STUDY OF FINGERPRINTS RIDGE DENSITY AND ITS RELIABILITY IN SEX DETERMINATION IN A SAMPLE OF SOHAG POPULATION

BY

Maha A. Hilal and Soheir A. Mohamed

Department of Forensic Medicine & Clinical Toxicology, Faculty of Medicine, Sohag University, Egypt.

ABSTRACT

*Fingerprint identification is the first simple individual identification before using complicated techniques such as DNA analysis. Identification of sex plays a vital role in medicolegal investigations. The aim of the present study was to find out sex differences based on fingerprint ridge density and its possible applicability in determination of sex in forensic medicine. The present study was conducted on 300 students (150 males and 150 females) in faculty of Medicine, Sohag University. For collection of fingerprints, plates uniformly smeared with thin layer of black printer ink were prepared. Subjects were asked to apply their fingers on the smeared plate and then transferred to the prepared fingerprint card. Epidermal ridges of both men and women were counted within a square of 5 mm * 5 mm drawn on a transparent film fixed to a lens. The results revealed that the mean values of the number of fingerprint ridges in females in the right and left hands was 17.73 ± 1.69 and 17.74 ± 1.73 respectively. The mean value of fingerprint ridges of both hands were 17.74 ± 1.63. The mean values of fingerprint ridges of the right and left hands in males was 14.82 ± 1.52 and 15.22 ± 1.32 respectively. The mean value of fingerprint ridges of both hands were 15.02 ± 1.33. Analysis of Receiver Operating Curve results showed that the mean of right finger ridges of 15.9 is the most accurate cut point to differentiate females from males. Meanwhile the mean of 16.3 ridges is the most accurate cut point for the left fingers. The present study revealed that females have a statistically significant ridge density more than males. The mean ridge densities can be used as a presumptive indicator of sex of an unknown print left at the crime scene.*

INTRODUCTION

A fingerprint is the representation of the epidermis of a finger. It consists of a pattern of interleaved ridges and valleys. Fingertip ridges evolved over the years to allow persons to grasp and grip objects. Fingerprints are unique to every single individual and are formed in the human fetus before birth. It does not change

throughout life unless damage occurs to the dermal of the finger skin layer (Han et al., 2004). During growth, the overall size of the palm increases, the fingerprint increases in size without adding new ridges. Ridge breadth is defined as the measurement from the center of one furrow across the ridge to the center of the next furrow (Penrose, 1969). Therefore, there are not two fingers were found to have identical prints even identical twins who share the same DNA profile. It has been estimated that chances of two persons having identical finger impressions are about one in sixty-four thousand million of the world population (Nithin et al., 2011). Identification means that determination of a person individuality may be complete (absolute) or incomplete (partial). Complete identification means the absolute fixation of the identity of a person. Partial identification implies ascertainment of only some facts about the identity like (sex, age, stature, etc.), while others still remain unknown (Gutiérrez-Redomero et al., 2008).

Identification of sex plays a vital role in forensic and medicolegal investigations. Recently, there is an increasing interest in biometric technologies for human identification based on the individual features. The various used identification data are fingerprints, handwriting, and bite marks. DNA fingerprinting is the most effective identification of evidence, especially in case of missing person or disaster victims. Sex is among the most important information that discriminates individuals. Researchers addressed the use of fingerprint for sex identification which will be more helpful in short listing of the suspects. Fingerprint identification is the first simple technique before using complicated ones such as DNA analysis. Now it has become more automated due to advancements in the computing capabilities (Karki and Singh 2014).

The aim of the present work was to find out sex differences based on fingerprint ridge density and its possible applicability in determination of sex in forensic medicine.

SUBJECTS AND METHODS

The present study was conducted on 300 students (150 males and 150 females) in faculty of Medicine, Sohag University. They were aged between 18 and 25 years. The protocol of the study was approved by the Ethical Committee in Sohag Faculty of Medicine. The purpose of the study was explained and the written informed consent was obtained from all participants.

Exclusion criteria :

Subjects with any evidence of disease or injury of the fingertips that was likely to alter the fingerprint pattern (leprosy, lacerations, scars of the fingertips, etc.) were excluded.

Material :

Printer black ink, glass plate, roller, magnifying lens, transparent film, and pin were used.

Methods :

The subjects included in the study were asked to wash their hands to remove any dirt or/and grease. For collection of fingerprints, a glass plate 12 * 12 inches was cleaned and uniformly smeared with thin layer of black printer ink by using the roller. The subjects were asked to apply their fingers on the smeared plate and then transferred to the prepared fingerprint card. By this way the entire prints of ten fingers were prepared. Only plain prints were taken.

A total of 3000 fingerprints were obtained. Fingerprints obtained from different digits were denoted as R 1, R 2, R 3, R 4, R 5 and L I, L 2, L 3, L 4, L 5 for thumb, index, middle, ring, and little fingers respectively on the right and left hands.

After taking the fingerprints, the upper portion of the radial side of the prints was chosen as an area for data collection because all fingerprint pattern types showed a similar ridge flow in this region (Kumar et al., 2013). In this selected area, epidermal ridges of both men and women were counted carefully within a square of 5 mm * 5 mm drawn on a transparent film fixed to a magnifying lens (Grieve and Dunlop, 1992). Counting started from one corner of the square to the diagonally opposite corner in a zigzag manner. Some specific criteria were observed during the counting procedure such as dots, which were not counted, but the fork (excluding the handle) and the lake were counted as two ridges. Hence this value represented the number of ridges in 25 mm^2 area and reflected the ridge density value (Figure 1).

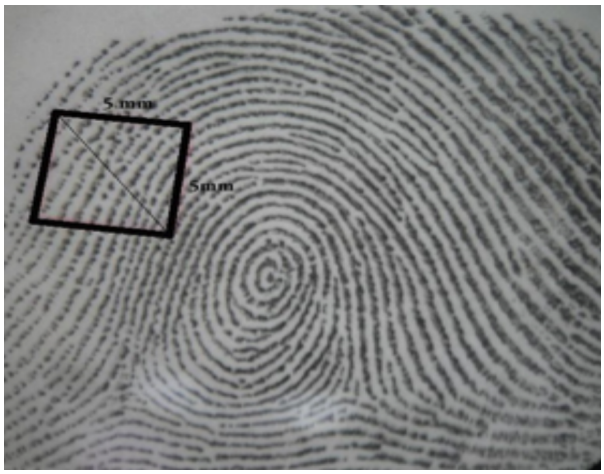

Fig. (1) : Counting of fingerprint ridges in a square of 5 mm * 5 mm within the redial side of the print (Kumar et al., 2013).

Statistical analysis :

Statistical Package for the Social Sciences (SPSS), version (19) was used for statistical analysis of the data. Mean, standard deviation and Student t test were used to compare the mean ridge density between males and females. Receiver operating curve (ROC) analysis was used to compare the difference in ridge density between males and females and to calculate the most appropriate cutoff value. Also, the standard error was calculated.

RESULTS

The mean values of the number of fingerprint ridges in 25 mm^2 of the right and left hands in females were 17.73 ± 1.695 and 17.74 ± 1.735 respectively. The mean value of the number of fingerprint ridges in 25 mm^2 of both hands in females was 17.74 ± 1.630. Generally, the mean value of ridge density in the five fingers in both hands in females was more or less equal (Table 1).

The mean values of the number of fingerprint ridges in 25 mm^2 of the right and left hands in males were 14.82 ± 1.517 and 15.22 ± 1.323 respectively. The mean value of ridges in the left hand was a little higher than in the right hand. The mean value of the number of fingerprint ridges of both hands in males was 15.02 ± 1.326 (Table 2). A highly significant difference was found on comparing the mean value of ridge density between males and females in the right hand ($P < 0.001$).Each individual finger in females has nearly 3 ridges more than males (Figure 2 and Table 3).

Comparing the mean value of ridges density between males and females in the left hand, there was a highly significant difference where P value was < 0.001. Each individual finger in females has nearly 2.5 ridges more than males (Figure 3 and table 3). Also a highly significant difference was found on comparing the mean value of ridge density between males and females in both hands ($P < 0.001$). Each individual finger in females has nearly 2.7 ridges more than males (Figure 4 and Table 3).

Analysis of Receiver Operating Curve (ROC) results revealed that the ring finger showed the highest difference between males and females in the right hand, followed by the little finger, thumb, index and lastly the middle finger (Table 4). On the other hand, the little finger showed the highest difference between males and females in the left hand, followed by the ring finger, index, middle and lastly thumb finger (Table 5).

As expected, recording the ridges in both hands together showed the most accurate differentiation between males and females. Using each hand alone, the right

hand was more accurate than the left one (Table 6).

Table 7 and figure 5 revealed the frequency distribution of the mean fingerprint ridge densities among males and females. It was observed that 47.33% of males have a mean ridge density of 15 compared to 2.67% of the females. On the other hand, 22.67% of the females have a mean ridge density of 17 and 23.33 % of the females have a mean ridge density of 19. Males showed a peak at 15 ridges, compared to two peaks for females, one at 17 ridges and another at 19 ridges Also, it was observed that none of males have a mean ridge density of more than 18 and none of females have a mean ridge density below 14. So, seventy six percent of subjects in the study were in the overlapping zone.

Probability densities, derived from the frequency distribution, were used to calculate the likelihood ratio. The probability density for males (C) and for females (C1) was used to calculate the likelihood ratios (C/C1) and (C1/C) . Odds ratio was calculated for subjects. It was found that in the range from 12-15 ridge count, the likelihood ratio for males is higher than females (ranged from 14 to 80, compared to 0.013 to 0.071 for females). This of course reflected highly favored odds ratio for males (ranged from 0.934 to 0.988) compared to (0.012 to 0.067 for females). The opposite can be seen just by changing into the range of 16-21 ridge count. The likelihood ratio showed female predominance (ranged from 1.667 to 233.3) compared to males (0.004 - 0.600). This reflected high favored odd for females (ranged from 0.625 to 0.996) compared to males (0.004 - 0.375). This means that a fingerprint ridge count of 15/25 mm^2 or less is more likely of male origin and a fingerprint ridge count of more than 15/25 mm^2 is more likely of female origin (Table 8).

Table (1) : The number of fingerprint ridges in 25 mm^2 in the right and left hands of females (n=150).

Ridges in right and left hands	Minimum	Maximum	Mean± SD
R I	11	21	16.16 ± 2.220
R 2	12	22	16.92 ± 2.074
R 3	13	22	17.94 ± 2.184
R 4	14	24	19.34 ± 2.052
R 5	15	24	18.30 ± 2.136
L 1	11	22	15.86 ± 3.154
L2	12	22	17.44 ± 1.978
L 3	12	22	18.38 ± 2.322
L 4	14	22	18.76 ± 1.834
L5	12	22	18.26 ± 2.141
Mean of ridges in right hand	13.40	21.40	17.73 ± 1.695
Mean of ridges in left hand	13.60	21.60	17.74 ± 1.735
Mean of ridges in both hands	13.50	21.40	17.74 ± 1.630

R 1 : Right thumb finger, R 2: Right index finger, R 3: Right middle finger, R 4: Right ring finger, R 5: Right little finger, L 1: Left thumb finger, L2: Left index finger, L 3: Left middle finger, L 4: Left ring finger, L 5: Left little finger, SD: standard deviation.

Table (2) : The number of fingerprint ridges in 25 mm^2 in the right and left hands of male (n=150).

Ridges in right and left hands	Minimum	Maximum	Mean± SD
R 1	10	17	13.24 ± 1.625
R 2	11	19	14.34 ± 1.857
R 3	12	21	15.64 ± 1.943
R 4	10	20	15.82 ± 2.014
R 5	11	18	15.08 ± 1.748
L 1	10	17	13.58 ± 1.716
L2	12	20	14.96 ± 1.702
L 3	12	21	15.76 ± 1.920
L 4	11	21	16.22 ± 1.907
L5	11	21	15.56 ± 1.740
Mean of ridges in right hand	11.40	18.40	14.82 ± 1.517
Mean of ridges in left hand	13.00	18.60	15.22 ± 1.323
Mean of ridges in both hands	12.30	18.10	15.02 ± 1.326

R 1: Right thumb finger, R 2: Right index finger, R 3: Right middle finger, R 4: Right ring finger, R 5: Right little finger, L 1: Left thumb finger, L2: Left index finger, L 3: Left middle finger, L 4: Left ring finger, L 5: Left little finger, SD: standard deviation.

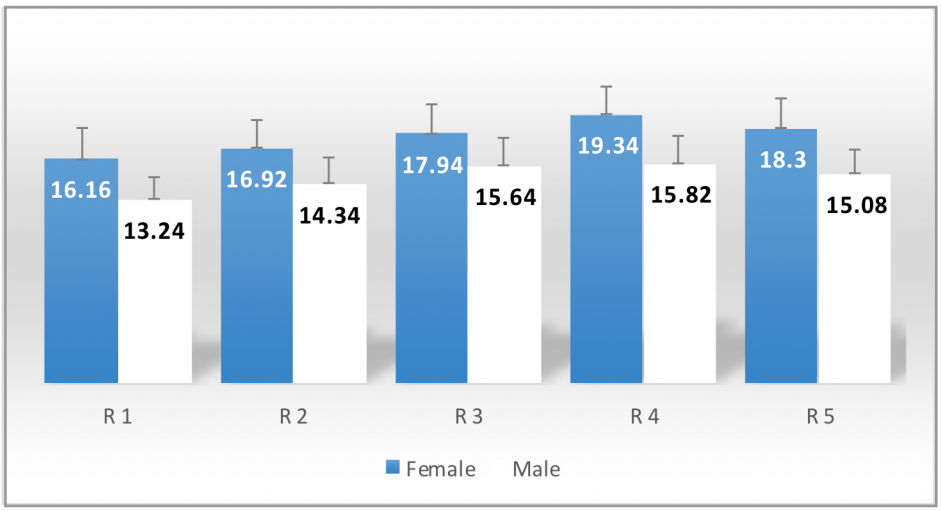

Fig. (2) : The number of fingerprint ridges in 25 mm^2 in the right and left hands of females (n=150).

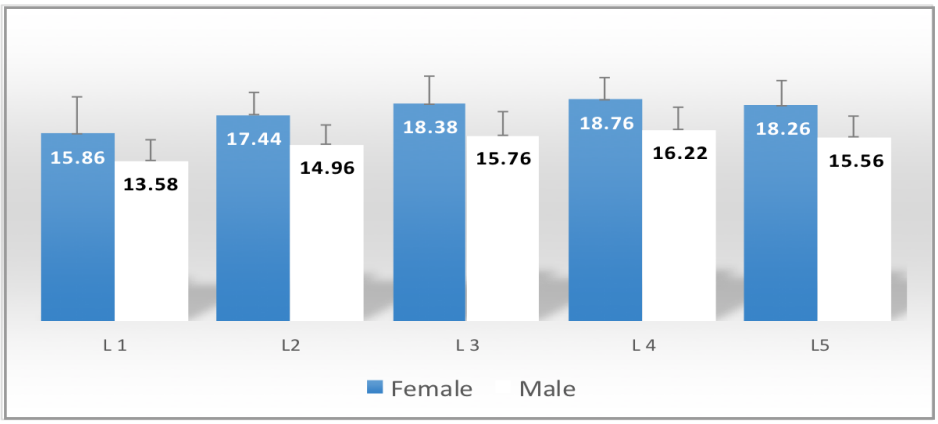

Fig. (3) : Comparison of the mean number of fingerprint ridges in the left hand between males and female.

Table (3) : Comparison of the mean number of fingerprint ridges in the left hand between males and female (n = 300).

Gender		Mean± SD	t-test	P- value
Mean right hand	Males	14.8240±1.51749	15.653	<0.001 *
	Females	17.7320±1.69545		
Mean left hand	Males	15.2160±1.32250	14.169	<0.001 *
	Females	17.7400±1.73519		
Mean both hands	Males	15.0200±1.32640	15.829	<0.001*
	Females	17.7360±1.62997		

* Highly significant., P is significat < 0.05.

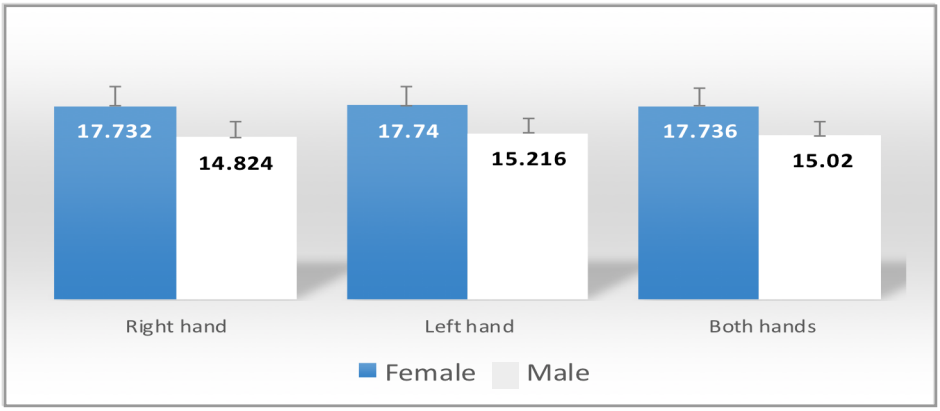

Fig. (4) : Comparison of the mean number of fingerprint ridges between males and females.

Table (4) : Receiver operating curve analysis of the right hand fingers of both males and females (n = 300).

Test result variable(s)	Area	Std. error	P value	Asymptotic 95% confidence interval	
				Lower bound	Upper bound
R 1	.856	.022	.000	.814	.899
R 2	.818	.024	.000	.771	.865
R 3	.779	.027	.000	.727	.832
R 4	.890	.018	.000	.854	.926
R 5	.869	.019	.000	.831	.907

R 1: Right thumb finger, R 2: Right index finger, R 3: Right middle finger, R 4: Right ring finger, R 5: Right little finger, P is significat < 0.05.

Table (5) : Receiver operating curve analysis of the left hand fingers of both males and females (n = 300).

Test result variable(s)	Area	Std. Error	P value	Asymptotic 95% Confidence Interval	
				Lower bound	Upper bound
L 1	0.790	0.026	<0.0001	0.739	0.840
L2	0.830	0.024	<0.0001	0.784	0.877
L 3	0.807	0.025	<0.0001	0.757	0.856
L 4	0.833	0.024	<0.0001	0.787	0.880
L5	0.840	0.024	<0.0001	0.793	0.886

Left thumb finger, L2: Left index finger, L 3: Left middle finger, L 4: Left ring finger, L 5: Left little finger, P is significat < 0.05.

Table (6) : Receiver operating curve analysis of the right, left and both hand fingers of both males and females (n = 300). .

Test result variable(s)	Area	Std. Error	P value	Asymptotic 95% confidence interval	
				Lower bound	Upper bound
Right hand	0.901	0.018	<0.0001	0.867	0.936
Left hand	0.877	0.021	<0.0001	0.836	0.919
Mean ridges in both hands	0.905	0.019	<0.0001	0.869	0.942

Table (7) : Frequency distribution of the mean fingerprint ridge densities (n = 300).

		Gender				Total
		Females		Males		
		No	%	No	%	
Mean ridges	12.00	0	0	3	2	3
	13.00	0	0	12	8	12
	14.00	2	1.33	28	18.67	30
	15.00	4	2.67	71	47.33	75
	16.00	30	20	18	12	48
	17.00	34	22.67	8	5.33	42
	18.00	24	16	10	6.67	34
	19.00	35	23.33	0	0	35
	20.00	16	10.67	0	0	16
	21.00	5	3.33	0	0	5
Total		150	100	150	100	300

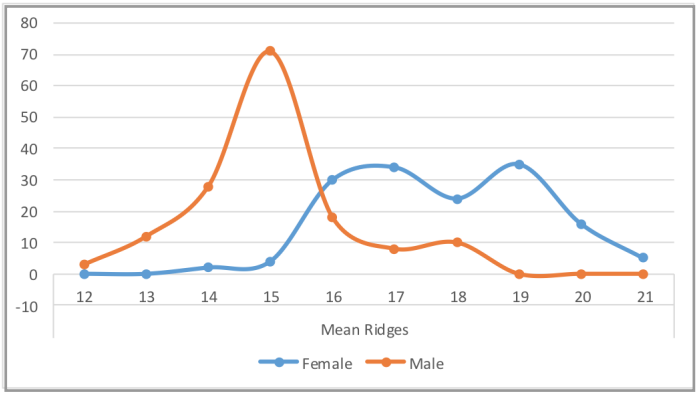

Fig. (5) : Frequency distribution of mean fingerprint ridge densities.

Table (8) : Probability densities and likelihood ratios derived from the observed ridge count (n = 300).

Ridge count	Probability density		Likelihood Ratio		Favored Odds Ratio	
	Males (C)	Females (C1)	LR (C/C1)	LR (C1/C)	Males	Females
12	0.020	0.001	20.000	0.050	0.952	0.048
13	0.080	0.001	80.000	0.013	0.988	0.012
14	0.187	0.013	14.038	0.071	0.934	0.067
15	0.473	0.027	17.727	0.056	0.947	0.053
16	0.120	0.200	0.600	1.667	0.375	0.625
17	0.053	0.227	0.235	4.253	0.190	0.810
18	0.067	0.160	0.417	2.399	0.294	0.706
19	0.001	0.233	0.004	233.300	0.004	0.996
20	0.001	0.107	0.009	106.700	0.009	0.991
21	0.001	0.033	0.030	33.300	0.029	0.971

(C): The probability density for males, (C1): The probability density for females
LR: Likelihood Ratio

DISCUSSION

Many human body features have been used to estimate sex. Fingerprint is one of the most commonly employed biometric features (Jain et al., 1997). Fingerprints of an individual have been used as one of the vital parts of identification in both civil and criminal cases because of their unique properties of absolute identity (Nandy, 2001).

The present study was designed to broaden the horizon of ridge count i.e. sex determination by fingerprint ridge density. Ridge width varies according to age; subjects of similar ages (18 - 25 years) were recruited in the present study to ensure that growth had been stopped. Hsieh et al. (2005) recorded that patterns of fingerprints become fixed when a person is about 14 years or older. The upper portion of the radial side of the central core region of the prints was chosen as an area for data collection as all fingerprint pattern types showed a similar ridge flow in this region (Gungadin, 2007).

In the present study, the mean value of the number of fingerprint ridges in 25 mm^2 of the right and left hands of females was more or less equal. On the other hand, the mean value of the number of fingerprint ridges in 25 mm^2 of the left hand of

males was a little higher (15.22 ± 1.32) than in the right hand (14.82 ± 1.52). Eshak et al. (2013) found that in males, the mean ridge count for the left hands (20.15 ± 2.15) was lesser than the right hands (20.86 ± 2.34). However in females, the mean ridge count for the left hands (21.43 ± 3.37) was higher than the right hands (21.3 ± 2.43). Green and Young (2000) reported that both males and females have higher finger ridge count on their right hand than on their left hand, but Wang et al.(2008) reported that Chinese males and females had higher finger ridge count on their left hands than on their right hands. This inconsistency may be caused by the different ridge count measurement method employed or by the difference between the tested populations. The mean value of the number of fingerprint ridges in both hands in females was 17.74 ± 1.63. The mean value of the number of fingerprint ridges in both hands in males was 15.02 ± 1.33.

Comparing the mean value of ridge density between males and females in both hands, there was nearly three ridges for the right hand (higher in females than males), around 2.5 ridges difference for the left hand, and 2.7 ridges difference for both hands. The result showed highly significant differences for all these comparisons.

Acree (1999) used the ridges density for determination of sex. It was found that the females have higher ridge density. Kralik and Novotny, (2003) reported that males have higher ridge breadth than females, and hence the number of ridges should be more in females than in males. Eshak et al. (2013) explained sexual dimorphism (females had higher values than males) as the average body proportions of males are larger than females. Hence, when the same number of ridge is accommodated in a larger surface area, a lower density is observed among males. Moore (1994) added that the mean ridge to ridge distance, which was more in males compared to females can explain the higher ridge density encountered in females. On contrary to the present results, Hall and Kimura (1994) and Cote et al. (2002) recorded that males had higher ridge density than females.

In the present work it was found that, in the range from 12 - 15 ridge count, the likelihood ratio for males was higher than females. The opposite could be seen just by changing into the range of 16 - 21 ridge count. The likelihood ratio showed female predominance compared to males. This means that a fingerprint ridge count of 15/25 mm^2 or less is more likely of male origin and a fingerprint ridge count of more than 15/25 mm^2 is more likely of female origin. Similarly, Acree (1999) stated that the favored odds showed that fingerprint ridge density <13 ridges/25 mm^2 is most likely to be of male origin. Likewise, fingerprints having ridge count >14 ridg-

es/25 mm^2 are most likely to be of female origin.

Vinod et al. (2010) reported that significant gender differences were found in Chinese subjects. The finger ridge count of 12 ridges is more likely to be of males and more than 13 ridges is more likely to be of females. Also, the same author recorded that in Malaysian subjects, 11 ridges or less is likely to be of male and in female more than 13 ridges were observed. In contrary to the present study, Khadri et al. (2013) observed that the mean ridge density for females were lower than that for males (12 ridge density for females compared to 12.4 for males). The variations in the results could be due to the difference in the counting method, small number of subjects under study or due to geographical variations.

By analyzing the results of ROC for the right hand, the ring finger showed the highest difference between males and females, followed by little finger, thumb, index and lastly middle finger. By analyzing the results of ROC for the left hand, the little finger showed the highest difference between males and females, followed by ring finger, index, middle and lastly thumb finger. On contrary to the present results, Gutiérrez-Redomero et al. (2014) found that thumbs and index fingers showed a higher ridge density than middle, ring, and little fingers in both sexes. This population differences were found between these studies could be of methodological nature due to the lack of standardization in the position of the counting area, as well as to the differences in the method used for obtaining the fingerprint.

As expected, recording the ridges in both hands together showed the most accurate differentiation between males and females. Using each hand alone, right hand was more accurate than left one.

This study has proved that there is an increased ridges density in female gender rather than male gender because of less coarseness of ridges. The study of sex identification by density is more specific and highly significant.

These results are helpful for fingerprint experts as they can be used as a presumptive indicator of gender based on the degree of ridge density.

CONCLUSION

The present study revealed that females have a statistically significant ridges density more than males. Fingerprint ridge density of 15 ridges/25 mm^2 or less is more likely to be of males. Likewise, a mean ridge density of more than 15 ridges/25 mm^2 is more likely to be of female origin. The mean ridge densities can be used as a presumptive indicator of gender

of an unknown print left at the crime scene also as a method of identification for mutilated bodies.

RECOMMENDATIONS

Further studies on fingerprint ridges density in different population groups are proposed. In order for the results of different studies to be comparable, it is necessary to standardize the position of the counting area and to use the same method of obtaining the fingerprint, especially when involving a forensic application.

REFERENCES

Acree, M.A. (1999): "Is there a gender difference in fingerprint ridge density?" Forensic Sci Int., 102:35-44.

Cote,K.; Earls, C.M.; and La Lumiere, M.L. (2002): "Birth order, birth interval, and deviant sexual preferences among sex offenders". Sexual Abuse: A Journal of Research and Treatment, 14(1):10-12.

Eshak, G. A.; Zaher, J.F.; Hasan, E.I. and Ewis, A.A. (2013): "Sex Identification from fingertip features in Egyptian population". J. Forensic Leg. Med., 20(1): 46–50.

Green, R. and Young, R. (2000): "Fingerprint asymmetry in male and female transsexuals". Personality and Individual Differences, 29: 933–942.

Grieve, M. C. and Dunlop, J. A. (1992): "Practical aspect of the Bayesian interpretation of fiber evidence". J. Forensic Sci. Soc. 32:169-175.

Gungadin, S. (2007): "Sex determination from finger ridge density". Internet J. Med. Update, 2(2):4-7.

Gutiérrez-Redomero, E.; Alonso, C.; Romero, E. and Galera, V. (2008): "Variability of fingerprint ridge density in a sample of Spanish Caucasians and its application to sex determination". Forensic Sci. Int., 180:17–22.

Gutiérrez-Redomero, E; Rivaldería, N; Alonso, C. and Sánchez-Andrés, A. (2014): "Assessment of the methodology for estimating ridge density in fingerprints and its forensic application". Science and Justice, 54(3): 199- 207.

Hall, J.A.Y and Kimura, D. (1994): "Dermatoglyphic asymmetry and sexual orientation in Men". Behavioral Neuroscience, 108:1203-1206.

Han, Y.; Ryu, C.; Moon, J.; et al. (2004): "Study on evaluating the uniqueness of fingerprints using statistical analysis". Information security and cryptology. ICISC, 5:467–477.

Hsieh, C.T.; Shyu, S.R. and Hu, C.S. (2005): "An effective method of fingerprint

classification combined with AFIS". Embedded and Ubiquitous Computing, 1107–1122.

Jain, A.K.; Hong, L.; Pankanti, S.; et al. (1997): "An identity- authentication system by using fingerprints". Proceedings of IEEE, 85(9):1365-1388.

Karki, R.K. and Singh, P.K. (2014): "Gender determination from finger print". Journal of Universal Collage of Medical Sciences, 2(5): 12-15.

Khadri, S.Y.; Goudar, E.S and Khadri, S.Y (2013): "A study of fingerprint pattern and gender distribution of fingerprint in and around Bijapur". Al Ameen J. Med. Sci., 6(4):328-331.

Kralik, M. and Novotny, V. (2003): "Epidermal ridge breadth: An indicator of age and sex in paleoderma¬toglyphics". Variability and Evolution, 11: 5–30.

Kumar, L.; Agarwal, S.; Garg, R.; et al. (2013):"Gender determination using fingerprints in the region of Uttarakhand". J. Indian Acad. Forensic Med., 35(4):971-973.

Moore, R.T. (1994): Automatic fingerprint identification systems. In: Advances in Fingerprint Technology. Lee, H.C. and Gaensslenm, R.E. (Eds.). CRC Press, Boca-Raton, FL. P.P. 169-170.

Nandy, A. (2001): Identification: Principles of Forensic Medicine, 2nd Edition. New Central Book Agency (P) LTD. Calcutta. P.P. 47-109.

Nithin, M.D.; Manjunatha, B.; Preethi, D.S. and Balarai, B.M. (2011): "Gender differentiation by finger ridge count in South Indian population". J. Forensic Leg. Med., 18: 79–81.

Penrose, L.S. (1969): "Memorandum on dermatoglyphic nomenclature". Birth defects. Original Article Series, 6:72-84.

Vinod, C. N; Rastogi, P; Kanchan, T; et al. (2010): "Sex differences from fingerprint ridge density in Chinese and Malaysian population". Forensic Sci. Int., 197(1-3):67-76.

Wang, J. F.; Lin, C.L.; Chang, Y.H.; et al. (2008): "Sex determination using fingertip features". Internet J. Med. Update, 3: 22–28.

دراسة كثافة تعرجات بصمات الأصابع ومصداقيتها في تحديد الجنس في عينة من سكان محافظة سوهاج

المشتركون فى البحث

مها عبد الحميد هلال سهير على محمد

قسم الطب الشرعي والسموم الإكلينيكية – كلية الطب – جامعة سوهاج - مصر

تعتبر بصمات الأصابع فريدة ومميزة لكل فرد، والتعرف على الأشخاص بإستخدام بصمات الأصابع من الطرق الأولية البسيطة من قبل استخدام التقنية المعقدة مثل تحليل الحامض النووي. ويلعب تحديد الجنس دوراً حيوياً في تحقيقات الطب الشرعي.

وتهدف هذه الدراسة إلى العثور على الفروق بين الجنسين استناداً على كثافة تعرجات بصمات الأصابع وإمكانية تطبيقها في تحديد الجنس في مجال الطب الشرعي. وقد أجريت هذه الدراسة على ٣٠٠ طالب وطالبة (١٥٠ من الذكور و ١٥٠ من الإناث) من كلية الطب، جامعة سوهاج. تم الحصول على بصمات الأصابع من المشاركين عن طريق أسلوب التحبير. وبعد ذلك تم عد تعرجات الأصابع من خلال مربع أبعاده ٥×٥ مم مرسوم على فيلم شفاف مثبت على عدسة.

وقد أظهرت النتائج أن القيمة المتوسطة لكثافة التعرجات في اليد اليمنى من الإناث ١٧,٧٣ ± ١,٦٩ وفي اليد اليسرى كانت ١٧,٧٤ ± ١,٧٣ ولكلتا اليدين ١٧,٧٤ ± ١,٦٣ وكانت القيمة المتوسطة لكثافة التعرجات في اليد اليمنى من الذكور ١٤,٨٢ ± ١,٥٢ واليد اليسرى كانت ١٥,٢٢ ± ١,٣٢ بينما لكلتا اليدين ١٥,٠٢ ± ١,٣٣ . وقد وجد ما يقرب من ٢-٣ تعرجات تزيد في كل إصبع في الإناث عن الرجال وهذه الفروق ذات دلالة إحصائية. وأظهر البنصر أعلى فارق بين الذكور والإناث في اليد اليمنى، في حين أظهر الخنصر أعلى فارق في اليد اليسرى. وقد وجد أن متوسط كثافة التعرجات بقيمة ١٥,٩ لليد اليمنى من القيمة الأكثر دقة والفاصلة بين الإناث والذكور. وكان متوسط كثافة التعرجات بقيمة ١٦,٣ لليد اليسرى من القيمة الأكثر دقة والفاصلة بين الإناث والذكور.

ولقد أثبتت هذه الدراسة أن كثافة التعرجات تكون أكبر في الإناث من الرجال؛ وبالتالي يمكن أن تستخدم كمؤشر للجنس في حالة ترك بصمات في مسرح الجريمة، وأيضاً في التعرف على الأجسام المشوهة المجهولة.