A COMPARATIVE STUDY OF THE DIGITAL PATTERN, POSITION OF TRIRADII, b-c AND a-d PALMAR DISTANCES OF DIABETIC SUBJECTS AND ESSENTIAL HYPERTENSIVE INDIVIDUALS IN RIVER STATE.

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ABSTRACT

The study was carried out to document characteristic dermatoglyphic features in subjects with Diabetes Mellitus and also subjects with Essential Hypertension in River State, Nigeria. Digital and palmar dermatoglyphic analysis of 160 subjects was carried out. 80 subjects with Diabetes Mellitus (40 males and 40 females) and 80 subjects with Essential Hypertension (40 males and 40 females) were used. Dermatoglyphic features such as the digital patterns frequency, position of triradii, b-c and a-d palmar distances were accessed. The results from this study demonstrated that the diabetic subjects had significantly higher frequency of ulnar loop digital pattern than the hypertensive subjects (76.1%) while the hypertensive subjects had a significantly higher frequency of whorl digital pattern than the diabetic subjects (66.6%), (P<0.05). It was observed that the percentage frequency of position of T-triradii on the right and left hand of male and female Diabetic patients and essential hypertension. It was observed that the frequency of position of T-triradii is highest at T (90.0% for male and 95.0% for female) in the right hand of diabetic patients and (92.5% for male and 90.0% for female) in the left hand of diabetic patients while in essential hypertensive patients, the frequency of position of T-triradii is also highest at T (82.5% for male and 97.5% for female) in the right hand and (87.5% for male and 95.0% for female) in the left hand of diabetic patients. The position of T-triradii at t^i and t^{ii} had the least frequency. It was also observed that there is significant difference in the b-c palmar ridge count between the diabetic patients and the essential hypertensive patients with the male essential hypertensive patients having a higher average value of 13.50 for the right hand and 13.54 for the left hand than male diabetic patients (12.45 for the right hand and 12.00 for the left hand). Also, the b-c palmar ridge count in female essential hypertensive patients had a higher average value of 14.14 for the right hand and 14.34 for the left hand than in the diabetic patients (13.50 for the right and 12.50 for the left hand), (P<0.05). These results demonstrate the distinct dermatoglyphic patterns and values which could be used as a noninvasive anatomical marker for Diabetes mellitus and Essential Hypertension. However, further studies are needed to confirm these findings for Nigerians, possibly using a larger population.

KEYWORDS: Dermatoglyphic, Diabetes mellitus, Essential hypertension, River State, Nigerians

INTRODUCTION

Dermatoglyphics is a scientific study of the epidermal ridge patterns present on the skin of the palms, fingers, toes and sole of feet[1]. This scientific study was credited, beginning with the work of Purkinje J.E in 1823[2]. Epidermal ridge patterns form early in fetal development and remains unchanged throughout life hence, they could be used to indicate gene or chromosomal abnormalities[3].

Cummins[1] proposed that the direction of epidermal ridges was determined by growth factors and contours of volar skin at the time of ridge formation. These epidermal ridges form well-defined patterns that characterize individuals and they have been found useful in the clinical diagnosis of hereditary diseases.[1]

Both Diabetes mellitus and Essential hypertension could be caused as a result of genetic and environmental influences. Diabetes mellitus, often simply referred to as diabetes, is a group of metabolic diseases attributed to high blood sugar content in the body[4], while essential hypertension is defined as sustained high blood pressure not attributed to a single cause but reflecting the interaction of multiple genetic and environmental influences such that siblings of hypertensive parent or parents stand a higher a higher chance of developing hypertension later in life[5].

Some studies have identified the existence of variations in different ethnic groups[6, 7]. Various authors have also reported the existence of peculiar dermatoglyphic characteristics in genetic disorders, malignancies and some other idiopathic diseases[8-11].

Some studies have also shown links between diabetes mellitus and dermatoglyphic features[12-19].

The aim of this study therefore, was to determine the dermatoglyphic patterns of subjects with diabetes mellitus and essential hypertension hence bringing about a dermatoglyphic reference value for detection for early detection of diabetes as well as essential hypertension.

MATERIALS AND METHODS

A total of 160 subjects were used for the study; 80 diabetic patients (40 males and 40 females) and 80 Essential hypertensive patients (40 males and 40 females). The patients and out-patients aged 25-70 were gotten from university of Port Harcourt teaching hospital Rivers State. All the subjects have both parents and grandparent who are indigenes of River State.

Palmar and digital prints were collected using stamp pad impregnated with ink and placing them on a duplicating. The prints were studied with a magnifying lens for easy identification of the different finger pattern and also to allow for digital ridge counting. The method used for the analysis of the prints was based on Cummins method[1].

The following parameters were studied for each subject in both hands; fingerprint pattern, position of triradii, b-c and a-d Palmar distances. The various dermatoglyphic parameters were analyzed using discrete statistics and the readings tabulated. Chi square test and z-test of significance was applied to compare the variables and P values < 0.05 was considered statistically significant.

RESULTS

The results of the dermatoglyphics of essential hypertension and diabetes mellitus patients are shown in tables 1- 4. Table 1 shows the percentage frequency of digital patterns of male and female Diabetic patients and essential hypertensive patients respectively. It was observed that the diabetic patients had the highest frequency of ulnar loop pattern with the average value of 76.1%. This is followed by the whorl pattern, (22.0%). The arch pattern (6.5%) and the radial loop pattern (5.3%) had the lowest frequency. The essential hypertensive patients had the highest frequency of whorl pattern on both hands with the average value of 66.6%, this

is followed by the ulnar loop pattern (20.6%). The arch pattern (9.0%) and radial loop pattern (7.0%) had the lowest frequency, (P<0.05). Tables 2-3 show the percentage frequency of position of T-triradii on the right and left hand of male and female Diabetic patients and essential hypertension. From the tables, it was observed that the frequency of position of T-triradii is highest at T (90.0% for male and 95.0% for female) in the right hand of diabetic patients and (92.5% for male and 90.0% for female) in the left hand of diabetic patients while in essential hypertensive patients, the frequency of position of T-triradii is also highest at T (82.5% for male and 97.5% for female) in the right hand and (87.5% for male and 95.0% for female) in the left hand of diabetic patients. Following the T position is the t^i which has the value of (7.5% for male and 10.0 % for female) in the diabetic right hand and (10.0% for male and 5.0% for female) in the diabetic left hand, while in essential hypertensive patients, the frequency of position of T-triradii at t (12.5% for male and 5.0% for female) in the right hand and (17.5% for male and 2.5% for female) in the left hand of essential hypertension patients. T position at t^{ii} had 0% frequency.

Table 4 shows the summary of mean of b-c and a-d palmar ridge count of the left and right hands of male and female diabetic patient and essential hypertensive patients. It was also observed that there is significant difference in the b-c palmar ridge count between the diabetic patients and the essential hypertensive patients with the male essential hypertensive patients having a higher average value of 13.50 for the right hand and 13.54 for the left hand than male diabetic patients (12.45 for the right hand and 12.00 for the left hand). Also, b-c palmar ridge count in the female essential hypertensive patients had a higher average value of 14.14 for the right hand and 14.34 for the left hand than in the diabetic patients (13.50 for the right and 12.50 for the left hand), (P<0.05). In addition, the a-d palmar ridge

count is significantly higher in male essential hypertensive patients with the average value of 59.55 for the right hand and 59.87 for the left hand than male diabetic patients (58.90 for the right hand and 58.45 for the left hand).

Also, the a-d palmar ridge count in female essential hypertensive patients had a higher average value of 60.54 for the right hand and 60.55 for the left hand than in the diabetic patients (58.85 for the right and 58.50 for the left hand), (P<0.05).

Table 1: Percentage (%) frequency of digital pattern of male and female essential hypertensive patient and

Patterns	MALE		FEMALE		MALE		FEMALE	
	RDM	REHP	RDM	REHP	LDM	LEHP	LDM	LEH
Arch (A)	6.5	9.0	5.2	8.5	5.0	7.4	3.5	12.6
Ulnar loop (UL)	69.0	20.4	67.5	19.6	76.1	17.5	67.5	19.0
Radial loop (RL)	5.6	4.0	5.3	11.0	5.0	9.0	7.5	7.0
Whorl (W)	19.6	66.6	22.0	61.0	14.5	65.1	20.5	60.5

diabetic patient.

P<0.05   Note: R=Right hand, DM=Diabetes Mellitus patient, EHP= Essential Hypertension, i=1st digit, ii= 2nd digit, iii=3rd digit, iv= 4th digit, v=5th digit

Table 2: Percentage (%) frequencies of position of T-triradii on the right hand of patients with essential hypertension (EHP) and Diabetes mellitus patients (DM)

Position of triradii	DM (Male)	DM (Female)	EHP (Male)	EHP (Female)
T	92.5	90.0	87.5	95.0
t^i	7.5	10.0	12.5	5.0
t^{ii}	0.0	0.0	0.0	0.0

DM=Diabetes Mellitus patient, EHP= Essential Hypertension

Table 3: Percentage (%) frequencies of position of T-triradii on the left hand of patients with essential hypertension (EHP) and Diabetes mellitus patients (DM)

Position of triradii	DM (Male)	DM (Female)	EHP (Male)	EHP (Female)
T	90.0	95.0	82.5	97.5
t[i]	10.0	5.0	17.5	2.5
t[ii]	0.0	0.0	0.0	0.0

DM=Diabetes Mellitus patient, EHP= Essential Hypertension

Table 4: Summary of mean of palmar ridge count of the right and left hand of the male and female diabetic patients and essential hypertensive patients.

Parameter	MALE		FEMALE		MALE		FEMALE	
	RDM	REHP	RDM	REHP	LDM	LEHP	LDM	LEHP
b-c ridge count	12.45	13.50	13.50	14.14	12.00	13.54	12.50	14.34
a-d ridge count	58.90	59.55	58.85	60.54	58.45	59.87	58.50	60.55

b-c ridge count P>0.05, **a-d** ridge count P<0.05. R= Right hand L=Left hand, DM=Diabetes Mellitus patient, EHP= Essential Hypertension.

DISCUSSION

A number of studies have indicated dermatoglyphic correlation in large number of genetic disorders which include diabetes mellitus [20,11], schizophrenia[8], congenital heart disease[21], Androgenetic alopecia[22] and Down Syndrome[10]. Some of the variable implicated with dermatoglyphics correlation include: digital pattern, ATD angle, DAT angle digital ridge count, pattern intensity index and palmer crease pattern[20, 23-25].

The statistical analysis of this study has shown that the male and female diabetic patients have significantly higher percentage frequency of ulnar loop fingerprint patterns. This result is in line with the findings of some authors[12-15, 19, 26, 28] which reports a significantly higher frequency of ulnar loop in diabetic subjects followed by the whorl pattern. The arch and radial loop had the least percentage frequency.

The present study has also shown that the essential hypertensive patients have significantly higher whorl pattern (male and female) than other fingerprint pattern. This is similar to the findings of Jain et al.[25], Oladipo et al.[26]. Oladipo and Akanigha [20] reported that whorl had the highest frequency amongst individuals with Alopecia. In this study, the observation made on the frequency pattern of diabetic patients and essential hypertensive patients is in accordance with the result of a study carried out by Oladipo et al.[26] who reported that the percentage frequency of whorl digital pattern in both male and female essential hypertensive patients was significantly higher than the normal males and females, and that the whorl pattern on the right hands were strongly associated with EHP (with the first right digit of males and females showing percentage occurrence of 100% and 80.77% respectively). It could therefore be deduced that the high frequency of whorl pattern on the first digits of essential hypertensive patients and the high frequency of ulnar loop on the last digits of diabetic patients could be relied on as early diagnostic tool for essential hypertension and diabetes mellitus respectively.

The result on the position of T-triradius in this study is in line with report by Oladipo et al., 2010 who observed a higher percentage frequency of position of T-triradii at T-position in both essential hypertensive patients (84.6% for male and 91.7% for female) and normal population(92.3% for male and 79.3% for female). Hence it could be deduced that there was no significant difference between the hypertensive patients and the normal population, likewise the diabetic subjects and hypertensive subjects. Therefore, the position of T-triradii is not a suitable parameter for pre-detection of diabetes mellitus or essential hypertension. The

observation made on the b-c and a-d palmar ridge count in this study is in agreement with the study of Mandesescu et al., 2002, who observed a significant difference in the b-c ridge count of the right hand of female diabetic subjects and the male diabetic patients. They also observed a significant difference in the a-d ridge count of the right hand of male diabetics (62.3) and also a significant difference in the right hand of female diabetic patients (60.5)

CONCLUSION

This study has highlighted differences in the digital dermatoglyphic features between diabetes mellitus and essential hypertension. The differences exhibited were demonstrated better in the digital pattern, position of triradii, b-c and a-d palmar ridge count/ distance. From this study, it could be deduced that the specific dermatoglyphic features associated with diabetes mellitus includes a higher frequency of the ulnar loop pattern, low b-c ridge count and low a-d ridge count. Also presence of whorl pattern on the thumb and higher frequency of whorl in hands (male and female) as well as high b-c ridge count and a high a-d ridge count could also serve as indicators for essential hypertension.

The observation in this study can be used as early diagnostic tool in detection of diabetes mellitus as well as essential hypertension in the population under investigation. I also recommend that similar studies should be carried out on other populations of the country and the world at large in order to produce a more comprehensible data that could be used in early diagnosis of these diseases in other population.

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