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Relationship between dermatoglyphics and blood group of male and female first-year medical students at Rama Medical College, Kanpur

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ABSTRACT

Background: Apart from the flexion crease and secondary folds, dermatoglyphics is the scientific study of naturally existing epidermal ridges and their arrangement on the digits, palms, and soles. In medicolegal cases, fingerprints can be used to identify suspects, victims, and other people who touch a surface as well as to diagnose inherited diseases. ABO blood group is divided into A, B, AB, and O. ABO type is determined by two antigens and two antibodies. Due to the presence or absence of the D antigen, it is further divided into Rh-positive and Rh-negative. **Aims and Objectives:** This study aimed to find correlation between ABO and Rh blood group with dermatoglyphic pattern in human beings. **Materials and Methods:** The study was conducted among 107 medical students studying at RMCHRC, Kanpur, UP, India. Rubber stamp ink pads were utilized to smear each finger. Imprints were obtained, and each fingerprint pattern was inspected and documented using a strong hand lens on a sturdy white piece of paper. **Results:** Among 1070 fingerprint patterns studied, the most common pattern observed was whorl. This pattern was present in 226 male's digits (49.23%) and 233 female's digits (50.26%), totaling to 459 forming 42.89% of the total patterns observed. B + blood group was the most common blood group present with whorl pattern, seen in 92 males and 99 females. **Conclusion:** This study shows the association between the distribution of dermatoglyphics, ABO, Rh blood group, and gender.

Key words: Dermatoglyphics; Blood group antigens; Twins; Monozygotics

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INTRODUCTION

There are very few examples in the world of science and innovation which are related to India. Perhaps the study of fingerprints is one of those few examples which has its beginning as a tool for personal identification, being in India in the 19th century by Sir Herschel.[1] Although initially its use was to identify prisoners and for signing contracts later its uniqueness made one of the universally accepted methods of identification of an individual.[2]

Apart from the flexion crease and secondary folds, dermatoglyphics is the scientific study of naturally existing epidermal ridges and their arrangement on the digits, palms, and soles. Anatomist Cummins first used the term "dermatoglyphics" in 1926. He discovered that the pattern of ridges on the sole and foot is rough due to hereditary as well as unintentional or environmental influences during their intrauterine life.[3] From the 12th to the 16th week of intrauterine life, dermatoglyphic development begins, and it is finished by the 20th week.[4] Dermatoglyphics is constant and idiosyncratic even in monozygotic twins from birth till demise. Fingerprint is the personal identification of a human being.[5,6] In medicolegal cases, fingerprints can be used to identify suspects, victims, and other people who touch a surface

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as well as to diagnose inherited diseases. In addition, fingerprints are scanned for use in forensic investigations, the Indian government's digital mission, biometric systems, authenticating electronic registration, cashless transactions, and library access.[7,8]

Karl Landsteiner, an Austrian scientist, made the discovery of the ABO blood type system at the University of Vienna. Compared to other systems, the ABO and Rh blood type systems are extremely important.[9] ABO is further divided into the following four major types: A, B, AB, and O. ABO type is determined by two antigens and two antibodies. Due to the presence or lack of the D antigen, the Rh blood group, one of the most complex blood groups in humans, is further divided into Rh-positive and Rh-negative.[10] Different diseases commonly affect specific blood groups, such as duodenal ulcer in O and gastric ulcer in A blood group.[11,12] The aim of this study was to find correlation between ABO and Rh blood group with dermatoglyphic pattern in human beings.

Aims and objectives

The aim of this study was to find correlation between ABO and Rh blood group with dermatoglyphic pattern in human beings.

MATERIALS AND METHODS

The study was conducted among 107 medical students studying at Rama Medical College, Hospital and Research Centre, Kanpur, UP, India. Ethical clearance was taken from Institutional Medical Ethics Committee, RMCHRC, Kanpur (RMCHRC/Ethics/2022/1992-A dated August 08, 2022). All of the study participants were in good health; those with blood group problems and deformed hands or fingers were excluded. Rubber stamp ink pads were utilized to smear each finger. Imprints were obtained, and each fingerprint pattern was inspected and documented using a strong hand lens on a sturdy white piece of paper. The INK method, originally demonstrated by Cummins and Mildo in 1961, was used to collect fingerprints. Faber-Castell blue ink pad, A4-size white paper, cardboard, gauze pads, magnifying lens, pencil, and pen were the materials used for this study. Basic information about each participant, including name, sex, date of birth, blood type, and fingerprints from the right and left palms, were included on each white page.

Statistical analysis

The data collected were analyzed using SPSS, version 20.0 (2011) (SPSS, IBM, IL, USA). Data were expressed as numbers and percentages.

RESULTS

In the present study, fingerprint patterns of both hands of a total 107 students were documented and studied. Among these, 52 were male and 55 were female students. Their blood group was also noted. Fingerprint pattern was then divided into four primary types, i.e., Arch, Ulnar loop, Radial loop, and Whorl (Table 1).

Among 1070 fingerprint patterns studied, the most common pattern observed was whorl. This pattern was present in 226 male's digits (49.23%) and 233 female's digits (50.26%), totaling 459 forming 42.89% of the total patterns observed. B + blood group was the most common blood group present with whorl pattern, seen in 92 males and 99 females (Tables 2 and 3).

It has been observed that, in B^{+ve} blood group, ulnar loop is more common in male (101) and whorl is more common in female (99). In O+ve blood group, whorl is more common in male (83) and female (65) both. In A+ve blood group, whorl is more common in male (23) and ulnar loop is more common in female (46). In AB+ve blood group, whorl is more common in both male (28) and female (23). A-ve and O-ve blood groups are only observed in females. In A-ve arch is more common (4 females) and in O-ve, whorl is more common (7 females (Table 4).

DISCUSSION

A fingerprint pattern is an ancient tool of the identification of a person. Its role in forensic medicine is undisputed and unparalleled. Although there are many studies in the recent past correlating it with blood groups; this study is the first of its kind to be conducted in this geographical area.

Table 1: Showing distribution of different blood groups according to gender

Blood group	Male	Female	Total
A+	5	11	16
B+	24	21	45
AB+	6	4	10
O+	17	17	34
A-	00	01	01
O-	00	01	01
Total	52	55	107

Table 2: Showing distribution of primary fingerprint pattern in both hands

Fingerprint pattern	Total number(1070)	Percentage
Arch	164	15.33
Ulnar loop	399	37.29
Radial loop	48	4.48
Whorl	459	42.89

Table 3: Showing distribution of primary fingerprint patterns according to gender

Fingerprint pattern	Male	Male (%)	Female	Female (%)	Total
Arch	78	47.56	86	52.44	164
Ulnar loop	196	49.12	203	50.87	399
Radial loop	20	41.66	28	58.33	48
Whorl	226	49.23	233	50.76	459

Table 4: Showing gender wise distribution of fingerprint patterns among different blood groups

Fingerprint pattern	B+		O+		A+		AB+		A-		O-		Total
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	
Arch	42	18	24	34	06	24	06	05	00	04	00	01	164
Ulnar loop	101	79	50	63	20	46	25	11	00	03	00	01	399
Radial loop	5	14	13	08	01	03	01	01	00	01	00	01	48
Whorl	92	99	83	65	23	37	28	23	00	02	00	07	459
Total													1070

As indicated by Fayrouz et al., in 2012 biological characteristics such as fingerprint patterns and blood groups of an individual are hard to replicate.[13] It is also not lost easily like tools such as keys or passwords, the new digital tool of the modern world. This is the reason why fingerprint patterns are still the major biometric recorded and used for the identification of a person; being used even by the Government of India through ADHAR card.

The results of a study conducted on Omani population suggested that the predominant fingerprint pattern among their study population was loop (49.4%), followed by whorl (44.9%) and then arch (5.7%) pattern.[14] Similar results were documented by majority of other studies from different parts of the world. The loop was the most common pattern observed in a study by Patil et. al. 2017. It was found in 62.35% cases followed by whorl (32.94%) and arch (4.7%).[15] These results are not similar to what we found in our study. In the present study, the most common primary pattern observed was Whorl, which was seen in 459 out of 1070 patterns observed (42.89%), followed by ulnar loop in 399 (37.29%) patterns and arches in 164 patterns observed (15.23%).

However, as observed by Thakur et al., in 2019, another study on Indian population, whorl was found to be the most common pattern as observed in our study. This difference could be attributed to the geographical distribution of the study samples.[16]

In the study on Omani population, the influence of gender was seen on the distribution of fingerprint pattern which was similar to some other studies like by Anyanwu done in 2020 in Nigeria.[17] The whorl pattern was found to be the major pattern (50.0%) among male participants, whereas the loop pattern was the most common among female subjects (54.6%). In our study, the most common pattern observed was whorl pattern which was the dominant pattern present in both male and female subjects being seen in 226 male's digits (49.23%) and 233 female's digits (50.26%), totaling to 459 forming 42.89% of the total patterns observed. The second most common pattern in our study was ulnar loop which was observed in total 399 patterns; 196 patterns in male subjects and 203 patterns in female subjects. Hence, it can be seen that gender influence was not found significant in our study. Studies with similar suggestions that did not find a significant correlation between fingerprint patterns and gender are Heng et al., 2018.[18]

Correlation of the fingerprint patterns with the ABO–Rh blood groups was also done by some other studies. The study on Omani population found that loop was the major pattern observed in person with blood group A (60.0%, 12 fingerprints), blood group Aþ (47.6%, 181 fingerprints), blood group Bþ (53.9%, 194 fingerprints), blood group B (55.0%, 11 fingerprints), and blood group Oþ (49.9%, 539 fingerprints). Whorl pattern was found to be dominant only in ABþ (60.0%, 45 fingerprints) and O (48.0%, 24 fingerprints) types of blood groups. Comparable results were found in another study from Nigeria (Eboh, 2013).[19]

B + blood group was the most common blood group observed in our study, present in 24 out of 52 male subjects (240 patterns) and 21 out of 55 female subjects (210 patterns). Among B+ males, the most dominant pattern found was ulnar loop (101 patterns), followed by whorl (92 patterns) and arch (42 patterns), respectively. In B+ females, whorl (99 patterns) was the most common pattern followed by ulnar loop (79) and arch (18), respectively. The second most common blood group found was O+, which was observed equally in males and females (17 subjects each; 170 patterns in both males and females). In O + males, the most common pattern observed was whorl (83 patterns) followed by ulnar loop (50 patterns). In 0 + females again

whorl was most common being present in 65 patterns observed, followed by ulnar loop in 63 patterns.

Limitations of the study

The small sample size and single centric study are the major limitations of the present study. We recommend study on a large sample size to overcome the limitations and to increase the reliability of the study.

CONCLUSION

The present study of correlating fingerprints with blood group is first from kanpur region. All other studies are commonly from other countries or other parts of India. It is the first study where fingerprint patterns and blood group types are correlated in the region of Kanpur city of Uttar Pradesh. It will supplement the data bank of the research world and will provide insight into common fingerprint patterns prevalent in this area.

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REFERENCES

1. Herschel WJ. The Origin of Fingerprinting. Oxford: Oxford University Press; 1916.
2. Herschel WJ. On the skin furrows of the hand. Sci J Nat. 1880;23:79.
   https://doi.org/10.1038/023076b0
3. Cummins H. Palmar and plantar epidermal ridge configuration (dermatoglyphics) in Europeans and Americans. Am J Phys Anthropol. 1926;9(4):471-502.
   https://doi.org/10.1002/ajpa.1330090422
4. Bhavana D, Ruchi J, Prakash T and Kalyan JL. Study of fingerprint patterns in relationship with blood group and gender-a statistical review. Res J Forensic Sci. 2013;1(1):15-17.
5. Vij K. Textbook of Forensic Medicine and Toxicology. 3rd ed. New Delhi: Elsevier; 2005. p. 89-91.
6. Tanuj K and Chattopadhyay S. Distribution of fingerprint patterns among medical students. J Indian Acad Forensic. Med 2006;28:65-68.
7. Pillay VV. Textbook of Forensic Medicine and Toxicology. 15th ed. Hyderabad: Paras Medical Publishers; 2009. p. 53-94.
8. Galton F. Finger Prints. London: Macmillan and Co; 1892.
9. Mehta AA and Mehta AA. Palmar dermatoglyphis in ABO, RH Blood groups. Int J Biol Med Res. 2011;2(4):961-964.
10. Bijlani RL. Blood Groups. Textbook of Physiology. 2nd ed. New Delhi: Churchill Livingstone; 2002. p. 93-94.
11. Aird I, Bentall HH and Roberts JA. A relationship between cancer of stomach and the ABO blood groups. Br Med J. 1953;1(4814):799-801.
    https://doi.org/10.1136/bmj.1.4814.799
12. Aird I, Bentall HH, Mehigan JA and Roberts JA. The blood groups in relation to peptic ulceration and carcinoma of colon, rectum, breast, and bronchus; an association between the ABO groups and peptic ulceration. Br Med J. 1954;2(4883):315-321.
    https://doi.org/10.1136/bmj.2.4883.315
13. Fayrouz IN, Farida N and Irshad AH. Relation between fingerprints and different blood groups. J Forensic Leg Med. 2012;19(1):18-21.
    https://doi.org/10.1016/j.jflm.2011.09.004
14. Al Habsi T, Al Khabori H, Al Qasmi S, Al Habsi T, Al Mushaiqri M, Das S, et al. The association between fingerprint patterns and blood groups in the Omani population. Arab Gulf J Sci Res. 2023;41(3):283-292.
    https://doi.org/10.1108/AGJSR-10-2022-0223
15. Patil A, Malik A and Shirole T. Fingerprint patterns in relation to gender and blood groups-a study in Navi Mumbai. Indian J Forensic Community Med. 2017;4(3):204-208.
    https://doi.org/10.9734/bpi/nfmmr/v5/3498f
16. Thakur A, Yadav J and Tiwari G. Fingerprint patterns in relation to gender and blood group among residents of central Indian District. Indian J Med Forensic Med Toxicol. 2019;13(3):73-77.
    https://doi.org/10.5958/0973-9130.2019.00170.1
17. Anyanwu LC. Variations of finger dermatoglyphics among the Esan ethnic group of Edo State, Nigeria. Int J Mod Anthropol. 2020;2(14):275-289.
    https://doi.org/10.4314/IJMA.V2I14.3
18. Heng GS, Ismail NA, Rahman ZA and Anan A. Distribution of fingerprint patterns among young adults and siblings in Malaysia. Int J Med Sci. 2018;3(1):11-17.
19. Eboh D. Fingerprint patterns in relation to gender and blood group among students of delta state university, Abraka, Nigeria. J Exp Clin Anat. 2013;12(2):82.

Authors' Contributions:
HA- Data collection, interpretation of data and statistical analysis, writing of article; **MFA-** Data collection and entry of data; **MD-** Original idea of research and writing of article and guidance.

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