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A study on the importance of thumb print in human identification

Deka Rup Sekhar[1], Medhi Shobhana[2]

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Abstract

Introduction*: Human identification by the use of finger prints is infallible, because the ridge arrangement on every finger of every human being is unique and does not alter with growth or age. The present study has been conducted with an aim to determine the most common thumb print pattern in both males and females and whether there is any relation between them.* ***Methods****: The study has been conducted in the Department of Anatomy, Gauhati Medical College, Guwahati, amongst a group of 145 1st MBBS students (89 males and 56 females), having different ethnic backgrounds after approval of the Institutional Ethical Committee. Participants were briefed about the purpose of the study and written informed consent was also taken from them. The thumb print of the dominant hand was taken using printer's blue ink and was transferred on to a white bond A4 paper. The prints thus recorded were studied with a magnifying lens and were classified on the basis of Michael Kucken's classification system as Loop, Arch, Whorl and Composite pattern.* ***Results****: The present study revealed that there is no significant difference between male and female as far as the distribution of the different types of thumb print is concerned. Also, it is seen that the 'loop' and 'whorl' variety is much higher than the 'arch' and 'composite' variety of print which is more evident in case of males.* ***Discussion****: The finding of our study has the similarity with the observations made by other researchers in this field.* ***Conclusion****: Such a study may be useful in establishing a database which may be useful in various medicolegal cases to identify an individual.*

Keywords*:* Fingerprints, Thumb-prints, Identification, Dermatoglyphics

Introduction

Fingerprints are considered to be the most reliable criteria for personal identification.[1] These are the reproductions of the patterns formed by the papillary ridges present on the palmar aspects of the thumbs and fingers. They afford an infallible means of personal identification, because the ridge arrangement on every finger of every human being is unique and does not alter with growth or age.[2, 3] The fingerprint patterns become fixed when a person is about 14 years or older.[4] No two fingers are found to have identical prints even in identical twins, who share the same DNA profile.[5] The use of fingerprint recognition has expanded to personal authentication and government-to-citizen applications as well.[6] The study of finger prints is also known as Dermatoglyphics.[7, 8, 9] In the present study we have aimed at determining the most common finger print pattern in both sexes.

Materials & Methods

Materials: Printer's blue ink, White bond paper (Royal Executive Bond, Premium White A 4 sheets), Magnifying glass (10X), Pen for labelling individual details.

Method: The study was conducted in the Department of Anatomy, Gauhati Medical College, Guwahati, amongst a group of 145 1st MBBS students (89 males and 56 females), having different ethnic backgrounds. Necessary approval was taken from the Institutional Ethical Committee. All the participants were briefed about the purpose of the study and written informed consent was also taken from them. Care was taken to select individuals having no lesions, whether active or passive on the fingers.

Collection and analysis of print: For obtaining the prints, the thumb of the dominant hand of the subjects was considered. The imprint obtained from the thumb using printer's blue ink was transferred on to a white bond A 4 paper. The prints thus recorded were studied with a magnifying lens. The thumbprint patterns

Address for correspondence:
[1]Associate Professor (**Corresponding Authors**)
Email: rupsekhar@yahoo.com
Mobile: +919435196276
[2]Demonstrator,
Dept. of Anatomy, Gauhati Medical College, Guwahati-32, Assam and India

were classified on the basis of Michael Kucken's classification system as Loop, Arch, Whorl and Composite pattern.

Results

Table 1 Total number of male and female cases

Different type of thumb print in male & female		
Type of thumb print	**Number of cases**	
	Male	**Female**
Loop	40	31
Whorl	29	12
Arch	14	6
Composite	6	7
SUM	**89**	**56**
Mean	**22.250**	**14.000**
SD	**±15.196**	**±11.633**
SEM	**±7.598**	**±5.816**

In the present study it is seen that the number of male cases in various type of thumb prints ranges from 6 to 40 with a mean value of 22.250, Standard Deviation ± 15.196 and Standard Error of Mean ± 7.598 and the number of female cases in various type of thumb prints ranges from 6 to 31 with a mean value of 14.000, Standard Deviation ± 11.633 and Standard Error of Mean ± 5.816 as evident in **Table 1** and **Figure 1**.

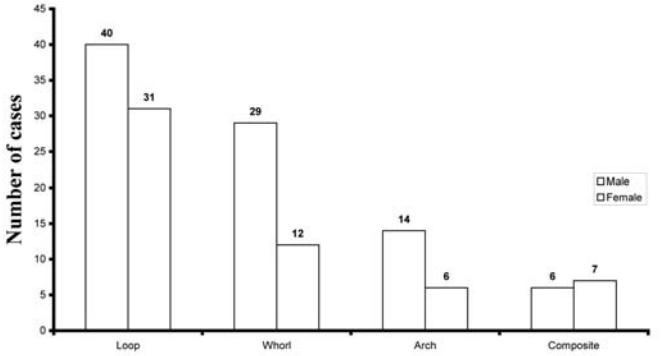

Figure 1 Number of cases in different type of thumb print

Table 2 Total number of male and female cases in loop & whorl type of finger print

Loop and whorl type of thumb print in male & female		
Type of thumb print	**Number of cases**	
	Male	**Female**
Loop	40	31
Whorl	29	12
SUM	**69**	**43**
Mean	**34.500**	**21.500**
SD	**±7.778**	**±13.435**
SEM	**±5.499**	**±9.499**

In male for loop and whorl type of thumb print we get the mean value of 34.500, Standard Deviation ±7.778 and Standard Error of Mean ±5.499 and in female cases for loop and whorl type of thumb print we get the mean value of 21.500, Standard Deviation ±13.435 and Standard Error of Mean ±9.499 as evident in **Table 2** and **Figure 1**.

Table 3 Total number of male and female cases in arch & composite type of finger print

Arch and composite type of thumb print in male & female		
Type of thumb print	**Number of cases**	
	Male	**Female**
Arch	14	6
Composite	6	7
SUM	**20**	**13**
Mean	**10.000**	**6.500**
SD	**±5.657**	**±0.707**
SEM	**±4.000**	**±0.499**

In male for arch and composite type of thumb print we get the mean value of 10.000, Standard Deviation ± 5.657 and Standard Error of Mean ± 4.000 and in female cases for loop arch and composite type of thumb print we get the mean value of 6.500, Standard Deviation ± 0.707 and Standard Error of Mean ± 0.499 as evident in **Table 3** and **Figure 1**.

Table 4 Distribution of frequency, relative frequency & percentage of frequency

Class interval of different type of thumb print	**Thumb print in male & female**					
	Male			**Female**		
	f (frequency)	fr (relative frequency)	f% (percentage)	f (frequency)	fr (relative frequency)	f% (percentage)
Loop	40	0.449	44.900	31	0.553	55.300
Whorl	29	0.325	32.500	12	0.214	21.400
Arch	14	0.158	15.800	6	0.108	10.800
Composite	6	0.068	6.800	7	0.125	12.500
Sum	**89**	**1.000**	**100.000**	**56**	**1.000**	**100.000**

Table 4 shows that for the male group highest number of subjects is found in the class interval of 'Loop' type of thumb print with a relative frequency of 0.449, simple frequency of 40 and a percentage of 41.900. The lowest number of subjects is found in the class interval of 'Composite' type of thumb print with a relative frequency of 0.068, simple frequency of 6 and a percentage of 6.800 as evident in **Figure 2 & 3**.

For the female group highest number of subjects is found in the class interval of 'Loop' type of thumb print with a relative frequency of 0.553, simple frequency of 31 and a percentage of 55.300. The lowest number of subjects is found in the class interval of 'Arch' type of thumb print with a relative frequency of 0.108, simple frequency of 6 and a percentage of 10.800 as evident in **Figure 2 & 3**.

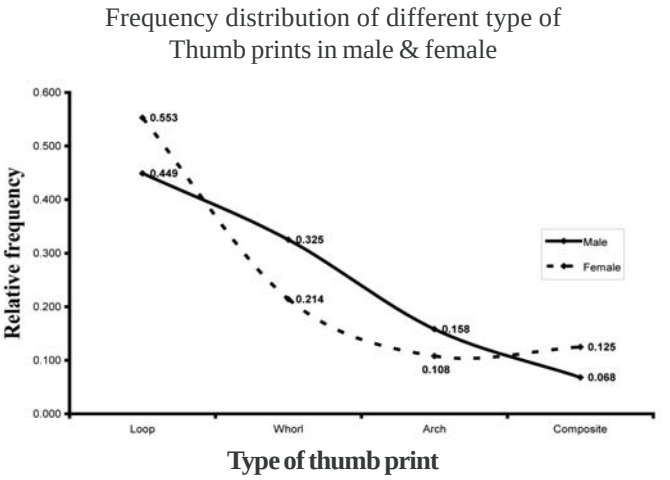

Figure 2 Relative frequency

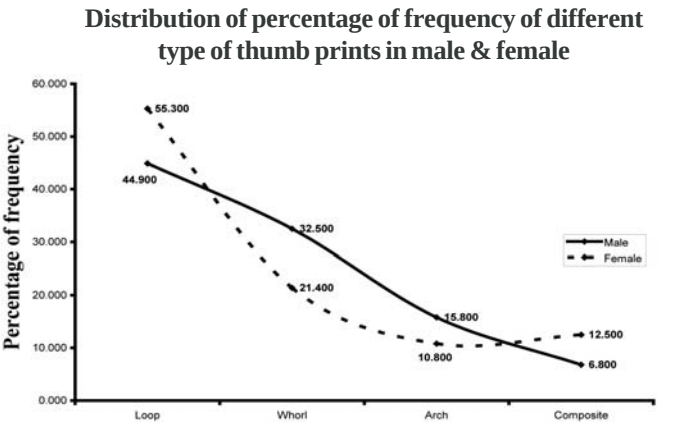

Figure 3 Percentage of frequency

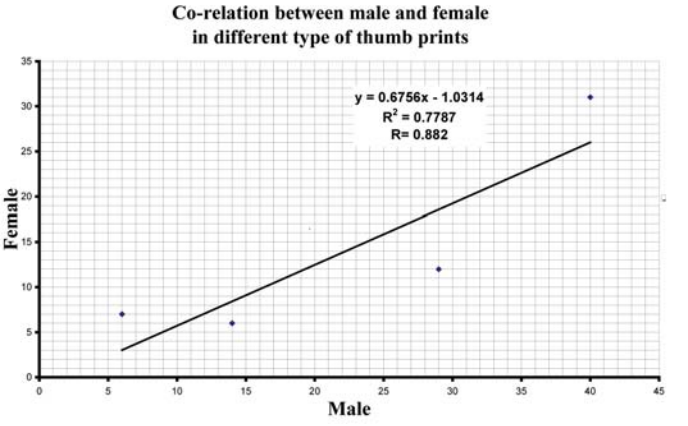

Figure 4 XY (Scatter) chart with trend line and R-Value

Table 5 Level of significance of differences between the various categories

Serial number	Comparison of mean between	"t"	P
1	Different type of thumb prints in male and different type of thumb prints in female	0.862	> 0.05
2	'Loop & whorl' type of thumb print in male and 'arch & composite' type of thumb print in male	3.603	< 0.05
3	'Loop & whorl' type of thumb print in female and 'arch & composite' type of thumb print in female	1.576	> 0.05

DISCUSSION

Establishing the identity of an individual is necessary for many reasons such as personal, social, and legal, including certification of death.[8] Finger prints are constant and individualistic and form the most reliable criteria for identification.[9, 10] A lots of studies have been conducted till date on fingerprinting. However, no such documented study regarding fingerprinting in the establishment of the sex of an individual is available from North-eastern India. The present study aims at throwing some light in this aspect. The present study revealed that in males highest to lowest number of incidences of different variety of thumb prints are respectively loop, whorl, arch and composite. In females highest to lowest number of incidences of different variety of thumb prints are respectively loop, whorl, composite & arch. If we compare all the four variety of thumb prints of both male and female together though there is difference in number of cases in

each variety, it is without any significance (P>0.05). There is strong co-relation between male and female if all varieties are compared together (R= 0.882). Again, in males if 'loop' & 'whorl' together is compared with 'arch' & 'composite' the incidence of the first two varieties is much higher than the last two varieties with significance (P<0.05). Like wise in case of females though the first two varieties are much higher than the last two varieties, but it is without any significance (P> 0.05).

CONCLUSION

Establishing the identity of an individual is necessary for many reasons such as personal, social, and legal, including certification of death.[10] Finger prints are constant and individualistic and form the most reliable criteria for identification.[11, 12] From the above study, we can conclude that in different type of thumb print there is no significant difference between male & female; and the 'loop' and 'whorl' variety is much higher than the 'arch' and 'composite' variety of print which is more evident in case of male under the limitations of the present set of studies.

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