Biomedicine International

Biomedicine International (2010) 1: 66-69

ORIGINAL ARTICLE

Dermatoglyphic Patterns of Obese versus Normal Weight Nigerian Individuals

Gabriel S. Oladipo,[1*] Emmanuel O. Afolabi,[1] Chinagorum Esomonu[1]

[1]*Department of Human Anatomy, Faculty of Basic Medical Sciences, College of Health Sciences, University of Portharcourt, Nigeria*

ABSTRACT

The aim of this study was to determine the dermatoglyphic features of obese patients from the Ibibio ethnic group. One hundred individuals were examined: 50 obese (20 male and 30 female) and 50 normal (25 male and 25 female) subjects. Dermatoglyphic features such as digital and total ridge counts, DAT (angle formed by the triradius below the index finger) and ATD (angle formed by the triradius close to the wrist of the hand) were assessed. The results demonstrated that on digital prints, the arch pattern was most common on the first right digits of obese males (54.5%) and females (42.33%), while in normal individuals, an ulnar loop was more frequent ($P < 0.05$, chi-square test). The ATD and DAT angles on the right hands of male and female obese patients were significantly greater than those of normal male and female subjects ($P < 0.05$, z-test). Therefore, this study demonstrated that certain dermatoglyphic patterns are associated with obesity among the Ibibio population of Nigeria. The potential utility of these dermatoglyphic patterns in identifying individuals at high risk for obesity may be considered in future studies. *Biomed. Int. 2010; 1: 66-69. ©2010 Biomedicine International, Inc.*

Key Words: Dermatoglyphics, Ibibios, Nigeria, Obesity

INTRODUCTION

Obesity is a disorder resulting from a complex interplay of environmental and genetic factors. It is associated with significant morbidity and mortality. It occurs when caloric intake exceeds energy expenditure, but a growing body of evidence supports the view that obesity is caused by inherited tendencies towards subtle disorders in the weight-regulating mechanism, magnified by excessive feeding and lack of activity.[1]

The dermatoglyphic patterns of obese patients are dependent on such inherited or genetic tendencies towards obesity.[2,3] Dermatoglyphic studies are uniquely valuable for assessing the effect of toxins on the intrauterine environment (over 20% of all pregnancies never come to term), influencing the fetal development of finger-prints; expression of an obesity-related gene is likely to predetermine *in utero* the pattern of fingerprint formation in obese patients.[4]

Several studies have explored the relationship of dermatoglyphics to schizophrenia[5], alopecia[6], mental retardation, congenital heart defects and diabetes mellitus.[7,8,9] Autosomal trisomies - trisomy 21, trisomies 13-18 and trisomy 8 (mosaiacism) - have been the subject of many studies in relation to dermatoglyphic patterns.[10] However, there is no documented work concerning dermatoglyphics in obese patients of Nigerian origin. The objective of this study was therefore to establish the dermatoglyphic patterns and parameter values of obese patients for use in Nigeria, particularly in the Ibibio ethnic group from which the subjects for the study were selected.

MATERIALS AND METHODS

A total of 100 subjects, 50 obese patients (OB) and 50 normal controls (N), were randomly selected for the study. The 50 obese patients comprised 30 females and 20 males and the control group comprised 25 females and 25 males, all selected from the Ibibio ethnic group of Southern Nigeria. Palmar and digital prints of both hands were collected from the subjects using a standard method.[6] The subjects were required to wash their hands with soap and water and dry them with a hand towel to avoid dirt from interfering with the ink prints. The stamp pad was soaked with endorsing ink. Ensur-

[*]Address correspondence to Gabriel S. Oladipo, PhD. Department of Anatomy,
Faculty of Basic Medical Sciences, College of Health Sciences, University of Portharcourt, Nigeria. E-mail: oladipogabriel@yahoo.com. Phone: +2348050428628.

Submitted May 23, 2009; accepted in revised form December 9, 2009.

Advance Access Publication July 15, 2010 (see www.bmijournal.org)

ing that the ink was thoroughly spread on the pad, the fingers were placed on it one after the other and then transferred to the duplicating paper and rolled gently and slowly from side to side in order to obtain clear complete prints. To obtain palmar prints, subjects had their hands extended at the wrist with the fingers fully abducted, and were asked to make impressions by placing their palms on the duplicating paper, starting with the proximal part of the hand and lowering it until the digits came in contact with the paper, applying little pressure.[6] Palmar angles were measured as shown in figure 1. The body mass indices (BMI) of the obese group were obtained.

To determine whether an individual is obese, the BMI is taken by measuring his/her weight (kg), height (m) and waist circumference (cm). An individual is obese if his/her BMI ≥ 30 kg/m^2 with a waist circumference ≥ 89 cm (female) or 102 cm (male). The control group in this study comprised individuals with BMI ≤ 25 kg/m^2. Statistical analysis using *z*-tests and chi-square tests was performed using SPSS version 15.0.

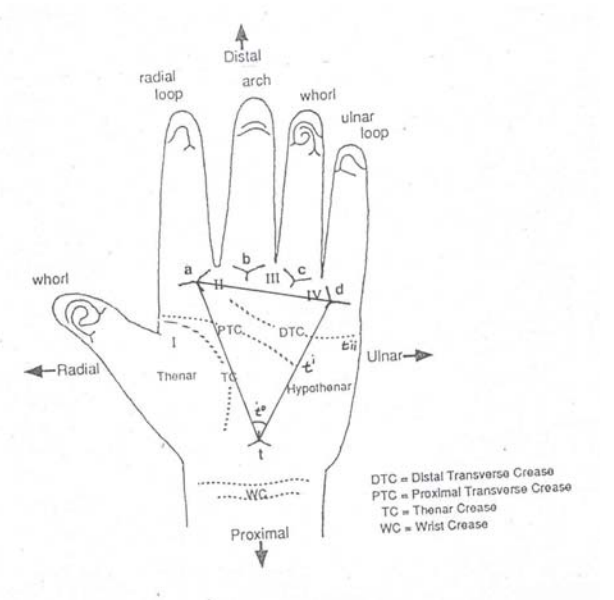

Figure 1. ATD angle, DAT angle and digital patterns.[23]

RESULTS

The study was carried out on 50 normal healthy persons (25 males and 25 females) and 50 obese patients (30 females and 20 males) from the Ibibio ethnic group of Southern Nigeria. The results are shown in tables 1-6. Chi-square tests confirmed significant differences between obese patients and normal subjects in the frequencies of digital patterns on all the right and left

Table 1. Frequencies of digital patterns of the right hands of obese patients and normal male subjects.

Finger	Thumb	Thumb	Index	Index	Middle	Middle	Ring	Ring	Little	Little
	Obese	*Normal*	*Obese*	*Normal*	*Obese*	*Normal*	*Obese*	*Normal*	*Obese*	*Normal*
Ulnar loop	21.60	42.00	52.50	37.30	51.80	38.70	54.50	32.00	52.00	42.70
Radial loop	8.20	3.30	11.00	7.33	0.60	12.00	6.00	11.33	3.30	17.30
Whorl	15.60	38.60	10.50	32.80	33.80	30.70	20.60	49.33	30.30	18.00
Arch	54.50	16.10	26.40	22.60	15.50	18.00	19.80	7.34	14.40	22.00

$P < 0.05$. Note: comparisons were between the digit patterns of the normal and obese groups.

Table 2. Frequencies of digital patterns of the right hands of female obese patients and normal subjects

Finger	Thumb	Thumb	Index	Index	Middle	Middle	Ring	Ring	Little	Little
	Obese	*Normal*	*Obese*	*Normal*	*Obese*	*Normal*	*Obese*	*Normal*	*Obese*	*Normal*
Ulnar loop	24.81	43.40	21.40	45.70	50.85	36.70	37.51	37.30	51.30	41.00
Radial loop	3.33	4.30	7.60	3.70	4.50	9.30	9.41	6.80	2.11	12.30
Whorl	30.50	34.20	53.70	38.30	11.73	30.00	35.60	26.00	33.60	19.60
Arch	42.33	18.50	18.80	12.30	34.50	24.00	18.00	19.60	13.31	27.00

$P < 0.05$. Note: comparisons were between the digit patterns of the normal and obese groups.

Table 3. Frequencies of digital patterns of the left hands of male obese patients and normal subjects.

Finger	Thumb	Thumb	Index	Index	Middle	Middle	Ring	Ring	Little	Little
	Obese	Normal	Obese	Normal	Obese	Normal	Obese	Normal	Obese	Normal
Ulnar loop	18.40	48.00	18.60	39.30	50.41	46.00	52.10	52.00	53.40	48.90
Radial loop	34.40	1.30	20.60	7.30	0.00	13.30	3.30	12.00	4.10	18.00
Whorl	11.50	34.00	17.80	31.30	18.30	23.30	36.60	21.30	21.15	14.70
Arch	40.10	16.70	46.40	22.00	33.10	17.40	11.10	14.70	22.10	19.30

$P < 0.05$. Note: comparisons were between the digit patterns of the normal and obese groups.

Table 4. Frequencies of digital patterns of the left hands of female obese patients and normal subjects.

Finger	Thumb	Thumb	Index	Index	Middle	Middle	Ring	Ring	Little	Little
	Obese	Normal	Obese	Normal	Obese	Normal	Obese	Normal	Obese	Normal
Ulnar loop	18.45	46.00	40.50	36.00	33.41	46.40	44.60	51.70	43.81	41.20
Radial loop	41.01	2.10	21.02	5.10	6.80	12.20	9.02	11.00	21.01	12.10
Whorl	33.41	28.80	22.41	32.00	44.60	22.30	32.80	24.70	30.46	22.70
Arch	16.11	23.20	20.11	26.40	24.60	21.10	18.04	13.80	25.00	15.00

$P < 0.05$. Note: comparisons were between the digit patterns of the normal and obese groups.

Table 5. Parameters with significant differences between obese and normal individuals from the Ibibio ethnic group.

	Obese individuals		Normal individuals	
Parameters	**Males**	**females**	**Males**	**Females**
Left hand ATD angle (^{0})	*44.50 ± 1.34	†45.20 ± 1.10	*39.00 ± 1.25	†43.00 ± 1.30
Right hand ATD angle (^{0})	*46.30 ± 1.34	†44.60 ± 1.10	*40.50 ± 1.25	†41.60 ± 1.25
Left hand distance a-d (mm)	‡58.90 ± 1.78	+58.60 ± 1.37	‡47.20± 1.35	+47.60 ± 1.35
Right hand distance a-d (mm)	‡59.33 ± 1.74	+58.00 ± 1.37	‡48.40 ± 1.65	+48.00 ± 1.50

Table 6. DAT angles (^{0}) of the palmar prints in obese vs. normal-weight individuals.

	Obese (Right hand)		Normal (Right hand)		Obese (Left hand)		Normal (Left hand)	
	Male	**Female**	**Male**	**Female**	**Male**	**Female**	**Male**	**Female**
Mean (^{0})	66.20	61.00	62.4	61.7	66.20	63.10	62.90	63.0
SD	0.40	0.26	0.30	0.28	0.40	0.30	0.2	0.30
SE	0.04	0.02	0.03	0.02	0.03	0.03	0.02	0.03
Sample size	20	30	25	25	20	30	25	25

$P > 0.05$. Note: DAT angles in the same hand and sex were compared between obese and normal subjects. SD, standard deviation; SE, standard error.

hand digits ($P < 0.05$).

DISCUSSION

Nearly all chromosomal disorders have characteristic dermatoglyphic patterns useful in the diagnosis of those disorders.[11] Hirsch[12] reported the results of dermatoglyphic studies concerning mental retardation, congenital heart defects, child psychiatric conditions and retarded growth. In addition, psychotic patients have been extensively studied[13,14] and differences have been reported between the dermatoglyphic traits of patients and normal controls. Regoly et al.[8] studied the dermatoglyphic patterns of obese patients. Blanka and Milton[15] reported the dermatoglyphic patterns of autosomal trisomies - trisomy 21 (Down's syndrome), trisomies 13 and 18, trisomy 8 (mosaicism) - sex chromosomal anomalies, leukemia and other conditions. There are widespread dematoglyphic variations between ethnic groups, so there is a need to determine the parameter values necessary in making diagnoses in each ethnic group.[7] Intensive dermatoglyphic studies have been conducted on risk factors for diseases associated with obesity[16] such as type 2 diabetes mellitus.[17]

Shield et al.[9] reported no significant differences between normal individuals and diabetic patients with regard to total ridge count (TRC), digital pattern, ATD angle, a-d ridge count, a-d distance, b-c distance or position of the axial triradius (t). A similar study demonstrated no difference in the ATD angles of the right hand between the two groups,[16] but there were differences in ATD angle, DTA angle and distance a-d. Ravindranath and Thomas[18] reported increased radial and ulnar loops and arches with a decrease in whorls on the left hands of diabetic patients.

While obesity as defined by BMI is rare, central obesity is relatively common among Nigerian type 2 diabetic patients.[16] Obesity is more common in female than male patients [19] and this could be due to cultural practices that limit physical exertion by females with resultant sedentary habits, obesity and attendant complications. Dermatoglyphic patterns in the obesity risk factor for breast cancer demonstrate significant increases in the frequency of arch patterns followed by ulnar loops and whorl patterns.[10]

Oladipo et al.[20] reported that the arch pattern was most frequent amongst schizophrenics in the southern population of Nigeria; simian creases and Sydney lines were also identified. Dermatoglyphic studies concerning

digital patterns, axial digital triradius and palmar creases in sickle cell anemia patients revealed no characteristic dermatoglyphic pattern in this condition.[21] The authors also reported abnormally low ATD angles in prostate cancer patients.[22] Dermatoglyphic analysis of the digital patterns in Down's syndrome patients and normal individuals demonstrated a statistically significant difference in loop pattern frequency: 96% in the patients and 63.6% in controls.[23] Studies examining dermatoglyphics in relation to cancer patients have generally shown an increase in whorls.[24,25] In addition, some studies have confirmed a correlation between the digital whorl subtype and breast cancer.[26] However, others have demonstrated that ulnar loops are associated with breast cancer.[27,28] Observations in the present study are inconsistent with those reported on Down's syndrome, breast cancer and prostate cancer.

The results of the present study show that obese patients in the Ibibio ethnic group of Southern Nigeria have a significantly different characteristic percentage distribution of digital patterns from normal subjects in the same ethnic group. The high percentage of the arch pattern on the first right digits of the patients is peculiar to obese Ibibios; normal subjects had a low percentage of this pattern on the same digit. In addition, obese individuals in the Ibibio ethnic group have a significantly high ATD angle in both males and females. The dermatoglyphic patterns of obese patients are dependent on inherited or genetic tendencies towards obesity.[2,3] Dermatoglyphic studies are uniquely valuable for assessing the effect of toxins on the intrauterine environment (over 20% of all pregnancies never come to term), influencing the fetal development of fingerprints; expression of an obesity-related gene is likely to predetermine *in utero* the pattern of finger-print formation in obese patients.[4]

It is concluded that Ibibios with a tendency towards obesity have high percentages of arch patterns and significantly higher ATD angles than normal Ibibios. Therefore, the potential utility of these dermatoglyphic patterns in identifying individuals at high risk for obesity may be considered in future studies.

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