender	7.128	3	<0.001*
Lip & Fingerprints with blood group	5.454	3	<0.001*

Figure 1: The participants' lip and finger prints were recorded and classified



DISCUSSION

Fingerprints and lip prints serve as unique biometric identifiers extensively utilized in forensic science and medical diagnostics. These patterns exhibit distinctive characteristics shaped by genetic and environmental factors, making them valuable tools for individual identification.[11] Additionally, gender and blood group information are integral demographic variables that contribute to the unique biological profile of an individual.[12]

In our study, the mean age was 37.53 years, with 53.33% male and 46.67% female participants, contrasting with Aamir et al.'s (2022) findings where the mean age was 21.6 years, with 27% male and 73% female among medical students.[13] Our study's findings regarding blood group distribution, with group B being the most prevalent at 30.00%, followed by groups A and O at 26.67% each, and group AB at 16.67%, are consistent with the general trends reported by Smail (2019) and Bharadwaj and Ewoldt (2015).[14] Smail (2019) reported comparable proportions of blood groups A, B, and AB in their study population, indicating consistency in blood group distribution across different samples and regions.[15]

Our study found a predominant occurrence of Type IV patterns (40.00%), followed by Type II (23.33%). Similarly, Alam. et al. (2021) noted the prevalence of Type IV patterns as the least common in their study, with no

statistically significant difference observed between males and females.[16] Furthermore, when consider fingerprint patterns, our study found loops to be the most prevalent (46.67%), followed by whorls (30.00%) and arches (23.33%). This aligns with findings from Ballur (2019), who reported loops as the most common fingerprint pattern, followed by whorls and arches.[17] However, Aamir et al. (2022) reported a different distribution, with whorls, arches, and composites found in significant proportions.[13]

The significant associations observed between lip prints and fingerprints with both gender and blood group in our study ($\chi^2 = 7.128$, df = 3, $p < 0.001$* for gender; $\chi^2 = 5.454$, df = 3, p = 0.001* for blood group) provide statistically robust evidence of the interplay of genetic and phenotypic traits within the studied population. These findings align with Ghimire et al.'s (2022) study, which also reported significant associations between gender and dermatoglyphic traits.[18] Furthermore, our results contrast with previous studies by Rekha VR et al. and Debta FM et al., which reported inconclusive or non-significant associations between lip prints and left palm prints in different populations, highlighting potential variations in dermatoglyphic traits across populations and regions.[19,20]

CONCLUSION

This study demonstrates significant associations between fingerprints, lip prints, gender, and blood group characteristics among individuals at a tertiary care hospital. These findings underscore the potential utility of integrating biometric parameters for enhanced forensic identification and medical diagnostics.

LIMITATIONS

One limitation of our study is the potential for sampling bias due to the specific population studied.

SUGGESTIONS / RECOMMENDATIONS

Further research involving a more diverse and representative sample population could enhance the generalizability of our findings and provide deeper insights into the relationships between dermatoglyphic traits, gender, and blood group.

CONFLICT OF INTEREST / DISCLOSURE

None.

REFERENCES

1. Socheat S, Wang T. Fingerprint enhancement, minutiae extraction and matching techniques. Journal of Computer and Communications. 2020;8(5):55-74.
2. Malik AH, Zehra N, Ahmad M, Parui R, Iyer PK. Advances in conjugated polymers for visualization of latent fingerprints: a critical perspective. New Journal of Chemistry. 2020;44(45):19423-39.
3. Win KN, Li K, Chen J, Viger PF, Li K. Fingerprint classification and identification algorithms for criminal investigation: A survey. Future Generation Computer Systems. 2020 Sep 1;110:758-71.
4. Ghosh A, Pahari I. Fingerprinting: The unique tool for identification in forensic science. Advanced Research in Veterinary Sciences. 2021;22:22.
5. Gavrilova ML, Anzum F, Hossain Bari AS, Bhatia Y, Iffath F, Ohi Q, Shopon M, Wahid Z. A multifaceted role of biometrics in online security, privacy, and trustworthy decision making. InBreakthroughs in Digital Biometrics and Forensics 2022 Oct 15 (pp. 303-324).
6. Vitek M, Das A, Lucio DR, Zanlorensi LA, Menotti D, Khiarak JN, Shahpar MA, Asgari-Chenaghlu M, Jaryani F, Tapia JE, Valenzuela A. Exploring Bias in Sclera Segmentation Models: A Group Evaluation Approach. IEEE Transactions on Information Forensics and Security. 2022 Oct 21;18:190-205.
7. Kumaran M S, Bastia BK, Kumar L, Patel SH. Correlation between Fingerprint and Lip Print Pattern in Gujarati Population. Medico-Legal Update. 2017 Jan 1;17(1).
8. Negi A, Negi A. The connecting link! Lip prints and fingerprints. Journal of forensic dental sciences. 2016 Sep;8(3):177.
9. Murugan M, Karikalan T. A study of relative correlation between the pattern of finger prints and lip prints. Journal of evolution of medical and dental sciences. 2019 Oct 27;3(56):12768-73.
10. Ahmed SA, Salem HE, Fawzy MM. Forensic dissection of lip print as an investigative tool in a mixed Egyptian population. Alexandria Journal of Medicine. 2018 Oct 23;54(3):235-9.
11. Ragab AR, El-Dakroory SA, Rahman RH. Characteristic patterns of lip prints in Egyptian population sample at Dakahlia Governorate. International journal of legal medicine. 2013 Mar;127:521-7.
12. Kumar A, Goel N, Prasad M, Kumar S, Kumari P. Assessment of Lip Print Patterns among the People of Bihar. Journal of Medical Science and Clinical Resequadrant. 2019 Jan;7(1):372-75.
13. Aamir Y, Masood R, Irshad N, Malik R, Farid N, Shahab MA. Relationship between Pattern of Fingerprints and Blood Groups. Pakistan Journal of Medical & Health Sciences. 2022 Nov 16;16(09):698-702.
14. Smail HO, Wahab DA, Abdullah ZY. Relationship between pattern of fingerprints and blood groups. J Adv Lab Res Biol. 2019;10(3):84-90.
15. Bharadwaj, N.A. & Ewoldt, R.H. (2015). Constitutive model fingerprints in medium-amplitude oscillatory shear. J. Rheol., 59(2): 557-592.
16. Ballur MS. Study of fingerprints in relation to gender and blood group among medical students in Kerala region. Journal of Indian Academy of Forensic Medicine. 2019;41(2):98-101.
17. Alam BF, Anwar M, Syed K, Ahsan T, Bajwa SJ, Hussain T, Ali S, et al. Assessing relationship between lip prints, finger prints and different blood groups within the population of Karachi. Pak J Med Health Sci. 2021;15(10):2262-66.
18. Ghimire P, Ghimire S, Khanal A, Khapung A. Gender Specific Correlation between Lip Print, Fingerprint and Blood Groups among Adults aged 20-30 Years attending a Tertiary Health Care Centre. Nepal Medical College Journal. 2022 Sep 28;24(3):219-26.
19. Rekha VR, Sunil S, Rathy R. Heritability and Correlation of Lip Prints and Palm prints in South Kerala Population. Oral Maxillofac Pathol J 2015;6(1):544-549.
20. Debta FM et-al. Heritability and correlation of lip print, palm print, finger print pattern and blood group in twin population. J Oral Maxillofac Pathol. 2018;22(3):451-55.