Research Article

The Fingerprint Pattern of People of Bosso Local Government Area of Niger State, Nigeria

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Abstract

This study is aimed at surveying fingerprint pattern of people living in Bosso, Pai and Kodo communities of Bosso Local Government Area of Niger state, which can be helpful in resource management for Niger State of Nigeria. The samples were grouped into Bosso, Pai, Kodo and Bosso Local Government Area as a whole. The communities were visited for data collection. The fingerprints were captured using Digital persona 4500 sdk 4500 sdk fingerprint scanner. The collected fingerprints were tabulated in Microsoft excel 2010 and represented in percentile of occurrence of the fingerprint patterns for each group. The types of fingerprint patterns captured include; Ulnar Loop, Radial Loop, Plain Arch, Tented Arch, Plain Whorl, Double Loop Whorl and Central Pocket Whorl. There was no Accidental Whorl fingerprint pattern among the population of Bosso Local Government Area of Niger State.

Keywords: Bosso Local Government; Fingerprint Pattern; Genetic Marker

Introduction

The quest for identification is in the increase. With the advent of new technological advancement which makes communication very easy, has also make ease accomplishment of activities. This advancements are not followed with identification of individuals that are involved in these acts. Biometric characteristic is a unique and easy way of identifying persons, however [1,2] noted that not all biometric characteristics are the best option to identification because some biometric attributes tend to change with time, but [3] opined that some biometrics attributes such as fingerprints, bite marks, lip prints, DNA profiling, iris imaging, etc. do not change with time. Among all biometric recognition processes, fingerprint system is a good way to identify an individual.

Fingerprints have been used as the most popular biometric authentication and verification measure because of their high adequacy, immutability and uniqueness [4]. Classification allows an input fingerprint to be matched against only by a subset of a database and is critical in speeding up fingerprint identification. Conversely, classification is not enough to identify a fingerprint; it is useful in deciding when two fingerprints do not match. To reduce the search and space complexity, a systematic partitioning of the database into different classes is highly essential. The key to the task of classification is feature extraction. The effectiveness of feature extraction depends on the quality of the images, representation of the image data, the image processing models, and the evaluation of the extracted features. At the first stage of the fingerprint classification process, the image is only represented as a matrix of greyscale intensity values. Feature extraction is a process through which geometric primitives within images are isolated to describe the image structure, i.e. to extract important image information and to suppress superfluous information that is not useful for classification and identification processes. Thus, fingerprint features and their relationships provide a representative description of a fingerprint image.

Bosso is a Local Government Area in Niger State of Nigeria is a home for refugees in 2014 fleeing from fighting in Borno State looking for safe place to continue their lives. Coupled with the worldwide economic recess, the host community need a quick means of identification to ease their resource allocation and resource management. [5] postulated that there is similarity in the phenotypic inheritance of people of common descendants, this unique genetic characteristic includes but is not limited to fingerprint patterns [6].

Thus, fingerprint pattern of the group can be studied to help solve the lingering problem.
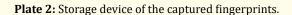
Materials and Methods

Study area

Bosso is a local government area in Niger state with its headquarters at Maikunkele with postal code of the area is 920 on Lattitude 13^0 41' 48.84"N and Longitude 13^0 18' 37.08"E. It has an area of 1,592 km^2 and a population of 203,134 as projected in 2019 using the national population census figures of 2006 with 2.5% annual growth rate.

Data collection

Digital method was adopted for fingerprint collection. The fingerprint pattern of the respondents were captured using a Digital persona 4500 sdk fingerprint scanner. This was processed (Plate 1) using a fingerprint database to store the information in the storage device (Plate 2) for each community which was later extracted for analysis. The results were tabulated using Microsoft Excel 2010, grouped into each community, and the same was used to compare by percentile of occurrence for each finger within each community in the Local Government. The database was developed by taking the fingerprints of 150 individuals, 50 from each from Bosso, Pai and Kodo communities using a serial communication USB-based fingerprint scanner sensor 'Digital persona 4500 sdk' Fingerprint Scanner.

Plate 2: Storage device of the captured fingerprints.

Data analysis

The various fingerprint patterns (UL, PA, PW, DLW, RL, CPLW, TA) shown in plate 3, were recorded from each community were tabulated in Microsoft excel 2010 after which they were used to compare by percentile of occurrence for each community.

Plate 3: (A) UL = Ulnar loop, (B) RL = Radial loop, (C) PW = Plain whorl, (D) DLW = Double loop whorl, (E) CPLW = Central pocket loop whorl, (F) TA = Tented arch, (G) PA = Plain arch.

Results

The fingerprint pattern of Bosso community people in Bosso Local government area of Niger state, Nigeria

The occurrence of fingerprint patterns among people of Bosso community in Bosso local government area in Niger state shows that Ulnar loop has the highest percentage of occurrence (84%) on the left little finger and least occurrence (38%) on the left thumb among people of Bosso community followed by the Plain arch with

Plate 1: Scanning process environment.

highest occurrence (28%) on the left thumb and least occurrence (22%) on the right thumb of Bosso people. Plain Whorl has highest occurrence (22%) on the left ring finger and least occurrence (4%) on the left little finger as shown in Table 1. DLW has the highest occurrence (16%) on the left thumb and least occurrence (4%) on the left index, left middle finger, left little finger, right thumb and right index. Radial loop (RL) has the highest occurrence (12%) on the left index of bosso people while CPLW has highest occurrence (4%)

on the right middle finger as shown in Table 1. Double loop whorl was absent on the ring finger of the left and right hands of Bosso people. Radial loop (RL) was absent on the left little finger. Central pocket loop whorl (CPLW) was absent on the thumb and middle fingers of the left hand of Bosso people as shown in table 1. TA was also absent on the thumb and little fingers of the left hands among people of Bosso community as shown in table 1.

Pattern	Left Finger					Right Finger				
	T	I	M	R	L	T	I	M	R	L
UL	38	52	56	60	84	44	50	60	74	80
PA	28	14	12	10	6	22	16	10	4	6
PW	14	14	18	22	4	14	22	14	14	6
DLW	16	4	4	0	4	12	4	4	0	0
RL	4	12	8	4	0	4	6	4	4	4
CPLW	0	2	0	2	2	2	0	4	0	0
TA	0	2	2	2	0	2	2	4	4	4
AW	0	0	0	0	0	0	0	0	0	0
Total	100	100	100	100	100	100	100	100	100	100

Table 1: Fingerprint pattern among people of Bosso community in Bosso Local government area of Niger state, Nigeria expressed in percentage (%).

Note: Those in red font are the commonest and those shaded yellow indicate absence of the pattern. T = Thumb, I = Index, M = Middle, R = Ring and L = Little, UL = Ulnar loop, PA = Plain arch, PW = Plain whorl, DLW = Double loop whorl, RL = Radial loop, CPLW = Central pocket loop whorl, TA = Tented arch, AW = Accidental whorl.

The fingerprint pattern of Pai community people in Bosso Local government area of Niger state, Nigeria

The occurrence of fingerprint patterns among people of Pai community of Bosso local government area in Niger state presented below. The result shows that Ulnar loop has the highest percentage of occurrence (80%) on the left little finger and least percentage of occurrence (40%) on the left index among people of Pai community followed by the Plain arch with highest occurrence of (22%) on the left thumb and least occurrence (4%) on the right ring finger of Pai people as shown in table 2. Plain whorl (PW) has highest occurrence of (16%) on the thumb and ring finger of left hands and on the thumb, index and ring fingers of the right hands of Pai people as shown in table 2. Double loop whorl (DLW) has the highest occurrence of (8%) on the thumb of the left and right

hands and least occurrence of (2%) on the left index and middle fingers of pai community people as shown in table 2. Radial loop has the highest occurrence of (12%) on the right index and least occurrence 4 on the thumb and index of the left hands of Pai people as shown in table 2. Central Pocket loop whorl (CPLW) has highest occurrence (12%) on the index and ring fingers of the left hands and least occurrence (2%) on the thumb and little fingers of the left hands of Pai people as shown in Table 2. Absence of DLW was recorded on the left ring finger, left little finger, right ring finger and rights little fingers among people of Pai. Also Tented arch did not occur on the left ring finger, left little finger and right thumb People in Pai. Accidental whorl did not occur on all of the fingers. The shaded areas with zeros are marked as the prominent markers for identifying people from Pai community in Bosso local government area of Niger state as shown in table 2.

Pattern	Left Finger					Right Finger				
	T	I	M	R	L	T	I	M	R	L
UL	46	40	52	60	80	50	46	60	62	74
PA	22	16	16	6	6	12	12	8	4	6
PW	16	14	14	16	6	16	16	14	16	6
DLW	8	2	2	0	0	8	4	6	0	0
RL	4	10	4	6	6	6	12	4	6	8
CPLW	2	12	8	12	2	8	8	6	10	4
TA	2	6	4	0	0	0	2	2	2	2
AW	0	0	0	0	0	0	0	0	0	0
Total	100	100	100	100	100	100	100	100	100	100

Table 2: Occurrence of fingerprint pattern among people of Pai community in Bosso Local government area of Niger state expressed in percentage (%).

Note: Those in red font are the commonest and those shaded yellow indicate absence of the pattern. T = Thumb, I = Index, M = Middle, R = Ring and L = Little, UL = Ulnar loop, PA = Plain arch, PW = Plain whorl, DLW = Double loop whorl, RL = Radial loop, CPLW = Central pocket loop whorl, TA = Tented arch, AW = Accidental whorl.

The fingerprint pattern of Kodo community people in Bosso Local government area of Niger state, Nigeria

The occurrence of fingerprint patterns among people of Kodo community in Bosso local government area of Niger state is presented below. The result shows that Ulnar loop has the highest percentage of occurrence (72%) on the left little finger and least occurrence (34%) on the right thumb among people of Kodo community followed by the Plain whorl with (28%) on the index and ring fingers of the left hands of Kodo people as shown in table 3. Plain arch (PA) has the highest occurrence of (16%) on the right middle finger and least occurrence of (4%) on the little finger of the left hand and right ring finger of people in Kodo community as shown in table 3. Double loopwhorl (DLW) has highest occurrence of (14%) on the thumb of the right hands of Kodo people and least occurrence of (2%) on the middle and ring fingers of the left hands of Kodo people as shown in table 3. Radial loop has highest occurrence of (14%) on the index of the right finger and least occurrence of (2%) on the thumb of the left hands of Kodo people. Central pocket loop whorl (CPLW) has the highest occurrence of (14%) on the index of the right hand and least occurrence of (2%) on the left little finger and right middle fingers of people in Kodo community as shown in table 3.

Pattern	Left Finger					Right Finger				
	T	I	M	R	L	T	I	M	R	L
UL	46	46	50	50	72	34	38	54	46	64
PA	14	10	10	8	4	14	10	16	4	10
PW	22	28	18	28	16	28	22	18	30	14
DLW	10	0	2	2	0	14	0	0	0	0
RL	2	6	6	6	6	4	14	6	6	6
CPLW	4	6	10	4	2	6	14	2	12	6
TA	2	4	4	2	0	0	2	4	2	0
AW	0	0	0	0	0	0	0	0	0	0
Total	100	100	100	100	100	100	100	100	100	100

Table 3: Fingerprint pattern among people of Kodo community in Bosso Local government area of Niger state, Nigeria expressed in percentage (%).

Note: Those in red font are the commonest and those shaded yellow indicate absence of the pattern. T = Thumb, I = Index, M = Middle, R = Ring and L = Little, UL = Ulnar loop, PA = Plain arch, PW = Plain whorl, DLW = Double loop whorl, RL = Radial loop, CPLW = Central pocket loop whorl, TA = Tented arch, AW = Accidental whorl.

Absence of DLW was recorded on the index and little finger of the left hands of people in Kodoand also absent on their right index, middle, ring and little fingers as shown table 3 Also Tented arch did not occur on the left little finger and right thumb People in Kodo as shown in table 3. Accidental whorl did not occur on all of their ten fingers as shown table 3. The shaded areas with zeros are marked as the prominent markers for identifying people from Kodo community in Bosso local government area of Niger state as shown in table 3.

The fingerprint pattern of people in Bosso Local government area of Niger state, Nigeria

The occurrence of fingerprint patterns among people of Bosso local government area of Niger state (Bosso, Pai and Kodo communities combined) is represented below. The result shows that Ulnar loop has the highest percentage of occurrence (79%) on the left little finger and least occurrence (43%) on the left thumb among people of Bosso Local government area of Niger state followed by the Plain whorl with (22%) on the left ring finger and least occurrence of (9%) on the little fingers of the left and right hands of people in Bosso local government area as show in Table 4. Plain arch (PA) has highest occurrence of (21%) o the thumb of the left hands and least occurrence of (4%) on the ring fingers of the right hands of Bosso Local government area peoples as shown in Table 4. Double loop whorl (DLW) has highest occurrence of (11%) on the thumb of the left and right hands and least occurrence of (2%) on the left index of people in Bosso local government area as shown in table 4. Radial loop has high occurrence (11%) on the right index and least occurrence (3%) on the thumb of the left hands of Bosso people. Central pocket loop whorl (CPLW) has high occurrence (7%) on the right index and least occurrence (2%) on the thumbs of the left hands as show in table 4. Absence of DLW was recorded on the ring and little fingers of the right hands of people in Bosso Local Government area in Niger state as show in Table 4. Also Tented arch did not occur on the left little finger while Accidental whorl did not occur on all of their ten fingers as show in Table 4. The shaded areas with zeros are marked as the prominent markers for identifying people from Bosso local government area of Niger state as show in table 4.

Pattern	Left Finger					Right Finger				
	T	I	M	R	L	T	I	M	R	L
UL	43	46	53	57	79	43	45	58	61	73
PA	21	13	13	8	5	16	13	11	4	7
PW	17	19	17	22	9	19	20	15	20	9
DLW	11	2	3	1	1	11	3	3	0	0
RL	3	9	6	5	4	5	11	5	5	6
CPLW	2	7	6	6	2	5	7	4	7	3
TA	1	4	3	1	0	1	2	3	3	2
AW	0	0	0	0	0	0	0	0	0	0
Total	100	100	100	100	100	100	100	100	100	100

Table 4: The fingerprint pattern among people of Bosso Local government area of Niger state expressed in percentage (%).

Note: Those in red font are the commonest and those shaded yellow indicate absence of the pattern. T = Thumb, I = Index, M = Middle, R = Ring and L = Little, UL = Ulnar loop, PA = Plain arch, PW = Plain whorl, DLW = Double loop whorl, RL = Radial loop, CPLW = Central pocket loop whorl, TA = Tented arch, AW = Accidental whorl.

Discussion

The occurrence of fingerprint patterns among people in (Bosso, Pai and Kodo and Bosso Local government area) respectively represented above. Accidental Whorl did not appear among persons of Bosso, Pai, and Kodo as shown in table 1, 2 and 3 respectively, in the same tendency, accidental whorl was also absent in the findings of [7,8].

The common fingerprint pattern among the ten fingers of the three communities is the Ulnar Loop (UL) having high percentage of occurrence (79%) in the little finger of the left hand among people of Bosso Local government area as shown in table 4. This result is similar to the findings of [8] where Ulnar loop was common among Major Ethnic Groups among Students of Ibrahim Badamasi Babangida University Lapai, Nigeria.

This result is also similar to the findings of [7] where Ulnar Loop was common on the little finger, the left thumb, and the right middle finger among Chinese-Javanese ethnic families, they noticed Whorl appearing in all the fingers of Javanese ethnic family and mixed Chinese-Javanese family [7,9].

Double loop whorl was completely absent on the right ring and right little fingers of Bosso and Pai people. Tented Arch (TA) was completely absent on the left little finger and Right thumb of PAI and KODO people, also Double Loop Whorl (DLW) does not occur on the right ring finger, left and right little fingers of all the people of the communities (Bosso, Pai and Kodo respectively).

The people of Bosso community have no TA on their left Thumb and left little fingers, DLW was also not on the left index fingers of Kodo people. According to [10] Double loop whorl was the dominant fingerprint patter on both thumbs of Arabian ethnic family and Plain Whorl on the right thumb and left index finger of Madurese ethnic family.

Plain Arch, Plain Whorl, Central pocket Loop Whorl and Radial Loop occur on all the fingers of people from Bosso, Pai and Kodo communities. Accidental whorl did not appear at all.

Samples of fingerprints were collected from 150 individuals, 50 each from Bosso, Pai and Kodo communities all in Bosso Local government area after which the results were tabulated in Microsoft excel and compared by percentile of occurrence for each pattern in each of the communities (Bosso, Pai and Kodo) all in Bosso Local government Area of Niger state.

Conclusion

The Ulnar Loop is the commonest fingerprint pattern among the ten fingers of people of Bosso Local Government Area. The Double Loop Whorl does not occur on the right ring finger and right little fingers as well as Tented Arch also not on the left thumb of people in Bosso Local Government Area of Niger state. Double Loop Whorl (DLW) does not occur on the left ring and little finger, right ring and little fingers of people inPai community. Tented arch did not occur on the left little fingers and right thumb and right little fingers of people in Kodo community of Bosso Local Governemnt area of Niger state.

The prominent fingerprint marker for the people living in Bosso community is the absence of Double Loop Whorl on the left ring finger, right ring and little fingers, absence of radial loop on the left little fingers, absence of central pocket loop whorl on the left thumb, left middle finger, right index, right ring and right little fingers, absence of Tented Arch on the left thumb and left little fingers.

The prominent fingerprint marker for the people living in Pai community is the absence of Double Loop Whorl (DLW) on the left ring finger, left little finger, right ring and little fingers and absence of Tented arch on the left ring finger, left little fingers and right thumb.

The prominent fingerprint marker for the people living in Kodo community is the absence of Double Loop Whorl (DLW) on the left index, left little finger, right index, right middle finger, right ring and little fingers and absence of Tented arch on the left little fingers and right thumb.

The absence of Double Loop Whorl (DLW) on the right ring and right little fingers is common to the people of Bosso, Pai and Kodo communities of Bosso local government area of Niger state.

Recommendations

The following are some recommendations from the research work:

- Bosso Local government can use this to identify indigenes in giving appointment into the Local government service, award of bursary and resource management.

- It can be used to identify a dead person whose identity is unknown, e.g. in the case of bandits sporadic killing of people.

- It is also important for the Bosso Local Government resource management.

Acknowledgement

Bibliography

1. Mridula P. "A Review on Classification of Fingerprint Images". *Electronics and Communication* 9.3 (2014): 61-66.

2. Wang L and Alexander CA. "Fingerprint Patterns and the Analysis of Gender Differences in the Patterns Based on the U Test". *International Transaction of Electrical and Computer Engineers System* 2.3 (2014): 88-92.

3. Bandameedi L N., *et al*. "Study of Fingerprint Patterns in Relation to Gender and Blood Group". 5.14 (2014).

4. Maltoni D., *et al*. "Automatic fingerprint identification system: from fingerprint to fingermarks". In: Tistarelli M., Champod C. (eds). Handbook of Biometrics for forensic Science. Advances in Computer Vision and pattern recognition. Springer, Cham (2017): 37-61.

5. Relethford JH. "Race and global pattern of phenotypic variation". *American Journal of physical Anthropology* 139.1 (2009): 16-22.

6. Templeton RA. "Biological races in humans". *History and Philosophy of Biological and Biomedical Sciences* 44.3 (2013): 262-271.

7. Nikmah I and Fatchiyah. "Identification of fingerprints pattern in mixed family of Chinese-Javanese Ethnic". *Journal of Tropical life Science* 7.3 (2017): 263-267.

8. Isah MC., *et al*. "Fingerprint Pattern of Major Ethnic Groups among Students of Ibrahim Badamasi Babangida University Lapai, Nigeria". *Journal of Tropical Life Science* 10.1 (2019): 43-47.

9. Awasthi V., *et al*. "Fingerprint analysis using termination and bifurcation minutiae". *International Journal of Emerging Technology and Advanced Engineering* 2.2 (2012): 124-130.

10. Iza N., *et al*. "Forensic profiling of Javanese and Madurese families in Malang and Madura, East Java Indonesia". *Cukurova Medical Journal*. 39.1 (2014): 26-38.