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Fingerprints & Blood Group Distribution In Identification Process At Tertiary Care Hospital: A Cross Sectional Study

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Abstract: *Identification or identity helps us to determine the individuality of person, living or dead. Establishing the identity is of immense importance in forensic medicine. The spectrum of identity covers various aspects like physical, social, psychological, personal, sexual etc. In day to day life it is very simple to identify the person. But when it comes to court of law the complexity of the identification process increases. Most important use of fingerprints is in crime scene. To ascertain criminal liability, identification of victim, witness or suspect needs the help of fingerprint analysis. The relativity is an important drawback of this technique as it needs some reference to compare with. It has a unique characteristic, mark or pattern that can be used to identify somebody or something. Literature has reports published on association of fingerprints with blood group, gender, sex. Therefore through this study we are trying to find out is there any correlation exist between blood group, gender and sex with finger print patterns. Our study reiterates that if fingerprint patterns and blood groups are studied properly further deep it may help in prediction of blood groups based on fingerprint pattern available.*

Keywords: *Blood Group, Fingerprints, Forensic, Identity.*

I. Introduction

Identification or identity helps us to determine the individuality of person, living or dead.[1] Establishing the identity is of immense importance in forensic medicine. The spectrum of identity covers various aspects like physical, social, psychological, personal, sexual etc. In day to day life it is very simple to identify the person. But when it comes to court of law the complexity of the identification process increases.[2] Here comes the role of forensic experts along with identification procedures. Essentially these procedures should be simple, possibly flawless and applicable to population.[3] For newborns procedures are more demanding in terms of accuracy and precision.

There are different ways to establish identity in court of law but undoubtedly the use of finger print is most acceptable and widely used one.[4] Fingers have specific patterns of ridges and furrows over them which are determined genetically. These patterns are formed in embryonic stage and remain unchanged till death. Statistical probability of two individuals having same pattern is almost nil.Nature offers the ridges to human for the purpose of grip. They also serve the excretory purpose. They contain sweat pores from which are excreted perspiration, salts and oils. The oils that are left on a surface are known as fingerprints.[4] Most important use of fingerprints is in crime scene. To ascertain criminal liability, identification of victim, witness or suspect needs the help of fingerprint analysis.

The relativity is an important drawback of this technique as it needs some reference to compare with. It has a unique characteristic, mark or pattern that can be used to identify somebody or something.Literature has reports published on association of fingerprints with blood group, gender, sex. Therefore through this study we are trying to find out is there any correlation exist between blood group, gender and sex with finger print patterns.

II. Materials And Method

This is cross sectional observational study in a tertiary care referral hospital and government medical college in Mumbai. Study was conducted after approval from Institutional ethical committee of the institute. As per Helsinki declaration written informed consent has been obtained from every participant prior to study. Subjects of the study are medical students, doctors from institute, patients in OPD, relatives of patients visiting OPD aged 18-50 years, irrespective of gender.

They were recruited only after obtaining written informed consent. Subjects were recruited randomly to avoid selection bias. Subjects with permanent scars on their fingers or thumbs; any hand deformities due to injury, birth defects or disease; those having worn fingerprints, extra, webbed or bandaged fingers were excluded from the study.Sample size was calculated using data from pilot study conducted. Anticipated

frequency was taken as 50%. Confidence interval was taken as ± 5%. As sampling was through random selection, design effect is taken as 1. Taking into consideration all the statistical parameters, sample size comes out to be 163. Therefore we have recruited 200 subjects in our study.

Each subject was instructed to wash the hands thoroughly with soap and water and dry them using a towel. They were then instructed to press the fingertip on the stamp pad provided and then to the paper to transfer the fingerprint impression. Starting with right hand thumb, the same method was repeated for all the fingers of both hands. In this way, the plain fingerprints of all the ten digits were taken separately on the respective blocks on the same sheet of paper. The fingerprint patterns were then studied, with the help of a magnifying lens and were classified as, Loops, Whorls, Arches and Composites based on the appearance of ridgelines.

The distribution of fingertip patterns in both hands of individuals was presented in percentages. The association of fingerprint pattern with gender, different ABO and Rh blood groups and handedness was evaluated statistically by using chi-square test with Yates correction where necessary, and bonferroni's correction was used for pairwise comparisons.

III. Observations & Results

The study comprised of 200 subjects of which 120 are female and 80 male. Results showed that blood groups are in the order B+ () > A+ () > O+ () > AB+ () >. Results also showed that Rh+ was the dominant Rhesus factor (97.8%). The general distribution of primary finger ridge patterns showed that the dominant finger ridge pattern was loop (54.4%), followed by whorl (27.6%), arch (14.7%) and then compositae (3.3%). It is shown in fig. 1. Gender wise distribution is shown in fig.2. It shows almost equal distribution of all the patterns in males and females except arches which are slightly more common in males than in females.Fig.

3 shows distribution of the Rh factor according to types of finger print patterns. According to this loops and whorls have more Rh +ve while that in arches and compositae have more Rh –ve.In fig. 4 distribution of blood groups along with Rh factor in context with gender is shown. A -ve was found to be absent in females while AB –ve was found to be absent in males. Figure 5A and 5B show fingerprint distribution according to the blood groups as Rh +ve and Rh –ve.

IV. Discussion

The study reiterates the fact that loops are most common pattern of fingerprints in population. It is followed by whorls, arches and compositae respectively. All fingerprint patterns found to be commoner in males than in females in the order arches > compositae > whorls > loops. Rh factor has almost equal distribution in terms of Rh +ve and -ve in loops. In whorls Rh +ve are more common while in arches and compositae the Rh –ve are more common in the population. Blood group A –ve solely found in the males while AB –ve was found only in females. In Rh +ve groups, loops are found in majority in B +ve. It is followed by O +ve, A +ve and at last AB +ve. Similar pattern is found in Rh –ve groups. B –ve > O –ve > A –ve > AB –ve For whorls, it also has similar pattern as loops in Rh +ve groups while in Rh –ve groups it varies as O –ve > B –ve > A –ve > AB –ve Arches in Rh +ve has O +ve > A +ve > B +ve > AB +ve. Arches found to be absent in O –ve blood groups. It has AB –ve > A –ve > B –ve.

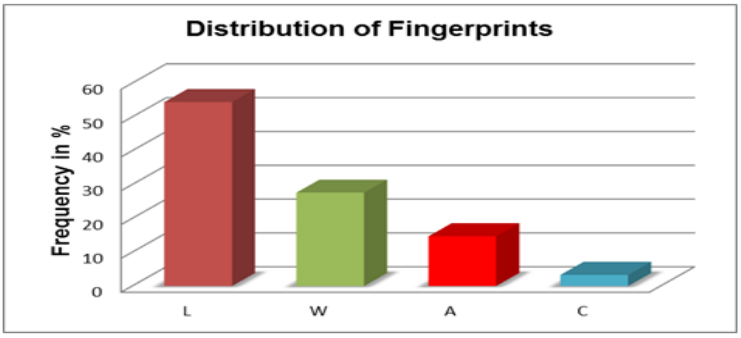
Compositae pattern is absent in AB blood group while in others it is present in very negligible numbers. Knowledge of such distribution is helpful as it may help in prediction of blood group in the individuals with particular distribution of fingerprint patterns. Similar findings were also suggested in literature by some authors. [4,6-8] at the crime scene, it will become somewhat easier to predict the fingerprint pattern based on blood group or vice versa.

V. Conclusion

We want to conclude the study with suggestion that if fingerprint patterns and blood groups are studied properly further deep it may help in prediction of blood groups based on fingerprint pattern available. With some confidence, the forensic expert could be able to speak about blood group at the crime scene.

Figures

Figure 1: Distribution of fingerprints



L: Loops; W: Whorls; A: Arches; C: Compositae

Figure 2: Gender wise Distribution of fingerprints

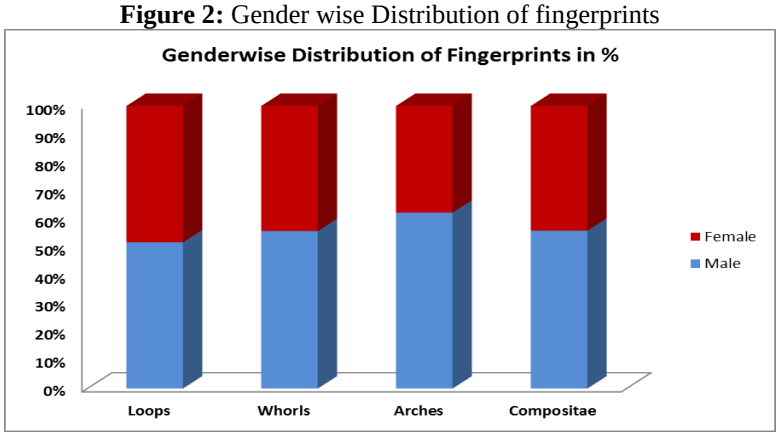


Figure 3: Distribution of Rh factor

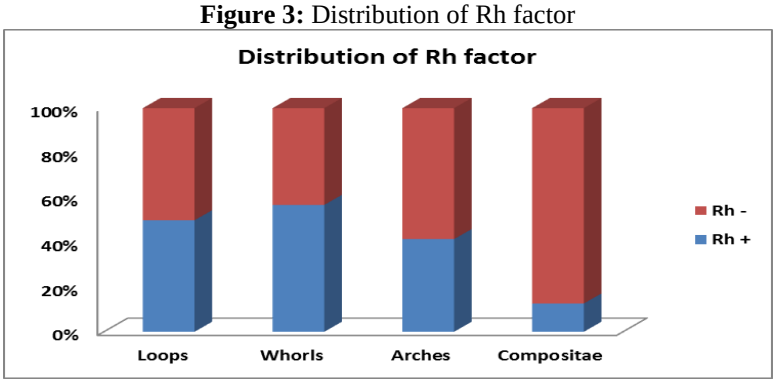


Figure 4: Gender wise distribution of blood groups (with Rh factor)

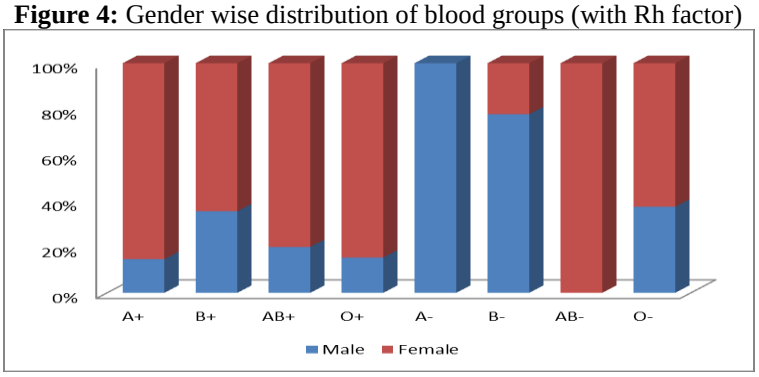


Figure 5A: Fingerprint pattern in Rh +ve blood groups

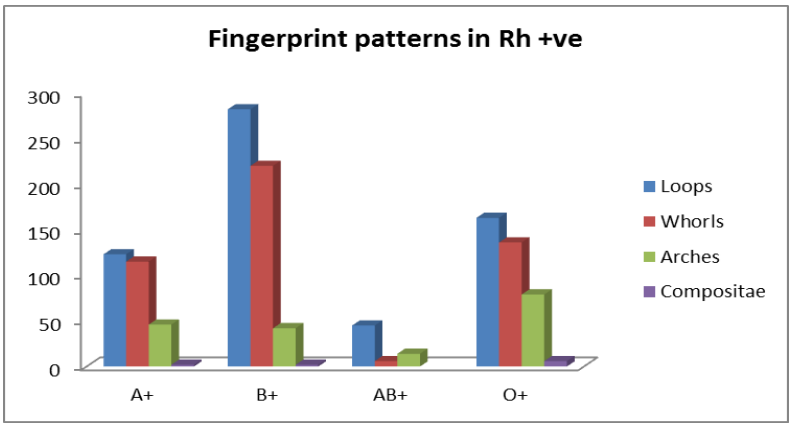
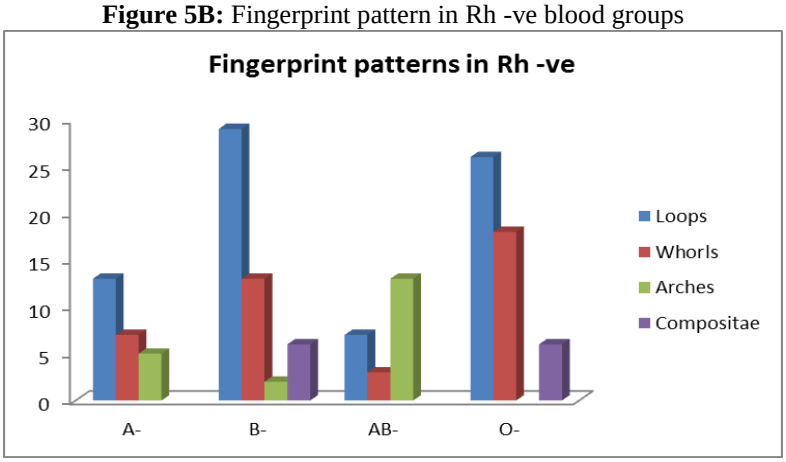


Figure 5B: Fingerprint pattern in Rh -ve blood groups



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