Decoding Identity: Integrating Fingerprints, Lip Prints, and Blood Groups in Forensic Investigations

Hari Ram [1,*] Mir Ghulam Ali Talpur [2], Naveed Ali Qadri [3], Mukaram Ali [4], Alia Sarfaraz [5], Farooq Ahmed Abro [6]

ABSTRACT:
Objective: To determine the relation between fingerprint and lip printing methods with blood groups of medical students at Shaheed Mohtarma Benazir Bhutto Medical College Lyari, Karachi.
Methodology: This cross-sectional study was conducted from April to August 2024 at Shaheed Mohtarma Benazir Bhutto Medical College Lyari, Karachi after getting institutional approval. Lip-print and fingerprints of all participants were recorded after getting informed consent. The blood sample were collected for blood grouping under aseptic conditions from middle finger through lancet. Collect data was analyzed through chi-square in SPSS ver. 26.
Results: Total 440 participants were included of which majority were male (53.4%) compared to female (46.6%). Type I' lip prints showed a significant gender differences ($p < 0.05$), with a higher prevalence in females. For fingerprints, the right thumb Arch pattern was also significantly associated with gender ($p<0.05$), while Loop patterns exhibited a notable preference in males ($p<0.05$). Relationship between lip prints and blood groups were significant for Type I' ($p<0.05$) and Type II ($p<0.05$).
Conclusion: Type I' lip prints demonstrate strong relation with both A+ and AB+ blood type. This study observed a distinct fingerprint patterns in right thumb arches and loops that show differences between male and female participants and point toward variations in gender-specific characteristics.

Key words: ABO Blood Groups, Forensic Science, Finger Prints, Lip Prints, Gender Determination, Cheiloscopy.

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Introduction:

Identity, the most crucial factor in forensics is a collection of physical traits that characterize a person, whether they are diseased or normal, psychological or functional. In forensic medicine, accurate identity or identification is paramount for official records, humanitarian efforts, and ethical considerations, particularly in criminal and legal investigations.[1] It is a key and significant responsibility in this field for analysis of individual recognition. It is also essential for inclusion or exclusion in the event of a mass tragedy, a missing person, or a suspected criminal offense.[2] However, not every situation can be solved by every method, such as DNA analysis, which is not only an expensive but a sensitive method that is not available in rural regions.[3] Whereas, Cheiloscopy and Dactylography are permanent identification methods of a person. Cheiloscopy is the process of analyzing a person's unique lip prints in order to identify them while Dactylography is the study of fingerprints.[4] Like finger prints, each lip print is unique and stable throughout time, making it suitable for use in identifying methods in the future. These characteristics are enduring, unique, and peculiar, which makes them outstanding indicators of uniqueness that are very hard to change. A lipstick that doesn't leave any noticeable residue after coming into touch with objects like glass, clothes, silverware, or cigarette butts has just been created. These prints are undetectable, but they may be removed with aluminum powder and a magnet. Moreover, the fingerprints and lip prints stay distinctive over the course of a person's life. [5] Another important biological characteristic that remains constant throughout time is individual's blood group. Two blood group systems are significant from a clinical standpoint. One is the Rhesus system, and the other is ABO. Landsteiner's Law states that when a certain antigen is present, the corresponding antibodies are not. Based on the presence of homologous antigens in plasma, the "ABO" blood group system is further divided into blood group types A, B, AB, and O. The presence or lack of a "D" antigen determines whether a person is "Rh positive" or "Rh negative" according to the "Rhesus" blood group classification.[6] The analysis of these biometric indicators can significantly enhance the field of forensic science. Fingerprints examinations are most significant and commonly performed practice in the field of forensic medicine. Like finger prints, each lip print is unique and stable throughout time, making it suitable for use in identifying methods in the future. Despite their potential utility as evidence in criminal cases, lip prints are often overlooked or disregarded in many forensic investigations. Whereas in investigations and legal situa-

1. Associate Professor; Department of forensic medicine and toxicology, Shaheed Mohtarma Benazir Bhutto Medical College Lyari, Karachi.
2. Assistant Professor; Department of forensic medicine and toxicology, Ghulam Muhammad Mahar Medical College, Sukkur.
3. Associate Professor; Department of forensic medicine, Isra University, Hyderabad.
4. Professor; Department of forensic medicine and toxicology, Liaquat National Medical College, Karachi.
5. Assistant Professor; Department of forensic medicine and toxicology, Islamabad Medical and Dental College, Islamabad.
6. Assistant Professor; Department of forensic medicine and toxicology, Chandka Medical College (SMBBMU) Larkana.

**=corresponding author* :
Email: drhariram89@gmail.com,

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tions, each of these components indicates a distinct aspect of a person's identity that might be crucial.[3,7]

In order to improve forensic identification techniques, this present study compares and correlates Cheiloscopy and dactyloscopy with blood types. The integration of blood group profiles, lip prints, and fingerprints in the local environment has not received enough attention. The researchers has not yet explored how fingerprints together with lip prints and blood group profiles can be integrated in local practices. Moreover, forensic departments and academic institutions experience low levels of cooperation which stops them from advancing forensic methodology. Our study designed with an objective to determine the relation between fingerprint and lip printing methods with blood groups of medical students at Shaheed Mohtarma Benazir Bhutto Medical College Lyari, Karachi. By investigating the links between these various identification procedures, the study hopes to get a better understanding of their combined value in forensic science, perhaps leading to improved practices and methodology in criminal investigations and judicial proceedings.

Objective:

To determine the relation between fingerprint and lip printing methods with blood groups of medical students at Shaheed Mohtarma Benazir Bhutto Medical College Lyari, Karachi.

Methodology:

This cross-sectional study was carried out in the department of Forensic Medicine and Toxicology Shaheed Mohtarma Benazir Bhutto Medical College Lyari, Karachi after obtaining the ethical approval from the institutional review board. Sample size of 415 was calculated in open-epi online calculator using finite population sample size formula (Slovin's formula) [8]

For addressing the non-response rate, 10% extra participants were included, so the final sample size was 447. All the medical students officially registered in the MBBS program from year one till final year at the time of study duration, regardless of gender and age were included in the study. Whereas, students registered in any other program of university, with permanent scars on their fingers, lips, or thumb, having any additional webbed or bandaged fingers, with congenital defect, or hand or lip related disease were excluded. Those who didn't gave consent of participation were excluded. Participants were selected using a stratified sampling technique. To ensure equal representation of students from each year, we first identified the total number of registered students in each year. We then calculated the proportion of each year group relative to the total student population. This approach allowed us to accurately represent each year in our sample. Informed consent was obtained from all the participants after explaining the purpose and details of the study.

The lipstick technique was used to produce lip prints, and a stamp pad was used to capture fingerprints. Participants' lips were washed with soap and water and then wiped dry with a gentle towel. A bright red, non-glossy lipstick was applied evenly, moving outward from the middle of the lips. To guarantee consistent application, participants were told to roll their lips inward on one another and allow lipstick to dry for two minutes. A 10-cm-long length of cellophane tape was cut and the bonded piece was applied to the closed lips while maintaining the oral fissure closed in its typical resting posture. Tape was then gently raised and adhered to the paper for a few seconds for making a lasting record. The created lip prints were then examined using magnifying glass to inspect each of the four quadrants that were created from each lip print. Using the categorization system put forth by Suzuki and Tsuchihashi, the lip prints were categorized as Type I (Vertical, comprising complete longitudinal fissures/patterns), Type I' (Incomplete longitudinal fissures), Type II (Branching Y-shaped pattern) Type III (Criss-cross pattern) and Type IV (Reticular, typical chequered pattern, fence like). To improve the quality and consistency of the findings, experienced observers critically examined the lip prints. Any discrepancies were discussed and resolved among the observers to achieve reliable interpretation of the information.

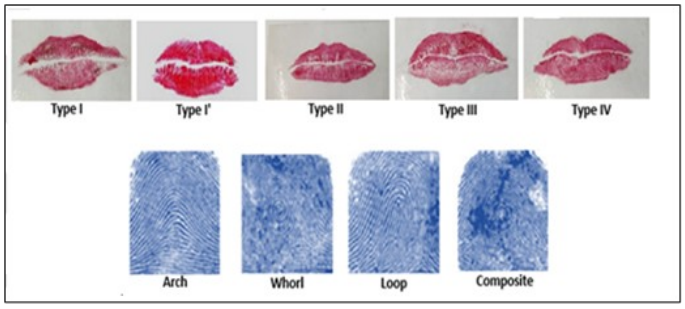
After getting lip prints, the fingerprints were obtained from all the participants. All the participants were instructed to place their thumbs of right and left hand over the stamp pad of size 157 × 96 mm. The participants were then ask to press their thumbs on the bond paper (80 gm.) in order to get fingerprints. Using a magnifying glass (TAG 3TM, 50 mm double reading glass optical graded lens with 5 × and 10 × magnifying capacity) thumb impressions were then examined. The analysis of each fingerprint involved studying particular core and delta formations beside ridge counts while considering the overall pattern orientation using Henry's classification system. This classification system involve categorization of finger prints as Arch pattern, Loop pattern, Whorls pattern, Tentarch pattern etc. Soon after recording fingerprints, blood group of participants were analyzed. The participant were instructed to wash and pat dry their hands using soap and water. The laboratory technician employed a lancet to make a hole in the pulp of the middle finger after cleaning the area with a spirit swab. A glass slide had two blood droplets pushed onto it while anti -A and anti-B sera were used in its treatment. The blood grouping process was executed under the supervision of a qualified laboratory technician who made sure that the established procedures were followed correctly and minimized any potential errors. The integrity of results remained consistent through regular quality checks and routine calibrations which were documented in an organized checklist.

The collected data was entered and analyzed using SPSS ver 26. The descriptive data is presented as frequencies and proportions. The chi-square test was employed to analyze the differences in fingerprint and lip patters among different both gender and in different blood groups. P-value ≤ 0.05 was considered as significant.

Results:

Total 447 participants were invited of which 440 given consent of participation making a response rate of (98.0%). Among the participants 235 (53.4%) were male compared to 205 (46.6%) were female. Majority of 117 (26.6%) were from 3rd year, 103 (23.4%) were from 1st year, 91 (20.7%) were from 2nd year, 77 (17.5%) from 4th year and 52 (12.0%) were from final year MBBS.

Fig No 1: Figure: Different lip and finger prints of participants



The table 1, provides a comparative analysis of lip print types among male and female participants. The results of a Chi-square test to examine the relationship between gender and lip print type are also presented in the table. Type II was the most frequent type of lip prints among the participants whereas, expect for type I' lip print type all lips print types were more common among male compared to their counterparts. A statistically significant difference ($p<0.05$) of lip print type I' between male and female.

Table No 1: Gender wise distribution of lip prints among study participants (n=440)

Lip Prints	Male n (%)	Female n (%)	Total	p-value
Type I	53 (59.0)	37 (41.0)	90 (20.4)	0.459
Type I'	30 (40.0)	45 (60.0)	75 (17.0)	0.010*
Type II	53 (54.0)	45 (46.0)	98 (22.3)	0.532
Type III	47 (53.4)	41 (46.6)	88 (20.0)	0.485
Type IV	37 (58.7)	26 (41.3)	63 (14.3)	0.573
Type V	15 (57.7)	11 (42.3)	26 (6.0)	0.886

*** p≤0.05 chi-square test**

The various fingerprint patterns that is Arch, Whorl, Loop, and Composite for both the left and right thumbs, broken down by gender, are shown in the table 2. There was a statistically significant difference ($p<0.05$) in Rt. Thumb arches and loops patterns between male and female.

Table No 2: Gender wise distribution of finger print among study participants (n=440

Thumb	Finger Prints Patterns	Male	Female	Total	p-value
Left	Arch	21 (58.3)	15 (41.7)	36 (8.2)	0.532
	Whorl	72 (53.3)	63 (46.7)	135 (30.6)	0.712
	Loop	130 (53.5)	113 (46.5)	243 (55.2)	0.802
	Composite	12 (46.0)	14 (54.0)	26 (6.0)	0.717
Right	Arch	26 (72.0)	10 (28.0)	36 (8.2)	0.037 *
	Whorl	72 (53.3)	63 (46.7)	135 (30.6)	0.320
	Loop	155 (64.0)	88 (36.0)	243 (55.2)	0.003 *
	Composite	12 (46.0)	14 (54.0)	26 (6.0)	0.580

Table N0 3: Relationship between lip prints of participants with blood groups

Lip Prints	Blood Groups							p-value
	A+	A-	B+	B-	AB+	O+	O-	
	108 (24.5)	14 (3.2)	121 (27.5)	13 (3.0)	32 (7.3)	140 (32.0)	12 (2.7)	
Type I	25 (23.1%)	3 (21.4%)	30 (24.8%)	2 (15.4%)	7 (21.9%)	35 (25.0%)	2 (16.7%)	0.751
Type I'	35 (32.4%)	1 (7.1%)	15 (12.4%)	2 (15.4%)	10 (31.3%)	10 (7.1%)	2 (16.7%)	0.002*
Type II	15 (13.9%)	6 (42.9%)	45 (37.2%)	1 (7.7%)	5 (15.6%)	60 (42.9%)	1 (8.3%)	0.001*
Type III	40 (37.0%)	2 (14.3%)	20 (16.5%)	5 (38.5%)	3 (9.4%)	15 (10.7%)	3 (25.0%)	0.008*
Type IV	8 (7.4%)	1 (7.1%)	9 (7.4%)	2 (15.4%)	4 (12.5%)	10 (7.1%)	1 (8.3%)	0.573
Type V	3 (2.8%)	1 (7.1%)	2 (1.7%)	1 (7.7%)	2 (6.3%)	2 (1.4%)	2 (16.7%)	0.886

* p≤0.05 chi-square test

Table 4: Relationship between figure prints of Rt. And Lt. thumbs with blood groups

		Blood Groups							p-value
		A+	A-	B+	B-	AB+	O+	O-	
Thumb	Finger Prints Patterns	108 (24.5)	14 (3.2)	121 (27.5)	13 (3.0)	32 (7.3)	140 (32.0)	12 (2.7)	
Left	Arch	10 (9.3%)	1 (7.1%)	12 (9.9%)	1 (7.7%)	3 (9.4%)	8 (5.7%)	1 (8.3%)	0.532
	Whorl	25 (23.1%)	3 (21.4%)	40 (33.1%)	4 (30.8%)	8 (25.0%)	50 (35.7%)	5 (41.7%)	0.048*
	Loop	65 (60.2%)	9 (64.3%)	60 (49.6%)	7 (53.8%)	18 (56.3%)	75 (53.6%)	5 (41.7%)	0.802
	Composite	8 (7.4%)	1 (7.1%)	9 (7.4%)	1 (7.7%)	3 (9.4%)	7 (5.0%)	1 (8.3%)	0.717
Right	Arch	18 (16.7%)	1 (7.1%)	8 (6.6%)	1 (7.7%)	5 (15.6%)	3 (2.1%)	0 (0.0%)	0.001*
	Whorl	30 (27.8%)	4 (28.6%)	35 (28.9%)	3 (23.1%)	7 (21.9%)	50 (35.7%)	6 (50.0%)	0.32
	Loop	50 (46.3%)	8 (57.1%)	70 (57.9%)	8 (61.5%)	15 (46.9%)	80 (57.1%)	5 (41.7%)	0.012*
	Composite	10 (9.3%)	1 (7.1%)	8 (6.6%)	1 (7.7%)	5 (15.6%)	7 (5.0%)	1 (8.3%)	0.58

* p≤0.05 chi-square test

The table 3 shows that some blood groups and lip print kinds have statistically significant correlations ($p < 0.05$). Although type I' is underrepresented in O+, it is highly associated with A+ and AB+, indicating a possible genetic or biochemical relationship with the A antigen. While Type III is more prevalent in A+ and B-, suggesting a dual antigen effect, Type II predominates in O+ and B+, potentially indicating evolutionary adaptations in these blood types. As neutral controls, non-significant types I, IV, and V spread uniformly. Although further research is required to validate biological causes, these discoveries may help with anthropological research or forensic identification.

Relationships between blood groups and thumbprints show important trends. Fingerprints from the right arch are almost nonexistent in O+ ($p = 0.001$) but highly linked to A+ and AB+, suggesting that the A-antigen may have an impact on the formation of embryonic fingerprints. In line with their high population frequencies, Right Loops are overrepresented in B+ and O+ ($p = 0.012$), but Left Whorls have weaker associations with O+/B+ ($p = 0.048$). Patterns that are not noteworthy, like Left Arch/Composite, are distributed evenly. Although complicating variables like ethnicity need to be looked into, these relationships may improve forensic profiling, especially when it comes to reducing suspect pools based on blood group and fingerprint combinations.

Discussion:

In forensic instances, these physical traits serve as an identifying sign. They include everything from accurate molecular DNA typing to macroscopic features that are distinct, long-lasting, and persistent from an individual's birth to death.[9] Majority of forensic investigations and personal identification depend on fingerprints and lip prints. Whereas, blood belongs to the same trait as the most common and necessary form of identification and verification.[10,11]

The objective of the present research was to ascertain relationship between different blood types, fingerprints, and lip prints among medical students at Shaheed Mohtarma Benazir Bhutto Medical College Lyari, Karachi. In contrast to Aamir et al. study findings, which showed that in their study 27% were male compared to 73% female, our study's having 53.4% male and 46.6% female participants.[3]These findings are consistent with those reported by Aziz et al. reported similar proportion of male and female in their study.[12] The most prevalent lip print among our study participants, as determined by the overall distribution of lip prints, was type II or branching (22.3%), followed by vertical or type I (20.4%), type III or crisscross (20.0%), type I' or Incomplete (17.0%), type IV or reticular (14.3%), and type V or undetermined (6%). This finding aligns with the research conducted by Kesarwani et al., which also indicated that certain lip print types tend to be more frequent in females.[7] However, no significant gender differences were noted for Types I, II, III, IV, and V (p-values > 0.05). Our study findings are also align with study by sunil et al. that reported the most common lip print pattern was type II.[13]

Our study results are not consistent with those of other investigations carried out by Malaysian and Pakistani researchers that reported type III and type IV lip patterns were more prevalent in their research respectively.[12,14 15] These results suggest that gender may influence the occurrence of specific lip print patterns, which can have implications in forensic contexts where gender identification is crucial. Our analysis of fingerprint patterns revealed that loops were most common (55.2%), followed by whorls (30.6%) and arches (8.2%). These findings are consistent with Aziz et al. and Zeeshan et al.[12,16] Whereas, contrasting with findings reported by Amir et al. reported significant number participants with whorls, arches and composite pattern. [3] Examining fingerprint patterns, significant gender disparities were noted, particularly in the right thumb's Arch and Loop ($p<0.05$) patterns, where males had a higher frequency. In forensics, these variations in digit patterns are essential because they may help identify suspects based on traits associated to gender. This is consistent with the findings of Saad et al. and Patil et al., which also suggested a correlation between fingerprint patterns and gender differences.[17,18] In contrast, no significant differences were found in the left thumb patterns, mirroring previous study by Zariwala et al. that have indicated consistency in fingerprint patterns independent of gender.[19] These insights contribute to the body of knowledge surrounding the reliability of fingerprints as a biometric identifier, and indicate gender-based variations that can be vital in forensic assessments.

The relationship between lip prints and blood groups showed significant correlations, particularly for Types I', II, and III (p-values < 0.05), affirming the findings of Shrivastava et al., who also reported significant associations between cheiloscopic patterns and blood types.[20] The results illustrate that certain lip print types are preferentially distributed among specific blood groups, thus enhancing the potential for using lip prints in forensic identification.

Similarly, when we analyzed the relationship between fingerprint patterns of both thumbs and blood groups, significant associations were found for the Whorl pattern on the left thumb ($p<0.05$) and the Arch and Loop patterns on the right thumb ($p<0.05$). This suggests that individuals with specific blood groups might have a predisposition towards certain fingerprint patterns, echoing the research by Aamir et al., who identified meaningful correlations between blood groups and fingerprint distributions.[3]

The findings of this study hold substantial importance for forensic science, particularly in enhancing identity verification processes. The association between lip prints, fingerprints, and blood groups reinforces the need for utilizing a multi-modal approach in forensic identification. The study has significant limitations, including a possibly non-representative sample with insufficient variety, reliance on subjective evaluations for identifying lip prints and fingerprints, and external factors that may alter quality. Furthermore, a restricted focus on gender and blood grouping without taking into account other characteristics, as well as the lack of longitudinal data, may limit generalizability.

Conclusion:

Type I lip prints show a substantial correlation with blood types A+ and AB+. This study observed a distinct fingerprint patterns in right thumb arches and loops that show differences between male and female participants and point toward variations in gender-specific characteristics. Highlighting the significant interactions between lip print types and fingerprint patterns with blood groups, offering broader insights into forensic identification processes.

References:

1. Iqbal F, Alam N, Yasmin RS, Khattak M, Farid N, Aziz I. Pattern of Fingerprints and Its Association with Gender among Medical Students of Peshawar Medical College: Fingerprint patterns and gender association. PJHS-Lahore. 2024 Jun. 30 ;5(06):114-7. Available from: https://thejas.com.pk/index.php/pjhs/article/view/1667

2. Ashraf, R., Zafar, D., Shabbir, S., Manzoor, S., Buzdar, Z. A., & Tahir, T. Beyond the Ridge: Exploring Fingerprints to Determine the Predominant Pattern in the Pakistani Population: Pakistan Journal of Health Sciences, 2025; 6(6), 127-132. doi:10.54393/pjhs.v6i6.3233
3. Patil, V., Ingle, D.R. An association between fingerprint patterns with blood group and lifestyle based diseases: a review. Artif Intell Rev. 2021; 54, 1803–1839. doi:10.1007/s10462-020-09891-w
4. Patel N, Jain A, Thukral R, Harani H, Vyas C. Pattern Predominance in Cheiloscopy, Dactyloscopy and its Correlation with Blood group: An Observational Study. Journal of Indian Academy of Forensic Medicine. 2024;46(1-Suppl)):148-52. doi:10.48165/jiafm.2024.46.1(Suppl).11
5. Alam BF, Anwar M, Syed K, Ahsan T, Bajwa SJ, Hussain T, 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. doi:10.53350/pjmhs2115102663
6. Schneider, W.H. Background and Key Developments of Blood Group Research. In: Blood Groups and Human Heredity, 1900-1950. Medicine and Biomedical Sciences in Modern History. Palgrave Macmillan, Cham.2024. springer nature. doi: 10.1007/978-3-031-69844-6_1
7. Kesarwani P, Choudhary A. Correlation of lip print with blood group in forensic science. J Oral Maxillofac Pathol. 2021 Jan-Apr;25(1):206. doi: 10.4103/jomfp.jomfp_55_21. Epub 2021 May 14. PMID: 34349448; PMCID: PMC8272480.
8. William K. Sample Size Calculator-Slovin's Formula To Calculate Sample Size For Surveys. SurveySparrow. 2021. https://surveysparrow.com/blog/sample-size-calculator/.
9. Nagervadze M, Gobadze J, Tskvitinidze S, Khukhunaishvili R, Dolidze K, Akhvlediani L, et al. Fingerprint distribution features in the population of Adjara (GEORGIA). International Journal of Advances in Biology (IJAB). 2023;10(01):15-28. doi:10.5121/ijab.2023.10102
10. Ramesh V, Channabasappa SR. A Study on Dactylographic Pattern in Relation to Abo-Blood Group and Iris Colour. Indian Journal of Forensic Medicine & Toxicology. 2021;15(2). doi:10.37506/ijfmt.v15i2.14597
11. Sudha IP, Singh J, Sodhi GS. Digital Dermatoglyphics as predictive biomarkers of genetic Criminal Tendency. Indian Journal of Science and Technology. 2021: 14(23):1944-1952. doi:10.17485/IJST/v14i23.578
12. Aziz, I., Tanoli, A. A., Rasheed, A., Ullah, F., Irshad, N., & Samad, A. (2023). Assessing the Relationship between Fingerprints and Lip Prints Patterns with Gender and Blood Group at a Tertiary Care Hospital. Annals of Punjab Medical College, 17(4), 558-561. doi:10.29054/apmc/2023.1285
13. Sunil, Singh S, Tyagi S, Chouksey V, Rani M, Duchania SK. A Comparative Analysis of Quadrants-Wise Distribution of Lip Print Pattern in Both Genders. Journal of Indian Academy of Forensic Medicine. 2023;45(1):72-75. doi:10.48165/jiafm.2023.45.1.18
14. Mahmoud NF, Afify MM, Elbendary RN, Shokry DA. Variations in morphological patterns of lip prints as evidence in racial and sexual discrimination. J forensic res. 2020;11(1):1-7. available at https://www.hilarispublisher.com/open-access/variations-in-morphological-patterns-of-lip-prints-as-evidence-in-racial-and-sexual-discrimination.pdf.
15. Tripathi P, Singh M, Kharbanda M, Singh R, Das S. Evaluation of Lip Prints and Its Association with Sex Determination and Blood Group in Adults. Indian Journal of Forensic Medicine & Toxicology. 2021;15(2). doi:10.37506/ijfmt.v15i2.14367
16. Zeeshan, R. M., Ahmad, R., Junaid, M., Ahmad, A., Rasheed, A., & Zafar, M. (2024). Dermatoglyphics and Their Association with Gender and Blood Group in Medical Students at Islam Medical and Dental College: Dermatoglyphics Association with Gender and Blood Group in Medical Students. Pakistan Journal of Health Sciences, 5(12), 93–97. doi:10.54393/pjhs.v5i12.2400
17. Saad KA, Abd Alalim HS. Association between fingerprint and blood group among Libyan students. Journal of Medical and Dental Science Research. 2020;6(3):07-10. available at https://www.researchgate.net/publication/340092189_Association_between_fingerprint_and_blood_group_among_Libyan_students
18. Patil V, Ingle DR. An association between fingerprint patterns with blood group and lifestyle based diseases: a review. Artif Intell Rev. 2021;54(3):1803-1839. doi: 10.1007/s10462-020-09891-w. Epub 2020 Aug 18. PMID: 32836652; PMCID: PMC7433280.
19. Zariwala R, Garg S, Khakhkhar T. A study of co-relationship among dactylography and blood groups among second year undergraduate students-A pilot project. Journal of Forensic Medicine and Toxicology. 2022;39(1):31-6. Available from: https://journals.acspublisher.com/index.php/jfmt/article/view/17841.
20. Shrivastava M, Jain AP, Agarwal R, Vishwakarma AK. Dermatoglyphic pattern in relation to ABO, RH blood group among medical students. Journal of Forensic Medicine and Toxicology. 2023;40(1):49-52.Available from: https://www.journals.acspublisher.com/index.php/jfmt/

"Author's Contribution"

Dr. Hari Ram, Dr. Naveed Ali Qadri, Dr. Mukaram Ali
Conception and design, Drafting of the article, Final approval and guarantor of the article

Dr. Mir Ghulam Ali Talpur, Dr. Alia Sarfaraz, Dr. Farooq Ahmed Abro.
Drafting of the article, Critical revision of the article for important intellectual content

Dr. Naveed Ali Qadri, Dr. Mukaram Ali, Dr. Farooq Ahmed Abro
Analysis and interpretation of the data, Critical revision of the article for important intellectual content, Statistical expertise.

Dr. Hari Ram, Dr. Mukaram Ali
Collection and assembly of data, Drafting of the article