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Palmar and digital dermatoglyphic patterns of the three major ethnic groups in Nigeria

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Summary

Palmar and digital dermatoglyphic patterns of the three major ethnic groups in Nigeria were taken and their variability examined. Six hundred people were assessed, consisting of 200 Hausas (156 males, 44 females), 200 Ibos (98 males, 102 females), 200 Yorubas (112 males and 88 females). Clear prints were obtained by ink procedure and classified into patterns. It was found that ulnar loop was the most predominant among the ethnic groups. Comparison of digital and palmar ridge patterns among the ethnic groups revealed significant differences. The study established that digital and palmar ridge patterns vary significantly for the three ethnic groups. It was concluded from the study that dermatoglyphic traits of the digits and the palm may be used to differentiate the three ethnic groups.

Keywords: *Dermatoglyphics, patterns, ethnic groups, Nigeria*

Résumé

Les fréquences palmaires et digitales dermatoglyphiques des trois groupes ethniques au Nigéria étaient enregistrées et leur variabilités examinées. Six cent individus étaient étudiés (200 Hausas, 200 Ibos et 200 Yorubas) Les empreintes claires étaient obtenues par la procédure d'encre imprégnée et classifiées par fréquence. Nous avons trouvé que la loupe ulnaire était la plus prédominante parmi les groupes ethniques. La comparaison des fréquences des rides palmaires et digitales des groupes ethniques des différences significatives. Cette étude établissait que les fréquences des rides digitales et palmaires variaient significativement entre ces trois groupes ethniques. Nous avons conclu de cette étude que les traits dermatoglyphiques des doigts et de la paume de main peut être utilisé pour différencier ces trois groupes ethniques.

Introduction

This study compared palmar and digital dermatoglyphic patterns of the three major ethnic groups in Nigeria. Dermatoglyphic details are

genetically determined and can be used to identify populations by tribe or race as well as individuals [1-2].

Dermatoglyphic patterns had been studied in some samples of ethnic Nigeria populations but this study was designed to determine if dermatoglyphic patterns could be used to differentiate the major ethnic groups.

In a study of dermatoglyphics in the southern Nigeria population, females were shown to have a greater tendency to have more arches than males while southern Nigerians were shown to have a significantly higher total ridge count than the Zulus [3]. In another study of digital dermatoglyphic patterns in a sample of the Nigerian population, the ulnar loop was found to be most predominant in frequency distribution, except for arches males have higher frequency of the patterns than females [4].

Among the black Zimbabweans ulnar loops were the most predominant digital pattern in both sexes followed by whorls in males and arches in females. Significant differences were demonstrated between Zimbabwean and Malawian [5]. In palmar and digital dermatoglyphic traits of Kenyan and Tanzanian subjects, it was found that ulnar loops were the most prevalent digital ridge patterns and arches were the least with significant sex difference exhibited in arches, ulnar loops and whorls [6].

In dermatoglyphic variations in Spanish Basque populations all variables were significant among valley populations and there was greater differentiation among valley populations than between sexes in one valley population [7]

Materials and method

The subjects in the study consisted of physically able bodied healthy, volunteers residing in Ibadan, Nigeria. Inclusion criteria for volunteers: age 15-75 years for subjects, both parents and grandparents must be Hausa, Ibo or Yoruba. Six hundred people were assessed, consisting of 200 Hausas (156 males, 44 females), 200 Ibos (98 males, 102 females), 200 Yorubas (112 males, 88 females). Bilateral palmar and digital prints were obtained by Antonuk's ink

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procedure [8]. Age, sex, right or left hand and ethnicity were recorded manually on the edge of the print paper.

The clear prints were classified into universal accepted digital patterns: arch, radial loop, ulnar loop and whorl. Ridge counting was done using a hand lens. Other variables measured were: total finger ridge count (TFRC), Atd angle, a-b ridge count and pattern intensity index (PII).

Table 1: Percentage frequency of digital ridge patterns among three ethnic groups residing in Ibadan, Nigeria

| Pattern types | Hausa(%) | Ibo(%) | Yoruba(%) |
|---------------|----------|--------|-----------|
| Arch | 1.98 | 13.25 | 9.39 |
| Ulnar loop | 73.70 | 62.61 | 62.02 |
| Radial loop | 0.58 | 2.50 | 2.02 |
| Whorl | 23.74 | 21.65 | 26.57 |

Definition of terms

Ridge count is the number of ridge intersection within the pattern area obtained by drawing a line from the triradius or delta to the core point (triradial point and point of core are not included in the count).

Total number ridge count (TFRC) is the sum of the ridge counts on all the ten fingers for each sex.

Pattern intensity index (PII) is the number of triradii found on digits per individual subjects.

a-b ridge count is the number of ridges observed between the (a) triradius point and the (b) triradius point.

Atd angle is the angle between two straight lines joining the radial (a) and ulnar (d) triradii to the hypothenar triradius.

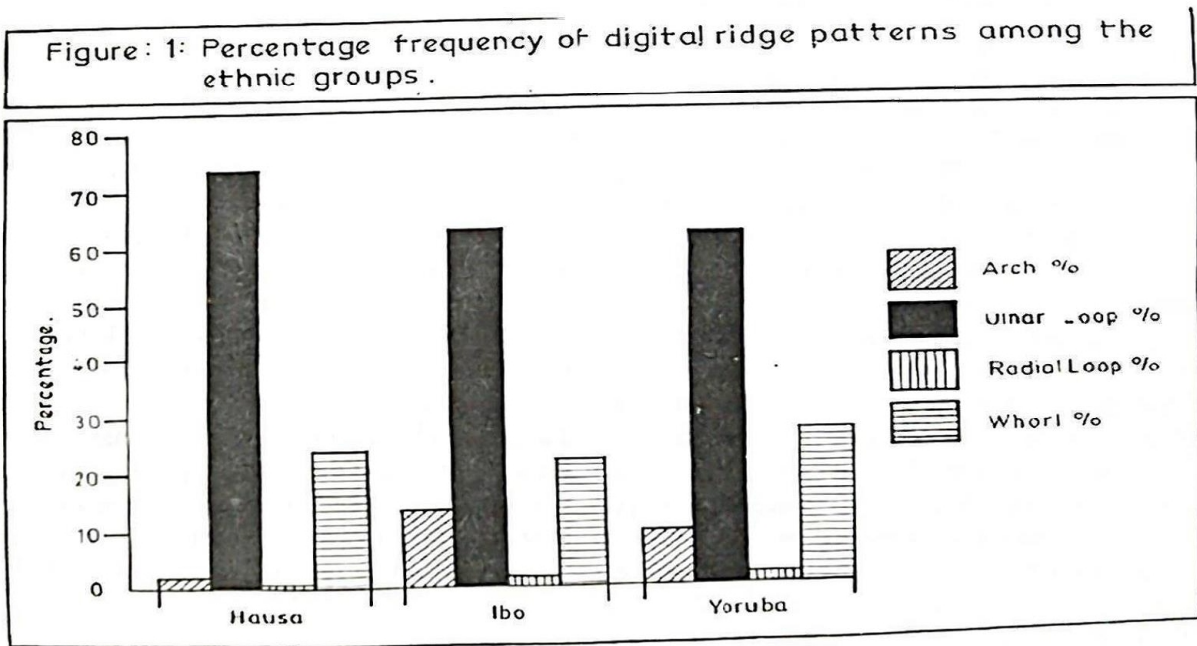


Fig. 1: Percentage frequency of digital ridge patterns among the ethnic groups

Table 2: Comparison of digital ridge patterns among three ethnic groups based on Gender.

| Pattern types | Male | Hausa Female | p value | Male | Ibo Female | p value | Male | Yoruba Female | P value |
|---------------|-------|--------------|---------|-------|------------|---------|-------|---------------|---------|
| Arch | 1.28 | 2.55 | 0.219 | 12.56 | 13.94 | 0.636 | 9.27 | 9.51 | 0.946 |
| Ulnar loop | 72.68 | 73.96 | 0.726 | 60.22 | 65.00 | 0.330 | 59.07 | 64.96 | 0.328 |
| Radial loop | 1.16 | 0.00 | 0.012 | 3.28 | 1.71 | 0.470 | 2.91 | 1.13 | 0.153 |
| Whorl | 23.93 | 23.49 | 0.635 | 23.94 | 19.35 | 0.508 | 28.40 | 24.75 | 0.657 |

Statistical analysis

The results were analyzed using t-test and analysis of variance (ANOVA). Confidence interval was calculated at 95% level and the level of significance fixed at $P < 0.5$.

Arch, radial and whorl digital ridge patterns showed no significant sex differences for Ibo and Yoruba ethnic groups. However, the Hausa ethnic group showed significant sex difference for radial loop (Table 2). TFRC and PII did not show significant sex differences for all the ethnic groups. The AtD

Table 3: Comparison of Palmar ridge patterns among the ethnic groups showing sex differences.

| Pattern Types | Hausa | | | Ibo | | | Yoruba | | |
|-----------------|-------|--------|----------|-------|--------|----------|--------|--------|----------|
| | Male | Female | P. Value | Male | Female | P. Value | Male | Female | P. Value |
| TFRC | 63.10 | 62.92 | 0.886 | 56.03 | 53.70 | 0.117 | 61.68 | 59.41 | 0.278 |
| Atd angle | 42.51 | 42.73 | 0.528 | 41.44 | 35.06 | 0.251 | 38.87 | 43.41 | 0.010 |
| a-b ridge count | 38.16 | 40.11 | 0.398 | 38.54 | 36.05 | 0.043 | 34.83 | 38.55 | 0.102 |
| PII | 6.09 | 6.09 | 0.966 | 6.00 | 5.52 | 0.796 | 6.59 | 5.34 | 0.211 |

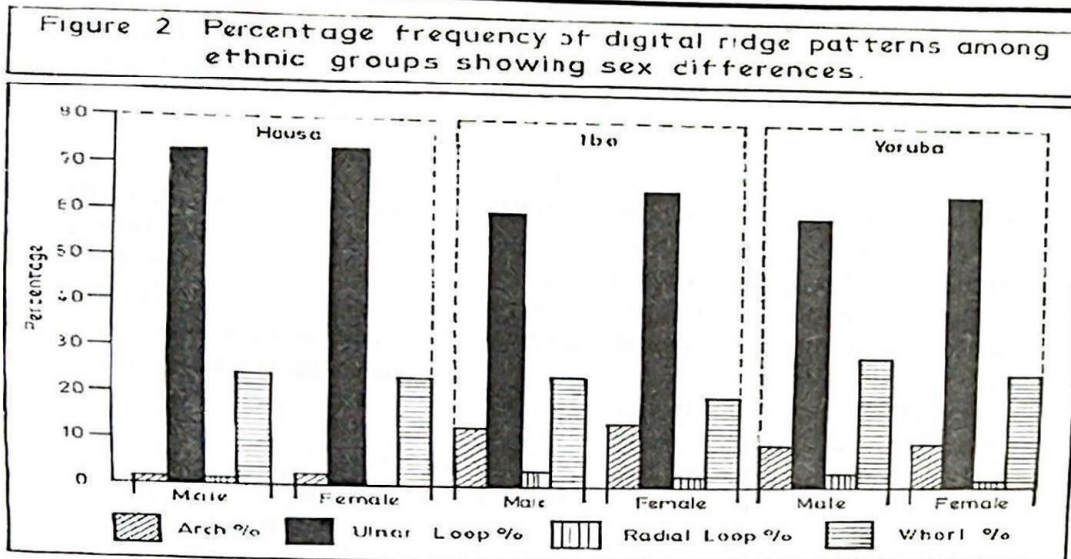


Fig. 2: Percentage frequency of digital ridge patterns among ethnic groups showing sex differences

Table 4: Comparison of digital ridge patterns among the ethnic groups

| | Hausa | | Ibo | | Yoruba | | F | P |
|-------------|-------|--------|-------|--------|--------|--------|---------|--------|
| | Mean | SD | Mean | SD | Mean | SD | | |
| Arch | 1.98 | 0.11 | 13.25 | 7.14 | 9.39 | 3.81 | 1799.0 | 0.0000 |
| Ulnar loop | 73.70 | 316.72 | 62.61 | 152.13 | 62.02 | 158.68 | 38.24 | 0.0000 |
| Radial loop | 0.58 | 0.02 | 2.50 | 0.29 | 2.02 | 0.19 | 1193.29 | 0.0000 |
| Whorl | 23.74 | 33.38 | 21.64 | 19.80 | 26.57 | 22.28 | 48.74 | 0.0000 |

Results

The ulnar loop was the most predominant digital ridge pattern in all the ethnic group (Table 1), it was also the most predominant in both sexes with no statistically significant differences in all ethnic groups ($P > 0.05$) (Table 2).

angle showed no significant sex differences for Hausa and Ibo, but significant for Yoruba ethnic group. The a-b ridge count showed no significant sex differences for Hausa and Yoruba but significant for Ibo ethnic group (Table 3).

When digital patterns were compared among Hausa, Ibo and Yoruba ethnic groups, there were

Table 5: Comparison of palmar ridge patterns between the ethnic groups

| Variable | Hausa n=200 | | Ibo n=200 | | Yoruba n=200 | | F | P |
|---------------------------------|----------------|--------|--------------|--------|-----------------|--------|-------|--------|
| | Mean | SD | Mean | SD | Mean | SD | | |
| TFRC | 63.01 | 153.83 | 54.87 | 121.02 | 60.54 | 148.24 | 24.71 | 0.0000 |
| Atd angle a-b ridge Count | 42.62 | 104.79 | 38.25 | 59.46 | 41.14 | 70.23 | 12.64 | 0.0000 |
| PII | 39.14 | 91.99 | 37.30 | 55.83 | 36.69 | 55.43 | 4.80 | 0.0000 |
| | 6.09 | 6.16 | 5.76 | 1.23 | 5.97 | 1.29 | 1.93 | 0.0000 |

n = 200

significant differences in frequency of arch, ulnar loop, radial loop and whorl among the ethnic groups ($P < 0.05$) (Table 4). Comparison of palmar variables revealed significant differences among the three ethnic groups ($P = 0.0000$) (Table 5).

Discussion

This study has demonstrated that ulnar loop was the most prevalent digital pattern followed by whorl among the three major ethnic groups with no significant sex differences while radial loop was the least prevalent. Similar findings were reported from previous studies by Borofice RA [4], Igbigbi *et al* [9]. Previous findings in African populations studied also revealed prevalence of digital ulnar loop followed by whorl [10-16], whereas in Caucasians high frequencies of digital arches and radial loop were reported [7].

Radial loop from this finding differentiated male and female Hausa ethnic group dermatoglyphically. This study shows that radial loop was absent among Hausa females, which is at variance with Danborno's finding of abnormal high frequency of radial loops in the female Hausas [10].

The arch frequency of 1.98%, whorl 23.74%, ulnar loop 73.70% and radial loop of 0.58% among Hausa ethnic group are comparable to the findings of Danborno [10] and Igbigbi *et al* [11]. The frequency of digital ridge pattern among the three ethnic groups is consistent with Borofice [4] finding in a sample of Nigerian population. The arch, ulnar loop, radial loop and whorl are significantly different when comparing the three ethnic groups ($P < 0.5$). This finding may demonstrate the significance of the digital dermatoglyphics variables in the differentiation of the three ethnic groups. Previous studies in sub-Saharan Africa populations have also demonstrated the existence of dermatoglyphic differences between various ethnic and population groups [4,5, 11-16]

The TFRC, Atd angle, a-b ridge count and PII showed significant differences for all the ethnic groups ($P = 0.0000$). Igbigbi *et al* [12] had shown Atd

angle to be more relevant than a-b ridge count in studies among Hausa and Urhobo, Yorubas and Ibos of Nigeria. Mean TFRC had been found to differentiate African population groups [6]. This study, however, suggests that TFRC, atd angle, a-b ridge count and PII may be used to differentiate the three Nigeria ethnic groups dermatoglyphically.

Conclusion

This study had shown that digital and palmar dermatoglyphics patterns may be used to differentiate the three major ethnic groups in Nigeria. We recommend large population studies using electronic data capturing device for finger printing with computerized analysis of the dermatoglyphic patterns, instead of the, mechanical counting method used in this study.

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