

Cross-Sectional Study of Minutiae Patterns in Bini Ethnic Group of Southern Nigeria

John Nwolim Paul*, Deborah Abosede Akinola, Oja-Alumehe Favour Erezih

Department of Anatomy, Faculty of Basic Medical Sciences, College of Health Sciences, University of Port Harcourt, Nigeria

*Corresponding Author

Abstract

Background: This study was aimed at evaluating the minutiae patterns in of Bini ethnic group of Southern Nigeria. The study was descriptive and cross-sectional with volunteers age ranging from 18-60 years. For the purpose of this study, an individual was considered to be a Nigeria of a particular ethnic group if the parents and four grandparents are of the same ethnic group.

Materials and Methods: Purposive sampling method was used for the study. The selection and collection of required parameters relied on informed consent of volunteer subjects. This was done by giving them a copy of the informed consent letter which was signed and dated. A total of 400 subjects (Males 225, Females 175) were recruited for the study. The fingerprints were obtained using print scanner (Hp G3110 Photo scanner) following Oghenemavwe and Osaat (2015) improvised model.

Results and Discussion: Distribution of total digital patterns in Bini showed that on the left hand they had the following: Ridge Ending 4399(17.1%), Ridge Crossing 2335 (9.0%), Bridge 1979(7.7%), Lake 2077(8.1%), Bifurcation 5283(20.5%), Double Bifurcation 2021 (7.8%), Dot 2015 (7.8%), Trifurcation 1938 (7.5%), Opposed Bifurcation 2029 (7.9%), Island 1723 (6.6%), while on the right hand the distributions were: Ridge Ending 4415 (17.2%), Ridge Crossing 2323 (9.0%), Bridge 1999(7.7%), Lake 2065(8.0%), Bifurcation 5303(20.6%), Double Bifurcation 2005 (7.7%), Dot 2025 (7.8%), Trifurcation 1915 (7.4%), Opposed Bifurcation 2044 (7.9%), Island 1709 (6.7%).

Conclusion: The descriptive cross-sectional study of minutiae pattern has revealed the following trend of patterns: Bifurcation 5283 (20.5%) > Ridge ending 4399(17.1%) > Ridge crossing 2335 (9.0%) on the left whereas on the right hand thus: Bifurcation 5303(20.6%) > Ridge ending 4415 (17.2%) > Ridge crossing 2323 (9.0%). This trend is in line with the stated trends for Africa, this study provides a baseline data on level 2 patterns or minutiae for the Bini people of Southern Nigeria.

Keywords: Bini, Southern Nigeria, Bifurcation, Ridge ending, ridge crossing.

I. INTRODUCTION

The term dermatoglyphics was "coined in 1926 by Dr. Harold Cummins from derma, skin + the Greek glyphe, carve". It is referred to as the branch of science which study the patterns of the skin (dermal) ridges present on human fingers, toes and the soles.^[1]

The role of dermatoglyphics on establishing similarities in ethnicity or ancestry cannot be overemphasized. In determining the dermatoglyphic patterns of people, the

fingerprint of subjects from the ethnic group, tribes or races under investigation are examined to check for the various patterns or minutiae that exists. It has been reported that people from the same ethnic group have similar trends that are peculiar to them.^[2-4]

The Edo or Bini (from the word "Benin") people are an ethnic group primarily found in Edo State, and spread across the Delta and Ondo states of Nigeria. They speak the Edo languages and are the descendants of the founders of the Benin Empire. They are closely related to other ethnic groups that speak Edo languages, such as the Esan, the Afemai and the Owan. They are primarily farmers with a population of about 2,208,700.^[5-7]

There have some reports on investigations done by other researchers on the level 2 dermatoglyphics patterns^[8-12] and other investigations at level 1 dermatoglyphics.^[13-21]

There is paucity of information on the level 2 dermatoglyphic patterns (minutiae) of the Bini people.

Aim and Objective: This study was aimed at evaluating the minutiae patterns in of Bini ethnic group of Southern Nigeria.

Scope of the Study: This study was done specifically on the digital prints.

Significance of the Study: This study will benefit the body of knowledge on ancestry of Bini people which will be significant to historians, sociologists, anthropologists and Edo State at large.

II. METHODS

Research Design: The study was descriptive and cross-sectional. For the purpose of this study, an individual was considered to be a Nigeria of a particular ethnic group if the parents and four grandparents are of the same ethnic group. Volunteers with age ranging from 18-60 years of Bini extraction were recruited for this study by purposive sampling. The study was conducted from January 6-December 20, 2018.

Data Collection: The selection and collection of required parameters relied on informed consent of volunteer subjects after the procedure was explained to them. This was done by giving each volunteer a copy of the informed consent letter which was signed and dated. A brief questionnaire on the age, sex, ethnicity of the parents and grandparents was self-

administered except for the subjects that could not read or write where the researcher administered the questionnaire himself. A total of 400 (Males 225, Females 175) subjects were recruited for the study. The fingerprints were obtained using print scanner (Hp G3110 Photo scanner) by Oghenemavwe and Osaat^[22].

Minutiae	Example	Minutiae	Example
ridge ending		bridge	
bifurcation		double bifurcation	
dot		trifurcation	
island (short ridge)		opposed bifurcations	
lake (enclosure)		ridge crossing	
hook (spur)		opposed bifurcation/ridge ending	

Figure 1: The level two dermatoglyphic patterns^[12]

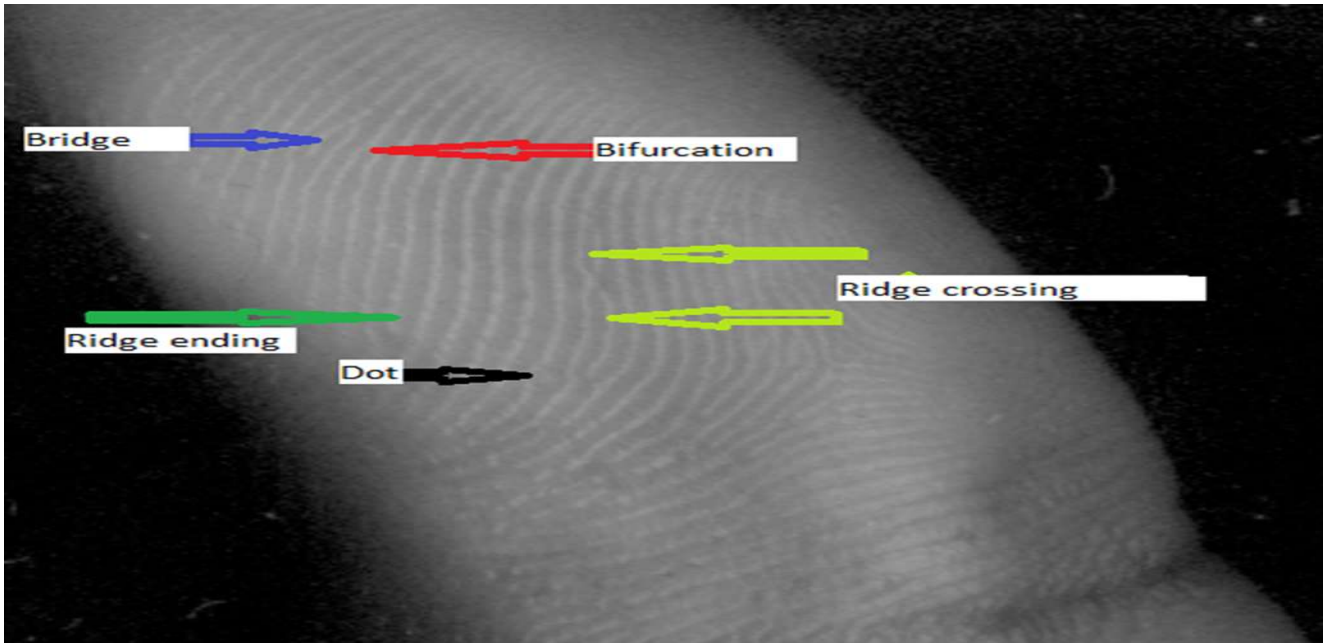


Figure 2: Bridge, Bifurcation, Ridge ending, Ridge crossing, Dot from the study.

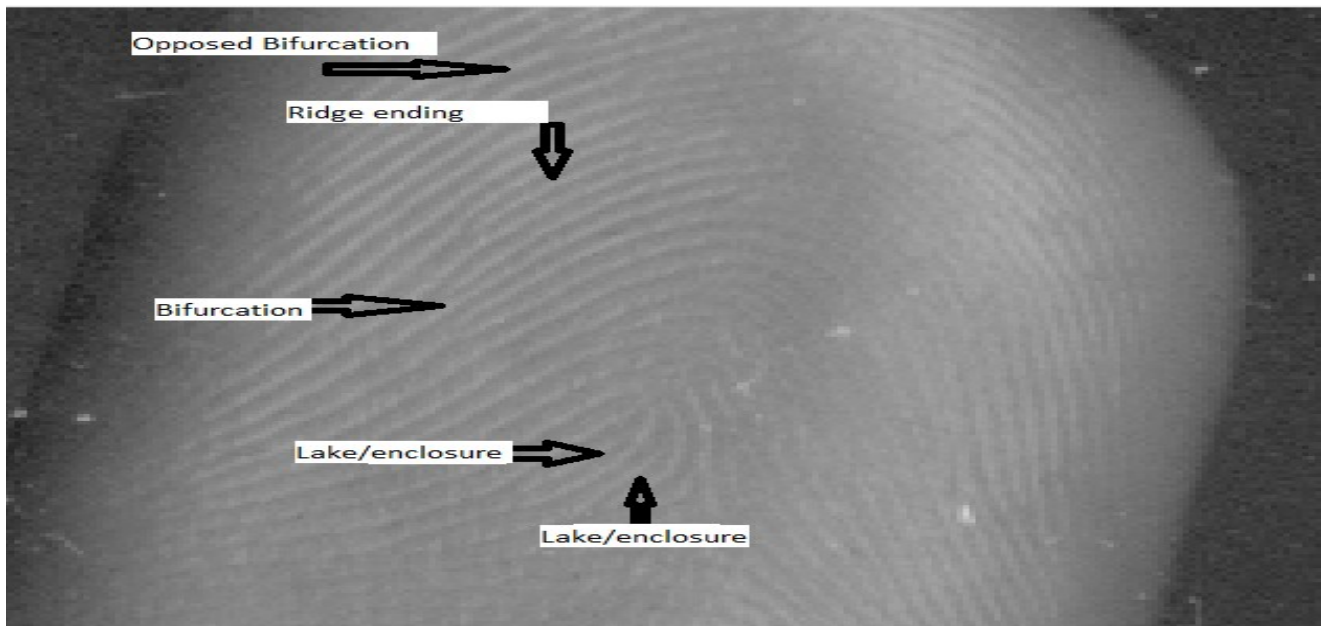


Figure 3: Opposed bifurcation, Ridge ending, Bifurcation, Lake (enclosure) from the study.

Data Analysis: Data obtained were inputted into Microsoft excel 2010 for data analysis using chi square test to determine the distribution of level 2 patterns in Bini ethnic group.

Criteria for Subject Selection: Subjects recruited were indigenes of the Bini ethnic group with no form of anatomical abnormality of the hands. Blurred prints were excluded.

Ethical Consideration

Ethical clearance was obtained from the Research Ethics Committee of the University of Port Harcourt: UPH/CEREMAD/REC/MM59/036 before start of the study.

III. RESULTS

In table 1 The Bini people had this distribution of digital patterns of the male and female subjects. The males had the following distributions: ridge ending left 2207 (16.8%), right 2213 (16.9%); Ridge Crossing left 1191(9.1%), right 1187(9.1%); Bridge left 996 (7.6%), right 1004 (7.7%); Lake left 1054(8.0%), right 1048(8.0%); Bifurcation left 2690 (20.5%), right 2700 (20.6%); Double Bifurcation left 1018 (7.8%), right 1008 (7.7%); Dot left 1011 (7.7%), right 1017 (7.8%); Trifurcation left 1015 (7.7%), right 1004 (7.6%); Opposed Bifurcation left 1022 (7.8%), right 1027 (7.8%);

Island left 901(7.0%), right 895(6.8%) whereas the females had the following: Ridge ending left 2192 (17.3%), right 2202 (17.3%); Ridge Crossing left 1144 (9.0%), right 1136 (8.9%); Bridge left 983 (7.7%), right 995 (7.8%); Lake left 1023(8.1%), right 1017(8.0%); Bifurcation left 2593 (20.4%), right 2603 (20.5%); Double Bifurcation left 1003 (7.9%), right 997 (7.9%); Dot left 1004 (7.9%), right 1008 (7.9%); Trifurcation left 923(7.3%), right 911(7.2%); Opposed Bifurcation left 1007 (7.9%), right 1017 (8.0%); Island left 822(6.5%), right 814(6.5%).

Table 2: Distribution of total digital patterns in Bini showed that on the left hand they had the following: Ridge Ending 4399(17.1%), Ridge Crossing 2335 (9.0%), Bridge 1979(7.7%), Lake 2077(8.1%), Bifurcation 5283(20.5%), Double Bifurcation 2021 (7.8%), Dot 2015 (7.8%), Trifurcation 1938 (7.5%), Opposed Bifurcation 2029 (7.9%), Island 1723 (6.6%), while on the right hand the distributions were: Ridge Ending 4415 (17.2%), Ridge Crossing 2323 (9.0%), Bridge 1999(7.7%), Lake 2065(8.0%), Bifurcation 5303(20.6%), Double Bifurcation 2005 (7.7%), Dot 2025 (7.8%), Trifurcation 1915 (7.4%), Opposed Bifurcation 2044 (7.9%), Island 1709 (6.7%).

Table 1: Distribution of digital patterns of the male and female subjects in Bini ethnic group

S/N	Parameters	Males n(%)		Females n(%)	
		Left hand	Right hand	Left hand	Right hand
1	Ridge Ending	2207 (16.8)	2213 (16.9)	2192 (17.3)	2202 (17.3)
2	Ridge Crossing	1191(9.1)	1187(9.1)	1144 (9.0)	1136 (8.9)
3	Bridge	996 (7.6)	1004 (7.7)	983 (7.7)	995 (7.8)
4	Lake	1054(8.0)	1048(8.0)	1023(8.1)	1017(8.0)
5	Bifurcation	2690 (20.5)	2700 (20.6)	2593 (20.4)	2603 (20.5)
6	Double Bifurcation	1018 (7.8)	1008 (7.7)	1003 (7.9)	997 (7.9)
7	Dot	1011 (7.7)	1017 (7.8)	1004 (7.9)	1008 (7.9)
8	Trifurcation	1015 (7.7)	1004 (7.6)	923(7.3)	911(7.2)
9	Opposed Bifurcation	1022 (7.8)	1027 (7.8)	1007 (7.9)	1017 (8.0)
10	Island	901(7.0)	895(6.8)	822(6.5)	814(6.5)

Bifurcation > Ridge ending > Ridge crossing

Table 2: Distribution of total digital patterns in Bini ethnic group

S/N	Digital Patterns	Left Hand n(%)	Right Hand n(%)
1	Ridge Ending	4399(17.1)	4415 (17.2)
2	Ridge Crossing	2335 (9.0)	2323 (9.0)
3	Bridge	1979(7.7)	1999(7.7)
4	Lake	2077(8.1)	2065(8.0)
5	Bifurcation	5283(20.5)	5303(20.6)
6	Double Bifurcation	2021 (7.8)	2005 (7.7)
7	Dot	2015 (7.8)	2025 (7.8)
8	Trifurcation	1938 (7.5)	1915 (7.4)
9	Opposed Bifurcation	2029 (7.9)	2044 (7.9)
10	Island	1723 (6.6)	1709 (6.7)

Bifurcation > Ridge ending > Ridge crossing

IV. DISCUSSIONS

The distribution of digital patterns across the three ethnic groups showed that Bifurcation was the most frequently distributed in Ikwerre followed by ridge ending and ridge crossing. In Bini and Igbo ethnic groups, bifurcation was most prevalent, followed by Ridge ending and Opposed bifurcation. This result is consistent with the reports of previous authors^[8-10] on distribution of level 2 patterns. Again, Krzysztof *et al.*^[11] reported that the ridge ending and bifurcation are the most prevalent level 2 pattern or minutia in their study. This furthermore, validates the results of this present study as it reiterates the previous reports. In addition, the works of Fournier and Ross^[12] on dermatoglyphics on races showed that the black race had the highest distribution of bifurcation which was considered an intrinsic African trait. Their result agrees with the findings of this current study which indicated high prevalence of bifurcation across the three ethnic groups.

V. CONCLUSION

The descriptive cross-sectional study of minutiae pattern has revealed the following trend of patterns: Bifurcation 5283 (20.5%) > Ridge ending 4399(17.1%) > Ridge crossing 2335 (9.0%) on the left whereas on the right hand thus: Bifurcation 5303(20.6%) > Ridge ending 4415 (17.2%) > Ridge crossing 2323 (9.0%). This trend is in line with the stated trends for Africa, this study provides a baseline data on level 2 patterns or minutiae for the Bini people of Southern Nigeria.

ACKNOWLEDGEMENTS

We want to appreciate the entire management and staff of the Department of Anatomy, University of Port Harcourt.

CONFLICT OF INTEREST

We write to state that there is no conflict of interest.

SOURCE OF FUNDING-Self-funding.

AUTHOR'S CONTRIBUTION

We write to state that all authors have contributed significantly, and that all authors are in agreement with the contents of the manuscript. 'Author A' (John Nwolim Paul) designed the study and protocol, wrote the first draft of the manuscript; 'Author B' (Tarimobo M. Otopo) 'reviewed the design, protocol; 'Author C' (Oja-AlumeheFavourErezih) examined the intellectual content of the manuscript. All authors read and approved the final manuscript.

REFERENCES

- [1]. Akingbade, A. M., Saalu, L. C., Akunna, G. G., Anderson, L. E., Olusolade, F. S. (2014). Finger and palmar dermatoglyphic study among the Yorubas in Jos, Nigeria. *Annals of Bioanthropology*, 2(2):49-53.
- [2]. Ali, IA. and Aboul EH. (2014) Impact of Some Biometric Modalities on Forensic Science, *Computational Intelligence in Digital Forensics: Forensic Investigation and Applications Studies in Computational Intelligence*. 555:47-62.
- [3]. Bhardwaj, N., Bhardwaj, P., Tewari, V., Siddiqui, M. S. (2015). Dermatoglyphics analysis of fingertip and palmar print patterns of obese children. *International Journal of Medical Science and Public Health*, 4: 946-949.
- [4]. Arquimbau R., Esteban E., Fananas L., 1993. Finger dermatoglyphics in Delta de l'Ebre: a Mediterranean population, *AnthropologischerAnzeiger*, 51:267-274.
- [5]. Forrester, T. (1994) *The Advance of African Capital: The Growth of Nigerian Private Enterprise*. Illustrated Edition. Edinburgh University Press. 272.
- [6]. Paul, J.N., Oladipo, G.S., Oghenemavwe, L.E. (2019). Investigation of Prevalence Pattern of Axial Triradii in the Ikwerres', Binis' and Igbo's. *Saudi Journal of Biomedical Research* 4(10): 349-354.
- [7]. JohnNwolim Paul, ChizinduAkubudikeAlikor, Chinyere O. Ndu-Akinla, Chikwuogwo W. Paul. (2019). Comparison of Paul's Index across the Ikwerre, Bini and Igbo Ethnic Groups of Southern Nigeria: An Ancestral Investigation. *Scholars Academic Journal of Bioscience* 7(11): 435-438
- [8]. Paul, C.W. and Paul, J.N. (2017). Gender Variation Studies in Dermatoglyphic Patterns (Level 2 Details) of the Ikwerre Ethnic Group in Rivers State, Nigeria. *Journal of Pharmaceutical Research International*. 19(2): 2231-2919.
- [9]. Paul, J. N., Amadi M. A. Ogbilikana P. S. (2018a). Review of Dermatoglyphic Studies at Level 2 in Nigerian Indigenous Populations. *Journal of Pharmaceutical Research International*. 4(6):535-537.
- [10]. Paul, J. N. Amadi M. A. (2018), Systematic Methodological Approach in Dermatoglyphics at Level 2. *Scholar Bulletin*. 4(6):531-534.
- [11]. KrzysztofKryszczuk, Andrzej Drygajlo and Patrice Morier. (2008). Extraction of Level 2 and Level 3 Features for Fragmentary Fingerprint Comparison. *EPFL*. 3:45-47.
- [12]. Fournier NA. and Ross AH. (2015). Sex, Ancestral, and Pattern Type Variation of Fingerprint Minutiae: A Forensic Perspective on Anthropological Dermatoglyphics. *American Journal of Physical Anthropology* 160(4):625-632.
- [13]. Segura-Wang M. and Barrantes R. (2009) Dermatoglyphic traits of six Chibcha-speaking Amerindians of Costa Rica, and an assessment of the genetic affinities among populations. *International Journal of Tropical Biology*, 57 (1): 357-369.
- [14]. Namouchi, I. (2011) Anthropological significance of dermatoglyphic trait variation: an intra-Tunisian population analysis. *International Journal of Modern Anthropology*, 4: 12 – 27.
- [15]. Luna F., and Pons J. (1987) The dermatoglyphics of the eastern Andalusia. *International Journal of Anthropology*, 2 (2): 183- 190.
- [16]. Loesch, D. (1979) Genetical studies of the palmar and sole patterns and some dermatoglyphic measurements in Twins. *Annals of Human Genetics*, 43:37-53.
- [17]. Lemza, SV. and Galaktionov, O.K. (1982) Sole dermatoglyphics in the Forest Nentsy, Nganasans, and Chukchi: Dermatoglyphic distances. *American Journal of Physical Anthropology*, 57(3):245-52.
- [18]. Karmakar B., Malkin I. and Kobylansky E. (2009) Genetic Determinants of 22 Quantitative Dermatoglyphic Traits in the Chuvashian Population of Russia: Complex Segregation Analysis. *The Open Anthropology Journal*, 2(2): 64-73.
- [19]. Karmakar, B., Yakovenko. K., and Kobylansky, E. (2002) Dermatoglyphic sexual dimorphism: Finger and palmar qualitative characteristics in five endogamous populations of West Bengal, India. *AnthropologischerAnzeiger*, 60(3):273-292.
- [20]. Igbigbi P.S. and Msamati B.C. (1999) Palmar and digital dermatoglyphic patterns in Malawian subjects. *East African Medical Journal*, 76: 668-671.
- [21]. Mbaka, G., Ejiwunmi A., Alabi, O., Olatayo, T. (2016) Digital dermatoglyphic variation and migratory pattern of ethnic Liberians. *Egyptian Journal of Forensic Sciences*, 6(3): 416–421
- [22]. Oghenemavwe EL and Osaat RS. (2015) An Improve Easy Digital Method for Palmar andPlantar Dermatoglyphics. *Bioscience and Bioengineering*. 1(3):85-89.