Pattern of Finger Prints in Raichur District Population A Prospective Studiy Conducted at Raichur Institute of Medical Sciences, Raichur

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Abstract

The present study was a prospective study conducted in LVD College, Raichur, Karnataka, and study period was December 2013 to November 2014 (One year). During study period, total of 210 subjects (40 male and 170 female) of Raichur origin were randomly selected and included in the study. The students were in the age group between 18 to 28 years. The purpose of the study was to find out the pattern of finger print patterns in Raichur district region.

Key Words: *Finger prints, Pattern, Region*

Introduction

The use of prints as a mean of personal identification is one of the common methods in forensic anthropology and the most popular prints are fingerprints. Even the fingerprints of twins are not similar[1]. Fingerprints of an individual are unique and remain unchanged from womb to tomb[2]. Dactylography also known as finger prints has been successful in field of Forensic science to identify individuals for both civil and criminal purposes. Theory of uniqueness is the scientific principle behind finger print analysis to convince the court of law.

Dactylography or the fingerprint system is based on the study of epidermal ridges and their configurations [Dermatoglyphics (derma = skin + glyphs=curves)] in the fingers, palms and soles.[3] The term dermatoglyphics was coined by Cummins.[4]

The analysis of finger prints for matching purpose generally requires the comparison of several features of the print pattern. These include patterns, which are aggregate characteristics of ridges and minutiae points which are unique features found within the patterns[6]. Galton classified the types of finger prints depending upon their primary pattern as loops, whorl, arches and composite.[5] An arch (plain and tented) is a pattern where the ridges enter from one side of the finger, rise in the centre forming an arc, and then exit the side of the finger and the loop (radial and ulna) is a pattern where the ridge enters from one side of a finger, form a curve and tend to exit from the same side they entered from. Whereas, in the whorl pattern ridges form circularly around a central point on the finger.[6] The term composite is used for combination of patterns that does not fit into any of the above classification.

Classification of Fingerprints

The most popular classification systems include the Roscher system, the Vucetich system, and the Henry

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Classification System. Of these systems, the Roscher system was developed in Germany and implemented in both Germany and Japan, the Vucetich was developed in Argentina and implemented throughout South America, and the Henry system was developed in India and implemented in most English-speaking countries.[7]

In the Henry system of classification, there are three basic fingerprint patterns: Loop, Whorl and Arch, which constitute 60–65%, 30–35% and 5% of all fingerprints respectively. There are also more complex classification systems that break down patterns even further, into plain arches or tented arches, and into loops that may be radial or ulnar, depending on the side of the hand toward which the tail points. Whorls may also have sub-group classifications including plain, accidental, double loop, peacock's eye, composites and central pocket loop.[8]

Based on the enhancing source of impression, fingerprints could be classified into various types such as Exemplar prints or known prints, which the name is given to fingerprints deliberately collected from a subject. Latent prints mean any chance or accidental impression left by friction ridge skin on a surface, regardless of whether it is visible or invisible at the time of deposition. Patent prints are chance friction ridge impressions which are obvious to the human eye and which have been caused by the transfer of foreign material from a finger onto a surface. Plastic prints are frictions ridge impression left in a material that retains the shape of the ridge detail.[9]

Prediction Potentials and Uses of Fingerprints

Sex Prediction: Females have more arches and ridges per cm^2, and males have more whorls. Men's prints tending to have higher levels of urea than women's.[10]

Diet and Life Style Prediction: Gelatin based tape and high-tech chemical analysis under spectroscopic microscope reveals the chemical and metabolic make-up found on a fingerprint. The study revealed that specific amino acids indicated whether the "suspect" was a vegetarian or meat-eater. Spectroscopic microscope method based on the study of chemicals and metabolic featured with a fingerprint can also reveal the use of substances, including: cigarettes, drugs, grooming products etc. [10]

Disease Risk Prediction: Patients with Alzheimer disease showed a significantly increased frequency of ulnar loops on their fingertips and a decreased frequency of whorls and arches. The positive predictive value of 6 or more digital whorls is an indicator of breast cancer.[11] It was reported dermatoglyphic correlated with diabetic's mellitus.[12] The dermatoglyphic patterns of obese patients are dependent on such inherited or genetic tendencies towards obesity.[13] Several studies have explored the relationship of dermatoglyphics alopecia[14], mental retardation, congenital heart defects and diabetes mellitus.[26] Some scientists believe that fingerprints improve grip, but others believe that it actually reduces friction between the skin and the surface of objects. One other idea is that fingerprints increase the sensitivity of touch.

Materials and Methods

The Source of data was students of L.V.D College, Raichur. The subjects were 210 persons (40 male and 170 female) of Raichur origin with known blood group and study period was one year i.e December 2013 to November 2014.

Recording of fingerprints: A self-inked pad was placed on a wooden table. The palmar aspects of the distal phalanges of a person's right hand were inked by applying firm pressure on the ink pad starting from the little finger. The unglazed white bond paper was applied firmly over a wooden pad. Then the bond paper which was divided into two (right and left), and each further into five columns marked as thumb, index, middle, ring and little. The finger prints were taken in the respective columns on the bond paper. The same procedure was done for recording the finger prints of left hand. Thus, finger prints of both hands will be obtained and recorded and classified as per Henry classification of the various finger patterns into four main types: Loops, Whorls, Arches and Composite.

Cases where there was any evidence of Permanent scar on any of the fingers, Hand deformity due to injury, Birth defect or disease of the hands, Students who were not from Raichur and Students who were below the age of 18 years or above the age of 28 years are excluded from study group. Descriptive statistical analysis comprising percentage is used to describe data and Chi-square of proportion shall be used to compare the

statistical significance of difference wherever required.

Results

During the present study a total of 210 students were included in the study group. Of which 170 (81%) were female and 40 (19%) were males. Male: Female = 1: 4.25

Table 1 shows the percentage distribution of the pattern of fingerprints on the 10 different digits on both hands the most common fingerprints pattern were loops (71.23%), followed by whorls (24.14%), arches (4.57%) and composite (0.04%).

Table 1: Fingerprint patterns in all the fingers

FP Type	Total	%
Loop	1496	71.23%
Whorl	507	24.14%
Arch	96	4.57%
Composite	1	0.04%

Table 2 shows the percentage distribution of the pattern of fingerprints on the 10 different digits on both hands, the most common fingerprints pattern were, maximum loops were seen in Little finger (16.42%), maximum whorls were seen in Ring finger(8.28%), arches were seen maximum in Index finger(2.04%) and composite was seen in Thumb(0.04%).

Table 2: Distribution of fingerprint patterns digit wise

	T	%	In	%	M	%	Ri	%	Li	%
L	314	14.95	270	12.85	328	15.61	239	11.38	345	16.42
W	88	4.19	107	5.09	70	3.33	174	8.28	68	3.23
A	17	0.81	43	2.04	22	1.04	7	0.33	7	0.33
C	1	0.04	0	0	0	0	0	0	0	0

Note: L-loops, W-whorls, A-arches and C-Composite

T-thumb, In-index finger M-middle finger, Ri-ring finger, Li-little finger

Table 3 shows the percentage distribution of the pattern of fingerprints on the 10 different digits on both hands, most loops pattern were seen in LL finger (177), maximum whorls were seen in RR (94), arches were seen maximum in LI (23) and composite was seen in RT (1).

Table 3: Distribution of fingerprint patterns in the individual fingers

	RT	RI	RM	RR	RL	LT	LI	LM	LR	LL	Total
Loop	157	131	170	112	168	157	139	158	127	**177**	1496
Whorl	43	59	31	**94**	38	45	48	39	80	30	507
Arch	9	20	9	4	4	8	**23**	13	3	3	96
Composite	**1**	0	0	0	0	0	0	0	0	0	1

RT-right thumb, RI-right index, RM-right middle, RR-right ring, RL-right little

LT-left thumb, LI- left index, LM- left middle, LR- left ring, LL- left little

Table 4 shows the percentage distribution of the pattern of fingerprints on the 10 different digits on both hands according to sex. In males (n= 400) the most common fingerprints pattern were loops (60.25%), followed by whorls (31%) and arches (8.75%). Similar patterns were seen in females (n=1700) as Loops (73.82%), Whorls (22.52%), Arches (3.59%) and Composite (0.06%). In both the sexes, loops exhibit high percentage of occurrence while composite was the least.

Table 4: Distribution of fingerprints sex wise

Finger print pattern	Male	%	Female	%	Total	%
Loop	241	60.25%	1255	73.82%	1496	71.23%
Whorl	124	31%	383	22.52%	507	24.14%
Arch	35	8.75%	61	3.59%	96	4.57%
Composite	0	0%	1	0.06%	1	0.04%
Total	400	100%	1700	100%	2100	100%

Discussion

Similar studies were conducted by various authors and their observations were as follows: in Bharadwaja et. al study the loops were the most common pattern, registering 51.87% frequency in the study; followed by whorls (35.83%) and arches (12.30%).[15]

In Bhavana D et. al study, it was observed that finger print patterns of all the fingers in both the hands. Total no of loops found in all the digits were 1178 (58.9%). Similarly numbers of whorls in all the digits of both the hands were 592(29.6%) and numbers of arches were 230(11.5%). This table clearly indicates that Loops were more common pattern followed by whorls and arches.[16] Frequency of Loops were found to be higher in females;

620 (52.63%) and Whorls were found to be higher in males; 338(57.09%). Arches were found more in females; 119(51.73%) compared to males; 111(48.26%). Loops are most commonly found fingerprint patterns and Arches are least common. The only association between gender and finger print patterns in this study is that Loops and Arches were found in higher frequency in Females compared to Males and whorls were found to be high in males compared to females.[16]

In the study conducted by Prateek Rastogi et. al, the fingerprint pattern analyses showed that, loops were the most common pattern in the study 1221(60.95%), followed by whorls 649(32.55%) while arches were present in a smaller percentage (6.5%) of the study group. Frequency of loops was found to be higher in females (52.42%) than in males (47.58%) whereas whorls were more frequent in males (55.78%) as compared to females (44.22%). 44.61% of arches were present in males and 55.38% in females.[17]

A study by Umraniya et. al it was seen that Loops were the most common pattern, registering (51.54%) frequency in the study; followed by whorls (35.79%) and arches (12.67%).[18]

In Deepa Deopa study - A total of 140 first year and second year MBBS students belonging to the age group 18- 25 year of Government Medical College, Haldwani were included in the study. Loops were the most common (58.29%) fingerprint pattern while whorls were moderate (37.00%) and arches were the least common (4.71%). Males had a higher incidence of whorls and females had a higher incidence of loops.[19]

Bharadwaja A, Saraswat PK, Agrawal SK, Banerji P, Bharadwaj S in the study, The general distribution of pattern of finger print showed high frequency (51.87%) of loops whereas whorls were moderate (35.83%) and arches were least (12.30%) in frequency.[15]

Conclusion

Identification is of paramount importance in any medico-legal investigation. Identification means the determination of the individuality of a person.[1] Personal identification is one of the most challenging processes confronted by mankind. In the living, in civil courts, identification is required in cases such as insurance, pension and inheritance claims, marriage, disputed sex and missing persons. In criminal courts, it is required in cases of absconding soldiers and criminals, persons accused of assault, rape, murder, etc., impersonation and interchange of babies in hospitals.[2] In the dead it is needed for: [3] the ethical and humanitarian need to know which individual has died, especially for the information of the surviving relatives.

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Refernces

1. Kannan K, Mathiharan K, Editors. Personal Identity: Modi A Text Book of Medical Jurisprudence and Toxicology. 24th ed. Noida: Lexis Nexis; 2012. 221- 4.
2. Jain LC, Anil J, Salis P. Intelligent Biometric Techniques in Fingerprint and face recognition. Boca Raton, FL: CRC press; 1999.
3. Pillay VV. Identification. Textbook of Forensic Medicine and Toxicology. 17th ed. Hyderabad: Paras Medical Publishers; 2016. 92.
4. Cummins H. Palmar and Plantar Epidermal Ridge Configuration (Dermatoglyphics) in Europeans and Americans. Am. J. Phy. Anthrop 1926; 179: 741-802.
5. Galton F. Textbook of Finger Prints. London: Macmillan and Co; 1892.
6. Langenberg G. Are one‟s fingerprints similar to those of his or her parents in any discernable way? [Internet]. Scientific American. [Cited 2017 Feb 8]. Available from: https://www.scientificamerican.com/article/are-ones-fingerprints-sim/
7. Engert G J. International coroner Identification News. [Internet]. 1964 [Cited 2017 Feb 8]. 11. Available from: www.coursehero.com/file/7156261/Fingerprinting.
8. Henry E R. Classification and uses of fingerprints. London: George Rutledge and Sons Limited; 1900. 54
9. Zabell S. Fingerprint Evidence. Journal of Law and Policy 1982; 6: 343-50
10. Charles Q. C. New Fingerprint Technique Could

Reveal Diet, Sex, Race [Internet]. [Cited 2017 Feb 3]. Available from: http://www.livescience.com/1728-fingerprint-technique-reveal-diet-sexrace.html.

11. D"Adamo A. The Blood Type Diets: The Ability to Predict Disease May be at Your Fingertips [Internet]. [Cited 2017 Jan 8]. Available from: http://www.dadamo.com/txt/index.pl?1041.
12. Oladipo GS, Ogunnowo MB. Dermatoglyphic patterns in diabetes mellitus in south eastern Nigerian population. African Journal of Applied Zoology and Environmental Biology 2004; 6: 6-10.
13. Bray GA, Ryan DH. Clinical evaluation of the overweight patient. Endocrine 2000; 13(2): 167-86.
14. Oladipo GS, Akanigha BE. Dermatoglyphic patterns in androgenetic alopecia in a south eastern Nigerian population. Journal of Experimental and Clinical Anatomy 2005; 2: 44-7.
15. Bharadwaja A, Saraswat PK, Agrawal SK, Banerji P, Bharadwaj S. Pattern of fingerprints in different ABO blood groups. J Forensic Med Toxicology 2004; 21(2): 49–52.
16. Bhavana D, Ruchi J, Prakash T, Kalyan JL. Study of fingerprint patterns in relationship with blood group and gender- a statistical review. Res J Forensic Sci 2013; 1(1): 12–7.
17. Prateek R, Keerthi RP, A study of fingerprints in relation to gender and blood group. J Indian Acad Forensic Med 2010; 32(1): 11- 4.
18. Umraniya YN, Modi HH, Prajapati HK. Study of Correlation of Finger Print Patterns in Different ABO, Rh Blood Groups. International journal of scientific research 2013 September; 2 (9): 337-9.
19. Deepa D, Chandra P, Ishwer T. A Study of Fingerprint in Relation to Gender and Blood Group among Medical Students in Uttarakhand Region. J Indian Acad Forensic Med 2014; 36(1): 23-7.