American Scientific Research Journal for Engineering, Technology, and Sciences (ASRJETS)
ISSN (Print) 2313-4410, ISSN (Online) 2313-4402

http://asrjetsjournal.org/

Prevalence of Fingerprint Patterns in Multiple and Single Births Women of Igbo-Ora, Nigeria, West Africa

Thomas Kehinde Adenowo[a*], Olugbenga Olawale Eweoya[b]

[a]*Department of Anatomy, Olabisi Onabanjo University, Ikenne, Ogun State. Nigeria*
[b]*Department of Anatomical Sciences, University of Abuja, Abuja. Nigeria*
[a]*Email: ewegbenga@gmail.com; Tel.No: +2347032202974*

Abstract

Fingerprints are very important in the identification of any individual in forensic science. Beginning from the 21st century, the study of fingerprints has gained much recognition as a diagnostic tool especially in Criminology, Anthropology, Dysmorphology and Medicine. This present study was conducted to establish the relationship between fingerprint patterns and Multiple births. A total of 200 healthy and consenting female subjects (105 multiple births and 95 single births women) aged between 25 and 50 years (37.5+/-2) of Igbo-Ora descent were selected for the study through random sampling. Fingerprints obtained from rolled ink pad were imprinted twice on a designed 10 digit proforma white A4 paper. Fingerprint patterns were identified with magnifying glass x20, analyzed, compared, and evaluated for the women by both authors independently. The principal patterns among women with Multiple births were Whorls (19.7%), Arches (15.5%), Ulnar (56.8%) and Twin loops (5.2%). The study also showed that Radial loop pattern (4.5%) was more predominant in Single births women. Whorls, Arches,Ulnar and Twin loops were more in women with Multiple births than those with Single birth and these differences were statistically significant ($p<0.05$).

Keywords: Fingerprints; Multiple births; Anthropology; Forensic science; Igbo-Ora, Ink pad.

1. Introduction

Human identification is an important aspect in Criminology and Forensic science. The identification may be partial or complete although the complete identification of an individual is a responsibility of police and most times it becomes difficult especially in decomposed or severely mutilated bodies. In such cases partial identification by Medical or Police officers may become important to arrive at a conclusion [10, 17].

---

* Corresponding author.

Some parameters used for the identification purposes include, fingerprints, race, handwriting, gender, skin texture, garments and DNA profile [4].The most important of these parameters is the fingerprint which often provide the positive identification of an individual or suspect because it is unique, durable and permanent [4]. Fingerprints are the prime and infallible means of identification in forensic investigations and trials [11]. Scientific study of the fingerprints, footprints and palm prints is referred to as Dermatoglyphics which was coined from two ancient Greek words; Derma=Skin, Glyphae=Carvings [1, 6, 15]. Fingerprint determination is genetic and it is affected by intrauterine environment in the first trimester of pregnancy though they are characterized by alternating strips of raised frictional ridge and depressed grooves on the fingertips [24]. Fingerprint starts to develop by 6^{th} week of intrauterine life and is fully formed by 21^{st} week and is permanent once formed [16, 24]). Human fingerprint is characterized by various types of ridge patterns classified as an Arch, a Loop, or a Whorl—each has a unique characteristic with respect to a reference point called a Triradius [9]. Multiple births occur when more than one fetus is delivered at birth which could be natural or through assisted human reproduction. Common multiples are usually twins and triplets but can also depend on the number of babies [13]. Multiple births can be monozygotic or dizygotic in nature, and Monozygotic twins result from a single fertilized ovum followed by splitting while dizygotic twins result from the fertilization of two separate ova by two different sperm cells [3]. The incidence of twins varies from all over the World but there is high Incidence in Kondihi,India(17%) and Candido Godoi,Brazil(10%) although the Incidence is not as high as in Igbo-Ora which was found to be 68% [18]. Twins played an important spiritual role among several societies of West Africa, some society such as Igbo in South East Nigeria were killing twins out of greater fear previously, a culture which was stopped by a Scottish missionary, Mary Slessor whereas their Yoruba counterpart in South Western Nigeria loved twins and worshipped them [2]. Variation was observed in the Dermatoglyphic patterns of different digits of same individual [7]. Previous researches had shown emphasis on fingerprint because of their permanence, repeatability, reliability and uniqueness in Dermatoglyphic, Anthropology. This study was therefore carried out to establish the relationship between fingerprint patterns and multiple births with a view to predicting the tendency of a woman to giving birth to multiples.

2. Materials and Methods

Ethical consideration

Ethical consideration was sought and obtained from Ladoke Akintola University Teaching Hospital, Ogbomosho, Oyo State, because of its proximity to the study site.

Limitations

Subjects who lived in Igbo-Ora since their birth and below 50years old were included in the study while subjects above 50years and with any injury or permanent deformity to the fingers were excluded from the study.

2.1 Methodology

The study was conducted on 200 presumably healthy and consenting females of Igbo-Ora indigenes (105 women with multiple births and 95 women with single births).

The subjects had parental history of about two Ancestral generations from Igbo-Ora. The subjects gave their free consent to take part in the study.Informed consents were obtained from the subjects before taken their fingerprint patterns.

2.1.1 Procedure

The subjects were asked to wash and dry their hands with the soap, water and towel provided, after which they were asked to roll their finger pulps on the stamp ink pad provided, and imprints were made serially on the 10 digit proforma form designed for the study [6] see Figure 2.

The prints were obtained in duplicates and 4,000 fingerprints were studied for dermatoglyphics analysis with the aid of a x 20 magnifying glass. Care was taken to ensure fingerprints were put in the spaces provided on the designed form and appropriately coded. The same steps were used for the ten fingers of all the other subjects who had given consent and randomly selected for the study.

Excessive pressure was avoided to prevent smudging of the prints. All the data were tabulated and statistically analyzed. Descriptive statistics were used to establish frequencies in the table for further analysis. Out of the 4,000 fingerprints collected from the subjects, 2000 were finally selected.

Patterns of the rolled fingerprint impressions were analyzed, compared, evaluated and verified, this was done by both authors independently.

Among the 2000 fingerprints analyzed, common patterns observed were: Ulnar and Radial loops, Whorls, and Arches see figure 1 below. (Arrow mark delineates the Triradius in the pattern).

3. Results

In this study, both qualitative and quantitative observations were recorded.

a. Evaluation of Digital Dermatoglyphic observations.

In all the subjects studied in Igbo-Ora, the underlisted fingerprints patterns were documented:

i) Ulnar Loop = The ridges were characterized by a waterfall flowing towards the little finger and it has one triradius.(see i below)
ii) Twin Loop = Here the loop was characterized by two triradii at the ulnar and radial sides of the finger, it is observed as two opposite loops which looks like capital letter S.(see iv)
iii) Simple Arches = This was characterized by ridges which appeared simple, and look hilly, with no triangle formation in the shape.(see iii)
iv) Concentric whorls = Here, the ridges formed lines starting from the center of the small circle, and expanded outwards like concentric circles and it has two triradii.(see ii).

(i) Ulnar loop (Rt Thumb) **(ii) Concentric whorl**

(iii) Simple Arches **(iv) Twin loop (Lt Thumb**

Figure 1: Digital patterns among females in Igbo-Ora.

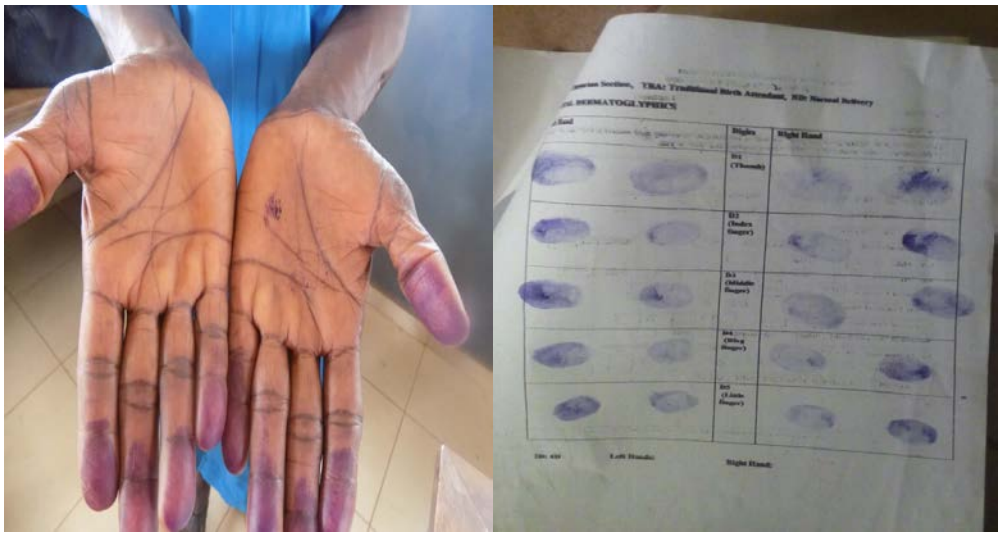

Figure 2: Picture of stained finger pulps and prints.

4. Discussion

Apart from qualitative classification of the fingerprint pattern described above, different indices are also taken into consideration for quantitative assessment. These indices include: Pattern Intensity Index, Dankmeijer's index and Furuhata index. The formulae are given below:

Pattern intensity index = [(2 × % whorl + % loop) ÷ 2].

Dankmeijer's index = [(% arches ÷ % whorl) × 100].

Furuhata's index = [(% whorl ÷ % loop) × 100] [24]

Table 1.0: Comparison of the Quantitative Index in Multiple and Single births women.

Quantitative Indices	Multiple births women	Single births women
Pattern Intensity Index	52.1	53.6
Dankmeijer's Index	78.7	62.2
Furuhata Index	30.4	27.0

A total of 4,000fingerprints were studied, out of which 2,000 fingerprints pattern were analyzed, compared and evaluated. Overall, whorls (19.7%) followed by arches (15.5%) and twin loop (5.2%) were found to be more prevalent in multiple births women compared to arches (11.7%), twin loop (4.0%), and whorls (18.8%) in single births women. The difference was statistically significant ($p < 0.05$). The radial loop (2.8%) was the least fingerprint pattern in multiple births women compared to single births women which was 4.5%.

A detailed frequency and percentage distribution of each fingerprint pattern is seen in Table 2.0 and 3.0 for both multiple and single births women respectively.

There was dominance of ulnar loop in both hands of multiple and single birth women (56.8% and 60.6% respectively) although prevalence was higher in single births women (Table 2.0).

In the fourth digits of both women, percentage whorls were observed to be more than loops and this supports the study by [18] (Table 4.0).

The result of this study contradicts contradicts the study done by [8].Also in Table 3.0 there was no radial loop on the fourth digit of multiple births women.

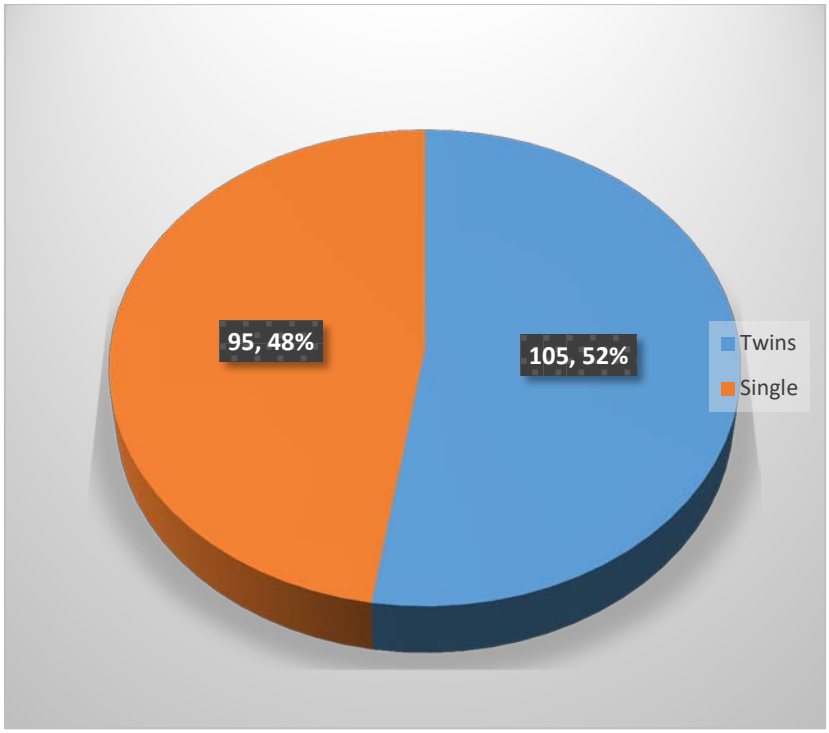

Figure 3: Pie chart showing the study group of multiple and single births women.

The frequency and percentage (%) of pattern types between mothers with multiple births (n=105) and mothers with single birth (n=95).

Table 2.0: Right (Rt) and Left (Lt) Hands.

Fingerprint Patterns	**Multip(Lt) Freq (%)**	**Single(Lt) Freq (%)**	**Multip(Rt) Freq (%)**	**Single(Rt) Freq(%)**	**Multip (Both hands) Freq (%)**	**Single (Bothhands) Freq (%)**	**Std. Devn**	**P-value**
Arches Lp	88(16.8)	58(12.2)	75(14.3)	54(11.4)	163(15.5)	112(11.8)	40.9	0.003
Ulnar Lp	285(54.3)	276(58.1)	311(59.2)	297(62.5)	596(56.8)	573(60.3)	152.6	0.001
Radial Lp	13(2.5)	20(4.2)	16(3.0)	23(4.8)	29(2.8)	43(4.5)	11.3	0.004
Twin Lp	31(5.9)	22(4.6)	24(4.6)	21(4.4)	55(5.2)	43(4.5)	13.8	0.002
Whorls	108(20.6)	99(20.8)	99(18.9)	80(16.8)	207(19.7)	179(18.8)	51.1	0.002
Total	**525**	**475**	**525**	**475**	**1050**	**950**		

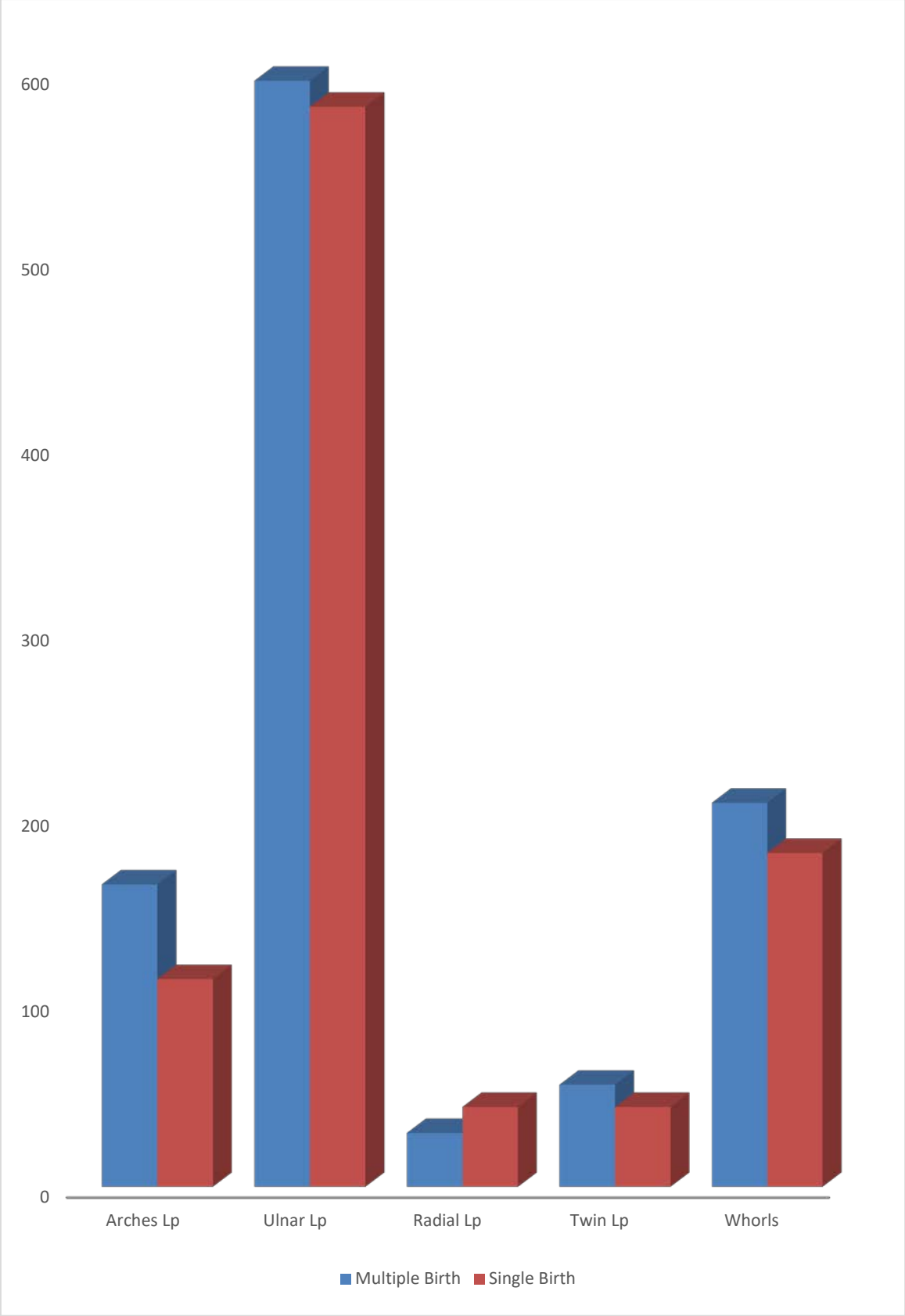

Figure 4: Bar chart showing fingerprint pattern distribution in multiple and single births women.

Table 3.0: Frequency of fingerprint digit patterns between mothers with multiple (n=105) and single births (n=95)

Digit	**Mothers with twin(n=105)**					**Mothers without twins(n=95**					**Both mothers(n=200)**				
	Lu	Lr	Lt	Whorl	**Arch**	Lu	Lr	Lt	Whorl	**Arch**	Lu	Lr	Lt	Whorl	**Arch**
D1	75	5	38	42	**50**	83	7	33	41	**26**	158	12	71	83	**76**
D2	105	13	7	47	**38**	92	12	4	43	**39**	197	25	11	90	**77**
D3	135	7	4	31	**33**	114	11	7	32	**26**	249	18	11	63	**59**
D4	129	0	2	63	**16**	118	6	2	49	**15**	247	6	4	112	**31**
D5	152	1	1	28	**28**	154	5	2	18	**11**	306	6	3	46	**39**
Total	**596**	**26**	**52**	**211**	**165**	**561**	**41**	**48**	**183**	**117**	**1157**	**67**	**100**	**394**	**282**

Table 4.0: Percentage of fingerprint digit patterns in mothers with multiple (n=105) and without multiple births (n=95) in Right and Left Hands.

Digit	**Mothers with twin(n=105)**					**Mothers without twins(n=95)**					**Both mothers(n=200)**				
	Lu	Lr	Lt	Whorl	**Arch**	Lu	Lr	Lt	Whorl	**Arch**	Lu	Lr	Lt	Whorl	**Arch**
D1	12.6	19.2	73.1	19.9	**30.3**	14.8	17.1	68.8	22.4	**22.2**	13.7	17.9	71.0	21.1	**27.0**
D2	17.6	50.0	13.5	22.3	**23.0**	16.4	29.3	8.3	23.5	**33.3**	17.0	37.3	11.0	22.8	**27.3**
D3	22.7	26.9	7.7	14.7	**20.0**	20.3	26.8	145	17.5	**22.2**	21.5	26.8	11.0	16.0	**20.9**
D4	21.6	0.0	3.8	29.9	**9.7**	21.0	14.6	4.2	26.8	**12.8**	21.3	9.0	4.0	28.4	**11.0**
D5	25.5	3.9	1.9	13.2	**17.0**	27.5	12.2	4.2	9.8	**9.5**	26.4	9.0	3.0	11.7	**13.8**
Tota	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**

The frequency of ulnar loop in the $2^{nd,}$,3^{rd} and 4^{th} digit of mothers with twins is higher than mothers with single births, while the frequency of radial loop in the 1^{st}, 3^{rd} ,4^{th} and 5^{th} digits of single births mother is more than in multiple births women Table 3.

Table 2.0 showed that the percentage of whorl pattern is more than arches pattern in both hands of multiple birth women, this is in relative association with the study conducted by [14] which revealed whorls to be a prevalent fingerprint pattern in the group studied and this contradicts the study done by [9] in a phillipine population, [8] in Anioma and Urobho students, [11] in a Muslim population in India . The radial loop pattern was more prevalent in single births women; this is in agreement with the study conducted by [20].

The result of this study support the work done by Ching Cho in New Zealand Samoans who reported predominance of whorls (60.6%) [8], by [22] among Tibetans [5] by Karmakar and his colleagues among Muzziena Bedouin [22] by Singh and his colleagues in Rajputs of Himachal Pradesh [12] and Ghosh *et al.* in Sunni Muslim males of West Bengal [21] who reported whorls to be the most common pattern.

5. Conclusion

Detailed classification and frequency distribution of fingerprint patterns were obtained in multiple and single births women of Igbo-Ora descent. Whorls, Twin loops and Arches were found to be most prevalent in multiple births women than single births women and the difference is statistically significant $p<0.05$.

One may now propose that women with higher whorls, twins loop and Arches fingerprint pattern with no radial loop on the fourth digit are more likely to give birth to twins than singletons since fingerprint pattern inheritance is an interplay of genetic and intrauterine environmental factor.

6. Recommendation

The result demonstrated a closer relationship between the finger and palmar print patterns with multiple births and therefore would recommend that dermatoglyphics be used to predict women with multiple birth tendency. However, there is still need to carry out similar studies on larger populations in Igbo-Ora and cases from other Nigerian ethnic groups.

Acknowledgement

We wish to express our profound appreciation to Miss. Adebimpe Lamide, Mrs. E. Gbolahan, Mrs. S. Badmus, Mr Adesope Wali, Mr Feranmi Okunlola, Medical Directors of Olugbon and Mak Mercy hospitals in Igbo-Ora with their staff and the participants in this study.

References

[1]. Adenowo, T.K., and Dare, B.J. (2016). Digital and Palmer Dermatoglyphic; A Bio-Indicator for Intelligence Quotient. Journal of Basic and Applied Research. 2 (3):313-319.

[2]. Adewumi, J. (2014). Twins in West African Culture and Society of the Iron Age.

[3]. Akinboro,A. ,Azeez,M.A., Bakare,A.A.(2008). Frequency of Twinning in Southwest Nigeria. Indian Journal of Human Genetics.14 (2):41-47.

[4]. Bansal, H.D., Hansi D., Badiye, A.D., Kapoor, N.S., (2014). Distribution of Fingerprint Patterns in an Indian Population. Malaysian Journal of Forensic Sciences 5(2):18-21.

[5]. Biswas, S, (2011). Finger and palmar dermatoglyphic study among the Dhimals of North Bengal, India. Anthropologist. 13(3):235–238.

[6]. Cummins,H.,and Midlo,C. (1961).Finger prints, palms and soles: an introduction to dermatoglyphics.Dover Publications, New York (1961).

[7]. Dehankar, R., N and Ksheersagar, D.,D.(2012).Study of Palmar Dermatoglyphics in Twins, Pakistan Journal of Medical Ssiences 2 (1);17 – 20.

[8]. Eboh, D.E.O, (2012). Digital Dermatoglyphic Patterns of Anioma and Urhobo Students in Two tertiary Institutions of Delta State, Southern Nigeria. Journal of Medicine and Biomedical Research. 11(2): 90-96.

[9]. Gutierez,S.,B., Lucenario,J.,S., and Yebes,M.,T.(2012). Dermatoglyphic Studies among the Dumagat-Remontado Tribal Population of the Philippines Journal of Anthropology 2012 (2012); 20-26.

[10]. Hueske, Edward. (2009). Firearms and Fingerprints. Facts on File/Infobase Publishing New York. ISBN 978-0-8160-5512-5518. Journal of Undergraduate writing, issue, 9.

[11]. Kapoor, N. and Badiye ,A. (2015). Digital dermatoglyphics: A study on Muslim population from India. Egyptian Journal of Forensic Sciences 5(3):90-95.

[12]. Karmakar, B., and Kobyliansky, E., (2012). Finger and palmar dermatoglyphics in Muzzeina Bedouin from South Sinai: a quantitative study. Papers on Anthropol. 21:110–122.

[13]. Kulkami,A.D.,Jamieson,D.J.,Jones,H.W.,Kissim,D.M.,Gallo,M.F.,Macaluso,M.,Adashi, Jones, H.W., Kissin, D.M., Gallo, M.F., Macaluso, M., Adashi, E.Y. (2013). "Fertility Treatments and Multiple Births in the United States". New England Journal of Medicine 369 (23):2218–2225.

[14]. Kumari,K.L.,Babu,V.S. and Kumar, S.V. (2014). Dermatoglyphics and Its Relation to Intelligence Levels of Young Students. Journal of Dental and Medical Sciences 13 (5) pp 1-3.

[15]. Mange AP, Mange EJ, (1990). Genetics: Human Aspects. 2nd edition. Sunderland, Massachusetts: Sinauer Associates.

[16]. Miličić, J., Pavićević, R, Halbauer, M.S.B. (2000). Analysis of qualitative dermatoglyphic traits of the digito-palmar complex in carcinomas. In The state of dermatoglyphics: the science of finger and palm prints. Edited by Durham NM Fox KH, Plato CC. New York: Edwin Mellen Press: 384.

[17]. Modi, J.P. (2002). Modi's medical jurisprudence and toxicology. 22nd ed. Noida: LexisNexis Butterworths; 37: 39- 40.

[18]. Mosuro, A., A. (1996).Twinning rates in South West Nigeria. Nigeria Journal of Science 30:39-45.

[19]. Nithin,M.D., Balaraj,B.M., Manjunatha,B.Mestri,S.C.,(2009). Study of fingerprint classification and their gender distribution among South Indian population Journal of Forensic and Legal Medicine, 16 (8): 460-463.

[20]. Reed T, Young RS. (1979) .Genetic analysis of multivariate fingertip dermatoglyphic factors and comparison with corresponding individual variables. Annual Human Biology 6(4):357-362.

[21]. Singh I, Garg R.K, (2004). Finger Dermatoglyphics: A study of the Rajputs of Himachal Pradesh. Anthropologist 6 (2): 155-156.

[22]. Tiwari, S.C, Chattopadhyay, P.K, (1967). Finger dermatoglyphics of the Tibetans. American Journal of Physiological Anthropology 26:289–296.

[23]. Umraniya, Y. N. Modi, H.H. and Prajapati, H.K. (2013). Sexual dimophism in Dermatoglyphics pattern study. Medical science 1 (1): 24 – 26.

[24]. Wijerathne, B.T.B., Rathnayake, G.K., Adikari, S.C., Amarasinghe, S., Abhayarathna, P.L.and Jayasena, A.S. (2013). Sexual dimorphism in digital dermatoglyphic traits among Sinhalese people in Sri Lanka. Journal of Physiological Anthropology 32(1):27.

[25]. Wijerathne, B.T.B., Meier, R.J., Agampodi, T.C., Agampodi, S.B.,(2015). Dermatoglyphics in hypertension: a review. Journal of Physiological Anthropology 34 (1):29.