

AN EFFORT TO ASCERTAIN BLOOD GROUP TYPES FROM THE FINGER PRINT PATTERNS AND GENDER

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Abstract:

Background: Forensic identification always remained a question of great concern in variety of civil as well as criminal investigations. Law enforcement person always rely on the findings of the medical man being the real forensic expert. The forensic analyst determines the blood group and fingerprints as the most basic and primary tool on their way to establish the identification.

Objective: The study explores the correlation if Blood Group Type could be ascertained from fingerprint pattern and gender of a particular person. A descriptive cross-sectional study was employed to carry out the analysis of data obtained from 293 third-year MBBS students between the ages of 19-23 over the duration of three years from 2021 to 2023. This study was conducted at Sahara Medical College Narowal, Pakistan, for three academic batches from 2021 to 2023.

Material and Methods: The fingerprints were taken through standard finger rolling against the inepad then onto the paper. The blood groups were assessed through some existing documentary evidence either in the form of laboratory test or driving license. Statistical analysis for correlation among blood group types, fingerprints pattern and gender frequency was conducted.

Results: The study established the association between the gender and fingerprint pattern. Almost all blood groups are more common or frequent in female except the O+ blood group which was more frequent in male. The association was significant with p value 0.004. The association of blood group A was more marked towards loop fingerprint while B+ was more prevalent in whorl pattern of fingerprint. Most prominent A - blood group was found only in whorl pattern of fingerprints with 0.011 value of p showing a significant association fingerprints and blood group analysis.

Conclusion: Our study exposes the convoluted connections between genetics, gender, blood group and fingerprint pattern being quit common in a peculiar pattern and rare in others. Study can be utilized establish identity with certain degree of assurance for forensic investigations.

Keywords: Blood Groups, Fingerprint Patterns, Gender, Forensic Science, Identification.

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Introduction:

Identifying an unknown individual amid medico legal investigation had always been a matter of utmost concern for any forensic expert. The identification procedure becomes even more problematic when it needs to be carried out in mass disasters. There are certain parameters of identification¹. Establishing one can link to another, this correlation is closely associated with each other. The fingerprint makes the foundation stone of identification. Blood groups are

also unique peculiarly associated with other parameters like gender and fingerprint pattern beside many others. The study is aimed to explore the correlation among these parameters to strengthen the process of identification².

The literature gap exists, though the correlation of biological markers, such as blood group types and fingerprint patterns, has long been a matter of interest for scientists in a variety of disciplines including

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forensic science, genetics and medical diagnostics³. In this study, the focus is placed on three separate parameters related to human fingerprint patterns, blood group types and gender frequencies among the local population of Pakistan. The main goal is to conduct an inquiry into all of these three different biological markers, as well as to comprehensively analyze the population regarding the chosen variables⁴. In recent years, the intersection of the science of genetics and forensic science has become a new and rapidly developing area of study⁵. The identification and characterization of blood group and fingerprint influenced by genetic markers that can be utilized for individual identification or disease diagnosis has been considered by many scientists⁶.

International literature reviewed provides essential information about correlation of blood groups with variety of other determinants. Differences in blood group distributions are noted among diverse populations and the evolutionary explanation of this diversity is a topic of recent studies. Moreover, the forensic application reveals the importance of blood group association with a particular gender having a peculiar fingerprint pattern.

Despite some current evidence on the relationship existing between blood group types and dermatoglyphic features particularly patterns of fingerprint patterns, the literature is considerably scanty and ambiguous^{7,8}. Moreover, there is quite limited literature on the association between blood group types and fingerprint patterns, especially among local ethnic origin of this populations⁹. As such our study aims to provide an extensive exploration of the said parameters of identification on third-year MBBS students, representation of local population of our country, Pakistan.

Furthermore, with all the provided distinctions of the association between blood group types, gender frequencies and fingerprint patterns, our study adds to the data refilling on human diversity and may be practical to medical diagnosis, human identification in forensic medication as well as genetic solutions in personalized medication¹⁰. Moreover, these results and the assumptions and discoveries formed from this study may further influence future research assignments and clinical practice thereby providing an incentive for forensic discipline and science.

Material and Method:

Study Design: A descriptive cross-sectional study design was employed to examine the association between fingerprint patterns, gender, and blood group types within the selected population.

Study Sample: The study was carried out among MBBS third year students of Sahara Medical College Narowal. The study population comprised 293 members of third year and aged between 19 and 23 years, among which 106 were male and 187 were female.

Study Settings: The data was gathered over the continuous three academic batch from 2021-2023 at the institute of Sahara Medical College (SMC) Narowal. The data was collected after approval of ethical committee by Institutional Review Board (IRB) of SMC wide No. 11/IRB/SMC dated: 06-06-2021.

Inclusion and Exclusion Criteria: In this study, only those were included in the study who were well aware of the study nature, willingly consented to be the part of the study, had documentary evidence of their blood group type and were having normal pulp of the finger for extraction of fingerprint. All those who were reluctant to participate in the study or had any problem with their definite fingerprint pattern like accidental damage or some disease involving skin pulp of finger were excluded from the study.

Data Collection: The structured questionnaire was used as data collection tool and all the students who were well aware of their ABO Blood Group and had presentable evidence in this regard like laboratory report or driving license which had its blood group type and Rh antigen mentioned. Fingerprint patterns was collected through standard fingerprints technique in which standard ink pad used to ink the pulp of the finger and then enrolled on designated site of the paper so to leave its impression. The descriptive statistics were applied using SPSS v 26.0 to find out the correlation.

Results:

The results were inferred to draw any conclusive evidence for correlation of gender and fingerprint pattern for helping ascertaining the ABO Blood group type. The analyses carried are here by mentioned in table 01 and 02 respectively.

Blood Group	Male	Female	Total	p-value
A +	9 (17.9%)	42 (22.5%)	1 (20.8%)	0.004
B +	0 (37.7%)	63 (33.7%)	103 (35.2%)	
AB +	11 (10.4%)	27 (14.4%)	8 (13.0%)	
O +	39 (20.9%)	31 (29.2%)	0 (23.9%)	
A -	0 (0.0%)	2 (1.1%)	(0.7%)	
B -	1 (0.9%)	6 (3.2%)	(2.4%)	
AB -	2 (1.9%)	2 (1.1%)	(1.4%)	
O -	2 (1.9%)	6 (3.2%)	8 (2.7%)	
Grand Total	106	187	293	

The table provides a detailed response to the ABO blood group distribution and demonstrates various gender demographics in terms of gender dimorphism for each blood group. Among ABO blood types, the most frequently found was A + noted in 19 males and 42 females, totaling 61 people. This type also represents the most considerable share in the total number and constitutes 20.8% of the entire population sample under consideration. Among the A B O blood types, the most frequently found was B+, observed in 40 males and 63 females, totaling 103 individuals (35.2%)

On the other hand, AB + and O + blood groups have a little lower counts compared to the A and B+. Specifically, AB + consists of 11 males and 27 females, making it to be 13.0% of the total population, whereas O +s include 39 males and 31 females, making it 23.9% of the total count. On that point, between the males and females, the number of ABO blood groups gets distributed differently across the blood types, suggesting that certain blood groups appear to have a gender dimorphism. The other point of concern from the table is that relatively small counts of the -s blood types, which are A -, B -, AB -, and O -. They have a smaller proportion compared to the +s blood types, and specifically the A - and B - comprises only 0.7% and 2.4% of the total population. AB - and O - has almost similar proportion, in which AB - is 1.4% while O - is 2.7%.

The table not only lists the total counts but also presents the percentages for each cell, which allows for a more comprehensive view of the patterns of distribution. This allows understanding in what proportions each blood group is represented in the total population sample, showcasing the differences in gender dimorphism between ABO blood groups. In summary, the information from the table adds to the knowledge about blood group prevalence in the population and gender and the complex relationships between gender and blood group distribution, thus potentially affecting medical research and practice. The association was statistically significant at p=0.004.

Table 02: Blood Group and Fingerprint Pattern Distribution in Relation to Blood Group Type Determination						
Blood Group	Loop	Whorl	Arch	Composite	Total	P Value
A +	30 (49.2%)	24 (39.3%)	7 (11.5%)	0 (0.0%)	61 (20.8%)	0.011
B +	42 (40.8%)	45 (43.7%)	15 (14.6%)	1 (1.0%)	103 (35.0%)	

AB +	20 (52.6%)	14 (36.8%)	3 (7.9%)	1 (2.6%)	38 (12.9%)	
O +	31 (44.3%)	29 (41.4%)	10 (14.3%)	0 (0.0%)	70 (23.7%)	
A -	0 (0.0%)	2 (100.0%)	0 (0.0%)	0 (0.0%)	2 (0.7%)	
B -	5 (71.4%)	1 (14.3%)	1 (14.3%)	0 (0.0%)	7 (24%)	
AB -	3 (75.0%)	1 (25.0%)	0 (0.0%)	0 (0.0%)	4 (14%)	
O -	3 (37.5%)	3 (37.5%)	2 (25.0%)	0 (0.0%)	8 (27%)	
Total	134 (45.7%)	119 (40.6%)	38 (12.9%)	2 (0.7%)	293 (100%)	

Blood Group A+:In the loop fingerprint pattern, the most commonly found blood group was A+ followed by B+; 30 cases or 49.2% of people with A+ blood group had this pattern. Compared to the A+ blood group its whorl pattern within A+was found with incidence of 7 cases or 11.5% of A+ people. Noteworthy is the occurrence of loop pattern in AB+ and O+ blood groups, 20 cases or 52.6 of AB+ people and 31 cases or 44.3% of O + individuals have this pattern.

Blood Group B+:Consequently, among the whorl fingerprint pattern group, the most widespread was B+ blood group with 45 cases, which accounts for 43.7% of B+ individuals followed by it were loop fingerprint patterns. Loops were likewise relatively frequently among B+ blood group with 42 cases, which made 40.8% of B+.

Blood Group AB+:AB+ pattern was more pronouncedly displayed by loop pattern of fingerprint more than half of its population and then in whorl present just in one-third of its sample size. Arch pattern was a rare presentation in this blood group

Blood Group O+: Most frequently the O+ blood group was exhibited by loop pattern of fingerprint like A+ and AB+ as stated above. Followed by loop almost in equal proportion it was whorl present in O+ blood group. A smaller proportion of arch pattern also had O+ blood group in them.

Blood Group A-: Among those with A- blood group, no loop or composite fingerprint patterns were detected. All A- blood groups, surprisingly had fingerprint patterns with whorl occurrence were completely prevalent with 2 cases constituting 100.0% incidence of A- blood group.

Blood Group B-: The B- blood group, which had 5 cases, and accordingly, 71.4% of B- individuals revealed loop patterns, could be mentioned as commonest of B- blood group presentation. Besides the one case or 14.3% B- with a whorl pattern. At the same time, there were no arch and composite patterns among B- blood group individuals.

Blood Group AB-: The AB- individuals had loop fingerprint patterns as substantial with 3 cases (75.0% of AB- individuals). The occurrence of whorl pattern was 1 case within the group, accounting for 25.0%. The arch and composite patterns were not found among the AB- individuals.

Blood Group O-: In those with loop pattern of the print, the occurrences among blood O - group was too with 3 cases which represented 37.5% of O- blood group type. In the whorl pattern group, O- also show equal occurrences with cases 3 which are 37.5%. There were also 2 cases of arch patterns among the O- constituting 25.0%.

There was a significant association between the blood group type and the pattern of the fingerprint. The p value was calculated as 0.011 being less 0.05 making it statistically significant. The inference can be drawn that either of the variable was associated with one another when the same could be used to determine any of the factor while establishing identification.

Discussion:

The analysis of gender frequency in the distribution of blood groups in the study population led to several noteworthy observations⁹. First, although B+ was the most common blood type of all, it was significantly more frequently encountered among female participants than males¹⁰. However the pattern was reversed in O+ population where male were in preponderance as compared to that of female though the difference was merely of 10% but it was the only type of blood group where male were in access to that of females.

Again for the B+ blood group, the pattern was dominated by female, with the type being much more common in female participants. On the other, there was also a difference between the components in the occurrence of rare blood types. Thus, A- and B- had a higher frequency in females. These differences may shed light on the genetic and physiological makeup affecting blood type prevalence in a specific population¹¹.

The result of the study revealed an interesting correlation between blood group type and fingerprint pattern. Some blood groups show a preference for some types of fingerprint pattern. Respondents with A+ tended to show a higher percentage of loop pattern. Meanwhile, B+ preferred to have whorl pattern. The distribution of AB+ varied on some types of fingerprint pattern^{12,13}. This finding suggested the possibility that due to some definite association or factors of blood group determination had correlations with fingerprint pattern development¹⁴.

Several congruencies and disparities came out when our findings were compared with existing literature on the subject. Specifically, our results were supported by some of the research on the link between blood groups and fingerprint patterns^{15,16} while conflicting with others¹⁷. Some works indicate the presence of the connection while others do not see the significant correlation. Existing disparities may be explained by the differences between the methodologies, sample sizes, and the selected demographic¹⁸. Our findings add to the current knowledge base by offering a new view of the blood groups-related fingerprint variations in the specific demographic targeted by our research¹⁹. However, more work is needed to explore these relations across various populations and confirm them.

Conclusion:

The study discovered an intriguing relationship between blood group types, fingerprint patterns and gender frequencies. The study reasonably established that the blood group types significantly correlate with the fingerprint patterns and gender. Moreover, the analysis discloses a distinct gender prevalence in blood group type existed. The blood group O+ was relatively common in men whereas the rest of the blood group types should female preponderance, which emphasizes the need to examine the gender as an independent factor in medical research and practice. Similarly the study established the fact that loop were the most common fingerprint pattern for A+, AB+, B- and AB- blood groups while whorl was more frequent in B+ blood group. Surprisingly there were just two cases of A- blood group and both had whorl pattern of fingerprint. The study concludes with reasonable confidence that to a lesser or greater extent the blood group type may be determined from fingerprint pattern and gender.

References:

1. Patil V, Ingle DR. An association between fingerprint patterns with blood group and lifestyle based diseases: a review. *Artificial intelligence review*. 2021 Mar;54(3):1803-39.
2. Newton-Cheh C, Hirschhorn JN. Genetic association studies of complex traits: design and analysis issues. *Mutation*

- Research/Fundamental and Molecular Mechanisms of Mutagenesis. 2005 Jun 3;573(1-2):54-69.
3. Duster T. The combustible intersection: Genomics, forensics, and race. In: *Race after the Internet* 2013 Jul 3 (pp. 310-327). Routledge.
 4. Butler JM. Forensic DNA typing: biology, technology, and genetics of STR markers. Elsevier; 2005 Feb 8.
 5. Berry J, Stoney DA. The history and development of fingerprinting. *Advances in fingerprint Technology*. 2001 Jun 15;2:13-52.
 6. Sengupta M, Karmakar B. Mode of inheritance of finger dermatoglyphic traits among Vaidyas of West Bengal, India. *Annals of Human Biology*. 2004 Sep 1;31(5):526-40.
 7. Sandhu H, Verma P, Padda S, Sunder Raj S. Frequency and correlation of lip prints, fingerprints and ABO blood groups in population of Sriganganagar District, Rajasthan. *Acta medica academica*. 2017 Jul 1;46(2).
 8. Cordeiro JV. Ethical and legal challenges of personalized medicine: Paradigmatic examples of research, prevention, diagnosis and treatment. *Revista Portuguesa de Saúde Pública*. 2014 Jul 1;32(2):164-80.
 9. Schneider WH. Blood group research in Great Britain, France, and the United States between the world wars. *American Journal of Physical Anthropology*. 1995;38(S21):87-114.
 10. Flegr J, Toman J, Hůla M, Kaňková Š. The role of balancing selection in maintaining human RhD blood group polymorphism: A preregistered cross-sectional study. *Journal of Evolutionary Biology*. 2021 Mar 1;34(3):426-38.
 11. Li S, Schooling CM. A phenome-wide association study of ABO blood groups. *BMC medicine*. 2020 Nov 17;18(1):334.
 12. Newton DE. DNA evidence and forensic science. Infobase publishing; 2008.
 13. Cao K, Pang L, Liang J, Tian J. Fingerprint classification by a hierarchical classifier. *Pattern Recognition*. 2013 Dec 1;46(12):3186-97.
 14. Meier RJ. Anthropological dermatoglyphics: a review. *American Journal of Physical Anthropology*. 1980;23(S1):147-78.
 15. Deopa D, Chandra P, Tayal I. A study of fingerprint in relation to gender and blood group among medical students in Uttarakhand region. *Journal of Indian Academy of Forensic Medicine*. 2014 Mar;36(1):23-7.
 16. AbdAlalim K. ASSOCIATION BETWEEN FINGERPRINT PATTERNS AND BLOOD GROUPS AMONG LIBYAN STUDENTS. *International Journal of Medical Science and Dental Health*. 2022 Sep 4;8(09):01-4.
 17. Kumar P, Singh P, Sharma M, Kumari K, Ajmal M, Ahmed A. Study of Fingerprint Patterns in Relation to Gender and ABO Blood Groups. *Indian Journal of Forensic Medicine & Toxicology*. 2023 Oct 1;17(4).
 18. Smail HO, Wahab DA, Abdullah ZY. Relationship between pattern of fingerprints and blood groups. *J Adv Lab Res Biol*. 2019 Jul;10(3):84-90.
 19. Hamid S, Hassan AU, Yasin S. Pattern of finger-prints in different blood groups among first year medical students. *Sch. J. App. Med. Sci*. 2016;4(7D):2575-8.