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Original Investigation

Evaluation of Blood Group in Co-relation with the Dermatoglyphics Patterns among Medical Students: A Cross-Sectional Study

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ABSTRACT

INTRODUCTION: Dermatoglyphics is the scientific study of naturally occurring epidermal ridges and their configuration on the digits, palms, and soles apart from flexion crease and secondary folds. Fingerprint scans are now-a-days used in the biometric systems, validating electronic registration, cashless transactions, library access and forensic purposes. The aim of this study was to investigate the correlation between dermatoglyphics patterns and blood groups. **MATERIALS AND METHODS:** This is a cross-sectional study designed to study the dermatoglyphics pattern in correlation with blood group among 200 medical students from November 2022 to April 2023. Data analysis was done using SPSS version 16 and Chi-Square test was used. **RESULTS:** The major type of blood group among the participants was blood group O (38.5%) followed by blood group B (37%), blood group A (17.5%) and blood group AB (7%). Rh positive was the dominant Rh factor (95.5%) while Rh negative was 4.5% only. The general distribution of dermatoglyphics pattern showed that the dominant pattern of finger print was loop type (52%) in both the genders, followed by whorls pattern (36.5%) and arch pattern (11.5%). Based on Chi- Square test it was observed that the dominant type of finger print was whorls type in blood group O and B while, arch type of finger print was common in blood group B. **CONCLUSIONS:** Finger prints of each individual is unique. Hence, it can be effectively used for corroborative identification of an individual in mass disasters as well as in other forensic and anatomical applications.

Keywords: ABO blood group, Anatomy, dermatoglyphics pattern, gender, forensic identity

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INTRODUCTION

Dermatoglyphics, also called as Dactylography or fingerprint is derived from the Greek term "Derma = Skin, Glyphe = Carve." Dermatoglyphics is the scientific study of naturally occurring epidermal ridges and their configuration on the digits, palms, and soles apart from flexion crease and secondary folds. Anatomist Harold Cummins in 1926 was first to coin this term and he found that the design of ridges on the sole and foot is gritty by heredity and accidental or environmental influence in their intrauterine life [1]. Several studies have aimed to explore the correlation and suggested a connection between the distribution of fingerprint patterns and ABO blood groups. Previous studies done by Sisodia et al., reported a correlation between these two identification tools [2]. Dermatoglyphics are developed in the intra-uterine life during the 12th to 16th week [3]. They are of much importance in medico-legal cases for recognition of the suspect, victims, and other person who touches the surface and for the diagnosis of inheritable disease. Fingerprint scans are now-a-days used in the biometric systems, validating electronic registration, cashless transactions, library access and forensic purposes [4]. Previous studies have demonstrated an ethnic variation in the proportion of fingerprint pattern types among various populations and no any gender differences in distribution of fingerprint patterns have been established [5]. A person's ABO blood type was used by lawyers in paternity suits, by police in forensic science, and by anthropologists in the study of different populations [6]. Various diseases usually influence particular blood group like duodenal ulcer in O and gastric ulcer in A

blood group [7]. The aims and objective of the present study was to find the correlation between blood group and dermatoglyphic pattern among medical students.

MATERIALS AND METHODS

Study design and setting

A cross-sectional study was conducted from November 2022 to April 2023 at Nobel Medical College Teaching Hospital, Biratnagar, Nepal.

Participants, sample size and sampling technique:

A total of 200 medical students with equal gender wise distribution between the ages of 17-22 years studying at Nobel Medical College Teaching Hospital, Biratnagar, Nepal were selected for this study. Randomised sampling techniques was used to select the participants who were apparently healthy medical students and knew their blood group. Students with finger or hand deformities and unknown blood groups were excluded from the study.

Data collection procedure and study variables:

A proforma was used to record the name, age, sex, blood group, ethnic origin and fingerprints of right and left hands. Then each subjects was asked to wash their hands and dry them with the help of a towel. After that, they were asked to press right and left hand fingertips separately in the stamp pad. Prints were taken on a white A4-size paper. Finally, fingerprint patterns (loops, whorls and arches) were observed with the help of a magnifying lens, and blood group data of each student was collected. The materials used for this study were Faber-Castell blue color INK pad, A4-size white paper, cardboard, gauze pads, magnifying lens, pencil, and pen.

Analysis of Fingerprints was done based on the, Henry's system of classification of finger prints as: Arch pattern (plain, radial, ulnar and tented), loop pattern (radial and ulnar), whorl pattern (plain, central pocket, double loop and accidental).

Statistical analysis and data management:

Data was entered into MS Excel and raw data were cleaned. The cleaned data was entered into SPSS version 16 to generate descriptive statistics. Data were expressed as numbers and percentages, and analyzed by $\chi 2$. Level of significance was set as p value < 0.05. Chi-square test revealed that the relation between blood group and fingerprint.

Ethical consideration:

Ethical approval was obtained prior to conducting the study from the Institutional Review Committee of Nobel Medical College, Biratnagar, (Ref. No.628/2022). An informed consent was obtained from the subjects after providing them the brief information about the study regarding its advantages and disadvantages.

RESULTS

In the present study, the total number of participants were 200 out of which 53.5% were male and 46.5% were female. The dominant type of blood group among the participants was blood group O (38.5%) followed by blood group B (37%), blood group A (17.5%) and blood group AB (7%). Rh positive was the dominant Rh factor (95.5%) and Rh negative was 4.5% only. Considering the ABO blood group, the prevalence of individual blood group in male was in the following order: A+ve (19.6%), A-ve (1.8), B+ve (34%), B-ve (0%), AB+ve (3.7%), AB-ve (1.8%), O+ve (38.3%) and O-ve (0%). In the same way the prevalence of blood group in female was: A+ve (12.9%), A-ve (0%), B+ve (34%), B-ve (5.3%), AB+ve (8.6%), AB-ve (0%), O+ve (38.7%) and O-ve (0%).

Both males and females had higher percentage of O+ve blood group followed by B+ve. There was no individual with O-ve and B-ve blood group among the males and there were also no individual with blood group O-ve, AB –ve and A-ve among the female subjects. Rh +ve was the dominant blood group among both the sexes. There was no statistically significant correlation between the Rhesus factor and gender (p >0.05) as shown in table 1.

The general distribution of dermatoglyphics pattern showed that the dominant pattern of finger print was the loop type (52%) in both the gender followed by the whorl (36.5%) pattern and arch pattern (11.5%). Males showed higher percentage of whorl type pattern compared to the females as shown in the table 2. There was no statistically significant association between gender and dermatoglyphics pattern, p= 0.254

Table 1 | Distribution of students with regard to gender and ABO blood grouping

Stream	MALES (N=107)								FEMALES (N=93)							
	A+	A-	B+	B-	AB+	AB-	O+	O-	A+	A-	B+	B-	AB+	AB-	O+	O-
MBBS and BDS	21	02	37	00	04	02	41	00	12	00	32	05	08	00	36	00
%	19.6	1.8	34	00	3.7	1.8	38.3	00	12.9	00	34	5.3	8.6	00	38.7	00

Table 2 | Distribution of dermatoglyphics pattern and blood group of studied subjects

Dermatoglyphics patterns	Gender		Total (%)
	Male	Female	
Arch	06 (5.6%)	17 (18.27%)	23 (11.5%)
Loop	58 (54.2%)	46 (49.46%)	104(52.0%)
Whorls	43 (40.18%)	30 (32.25%)	73(36.5%)
Total	107 (53.5%)	93 (46.5%)	200 (100%)
Chi-Square test =7.99; p-value = 0.254			
Significance at 5% = not significant			

Table 4 | Distribution of dermatoglyphics pattern within Rhesus blood group

Dermatoglyphics pattern	Blood group (%)		Total (%)
	Rh +ve	Rh –ve	
Arch	35	02	37
Loop	88	06	94
Whorls	68	04	72
Total	191 (95.5%)	09 (4.5%)	200
Chi-Square test = 1.024; p-value = 0.98			
Significance at 5% = Not significant			

(p>0.005). As seen in table 3, there was significant association between blood group and dermatoglyphics pattern among both the genders.

Based on Chi- Square test, it was observed that the dominant type of finger print was whorls type in the blood groups O and B, the arch type of finger print was common in blood group B. Blood group AB showed the least arch type of finger prints. In Rhesus blood group the most common finger print was loop type, followed by the whorls and Arch type as shown in table 4. The various patterns of dermatoglyphics i.e. the arch type, loop type and whorl type taken from the subjects are shown in the images. Double whorl pattern was mainly encountered among the individuals of blood group B+ve.

Table 3 | Distribution of dermatoglyphics pattern with respect to ABO blood group

Dermatoglyphics pattern	ABO Blood Group				Total	
	A	B	AB	O	N	%
Arch	05	10	02	08	25	12.5%
Loop	22	21	06	25	74	37.0%
Whorls	08	43	06	44	101	50.5%
Total	35	74	14	77	200	------
Frequency of blood group	17.5%	37.0%	7.0%	38.5%		
Chi-Square test =15.75*; p-value = 0.004						
Significance at 5% = highly significant at 5%level.						

IMAGES: Showing different Dermatoglyphics pattern.

DISCUSSION

In the present study, it was found that both the males and females had higher frequency of loop type of dermatoglyphics followed by whorl type and the arched type of fingerprint, which is in accordance with the studies done by Patil et al. on 170 subjects in Navi Mumbai and R. Pratik et al. where they found that the prevalent finger print type was loop followed by the arch pattern [9]. The present study also shown that there was no association (p>0.005) between the dermatoglyphics pattern and gender which is similar to the study done by Denis E.O. et al. in 2013 [10].

The distribution of the fingerprint pattern in different ABO blood groups [A, B, AB and O] and in Rhesus blood groups revealed that loop pattern had the highest percentage, followed by whorls and the arches. It means that irrespective of the blood group, loop was the commonest fingerprint pattern followed by whorl and arch. Similar, findings were observed by previous researchers [11]. The distribution of fingerprint patterns in individuals with the ABO-Rhesus blood groups was the same for A +ve, B +ve, B -ve, AB +ve, O +ve and O-ve, wherein loop was the commonest followed by whorls and the least was arches. These findings agree more or less with Bharadwaja et al. [12]. However, they observed that in A -ve individual's whorls was the commonest and in O -ve individuals loop was the commonest. AB -ve individuals had equal percentage of each fingerprint pattern [13]. In the present study it was also observed that, arch type of finger print was common in AB -ve subjects which was least in number compared to other respondents. In a similar, study conducted by Eboh et al., the general distribution of fingerprint patterns between Rh-positive and Rh-negative subjects was the same, in which loop was the highest and arch was the lowest. However, they found the association between primary patterns and Rhesus blood groups to be significant (p= 0.013) which is in accordance with our study [14].

Despite advances in detection technology and the science of biometrics, current literature suggests that fingerprints remain one of the most popular methods of identification and will continue to do so in the coming years. In the realm of forensic medicine, a strong correlation between fingerprint patterns and blood types is crucial for precise identification and for focusing the search in cases where there is insufficient information [15]. Knowing such an association will undoubtedly extend the use of biometric technology, which can be useful for both medical and personal identity needs giving advancements in fingerprint sensing. Additionally, such information may be useful for predicting many illnesses including cancers [16].

CONCLUSIONS

Finger prints of each individual is unique. Results of the present study reported the baseline data of fingerprint pattern among the subjects. The loop fingerprint pattern was the most common pattern. There is a significant association between fingerprint patterns and blood groups. Furthermore, because obtaining fingerprints and examining the dactylography pattern is cost-effective, time-consuming, and non-invasive, more studies with large sample sizes should be undertaken to improve the reliability of the dactylographic pattern-sex-blood-group connection.

ADDITIONAL INFORMATION AND DECLARATIONS

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Data Availability: Data will be available upon request to corresponding authors after valid reason.

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