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Evaluating the Palmar Fingerprint Pattern in ABO Blood Group System of Female Nursing Students

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Abstract: Dermatoglyphic analysis is one of the most authentic biometric technologies that provides authorized certification of identification. The present prospective study involves 114 female nursing students on an attempt to find out a correlation between the fingerprint pattern and ABO blood group system. It is a double-blind study wherein attentive supervision were done while examining the blood groups and collecting the fingerprints. The results unveil the fact that all the patterns are distinctive. The count of samples is far more in blood group 'A', 'B' and 'O' as and when compared to that of 'AB'. Based on the prevalence of palmar sequences, loops are found to be the most common pattern, followed by whorls and arches. A further in-depth study suggests that the incidence of loops was more in the thumb, middle and little finger whereas whorls are prevalent in the index finger of A, B, and O blood group of both the hands. Definitely, a close association is found between the palmar patterns and individual digits of the left and right hand with the blood groups.

Keywords: Dermatoglyphics, Fingerprint, Patten, Arches, Loops, Whorls, Blood group.

INTRODUCTION

Identity is an assemblage of distinguishable attributes and recognizable unique characteristics of an individual. There are diverse methods of identifying an individual – fingerprints of the palms and soles, the pattern of lip print and type of handwriting are some of the various approaches to name a few [1].

Dermatoglyphics is one such fascinating coinage of word that has been termed in the year 1926 by Cummins. It primarily indicates the typical distinct arrangement of dermal ridges on the palms, digits, and soles of an individual. As the pattern of print is persistent and individualistic, it has emerged to be one of the most authentic sources of identification and can be extensively used in forensic laboratories and criminological cases [2].

A fingerprint is a set of minute ridges and valley patterns on a baby's developing finger that results from small-scale friction. There is, in fact, no resemblance between the prints of two hands or even between the markings of identical twins [3]. The dermatoglyphic patterns that have been studied earlier have shown that these skin markings are constant in genetic and metabolism-related disorders.

The ridge is such a sequence that is completely dependent on the outermost layer of the epidermis and on the dermal papillae. The peculiar patterns of ridges are discriminated and modified in their absolute forms during the 3rd and 4th month of fetal life on the volar aspect of palm [4].

The fingerprint pattern in human individuals is primarily classified into Arches, Loops, and Whorls. It is one of the most uncomplicated, useful, quick and sorted methods of classification that have gained high popularity over the past few decades [4-6]. As less as five percent of the overall human population have an arches-like pattern, wherein the ridges simply run from one end to the other without any distinct pattern and in the absence of interspace. On the other hand, loops have interspaces that are preoccupied with ridges that curve and bend upon. Loops are the most common pattern (60-70%) that can be identified in any given palmar fingerprint pattern. About 30-35% of the pattern constitutes of the whorls wherein the ridges make complete circles thereby imparting whorl-like appearance [5, 6].

In 1907, Karl Landsteiner successfully discovered the ABO blood group system. This was followed by the discovery of the Rh blood group system

in the year 1937 by Landsteiner and Weiner. According to the International Society of Blood Transfusion, there are about thirty human blood group systems that have been unfolded over the years, still 'ABO' and 'Rh' system holds high levels of significance especially in scientific and clinical aspects. These two blood group systems are classified as mentioned herewith:

- "ABO" system = "A", "B", "AB" and "O" blood groups, based on the presence or absence of agglutinogen on the surface of red blood cells.
- "Rh" system = "Rh +ve" and "Rh -ve", based on the presence or absence of agglutinogen "D" [7].

Subsequent haematological studies presented that the ABO blood group system is inherited in nature. Much available literature displays an explicit correlation between the dermatoglyphic pattern and the ABO blood group system [7]. The present study is therefore carried out with the aim to find a significant correlation between the epidermal ridge patterns on fingertips with the ABO blood group system. This kind of prospective study has the potential to upgrade the authenticity of palmar fingerprints especially in detecting crime scenes and criminal cases [8, 9].

MATERIALS AND METHODS

This prospective study was carried out on 114 healthy female individuals over a period of 3 months after obtaining the clearance from the ethical committee. The subjects taken were 1st year nursing students from 2017 batch of Yenepoya Medical College in Mangalore. Written informed consent was taken from every single study subjects after clearly mentioning the procedure involved in detail.

- Inclusion criteria = Students who were aware of their blood group and whose age ranges between 17-20 years.
- Exclusion criteria = Individuals with any deformity in their hand or fingers and/or is suffering from any chronic disease. Individuals with polydactyly are also excluded from this study.

The students were randomly selected and were asked to wash and dry both their hands. This was followed by taking their finger-tip prints using the ink method. Careful monitoring was done to prevent any smudging of the impression that was taken. The prints obtained were then studied using a hand lens and a needle. It was a double-blind study wherein the following parameters were primarily studied – Arches, Loops (Ulnar and Radial) and Whorls. The blood group of every student was then verified by the conventional procedure.

RESULTS AND DISCUSSION

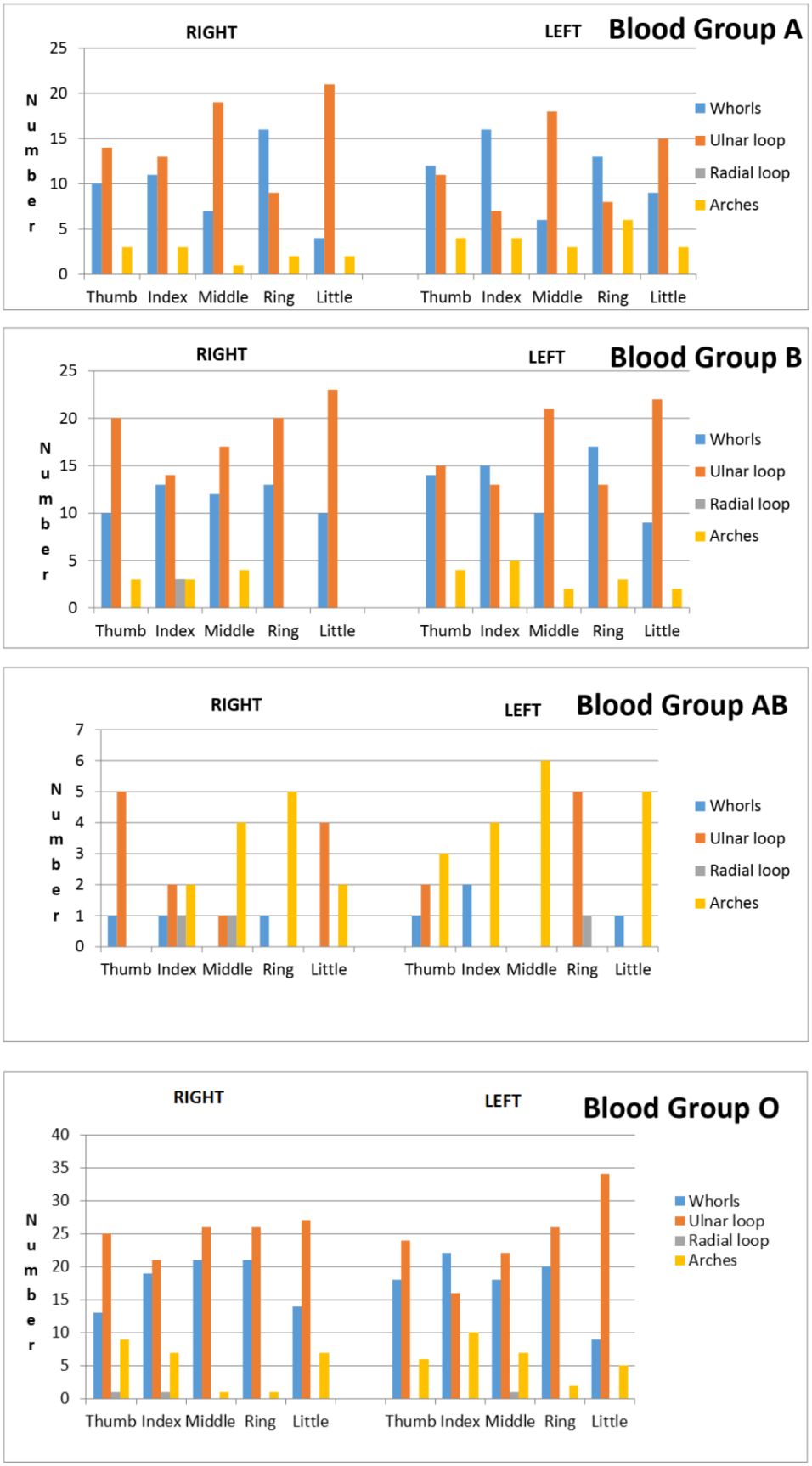
Table-1: General distribution of fingerprint pattern in ABO blood group

Blood Group	Number of Samples	Fingerprint Pattern			
			Loops		
		Whorls	Ulnar	Radial	Arches
A	27	98 36.29%	136 50.37%	0 0%	28 10.3%
B	33	123 38.4%	166 51.87%	3 0.9%	28 8.7%
AB	6	7 11.66%	20 33.33%	3 5%	30 50%
O	48	168 35%	261 54.37%	3 0.625%	54 11.2%
Total	114	396 35.04%	583 51.59%	9 0.79%	140 12.38%
p>0.001 chi-square value =103.829					

A total number of 114 female nursing students of Yenepoya Medical College actively participated in this prospective study. Among them, most of the students belonged to 'O' blood group whereas the least number of students were allied to 'AB' blood group [8]. Based on the number of incidences in each group, the accurate representation in descending order is as follows: O>B>A>AB [9].

Table-1 reveals the incidences of loops are most common, followed by whorls and arches. Similar results were previously reported by other authors pertaining to different geographical locations [9, 10]. The frequency of ulnar loops is comparatively the highest while that of the arches are the lowest.

The above-mentioned chi-square value discloses the relation between the pattern of palmer fingerprint and different blood group types which proves to be statistically significant, as $p<0.001$. Herein, the null hypothesis is rejected and thus it concludes that the distribution of the primary sequence of a fingerprint is closely related to blood grouping.



Graph-1: Distribution of primary pattern of fingerprint in all the digits of both the hands according to the blood group

The main objective of this study is to correlate loops (both radial and ulnar), whorls and arches with the ABO blood group system. At the end of the study, certain important interpretations that can be drawn are mentioned herewith:

- The frequency of ulnar loops is highest in the thumb, middle finger and little finger of the hands of A, B, and O blood group.
- The incidences of whorls range from moderate to high among the A, B, and O blood group.
- In most of the individuals, it has been seen that the prevalence of arches was very less in both right and left hands.
- As very fewer students belonged to the AB blood group, it has been difficult to find any correlation with the detailed analysis of fingerprint pattern.

CONCLUSION

Among all the naturally occurring palmar ridges, ulnar loops stand out to be the most common sequence whereas arches are not only the simplest but also the rarest of the pattern found in the digits. The prevalence of ulnar loops is especially observed in the thumb, middle finger and little finger of A, B, and O blood group. This is followed by the moderate incidence of whorls on the index finger and ring finger of the mentioned blood groups.

It can be concluded that the distribution of dermatoglyphic pattern is related to ABO blood grouping as well as the individual digits of both the hands. In future, similar kind of studies must be conducted on a large scale so as to enhance the precision of the findings.

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