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RESEARCH ARTICLE

Dermatoglyphic patterns of three ethnic groups and hereditary pattern of fingerprints in an urhobo community

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ABSTRACT

Dermatoglyphics study is an important aspect of forensic science in establishing an individual's identity. The aim of this study is to empirically determine the fingerprint pattern of subjects of Urhobo, Isoko, and Ika origin and to compare the prevalence of fingerprint pattern of parents and their biological children. This study is a descriptive cross-sectional study conducted for 6 months period among three ethnic groups in Delta State. The combined sample size for the study is 1200 subjects, each selected across the aforementioned ethnic groups. A similar study focusing on the hereditary pattern of print was conducted for the Urhobo people using a small village (Igun). Data collected were subjected to statistical analysis, using the Statistical Package for the Social Sciences version 20. $P < 0.05$ was considered significant. The statistical analysis showed that females had greater proportion of Arches and Loops in all five digits, while male had greater proportion of Whorl in all five digits. The current study shows that fingerprint pattern is unique among gender, ethnicity, and families. This study will be of great relevance in the field of anthropology and forensic sciences.

Keywords: Dermatoglyphics, Ethnicity, Families, Gender, Identification

INTRODUCTION

Dermatoglyphics is the systematic study or assessment of fingerprints to ascertain identity. Fingerprint is the distinctive pattern of minute ridges in the horny layer of the skin[1] Fingerprints identification is based on the fact that every individual has a unique pattern of prints. The pattern of prints visible on an individual digit follows this order: Loops, whorls, and arches. It has been recognized that no two individuals have identical fingerprints, making fingerprints a means of identifying unique characteristics.[2]

The pattern of classifying fingerprints was developed by Francis Galton and Sir Edward Henry in the late 18th century.[3] It has been said that the knowledge of fingerprinting remains the most reliable discovery in criminal justice. Furthermore, only DNA can stand in place of fingerprint as a complete means of proving a person's identification. Prints are unaltered except there is damage to the skin/surface regions where they are seen.[4]

The premeditated impression of fingerprints may be formed by ink or greasy substances staining the edge/peaks of fingers ridges/skin and transferring such to a smooth surface such as a fingerprint card.[5] Features of fingerprints usually contain impression from the pad on the last joint of fingers and thumb, also the lower joints area of the fingers can be recorded.

Human fingerprints have been said to offer a great solution in crime detection since its early use in 20th century.[6] A lot of criminals avoiding their fingerprints being identified now use gloves,

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furthermore detectives, and forensic expert now use gloves to examine crime scenes to avoid contaminating it with their fingerprints,[7] human fingerprints are explicit, inimitable, unchanging, and durable over the life of an individual making them reliable as long-term markers of human identity and may be used by police or other authorities to recognize individuals who wish to hide their identity, or to recognize human who are unable to identify themselves as a result of being deprived or deceased and also, as in the case of natural disaster.[6] A ridge is a portion of the outer layer of the skin (epidermis) on the digits, the palm of the hand or the sole of the foot.[8] These are caused by the underlying interface between the dermal papillae of the dermis and the interpapillary (rete) peys of the epidermis. These epidermal ridges have been reported to increase sensations triggered, for example, when fingertips sweep transversely on an uneven surface. These ridges are said to possibly help in holding irregular surfaces and may exceed surface contact in wet conditions.[9] Deposit of fingerprints is possible by the usual secretion of eccrine glands present in friction ridge skin, it is also possible by ink or other contaminants transferred from the peaks of friction skin ridges to a relatively smooth surface such as fingerprint card.[5]

METHODOLOGY

Study area

The subjects for this research were randomly selected from three study population in Delta State. Delta State is a state in Nigeria, situated in the South-South geo-political zone of her country. The state is divided into three senatorial districts: Delta Central: (with eight local governments), Delta North: (with nine local governments), and Delta South: (eight local governments), with a total population of 4,098,291 with each of the districts having a population size of 1,575,738: 1,293,074 and 1,229,282, respectively (2006 population census).[9]

Gender biased and equity were strictly observed in the study population, as equal number of subjects was selected both for males and females across three ethnic groups. This summed up to 330 males and females subjects in Urhobo study population, 150 males and females subjects in Isoko study population, 120 males and females in Ika population, and 29 families were consecutively selected for the hereditary study. Therefore, the male population makes up 50% and the female population makes up 50% for each ethnic group, respectively. This method was considered diligent so as to avoid any form of ethnic or gender bias on the final outcome of the statistical analysis of data collected.

For the Urhobo study population, subjects were randomly selected from towns and villages, including students of Delta State University in Abraka, State School of Nursing Eku, School of Health Technology Ufuoma, and other Urhobo respondents were selected from Okpara (inland and waterside), Oria, Ekuigbo, Afisiere, and Olomu, for Isoko study population, subjects were randomly selected from Ozoro polytechnic, Delta State University Oleh Campus, Olomoro, and Uzere. For Ika study population, subjects were randomly selected from College of Education Agbor, Abavo, Umunede, and Owa towns.

Sampling technique

All subjects for this study were selected by simple random sampling technique,[10] except in the family study where stratified sampling technique were employed, as such all subjects in the total population of the three ethnic groups were given equal possibility of being selected. This reduced bias and optimizes the analysis of results, as such, creating unbiased statistics.

Sample size

A sample size of 1200 subjects was selected for this study. It include 330 males and females each for subjects of Urhobo, 150 males and females for Isoko and 120 for Ika, all of which are of Delta State origin. The formula used for sample size determination for this study was given by Cochran (2012).[11] It was tested at 95% confidence interval and at 3% margin of error. The sample size

calculated using the formula below was 330, 150, and 120 for Urhobo, Isoko, and Ika, respectively.
For the hereditary study, families were selected by stratified random sampling technique from Igun? Community, there are 148 houses occupied by families in Igun, one out of every five consecutive families were selected, this amount to 29 families.

Sample collection

Biometrics device (digital persona) and a personal computer were used for the collection of individual data of only those who gave voluntary consent. To ensure clarity of the prints a sanitizer was given to the subject to wipe their fingers before placing it on the device for capturing.

Data analysis

All data collected and collated in the study were subjected to statistical analysis using the Statistical Package for the Social Sciences version 20. Significant association of fingerprint pattern within the population of the study was established using chi² statistical tool. Statistical significance was considered when $P \leq 0.05$.

RESULTS

The results are presented in tables showing the various prevalence of prints in frequency and percentage distribution among the study population.
Table 1 showed both frequency and percentage distribution of the various pattern of print observed in this study, it is important to note that TA, PA, UL, RL, PW, DW, CW, means tented arch, plain arch, ulnar loop, radial loop, plain whorl, double loop, and compound loop, respectively.
Table 1 showed that the prevalence of print in the thumb digit is loop (58.4%), whorl (53.8%), and arch (30.8%) in male, while female had prevalence of arch (69.2%), whorl (46.2%), and loop (41.6%). The X^2 result showed that there is significant difference of fingerprint pattern and gender in thumb digit.
Table 2 showed that male had prevalence of whorl (70.7%), arch (69.9%), and loop (31%), while female had prevalence of loop (69%), arch (30.1%), and whorl (29.3%). The X^2 analysis showed that there is significant difference of fingerprint pattern and gender in index digit.
Table 3 shows that male had prevalence of whorl (63.9%), loop (43.9%), and arch (43.8%), female had print prevalence of arch (56.2%), loop (56.1%), and whorl (36.1%). X^2 analyses that there is significant difference in fingerprint pattern and gender in middle digit.
Table 4 showed that male had prevalence of arch (68.6%), whorl (60.6%), and loop (38.9%) while their counterpart had prevalence of loop (61.1%), whorl (39.4%), and arch (31.4%) respectively. X^2 analysis showed that there is significant difference in fingerprint pattern and gender in ring digit.

Table 1: Distribution of fingerprint pattern in thumb digit among gender

Male pattern of print	Frequency (%)	Female pattern of print	Frequency (%)	% Total
Arch	88 (30.8)	Arch	109 (69.2)	100
Loop	195 (58.4)	Loop	187 (41.6)	100
Whorl	317 (53.8)	Whorl	304 (46.2)	100
Total	600		600	1200

X^2=16.883, df=6, P=0.010

Table 2: Frequency and percentage distribution of fingerprint pattern of index digit among gender

Male pattern of print	Frequency (%)	Female pattern of print	Frequency (%)	% Total
Arch	131 (69.9)	Arch	72 (30.1)	100
Loop	184 (31)	Loop	407 (69)	100
Whorl	285 (70.7)	Whorl	121 (29.3)	100
Total	600		600	1200

X^2=269.723, df=6, P=0.000

Table 3: Frequency and percentage distribution of fingerprint pattern of middle digit among gender

Male pattern of print	Frequency (%)	Female pattern of print	Frequency (%)	% Total
Arch	107 (43.8)	Arch	119 (56.2)	100
Loop	295 (43.9)	Loop	352 (56.1)	100
Whorl	198 (63.9%)	Whorl	129 (36.1%)	100
Total	600		600	1200

X^2=47.688. df=6, P=0.000

Table 5 showed that male had prevalence of whorl (56.8%), loop (45.4%), and arch (28.4%) while their counterpart had prevalence of arch (71.6%), loop (54.6%), and whorl (43.2%) respectively. X^2 result showed that there is significant difference in fingerprint pattern and gender in pinky digit.

Table 6 showed that Urhobo had prevalence of arch (73.3%), whorl (65.8%), and loop (61.5%); Ika had prevalence of whorl (21.7%), loop (20.8%), and arch (13.4%) while Isoko had prevalence of loop (17.6%), arch (13.3%), and whorl (12.5%), respectively. X^2 result showed that there is significant difference in fingerprint pattern and ethnic groups with regard to thumb digit.

Table 7 showed that Urhobo had prevalence of loop (64.6%), whorl (54.7%), and arch (55.4%); Ika had prevalence of whorl (25.3%), loop (18.7%), and arch (15.7%) while Isoko had prevalence of arch (28.9%), whorl (20%), and loop (16.7%), respectively. From the result, it can be deduced that there is significant difference in fingerprint pattern and ethnic groups in index digit.

Table 8 showed that Urhobo had prevalence of loop (72.4%), arch (59.5%), and whorl (55.9%); Ika had prevalence of whorl (34.3%), arch (21.5%), and loop (13.2%) while Isoko had prevalence of arch (26.9%), loop (14.3%), and whorl (9.8%), respectively. The result showed that there is significant difference in fingerprint pattern and ethnic groups in middle digit.

Table 9 showed that Urhobo had prevalence of loop (64.1%), whorl (64.1%), and arch (34.1%); Ika had prevalence of arch (55.7%), loop (24.2%), and whorl (15.6%) while Isoko had prevalence of whorl (19.8%), loop (11.7%), and arch (10.2%). From the analysis, it is deduced that there is significant difference in fingerprint pattern and ethnic groups in ring digit.

Table 10 showed that Urhobo had prevalence of whorl (72.7%), loop (65.2%), and arch (61.4%); Ika had prevalence of arch (17.6%), loop (15.1%), and whorl (12.3%) while Isoko had prevalence of

Table 4: Frequency and percentage distribution of fingerprint pattern in ring digit among gender

Male pattern of print	Frequency (%)	Female pattern of print	Frequency (%)	% Total
Arch	81 (68.6)	Arch	49 (31.4)	100
Loop	254 (38.9)	Loop	318 (61.1)	100
Whorl	265 (60.6)	Whorl	233 (39.4)	100
Total	600		600	1200

X^2=73.542, df=6, *P*=0.000

Table 5: Frequency and percentage distribution of fingerprint pattern in little digit among gender

Male pattern of print	Frequency (%)	Female pattern of print	Frequency (%)	% Total
Arch	43 (28.4)	Arch	97 (71.6)	100
Loop	428 (45.4)	Loop	380 (54.6)	100
Whorl	129 (56.8)	Whorl	123 (43.2)	100
Total	600		600	1200

X^2=63.868, df=12, *P*=0.000

Table 6: Frequency and percentage distribution of fingerprint pattern in thumb digit of three ethnic groups

IKA print pattern	Freq. (%)	URHOBO print pattern	Freq. (%)	ISOKO print pattern	Freq. (%)	% Total
Arch	40 (13.4)	Arch	1 (73.3)	Arch	46 (13.3)	100
Loop	103 (20.8)	Loop	185 (61.5)	Loop	95 (17.6)	100
Whorl	148 (21.7)	Whorl	364 (65.8)	Whorl	99 (12.5)	100
Total	300		660		240	1200

X^2=63.868, df=12, *P*=0.000

Table 7: Frequency and percentage distribution of fingerprint pattern in index digit of three ethnic groups

IKA print pattern	Freq. (%)	URHOBO print pattern	Freq. (%)	ISOKO print pattern	Freq. (%)	% Total
Arch	45 (15.7)	Arch	98 (55.4)	Arch	60 (28.9)	100
Loop	111 (18.7)	Loop	381 (64.6)	Loop	99 (16.7)	100
Whorl	144 (25.3)	Whorl	181 (54.7)	Whorl	81 (20)	100
Total	300		660		240	1200

X^2=239.629, df=12, *P*=0.000

Table 8: Frequency and percentage distribution of fingerprint pattern in middle digit of three ethnic groups

IKA print pattern	Freq. (%)	URHOBO print pattern	Freq. (%)	ISOKO print pattern	Freq. (%)	% Total
Arch	43 (21.5)	Arch	128 (59.5)	Arch	55 (26.9)	100
Loop	134 (13.2)	Loop	365 (72.4)	Loop	148 (14.3)	100
Whorl	123 (34.3)	Whorl	163 (55.9)	Whorl	37 (9.8)	100
Total	300		660		240	1200

X^2=148.924, df=12, *P*=0.000

Table 9: Percentage distribution of fingerprint pattern in ring digit among gender

IKA print pattern	Freq. (%)	URHOBO print pattern	Freq. (%)	ISOKO print pattern	Freq. (%)	% Total
Arch	65 (55.7)	Arch	50 (34.1)	Arch	15 (10.2)	100
Loop	134 (24.2)	Loop	307 (64.1)	Loop	131 (11.7)	100
Whorl	101 (15.6)	Whorl	303 (64.1)	Whorl	94 (19.8)	100
Total	300		660		240	1200

X^2=115.532, df=12, *P*=0.000

Table 10: Percentage distribution of fingerprint pattern in pinky digit among gender

IKA print pattern	Freq. (%)	URHOBO print pattern	Freq. (%)	ISOKO print pattern	Freq. (%)	% Total
Arch	65 (17.6)	Arch	50 (61.4)	Arch	15 (21)	100
Loop	134 (15.1)	Loop	307 (65.2)	Loop	131 (19.7)	100
Whorl	101 (12.3)	Whorl	303 (72.7)	Whorl	94 (15)	100
Total	300		660		240	1200

X^2=74.503, df=12, *P*=0.000

arch (21%), loop (19.7%), and whorl (15%). The analysis showed that there is significant difference in fingerprint pattern and ethnic groups in pinky digit.

Table 11 showed that the arch pattern of child I is slightly lower than that of the father but that of child II is similar to that of the father, loop pattern of both children I and II is similar to that of the fathers than the mothers, and also whorl pattern of both child is similar to the fathers compare to mothers. The analysis showed that there is no significant difference between parent fingerprint pattern and that of their biological children.

Table 12 showed that the arch pattern of both children I and II followed the pattern of the fathers, loop pattern of child I is slightly higher than both parents while Child II pattern is similar to both parents, the whorl pattern of Child I is slightly lower than the father but higher than the mother but Child II pattern is similar to the print pattern of the father. The analysis showed that there is no significant difference between parent fingerprint pattern and that of their biological children in index digit.

Table 11: Frequency and percentage distributions of fingerprint pattern in thumb digit of parents and their biological children

Print pattern	Father %	Mother %	Child I %	Child II %
Arch	4 (13.8)	6 (20.7)	3 (10.3)	4 (13.8)
Loop	9 (31)	14 (48.3)	8 (27.5)	8 (27.6)
Whorl	16 (55.1)	9 (31)	18 (62)	17 (58.6)
Total	100	100	100	100

X^2=10.377, df=10, *P*=0.408

Table 12: Frequency and percentage distributions of fingerprint pattern in index digit of parents and their children

Print pattern	Father %	Mother %	Child I %	Child II %
Arch	5 (17.2)	7 (24.1)	5 (17.2)	5 (17.2)
Loop	13 (44.8)	13 (44.8)	14 (48.2)	13 (44.8)
Whorl	11 (37.9)	9 (31)	10 (34.5)	11 (37.9)
Total	100	100	100	100

X^2=11.550, df=11, *P*=0.398

Table 13 showed that arch pattern of print of both children I and II is higher than that of the father but lower than that of the mother, loop pattern

Table 13: Frequency and percentage distributions of fingerprint pattern in middle of parents and their children

Print pattern	Father %	Mother %	Child I %	Child II % Middle
Arch	1 (3.4)	7 (24.1)	3 (10.3)	4 (13.8)
Loop	18 (62)	13 (44.8)	22 (75.8)	17 (58.6)
Whorl	10 (34.4)	9 (31)	4 (13.8)	8 (27.6)
Total	100	100	100	100

X^2=6.973, df=9, *P*=0.695

Table 14: Frequency and percentage distributions of fingerprint pattern in thumb of parents and their children

Print pattern	Father %	Mother %	Child I %	Child II % Ring
Arch	2 (6.8)	4 (13.8)	1 (3.4)	2 (6.9)
Loop	17 (58.6)	16 (55.1)	18 (62.1)	18 (62.1)
Whorl	10 (34.5)	9 (31)	10 (34.5)	9 (31)
Total	100	100	100	100

X^2=3.398, df = 8, *P* = 0.907

Table 15: Frequency and percentage distributions of fingerprint pattern in thumb of parents and their children

Print pattern	Father %	Mother %	Child I %	Child II %
Arch	2 (6.8)	3 (10.3)	2 (6.9)	3 (10.3)
Loop	21 (72.4)	18 (62.1)	23 (79.3)	22 (75.8)
Whorl	6 (20.7)	8 (27.6)	4 (13.8)	4 (13.8)
Total	100	100	100	100

X^2=3.433, df=8, *P*=0.904

of children I and II is higher than the father and mother print pattern, while whorl pattern of both children I and II is lower than both parents. The result showed that there is no significant difference between parent fingerprint pattern and that of their biological children in middle digit.

Table 14 showed that the arch print pattern of child I is similar to that of the father while child II arch pattern is similar to that of the father, loop pattern of both children I and II is closer to that of the father than the mother, while whorl pattern of Child I is similar to that of the father print pattern, and child II print pattern is similar that of the mother. From the analysis, it is deduced that there is no significant difference between parent fingerprint pattern and their biological children in ring digit.

Table15 showed that the arch pattern of print of child I is similar to that of the father, while the arch pattern of child II is similar to that of the mother. The loop pattern of print of both children I and II is slightly higher than both parents, while the whorl pattern of both children I and II is closer to that of the father than the mother. The result showed that there is no significant difference between parent fingerprint pattern and their biological children in pinky digit.

DISCUSSION

As regard gender specificity of fingerprint patterns, it is observed that the prevalence of print in the thumb of males is loop (58.4%), whorl (53.8%), and arch (30.8%) while that of female is observed to be arch (69.2%), whorl (46.2%), and loop (41.6%). In index digit, it is observed from the study that the prevalence pattern of print in males is whorl (70.7%), arch (69.95%), and loop (31%) while female had prevalence of loop (69%), arch (30.05%), and whorl (29.3%). The study also showed that the prevalence of print pattern in middle digit of male is whorl (63.9%), loop (43.9%), and arch (43.75%), female had prevalence in arch (56.25%), loop (56.1%), and whorl (36.1%). Furthermore, in ring digit, the prevalence of print in male is observed to be arch (68.6%), whorl (60.6%), and loop (38.95%), while female had prevalence of loop (61.05%), whorl (39.4%), and arch (31.4%). In the last digit (pinky), it is observed that male had prevalence of whorl (56.8%), loop (45.4%), and arch (28.35%), while female had prevalence of arch (71.65%), loop (54.6%), and whorl (43.2%).[12]

From the results in this study, it is observed that female had greater proportion of arches and loops in all five digits, while male had greater proportion of whorl in all five digits. This is consistent with the report of Igbigbi,[13] who reported same in a study of the Yoruba and Igbo ethnic groups. According to his report, the Yoruba females had more of arches and loops while males had more of whorl. In all five digits, whorl pattern occurred most for males, while loop pattern occurred most for females, but the occurrence of arch pattern in female exceed that of male. From this finding, it can be said that male pattern of print is likely to be whorl and female pattern of print is likely to be loop or arch.

Furthermore, an aspect of this study that involves Inter – ethnic Differences in Fingerprint Pattern, showed that Urhobo had high occurrence of arches (73.35%), whorl (65.8%), and loop (61.5%); Ika had prevalence of whorl (21.7%), loop (20.85), and arch (13.35%); Isoko had prevalence of loop (17.65%), arch (13.3%), and whorl (12.5%) in the thumb digit. From the index digit, it is observed that the Urhobo had prevalence of loops (64.6%), arch (55.4%), and whorl (54.7%); Ika had prevalence of whorl (25.3%), loops (18.7%), and arch (15.75%), while Isoko had prevalence of arch (28.85%), whorl (20%), and loops (16.7%). In middle digit, it was observed that the Urhobo had prevalence of loops (72.45%), arches (59.55%), and whorls (55.9%); the Ika had prevalence of whorls (34.3%), arches (21.5%), and Loops (13.25%), while Isoko had prevalence of arches (26.9%), loops (14.35%), and whorls (9.8%). The prevalence of prints observed in ring digit was whorls (64.5%), loops (64.1%), and arches (34.05%) in Urhobo; Ika had prevalence of arches (55.75%), loops (24.2%), and whorls (15.66%) while Isoko had prevalence of whorls (19.8%), loops (11.7%), and arches (10.2%). Furthermore, the pinky digit showed that the Urhobo had prevalence of whorls (72.7%), loops (65.2%), and arches (61.4%); Ika had prevalence of arches (17.6%), loops (15.1%), and whorls (12.3%); and Isoko had prevalence of arches (21%), loops (19.7%), and whorls (15%).

In all digits the most prevalent pattern of print among the Urhobo is Loop, next is Whorl and the least is Arch, the Ika study population had Whorl, followed by Arch and the least is Loop while the Isoko study population had Arch, next is Loop and the least is Whorl. The report of this present study is similar to the report of Jaja and Igbigbi;[12] Osunwoke *et al;*.[14] and Eboh,[15] who reported that the most prevalence pattern among the various ethnicity of their study is loops, next is whorls and the least is arches but did not concur with the work of Danborno and Idris,[16] who reported that the prevalence of whorls is higher than loops among Hausa ethnic groups. The reasons for the differences observed in this study could be as a result of the closeness and distant in ancestry origin.

Furthermore, this research also focused on hereditary pattern of print patterns among families. This study showed that the prevalence of print observed in the thumb digit of fathers (arch, loop, and whorl) was similar to that observed in both child I and child II. In index digit, it is observed that the arch pattern of both child is similar to that of the fathers, loop pattern of child II is similar to both parents but that of child I is slightly higher than that of their parents. In the middle digit, it was observed that both children I and II arch pattern differ slightly from their parents, loop pattern of child I was higher than that of the father and mother but child II loop pattern was slightly lower than that of the father. Furthermore, the ring digit showed that arch pattern of children I and II is similar to that of the father, loop pattern is slightly higher than the father and mother, while whorl pattern of child I is similar to that of the father but that of child II is similar to that of the mother. Results from pinky digit showed that arch pattern of child I is similar to that of the father, while child II is similar to that of the mother, loop pattern of both children I and II is slightly higher than the father while whorl pattern of both child is lower than both parents.

From the result above, the various patterns of prints observed in the father and mother digits and the prevalence of these patterns occurring in the digits of their children. The X^2 analysis of this study showed that there is no significant difference in fingerprint pattern of parents and their biological children. In terms of percentage, the results for the individual digit showed that in the thumb, fathers had prevalence of whorl (27.6%), next is loop (15.5%), and the least is arch (6.9%). In the index digit, the most prevalent pattern of print is loop (22.4%), followed by whorl (18.95%) and the least is arch (8.6%). In the middle digit, the prevalent pattern of print is loop (31%), whorl (17.2%), and arch (1.7%). In the ring digit, the most prevalent pattern of print is loop (29.3%), followed by whorl (17.25%) and the least is arch (3.4%), while the pinky digit showed prevalence of loop (36.2%), whorl (10.35%), and arch (3.4%).

In all digits of mothers, the thumb had prevalence of loop (24.2%), whorl (15.5%), and the least is

arch (10.4%). The index digit showed prevalence of loop (22.4%), next is whorl (18.95%), and the least is arch (8.6%). The result of the middle digit showed the prevalence of loop (31%), next is whorl (17.2%) followed by arch (1.7%). From the result of ring digit, the most prevalence pattern of print is loop (29.3%), next is whorl (17.25%), and the least is arch (3.4%). The pinky digit showed that loop (36.2%) is the most prevalent, followed by whorl (10.35%) and least is arch (3.4%).

The print pattern for child I show that the most prevalent in the thumb is whorl (31%), next is loop (13.8%), and the least is arch (5.2%). The most prevalent in the index digit is loop (24.1%), next is whorl (17.25%), and the least is arch (8.6%). For the middle digit, the most prevalent is loop (37.9%), next is whorl (6.9%), and the least is arch (5.15%). The prevalent pattern of print in the ring digit is loop (31%), followed by whorl (17.25%) and the least is arch (1.7%). The pinky digit showed the prevalence of loop (39.65%), followed by whorl (6.9%) and arch (3.4%).

In the digit of child II, the prevalent pattern of print seen in the thumb is whorl (29.3%), next is loop (13.8%), and the least is arch (6.9%). The index digit showed that the prevalent pattern of print is loop (22.4%), next is whorl (18.95%), and the least is arch (8.6%). The prevalent pattern seen in the middle digit is loop (29.3%), followed by whorl (13.8%), and arch (6.9%). In the ring digit, the prevalent pattern is loop (31.05%), next is whorl (15.5%), and the least is arch (3.45%). The pinky digit showed the prevalence of loop (37.95%), whorl (6.9%), and arch (5.15%).

In all five digit of fathers print pattern, the most prevalent is loop except in the thumb where whorl precedes loop, and the least frequent pattern is arch in all five digits. In mothers print pattern for all five digits, loop is the most prevalent and arch is the least. In all five digits of both Child I and Child II, the most prevalent pattern of print is loop except in the thumb where whorl precedes loop, the least prevalent in all five digits of both Child I and Child II is arch. From this study, the frequency of occurrence in fingerprint pattern between parents and their biological children showed that there is hereditary element in fingerprint pattern. This report corresponds with the report of Galton,[17] who reported that there is genetic link in fingerprint pattern between parents, children, and siblings. From the findings, it can be deduced that fingerprint pattern is not only unique among individual, gender, and ethnicity but is also unique among families.

CONCLUSION

Fingerprint study is an aspect of anthropology known as dermatoglyphic, this aspect of anthropology had served various importance's, and one of such is the identification of individuals. The relevance of this study is focused on the identification of gender, ethnicity and families using fingerprints. This research had achieved its objectives with regards to its focus; hence, this study had scientifically shown that fingerprint pattern is unique among gender, ethnicity, and families. This study will be of great relevance in the field of anthropology and forensic sciences.

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