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FINGERPRINT DISTRIBUTION PATTERNS AND RIDGE COUNTS IN PATIENTS ATTENDING *IN-VITRO* FERTILIZATION CLINIC, UNIVERSITY OF BENIN TEACHING HOSPITAL, BENIN-CITY. NIGERIA

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ABSTRACT: *Dermatoglyphics, the study of skin ridge patterns have been useful for personal identification and also applied as a preliminary supplementary diagnostic tool in unveiling basic biological problems with genetic aetiologies. Azoospermia/severe oligospermia and primary infertility/primary amenorrhoea are suspected to have multifactorial (genetic and environmental) aetiologies. The aim of this study was to evaluate the fingerprint patterns and ridge counts of a total of one hundred and sixty (160) subjects attending the In-vitro fertilization Centre, University of Benin Teaching Hospital, Benin City, Edo State Nigeria. The infertile patients (80) comprised forty (40) azoospermic/severe oligospermic males and forty (40) females with primary infertility/primary amenorrhoea. Their fingerprint patterns and ridge counts were compared with equal number of healthy age-matched control subjects (40 each) of both sexes. The fingerprint patterns and ridge counts were evaluated using a computer based Hp Scanjet scanner and AutoCAD computer software. The data collected were subjected to Chi-square and analysis of variance at 95 % confidence interval.The results showed differences in fingerprint patterns and ridge counts with the arch and whorl patterns insignificantly ($p>0.05$) lesser in the infertile group compared to control. The ulnar was insignificantly ($p>0.05$) more in infertile group while the radial loop was significantly ($p<0.05$) more in infertile group compared to control. Among the males, the distribution of radial loop and whorl was significantly ($p<0.05$) different while in the females, the distribution of arch and whorl was also significantly ($p<0.05$) different compared to control. The total finger ridge count was insignificantly ($p>0.05$) greater in azoospermic/severe oligospermic males but was significantly ($p<0.05$) greater in females with primary infertility/primary amenorrhoea compared to control. The inference from this study is that there is significant correlation between the pattern of fingerprint distributions and ridge counts in males and females with primary infertility attending the In-vitro Fertilization Centre, University of Benin Teaching Hospital (UBTH), Benin-City. Nigeria.*

KEYWORDS: Fingerprint, Ridge Count, *In-Vitro* Fertilization Clinic, UBTH.

INTRODUCTION

Dermatoglyphics pattern begins to appear on the volar aspect of palm at the early 6^{th} to 7^{th} week of gestation and become prominent later, till their maximum size by 12^{th} week of gestation. This pattern of the dermal ridges developed during the intrauterine life remains constant throughout life and each individual's ridge configurations are unique and remain unchanged (Maltoni *et al.*, 2009). Hence, fingerprint which are genetically determined and remains stable over lifetime can therefore be useful in genetic research, forensic investigation and even for the purpose of personal identification (Igbigbi *et al.*, 2004).

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Fingerprint patterns include the Arch, which is the simplest and commonest pattern formed by more or less parallel ridges, which traverse from one side of the finger, elevates in the centre to form an arc and then exit through the other side of the finger. It may be further sub-classified as plain when the ridges rise just over the middle of the finger or tented when the ridge rise to a point ((Marera *et al.,* 2015)). The Loop pattern ridges enter from one side of the finger re-curves abruptly and leaves the pattern area on the same side. It can also be subdivided into ulnar loop which opens to the ulnar side or radial loop which opens at the radial margin. In the Whorl pattern, ridges are arranged as a form of concentric ring or spiral around the central point either in a clockwise or anticlockwise manner. The three basic fingertip patterns are triradii, core and radiants. Triradius (Delta) is the meeting of three ridge system forming 120 degree angles with one another. The core is the approximate centre of the pattern while the radiants (Typelines) are ridges emanating from the triradius enclosing the pattern area (Thompson and Thompson, 1989; Igbigbi *et al.,* 2004; Umana *et al.*, 2013; Marera *et al.*, 2015). Dermatoglyphic characteristics have been proven to be effective diagnostic method as a disease marker for diseases with genetic origin such as diabetes and hypertension (Igbigbi *et al.*, 2004; Oladipo and Ogunnowo, 2004; Umana *et al.*, 2013). The diagnostic role of dermatoglyphics became obvious especially in chromosomal abnormality ((Marera *et al.*, 2015) where global interest in epidermal ridges developed, mostly in the last several decades with glaring evidence that most patients with chromosomal aberrations had unusual ridge formations. Hence, dermatoglyphic patterns of some genetical diseases such as leukemia, Down's syndrome, diabetes, schizophrenia, hypertension, breast cancer and sickle cell anaemia have been studied (Gillican *et al.*, 1985). Such study on sickle cell anaemia revealed that the whorl pattern was the commonest in patients with the disease state and also among male carriers (Ramesh, 2012).

Studies on the dermatoglyphics of patients with rheumatoid arthritis revealed that radial loop and whorl were more common while the arch and ulnar loop were less common (Alter and Schulengberg, 1976). Epidermal ridge inspection tends to provide simple and cheap means of determining whether a patient had a particular chromosomal defect, a single gene disorder and in cases where the genetic basis of the disorder is unclear (Alter and Schulengberg, 1976). Infertility is one of such health challenge with possible genetic origin. It is considered as the inability to conceive after one year of regular sexual intercourse without the use of contraception (Templeton *et al.*, 2000). It could be primary or secondary and the causes of infertility can be grouped as male factor, female factor, combined male and female factor and unexplained (Boivin *et al.*, 2007). Primary infertility often result from male and female factor abnormalities involving the gametes of sperm and ovum from congenital or idiopathic aetiology while secondary infertility is mostly from acquired causes (Gurunath *et al.*, 2011). In the female, age, genetics and failure to ovulate viable eggs have been implicated (Cooper *et al.*, 2010). In general, infertility in males and females has multiple aetiologies which could be genetic or environmental. In men, semen abnormalities such as oligospermia, asthenozoospermia, teratozoospermia and azoospermia are the main factors implicated. In over 50% of infertile men the cause of infertility is unknown and good proportions have been associated with several genetic and non-genetic conditions (Inhorn and Patrizio, 2015). Some genetic factors that have been associated with semen abnormalities include chromosomal disorder, mitochondrial DNA mutations, monogenic disorders, multifactorial and endocrine disorders of genetic origin (Gurunath *et al.*, 2011. There has been a marked increase in the population of patients in *In-vitro* fertilization clinics all over the world during the last two and

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half decades. Hence, it would be of great relevance if persons predisposed to infertility of genetic origin can be detected much earlier before the onset of the medical challenge (Boivin *et al.*, 2007). It has been strongly posited that the science of dermatoglyphics may help to identify suspected infertile patients from a large population which can be further subjected to more clinical investigation (Sontakke *et al.*, 2012).

Variations of finger and palmar dermatoglyphics have been conducted in diagnosed primary infertile males in different populations (Salam *et al.*, 1984; Makol *et al.*, 1994). Abeliovich *et al.*, (1986) concluded that patients with aberrations of Y chromosome were azoospermic and that they might have lost the required gene for normal spermatogenesis. Pour-Jafari *et al.*, (2005) showed that the loop pattern was most frequent in both oligospermic and azoospermic patients. It is the opinion of Meenaksi *et al.*, (2006) that studies on fingerprint patterns of primary amenorrhea cases could assist to further refer patients for karyotyping and counselling. Although similar studies have been conducted in several countries across the globe, no known literature presently exists on the fingerprint patterns among patients attending the *In-vitro* Fertilization Centre of University of Benin Teaching Hospital, Benin City; hence this study.

MATERIALS AND METHOD

Research design: The study adopted the descriptive cross-sectional survey of the quantitative design.

Study population: A total of one hundred and sixty (160) subjects, aged 18 years and above and Nigerians by nationality were used for the study. It involved the major ethnic groups around the geopolitical zone that attended the *In-vitro* Fertilization Centre, University of Benin Teaching Hospital, Benin-City, between February to July, 2017. The study population were of the following tribes: Ibo, Yoruba, Bini, Esan, Afemai, Urhobo and Isoko.

Sampling Technique: In the study centre, whole subjects attending the clinic were used. Of the one hundred and sixty (160) subjects, eighty (80) infertile patients of both sexes, were diagnosed at the *In-vitro* Fertilization Centre, University of Benin Teaching Hospital, Benin-City between February to July, 2017. Also, another eighty (80) respondents of both sexes aged-matched with no family history of infertility were used as the control group. The study groups, thus comprised of:

a) 80 infertile patients made up of 40 males azoospermic/ severe oligospermic males and 40 females with primary infertility/primary amenorrhea.

b) 80 fertile subjects as control group made up of 40 males with history of previous childbirth and no azoospermia/severe oligospermia but normal sperm analysis and 40 females who had given birth before, no detected gynaecological abnormality and currently pregnant.

Selection Criteria: The followings were the inclusion criteria:

a) No obvious physical deformities on the fingertips
b) Individuals who declined assent for inclusion in the study were excluded
c) Subjects must be Nigerians by nationality.

Exclusion criteria:

a) Subjects with deformities and inflammation on their Fingers
b) Individuals who declined assent for inclusion in the study were excluded
c) Non-Nigerians by nationality

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Study Area: The study was conducted at the University of Benin Teaching Hospital, (UBTH), Benin-City. The study essentially involves Nigerians. The Teaching Hospital is a tertiary health facility located in Benin- City, the capital of Edo state, Nigeria. Several referral cases from neighbouring States with peoples of diverse tribes and cultures are handled at this health Institution.

METHODOLOGY

The study and its aim were explained to the subjects whose consents were thereby obtained. Demographic details was obtained using a semi-structured questionnaire which comprised of subjects bio-data such as gender, age, marital status, tribe, occupation, diagnosis and number of children. Finger print was collected using a computer assisted data capture. Firstly, the palm was exposed and all forms of liquid were wiped with tissue paper. Forthwith, the hand was placed with the palm flat on the HP scanner (4800x9600 dpi resolutions) with the thumb approximately 30-40 degrees and other fingers 10-15 degree abduction. The palm and finger images were recorded in jpeg format on the computer (Oghenemavwe and Osaat, 2015).

Ethical Approval: The study was carried out under ethical approval with the protocol number of ADM/E22/A/VOL. VII/14517 from the Research and Ethics Committee of University of Benin Teaching Hospital, Benin-City and the consent of the subjects was also duly obtained.

Data Analysis: The data collected from the subjects were recorded and analyzed with the aid of the IBM Statistical Package of Social Sciences (SPSS) version 23. A p-value of <0.05 was considered significant. Obtained data were presented using descriptive statistics (standard error and mean). Chi- square test was used to assess the association between the variables of fingerprint patterns.

RESULTS

Table 1.1a & b showed the results of demographic data of the 160 questionnaires administered, out of which 80 (40 males and 40 females) were infertile, azoospermic/severe oligospermic or with primary amenorrhoea, respectively. Another group comprised 80 subjects (40 males and 40 females) which served as the fertile (Control) subjects. The age of respondents was between 18-60 years. From these, 35.62% were within the age group of 18-34, 57.50% were within the age range of 35-60 years while 60 years and above constituted 6.88%. More than half (58.75%) of the respondents were Binis while 41.25% was shared among the following tribes: Esan (12.5%), Afemai (7.5%), Ibo (6.88%), Urhobo (6.25%), Yoruba (5.0%) and Isoko (3.12%). Majority of the respondents (59.37%) were traders, 37.50% were civil servants and 3.13% were in School. One hundred and fifty six (97.5%) of the respondents were married while 2.5% were single. Most of the subjects were Christians (95.0%) while 5.0% were Muslims. Half of the respondents (50.0%) had not given birth before, while 16.87% had below five children and 33.13% had five and above number of children. Majority of them had their educational level as primary (46.87%) and 3.13% were without educational background while those who had secondary and post-secondary education were 32.50% and 17.50% respectively. One hundred and forty (87.50%) of the respondents had AA and 12.50% had AS genotype. Blood group 'O' was (46.87%) of the respondents, followed by 'A' (43.13%). Others include: 'B' and 'AB'

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blood groups with proportions of 6.25% and 3.75% respectively. More than half (53.13%) of the respondents had no family history of infertility while 46.87% had family history of infertility.

The results of this study revealed (Table 1.2) the distribution patterns of one thousand six hundred (1600) fingerprint obtained by assessing the ten (10) fingers of eighty (80) infertile subjects with Azoospermia/ severe Oligospermia and Primary infertility/Primary amenorrhea cases and eighty (80) fertile (control) subjects of both sex (800 fingerprint patterns each, respectively. They were assessed for the followings: Arch, Ulnar loop, Radial loop and Whorl patterns. For the control group, out of the eight hundred (800) fingerprints patterns assessed, Arch was 124 (15.5%), ulnar loop was 462 (57.8%), Radial loop was 12 (1.5%) and Whorl was 202 (25.2%). The result obtained for the infertile subjects was as follows: Arch was 104 (13.0%), Ulnar loop was 473 (59.1%), Radial loop was 30 (3.8%) and Whorl was 193 (24.1%). The findings showed that the distribution of arch pattern was insignificantly ($p>0.05$) lesser in the infertile subjects compared to the fertile control subjects. The ulnar loop pattern was though predominant in infertile subjects compared to control, but was also insignificant ($p>0.05$). The distribution of radial loop pattern was significantly more ($p<0.05$) in the infertile subjects compared to control while the whorl pattern was more in infertile patients but insignificant ($p>0.05$) compared to the fertile control subjects.

Table 1.3 showed the gender distribution of fingerprint pattern of the infertile (azoospermic/ severe oligospermic males and females with primary infertility) compared to the fertile control. A total of 400 fingerprint patterns for every male and female in the study group was obtained by assessing the ten (10) fingers of forty (40) males and forty (40) females of the infertile group and the control group respectively. For the males, the followings were found: arch was 55 (13.8%) for the control and 66 (16.5%) for azoospermic/ severe oligospermic group; ulnar loop was 199 (49.8%) for the control and 66 (16.5%) for azoospermic/ severe oligospermic group; radial loop was 7 (1.8%) for the control and 19 (4.8%) for azoospermic/severe oligospermic group; and whorl pattern was 139 (34.8%) for the control and 83 (20.8%) for azoospermic/severe oligospermic males. In females, the result was as follows: arch was 69 (17.2%) for the control and 38 (9.5%) for females with primary infertility; ulnar loop was 263 (65.8%) for the control and 241 (60.2%) for females with primary infertility; radial loop was 5 (1.2%) for the control and 11 (2.8%) for females with primary infertility; whorl pattern was 63 (15.8%) for the control and 110 (27.5%) for females with primary infertility, respectively. The findings here showed that the distribution of arch pattern was more but insignificant ($p>0.05$) in the male infertile group but was significantly ($p<0.05$) lesser in the female infertile group compared to the fertile control. The distribution of ulnar loop pattern was more but insignificant ($p>0.05$) in the male infertile group, whereas, it was insignificantly ($p>0.05$) lesser in the female infertile group compared to fertile control. The radial loop pattern was significantly ($p<0.05$) more in the male infertile group but insignificantly ($p>0.05$) more in the female infertile group compared to fertile control. The whorl loop pattern was significantly ($p<0.05$) lesser in the male infertile group but was significantly ($P<0.05$) more in the female infertile group compared to the fertile control.

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Table 1.4 showed the comparative distribution of fingerprint patterns between left and right hands of fertile control and the infertile male group (azoospermic/ severe oligospermic). A total of 200 fingerprint patterns each on the left and right hand of the study groups were obtained by assessing the five (5) fingers of forty (40) males each of both study groups. For the left hand, the followings were found: arch was 30 (15.0%) for the control and 35 (17.5%) for azoospermic/severe oligospermic males; ulnar loop was 102 (51.0%) for the control and 114 (57.0%) for azoospermic/severe oligospermic males; radial loop was 5 (2.5%) for the control and 9 (4.5%) for azoospermic/severe oligospermic males; whorl pattern was 63 (31.5%) for the control and 42 (21.0%) for azoospermic/severe oligospermic males, respectively. On the right hand, the result was as follows: arch was 25 (12.5%) for the control and 31 (15.5%) for azoospermic/severe oligospermic males; Ulnar loop was 97 (48.8%) for the control and 118 (59.0%) for azoospermic/severe oligospermic males; radial loop was 2 (1.0%) for the control and 10 (5.0%) for azoospermic/severe oligospermic males; whorl pattern was 76 (38.0%) for the control and 41 (20.5%) for azoospermic/severe oligospermic males, respectively. The result revealed that the distribution of arch pattern was insignificantly ($p>0.05$) more on the left and right hands of azoospermic/ severe oligospermic males compared to control. It also showed that the ulnar loop pattern was insignificantly ($p>0.05$) more in the left and right hands of azoospermic/severe oligospermic males compared to control. The radial loop was insignificantly ($P>0.05$) more on the left hand but was significantly ($p<0.05$) more on the right hand of azoospermic/severe oligospermic males compared to control. The whorl patterns was significantly ($p<0.05$) lesser on the left and right hands of azoospermic/severe oligospermic males compared to the fertile control.

Table 1.5 shows the comparative distribution of fingerprint patterns between left and right hands of females with primary infertility and control. A total of 200 fingerprint patterns each on the left and right hand of the study groups were obtained by assessing the five (5) fingers of forty (40) females each of both study groups. For the left hand, the followings were found: arch pattern was 36 (18.0%) for the control, and 18 (9.0%) for females with primary infertility; ulnar loop was 130 (65.0%) for the control and 122 (61.0%) for females with primary infertility; radial loop was 3 (1.5%) for the control and 6 (3.0%) for females with primary infertility; whorl pattern was 31 (15.5%) for the control and 54 (27.0%) for females with primary infertility, respectively. On the right hand, the result was as follows: arch pattern was 33 (16.5%) for the control and 20 (10.0%) for females with primary infertility; ulnar loop was 133 (66.5%) for the control and 119 (59.5%) for females with primary infertility; radial loop was 2 (1.0%) for the control and 5 (2.5%) for females with primary infertility; Whorl pattern was 32 (16.0%) for the control and 56 (28.0%) for females with primary infertility, respectively. The findings here revealed that the distribution of arch pattern was significantly ($p<0.05$) lesser on the left hand but insignificantly ($p>0.05$) lesser on the right hand in females with primary infertility compared to control. It also showed that the distribution of the ulnar loop was insignificantly ($p>0.05$) lesser on the left and right hands of females with primary infertility compared to control. The radial loop pattern was insignificantly ($p>0.05$) more on the left and right hands of females with primary infertility compared to control. The whorl pattern was significantly ($p<0.05$) more on the left and right hands of female with primary infertility compared to that of control.

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Table 1.1a: Socio-Demographic Characteristics of the Respondents

N=160

VARIABLE	FREQUENCY	PERCENTAGE
Category of respondents		
Azoospermic/oligospermic males	40	25.0
Females with Primary infertility	40	25.0
Control (fertile subjects, Males)	40	25.0
(fertile subjects, Females	40	25.0
Gender of respondents		
Male	80	50.0
Female	80	50.0
Age of respondents		
18-34	57	35.62
35-60	92	57.57
60+	11	6.88
Tribe of respondents		
Bini	94	58.75
Esan	20	12.5
Afenmai	12	7.5
Urhobo	10	6.25
Ibo	11	6.88
Isoko	5	3.12
Yoruba	8	5.0
Religion of respondents		
Christian	152	95.0
Muslim	8	5.0

Table 1.1b: Socio-Demographic Characteristics of the Respondents
N=160

VARIABLE	FREQUENCY	PERCENTAGE (%)
Marital status of respondents		
Married	156	97.5
Single	4	2.5
Number of children of respondents		
Nil	80	50
Below 5	27	16.87
5 and above	53	33.13
Educational status of respondents		
None	5	3.13
Primary	75	46.87
Secondary	52	32.50
Post-secondary	28	17.50

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Occupation of respondents		
Civil servants	60	37.50
Trading	95	59.37
In school	5	3.13
Genotype of respondents		
AA	140	87.50
AS	20	12.50
Blood group of respondents		
A	69	43.13
B	10	6.25
AB	6	3.75
O	75	46.87
Family history of respondents		
Yes	75	46.87
No	85	53.13

Table 1.2: Distribution of Fingerprint Patterns of Infertile Subjects and Control.

FERTILE CONTROL			INFERTILE SUBJECTS		
Pattern	Frequency	Percentage	Frequency	Percentage	P-value
A	124	15.5%	104	13.0%	0.185
UL	462	57.8%	473	59.1%	0.719
RL	12	1.5%	30	3.8%	0.005
W	202	25.2%	193	24.1%	0.651
TOTAL	800	100%	800	100%	

Table 1.3: Gender Distribution of Fingerprint Pattern of Control Subjects and Infertile group of both sexes.

PATTERN	Control Male	Azoospermia /Oligospermia Male	P-value	Control Female	Primary infertility Female	P-value
A	55(13.8%)	66(16.5%)	0.317	69(17.2%)	38(9.5%)	0.003
UL	199(49.8%)	232(58.8%)	0.112	263(65.8%)	241(60.2%)	0.327
RL	7(1.8%)	19(4.8%)	0.019	5(1.2%)	11(2.8%)	0.134
W	139(34.8%)	83(20.8%)	0.001	63(15.8%)	110(27.5%)	0.001
TOTAL	400(100%)	400(100%)		400(100%)	400(100%)	

A: Arch UL: Ulnar loop RL: Radial loop W: Whorl

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Table 1.4: Comparative Distribution of Fingerprint Patterns between the Right and Left Hands of Azoospermic/Severe Oligospermic Males and Control

PATTERN	Left Hand			Right Hand		
	Control	Azoospermic /Oligospermic	P-value	Control	Azoospermic /Oligospermic	P-value
A	30(15.0%)	35(17.5%)	0.384	25(12.5%)	31(15.5%)	0.423
UL	102(51.0%)	114(57.0%)	0.414	97(48.8%)	118(59.0%)	0.152
RL	5(2.5%)	9(4.5%)	0.285	2(1.0%)	10(5.0%)	0.021
W	63(31.5%)	42(21.0%)	0.040	76(38.0%)	41(20.5%)	0.001
TOTAL	200(100%)	200(100%)		200(100%)	200(100%)	

Table 1.5: Comparative Distribution of Fingerprint Patterns between the Right and Left Hands of Females with Primary Infertility and Control

PATTERN	LEFT HAND			RIGHT HAND		
	CONTROL	Primary Infertility	P-value	CONTROL	Primary Infertility	P-value
A	36(18.0%)	18(9.0%)	0.014	33(16.5%)	20(10.0%)	0.074
UL	130(65.0%)	122(61.0%)	0.614	133(66.5%)	119(59.5%)	0.378
RL	3(1.5%)	6(3.0%)	0.317	2(1.0%)	5(2.5%)	0.257
W	31(15.5%)	54(27.0%)	0.013	32(16.0%)	56(28.0%)	0.011
TOTAL	200(100%)	200(100%)		200(100%)	200(100%)	

A: Arch UL: Ulnar loop RL: Radial loop W: Whorl

DISCUSSION

Dermatoglyphics investigations has been useful for personal identification and also applied as a preliminary supplement in unveiling basic biological problems in genetics, evolution and medicine especially in situations where there is strong genetic evidence of a disease. The major concern of this study was the evaluation of dematoglyphics patterns in infertile patients (males and females) presenting with diagnosis of severe oligospermia/azoospermia in males and primary infertility (primary amenorrhea) in females at the UBTH, Benin-City.

The distribution of the arch pattern in this study was insignificantly (p>0.05) lesser in the infertile group compared to the control. This finding contradicts Pour-Jafari *et al.,* (2005); Meenakshi *et al.,* (2006) and Shweta *et al.,* (2014), who reported a significantly lesser arch pattern in infertile subjects compared to control. The distribution of the ulnar loop pattern was insignificantly (p>0.05) more in the infertile group compared to control. This result is at variance with the submissions of Salam *et al., (*1984); Pour-Jafari *et al.,* (2005); Meenakshi *et al.,* (2006); Sontakke *et al.,* (2012) and Shweta *et al.,* (2014)) who reported ulnar loop to be significantly more infertile subjects with abnormal karyotype compared to fertile control with normal karyotype. The distribution of the radial loop pattern was significantly (p<0.05) more in the infertile group compared to control. This finding is in agreement with Meenakshi *et al.,* (2006) and Shweta *et al.,* (2014) who reported a more significant distribution of radial loops in infertile subjects with abnormal karyotype compared to the fertile control. The distribution of the whorl pattern from this study was insignificantly (p>0.05) lesser in the infertile group

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compared to control. This finding supports Sontakke *et al.,* (2012) who reported an insignificant distribution of the whorl pattern in infertile subjects compared to control; but contradicts the submissions of Salam *et al.,* (1984); Pour-Jafari *et al.,* (2005) Meenakshi *et al.,* (2006) and Shweta *et al.,* (2014) who reported that the whorl pattern was significantly more in infertile subjects compared to control.

The findings (Table 1.3) revealed that the distribution of arch pattern was insignificantly (p>0.05) more in infertile male (azoospermic/severe oligospermic) but was significantly (p<0.05) more in females with primary infertility compared to control. For the males, this finding varies from that of Pour-Jafari *et al.,* (2005) who reported significantly (p<0.05) higher incidence of arch in azoospermic/severe oligospermic males compared to control. For the females, this finding is supported by Meenakshi *et al.,* (2006); Shweta *et al.,* (2014) who indicated the distribution of arch pattern as significantly lesser in females with primary infertility compared to control. The distribution of the ulnar loop pattern from the study was insignificantly (p>0.05) more in the azoospermic/severe oligospermic males but was insignificantly (p>0.05) lesser in females with primary infertility compared to control. The finding varies from the submissions of Salam *et al.,* (1984); Pour-Jafari *et al,* (2005) and Sontakke *et al.,* (2012) who reported significantly more incidence of ulnar loop pattern in azoospermic/severe oligospermic males compared to control. In the females, this finding supports the submissions of Meenakshi *et al.,* (2006) and Shweta *et al.,* (2014) where the ulnar loops was significantly lesser in the primary amenorrhoeic females compared to control. The distribution of the radial loop pattern was significantly (p<0.05) more in azoospermic/severe oligospermic males but was insignificantly (p>0.05) more in females with primary infertility compared to control in this study. Related studies reveals that this finding supports the submissions of Salam *et al.,* (1984); Pour-Jafari *et al.,* (2005); Sontakke *et al.,* (2012) who reported that the radial loop is significantly more in infertile male compared to control. However, the finding in females contradicts the submissions of Meenakshi *et al.,* (2006) and Shweta *et al.,* (2014) where the radial loop was significantly more in the primary amenorrhea patients compared to fertile female control. The distribution of the whorl pattern was significantly lesser (p<0.05) in the azoospermic/severe oligospermic males but was significantly (p<0.05) more in females with primary infertility compared to control in this study. This result in the males is supported by the submissions of Pour-Jafari *et al.,* (2005) where the whorl was significantly lesser in the azoospermia/oligospermic males compared to control. However, it contradicts the submission of Sontakke *et al.,* (2012) who reported the whorl pattern as insignificantly more in infertile males compared to control. The result in females supports the earlier submission of Shweta *et al.,* (2014) where the whorl pattern was significantly more in females with primary infertility compared to control. However it is at variance with the submission of Meenaskhi *et al.,* (2006) where whorl was insignificantly lesser in females with primary infertility compared to control. A possible explanation for these observed differences could be attributed to the effects of genetic and ethnic variations.

The distribution of fingerprint patterns among males assessed from both hands (Table 1.4) revealed arch and ulnar loop patterns as insignificantly (p>0.05) more in both the right and left hands of azoospermic/severe oligospermic males compared to control. The distribution of radial loop pattern was insignificantly (p>0.05) more in the left hand and significantly (p<0.05) more in the right hand of azoospermic/severe oligospermic males compared to control. The distribution of the whorl pattern was significantly (p<0.05) less in the both right and left hands

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of azoospermic/severe oligospermic males compared to control. In this study, the distribution of fingerprint patterns among females assessed from both hands (Table 1.5) revealed arch pattern as significantly ($p<0.05$) lesser on the left hand and insignificantly lesser ($p>0.05$) on the right hand of females with primary infertility compared to control. The distribution of the ulnar loop pattern was insignificantly ($p>0.05$) lesser on both the right and left hands of females with primary infertility compared to control. The distribution of the radial loop pattern was insignificantly ($p>0.05$) more on both right and left hands of females with primary infertility compared to control. The distribution of the whorl pattern was significantly ($p<0.05$) more on the right and left hands of females with primary infertility compared to control.

CONCLUSION

It is remarkable that preponderance of ulnar loops to other patterns of distribution was noted in the study sample. Also, the specific fingerprint features associated with infertility cases include a greater distribution of arch, ulnar loop and radial loop patterns, but lesser distribution of whorl pattern in the infertile male compared to the control. In the females, there were lesser distribution of arch and ulnar loop patterns and greater distribution of radial loop and whorl patterns, compared to control. It was also noted that there was a greater mean value of total finger ridge count in the infertile group (male and female) compared to the controls. One might thus infer from these that significant association exists between the distribution of fingerprint patterns in infertile subjects (azoospermic/oligospermic males and primary infertile females), compared to the controls.

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