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RESEARCH ARTICLE

Types of Fingerprints Characteristics and their Association with Gender and Blood Groups in Sudan

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ABSTRACT

Background: Studies have shown different results on the association between fingerprints, gender and blood groups in the different settings. There is one published article in Sudan.

Objectives: To investigate the prevalence of fingerprints characteristics and assess if there is an association between fingerprints and gender or ABO blood groups and rhesus blood types in Sudan.

Results: A total of 394 participants were enrolled in the study. Their age ranged between 19 to 24 years, with a mean (standard deviation) of 21 (3) years. Of these 394, 114 (28.9%) and 280 (71.1%) participants were males and females, respectively. Of 394 participants, 111 (28.2%), 63 (15.9%), 13(3.3%), and 207(52.5%) had blood group A, blood group B, blood group AB and blood group O, respectively. While 373(94.7%) participants had rhesus positive blood, only 21 (5.3%) had negative rhesus blood. Of 394 fingerprints, 2476 (62.84%) were loop, 1278(32.44%) were arch and186 (4.72%) were whorls. Fingerprints were significantly between males and females and between the different blood groups and rhesus factors.

Conclusion: loop (62.84%) and arch (32.44%) were common fingerprints. Fingerprints characteristics were significantly between males and females and between the different blood groups and Rhesus factor.

KEYWORDS: Fingerprints; loop; arch; whorl; blood groups, gender.

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INTRODUCTION

Fingerprints are the impressions left by the epidermal ridges of human fingers. In addition to being unique for each individual, the morphological characteristics of fingerprints do not change during an individual's lifetime (Krishan, Kanchan, and Sharma 2011). it is known that no two people have the same fingerprints (Gutiérrez-Redomero et al. 2013; Krishan, Kanchan, and Ngangom 2013; Krishan, Kanchan, and Sharma 2011). Fingerprints finding are important in forensic medicine, searching, and criminals body integrity (Krishan, Kanchan, and Sharma 2011).

Several studies have investigated an association between fingerprints and gender and blood groups(Fayrouz, Farida, and Irshad 2012; Oktem et al. 2015; Patil and Ingle 2021; KC et al. 2018; Saranya Manikandan, Leka Devishamani and, Gowri Shankar Palanisamy2, Priyadharsana Ponnusamy2 2017; Eboh 2013; Fadhel AL-Kalifa 2017). Some reported a significant association between them. Whilst others failed to document such associations. Also, some studies have examined fingerprints characterise, gender, and blood groups in different settings (Fayrouz, Farida, and Irshad 2012; Oktem et al. 2015; Patil and Ingle 2021; KC et al. 2018; Saranya Manikandan, Leka Devishamani and, Gowri Shankar Palanisamy2, Priyadharsana Ponnusamy2 2017; Eboh 2013; Fadhel AL-Kalifa 2017), there is one published article in Sudan (Osman, Mohamed, and Hamza 2018). This study was conducted to investigate the frequency of the fingerprints amongst Sudanese adults and to assess whether there is a relationship between fingerprints characteristics and gender or ABO" blood groups and "rhesus blood types in Sudan.

MATERIALS AND METHODS

Across sectional study was conducted amongst medical students at the National University of Sudan during March 2019. The systematic random sampling technique was used to select students from three separate semesters. Medical students from three semesters (third, fifth, and tenth) were chosen out of the ten semesters.

The sample size of 394 was divided between the three semesters. Female students outnumber males at this medical college. Therefore, more females than males were included in this sample. After signing informed consent, the participants' genders, blood group, and rhesus factors were recorded. The participants' blood group and rhesus factors were noted in the university identity chart and confirmed by the slide agglutination method using antiserum "A," antiserum "B," and anti-serum- D." This study assessed the fingerprint patterns using a magnifying glass lens and identified loops, whorls, and arches according to Galton's criteria (Galton and Zonbon 1982). Participants were asked to wash their hands thoroughly with soap and water to remove any dirt or oil, and their hands were dried with a towel. Next, they were asked to press their fingertips on a stamp pad and then on respective blocks of Performa to transfer their fingerprint impressions. Fingerprint patterns from both hands of the participants were taken and study their relationship with genders and different ABO blood groups.

Sample size calculation:

A single population proportion Kish Leslie formula (n = z2 p (1-p) / d2) was used to calculate the sample size. We assumed that the maximum proportion (50%) of blood group n had the maximum sample size estimation. Thus, our sample of 384 participants showed a 95% confidence level. We added ten more participants (to make a sample size of 394) as we expected that 10% of participants might not respond or might have incomplete data.

Statistical analysis:

The data were captured using SPSS software for Windows version 22.0 (SPSS Inc., Chicago, IL). The continuous data (age) were expressed as a mean (standard deviation), and categorised data were expressed as frequency and proportions. A chi-square test was used to compare proportions. A two-sided P-value of <0.05 was considered statistically significant.

RESULTS

A total of 394 participants were enrolled in the study. Of these 394 participants, 114 (28.9%) were male, and 280 (71.1%) were females. Their age ranged from 19 to 24 years with a mean (standard deviation) of 21 (3) years. A total of 111 (28.2%) had blood group A, 63 (15.9%) had blood group B, 13 (3.3%) had blood group AB, and 207(52.5%) had blood group O. Whilst 373 (94.7%) participants had rhesus positive blood, only 21 (5.3%) had negative rhesus blood.

Of 394 fingerprints, 2476 (62.84%) were loops, 1278 (32.44%) were arches and186 (4.72%) were whorls. Whilst males had a significantly higher prevalence of whorls and loops. Females had a significantly higher prevalence of arches and loops (Table 1).

Table 1: The association between gender and fingerprints in Khartoum, Sudan.

Gender	Loop (n=2476)	Arch (n=1278)	Whorl (n=186)	Total (n= 394)	P
Male	734 (29.6)	338 (26.45)	68 (36.6)	114 (28.9)	0.007
Female	1742 (70.4)	940(73.55)	118(63.4)	280 (71.1)	

There was a significant difference between the fingerprints and blood groups. Participants with blood group A had a higher prevalence of whorls in their fingerprints, those with blood group B had a higher majority of loops, and participants from blood groups AB had a higher prevalence of arches when compared to the other blood groups fingerprints. Arch and loop fingerprints were the most common types amongst participants with blood group O (Table 2).

Table 2: The association between blood groups and fingerprints in Khartoum Sudan (P<0.001).

Blood group	Loop (n=2476)	Arch (n=1278)	Whorl (186)	Total (n=394)
A	658 (26.5)	388 (30.3)	64 (34.4)	111 (28.2)
B	443 (17.8)	163 (12.7)	33 (17.7)	63 (15.9)
AB	61(2.4)	71(5.5)	3 (1.6)	13 (3.3)
O	1314 (53.1)	656 (51.3)	86 (46.3)	207 (52.5)

In addition, there was a borderline significant difference between the rhesus factor and fingerprints (P= 0.051). Fingerprints with arches and loops were the most common amongst participants with rhesus positive, and whorl and loop were the most common in participants with rhesus negative (table 3).

Table 3: The association between rhesus factors and fingerprints in Khartoum, Sudan (P= 0.051).

Rhesus factor	Loop (n=2476)	Arch (n=1278)	Whorl (186)	Total (n=394)
Positive	2339 (94.5)	1228 (96.1)	168 (91.3)	373 (94.7)
Negative	137 (5.5)	50 (3.9)	18 (9.7)	21 (5.3)

DISCUSSION

The current study demonstrated that the most common fingerprints had loops (62.84%) and arches (32.44%), whilst only 4.72% of the participants had whorl fingerprints. This previously confirmed Sudan finding reported that loops were the most commonly obtained fingerprints (45.58%). However, in the current study, whorls (33.44%) were the second most common fingerprints (Osman, Mohamed, and Hamza 2018). Moreover, it has been shown that loops, followed by arches and whorls, were the most frequently encountered fingerprints in India (Saranya Manikandan, Leka

Devishamani and, Gowri Shankar Palanisamy2, Priyadharsana Ponnusamy2 2017). In neighbouring Libya, a high frequency of loops (50.5%), moderate whorls (35.1%), and a low frequency of arches (14.4%) has been documented. Moreover, in neighbouring Egypt, loops (50.5%) and whorls (35.1%) were the most common pattern of fingerprints (Fayrouz, Farida, and Irshad 2012). Although our results showed a significant association between fingerprints characteristics and gender, previous studies in Nigeria (Eboh 2013) and Nepal (KC et al. 2018) showed no significant association between fingerprints characteristics and gender. The current study showed a substantial difference in fingerprints characteristics and the different blood groups, with only borderline significance in terms of rhesus factor). These findings are similar to the previous study in Egypt, which showed a significant difference in fingerprints characteristics and blood groups (Fayrouz, Farida, and Irshad 2012). Moreover, a prior study in Iraq showed a significant decrease of arches fingerprints participants with blood group AB compared with the rest of the participants who had blood groups other than AB (Fadhel AL-Kalifa 2017). A previous study showed a significant association between fingerprint patterns and the Rhesus blood group in Nigeria (Eboh 2013). However, different fingerprints were not associated with the blood group in Nepal (KC et al., 2018).

CONCLUSION

The common fingerprints were Loop (62.84%) and arch (32.44%). Fingerprints were significantly between males and females and between the different blood groups and Rhesus factor.

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AUTHORS' CONTRIBUTIONS

The participation of each author corresponds to the criteria of authorship and contributorship emphasized in the Recommendations for the Conduct, Reporting, Editing, and Publication of Scholarly work in Medical Journals of the International Committee of Medical Journal Editors. Indeed, all the authors have actively participated in the redaction, the revision of the manuscript, and provided approval for this final revised version.

COMPETING INTERESTS

The authors declare no competing interests with this case.

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REFERENCES

[1] Dennis EOE. Fingerprint Patterns in Relation to Gender and Blood Group among Students of Delta State University, Abraka, Nigeria. J Experim Clin Anatomy. 2013. 12 (2). DOI: 10.4103/1596-2393.127969

[2] Fadhel AL-Kalifa N. A Study of Morphological Patterns of Dermatoglyphics among Mother and Fetus in Different ABO, RH Blood Groups. Diyala J Med. 2017; 13 (2): 80–86. DOI: 10.26505/djm.13023620906

[3] Fayrouz IN, Farida N, Irshad AH. 2012. Relation between Fingerprints and Different Blood Groups. J Forensic Leg Med. 2012 Jan; 19(1):18-21. DOI: 10.1016/j.jflm.2011.09.004

[4] Galton F. F I N G E R P R I N T S. In Finger Prints. 1982: 73–79. [Accessed 2022 Jan 21]. Available from: https://galton.org/books/finger-prints/galton-1892-fingerprints-1up.pdf

[5] Gutiérrez-Redomero E, Sánchez-Andrés A, Rivaldería N, Alonso-Rodríguez C, Dipierri JE, Martín LM. A Comparative Study of Topological and Sex Differences in Fingerprint Ridge Density in Argentinian and Spanish Population Samples. J Forensic Leg Med. 2013 Jul; 20(5):419-29. DOI: 10.1016/J.JFLM.2012.12.002

[6] Kc S, Maharjan N, Adhikari N, Shrestha P. Qualitative Analysis of Primary Fingerprint Pattern in Different Blood Group and Gender in Nepalese. Anat Res Int. 2018 Jan 18; 2018:2848974. DOI: 10.1155/2018/2848974

[7] Krishan K, Kanchan T, Ngangom C. A Study of Sex Differences in Fingerprint Ridge Density in a North Indian Young Adult Population. J Forensic Leg Med. 2013 May; 20(4):217-22. DOI: 10.1016/J.JFLM.2012.09.008

[8] Krishan K, Kanchan T, Sharma A. Sex Determination from Hand and Foot Dimensions in a North Indian Population. J Forensic Sci. 2011 Mar; 56 (2): 453-9. DOI: 10.1111/J.1556-4029.2010.01652.X

[9] Oktem H, Kurkcuoglu A, Pelin IC, Yazici AC, Aktaş G, Altunay F. Sex Differences in Fingerprint Ridge Density in a Turkish Young Adult Population: A Sample of Baskent University. J Forensic Leg Med. 2015 May; 32:34-8. DOI: 10.1016/j.jflm.2015.02.011

[10] Osman Yousra AM, Elnazier OH. Investigation of the Relationship between Fingerprint Pattern , Gender and Blood Group. 2018; 30 (02): 1–7. [Accessed 2022 Jan 21]. Available from: http://www.ijemhs.com/Published%20Paper/Volume%2030/Issue%2002/IJES%2001/IJEMHS_Q2_2018_1_7_Yousra.pdf

[11] Patil V, Ingle DR. An Association between Fingerprint Patterns with Blood Group and Lifestyle Based Diseases: A Review. Artif Intell Rev. 2020 Aug 18; 1-37. DOI: 10.1007/s10462-020-09891-w

[12] Manikandan S, Devishamani L, Vijayakumar S, Palanisamy GS, Ponnusamy P, Lalpettai Jayakar SL. Dermatoglyphics and Their Relationship With Blood Group: An Exploration. J Pharm Bioallied Sci. 2019 May; 11(Suppl 2):S285-S288. DOI: 10.4103/jpbs.jpbs_13_19