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Dermatoglyphics and Cheiloscopy Pattern in Hypertensive Patients; A Study in Ahmadu Bello University Teaching Hospital, Zaria, Nigeria and Environs.

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Abstract- Essential hypertension is sustained high blood pressure not attributable to a single cause but reflecting the interaction of multiple genetic and environmental influences. Dermatoglyphic involves the study of epidermal ridges present on the surface of palms, finger, soles and toes while cheiloscopy is the study of the grooves or furrows present on the vermilion border of the human lips. Finger and lip prints are known useful genetic markers in some congenital and clinical diseases; as such this study was aimed at determining the association between fingerprint and lip print patterns in hypertensive patients. The present study was carried out with hypertensive patients attending the outpatient clinic of Ahmadu Bello University Teaching Hospital (ABUTH), Zaria and was compared with a control group with normal blood pressure. The subjects were 118 clinically diagnosed patients with hypertension and 126 subjects who were normotensives with no family history of hypertension. The digital dermatoglyphic patterns were studied using method of Cummins while the lip prints were identified and classified according to method of Suzuki and Tsuchihashi. The prints were analyzed and results from obtained showed significant association between fingerprint patterns and hypertension in female subjects ($p<0.001$). The fingerprint patterns of male subjects did not show association with hypertension. The lip print patterns of both male and female subjects showed association with hypertension ($p<0.001$). In conclusion, the present study indicates association between finger and lip print pattern with hypertension in females subjects. While for the males there is no association between fingerprint patterns hypertension, but the lip print pattern showed association with hypertension.

Index Terms- association, cheiloscopy, dermatoglyphics, hypertension.

I. Introduction

Dermatoglyphics has proved to be a very important tool used for identification of many gene-linked abnormalities or diseases. Same can also be said of Lip prints which as dermatoglyphics are unique to individuals, and has been shown to be a useful genetic markers in some congenital and clinical diseases. Genetic predisposition is one of the known risk factors associated with diseases, and studies have been previously done to establish the relation between dermatoglyphic pattern and cardiovascular diseases. The science of dermatoglyphics involves the study of epidermal ridges present on the surface of palms, finger, soles and toes (Cummins and Midlo, 1961). The fingerprints develop in relation to the volar pads which are fully formed by the 16th week of intrauterine life and environmental factors affect them. Lip prints are normal lines and fissures in the form of wrinkles and grooves present in the zone of transition of human lip, between the inner labial mucosa and outer skin, examination of which is known as cheiloscopy. It is unique for individuals, as is finger prints. Hypertension is one of the most common diseases in the world affecting an estimated 20 percent of adult population and it is associated with high risk of morbidity and mortality**.** It is a condition with genetic influence. It is defined as sustained high blood pressure not attributable to single cause but reflecting the interaction of multiple genetic and environmental influences, such that siblings of hypertensive parent or parents stand a higher chance of developing hypertension in later life (Neal and Dan, 2004).

II. Materials and Methods

Ethical approval was obtained and informed consent also obtained from the subjects. A questionnaire which included patients' biodata such as name, sex, age, marital status, tribe, disease condition and occupation was handed to the correspondents to fill. Cummin's method was used for the fingerprints; which include the use of an ink pad. In this method, the subjects were asked to wash and dry their hands to avoid contamination. After that, the 10 fingers were pressed upon a stamp pad and impressed on a white duplicating paper; subjects were asked to roll their finger pads from one side of the nail to another to allow for better clarity of the impressions. This was then screened with the aid of a magnifying lens (x5) and the loop; arch and whorl fingerprint patterns on each finger were noted and documented based on the ridges and furrows (Cummins *et al.*, 1961).

III. LIP PRINT COLLECTION

The patients were made to sit in a relaxed position; after cleaning the lips, the prints were taken by placing a microscopic glass slide in a single motion evenly on the lips of each subject. This was then developed by dusting fine carbon black powder with an ostrich brush and preserved with a cello tape which was then

studied using a magnifying lens (Suzuki *et al.*, 1970). Because most lips contain more than one type of pattern, the lips were divided into four quadrants. Each quadrant is studied and the various types of lip prints are recorded. Each quadrant is read from the center of the lip outward toward the corner of the lip. The upper and lower lips are divided through the center by an imaginary vertical line, thus producing left and right upper and lower quadrants. The patterns in each quadrant were then analyzed and classified according to Suzuki and Tsuchihashi (Suzuki *et al.*, 1974, Tsuchihashi, (1974a,b).

IV. Results and Discussion

The fingerprint and lip print patterns was studied in 118 clinically diagnosed patients with hypertension and 126 subjects who were normotensives served as the control group and the following results were drawn using the Chi –square (x^2) test and this showed differences in percentages and frequencies in distribution of print patterns between patients with hypertension and normal subjects and the differences were statistically significant ($p<0.05$). This indicated association between the print patterns and hypertension.

Table 1; Association between fingerprint pattern on the left hand of hypertensive and normotensive male.

	Loop	Whorl	Arch
Normotensive	247 (65%)	103 (27.10%)	30 (7.90%)
Hypertensive	36 (63.45%)	13 (25.64%)	6 (10.91%)

$X^2 = 0.745$, df = 2, p = 0.69, p> 0.05

Where x^2 = Chi-square value, df= degree of freedom

This table shows a higher loop occurrence in both groups with the normotensive (65%) having a higher value than that of the hypertensive (63.45%) followed by that of the whorl which was also higher in the normotensive (27.10%) than in the hypertensive (25.64%) and the arch which has a higher frequency in the hypertensive (10.91%) than in the normotensive (7.90%).

Table 2; Association between the fingerprint pattern on the right hand of hypertensive and normotensive male

	Loop	Whorl	Arch
Normotensive	246 (64.74%)	114 (30.20%)	20 (5.26%)
Hypertensive	39 (70.91%)	13 (23.64%)	3 (5.45%)

$X^2 = 0.95$, df = 2, p = 0.62, p> 0.05

In this case also, loop value was predominant with the hypertensive (70.91%) having a higher value than that of the normotensive (64.74%) but the whorl of the normotensive (30.20%) was significantly higher than that of the hypertensive (23.64%) and the was higher in the hypertensive with 5.45% than in the normotensive with 5.26%.

Table 3; Association between the fingerprint pattern left hand of hypertensive and normotensive female

	Loop	Whorl	Arch
Normotensive	153 (61.2%)	52 (20.8%)	45 (18%)
Hypertensive	364 (68.04%)	150 (23.04%)	21 (3.93%)

X^2 =44.8, df =2, p = 0.000000000184, p< 0.05

In this table, there was a significantly higher loop pattern in the hypertensive (68.04%) than in the normotensive (61.2%) and the whorl pattern was also higher in the hypertensive (23.04%) than in the normotensive (20.8%) and the arch pattern had a higher frequency in the normotensive (18%) than in the hypertensive (3.93%).

Table 4; Association between the fingerprint pattern on the right hand of hypertensive and normotensive female

	Loop	Whorl	Arch
Normotensive	160 (64%)	53 (21.2%)	37 (14.8%)
Hypertensive	375 (70.09%)	137 (25.61%)	23(4.30%)

$X^2 = 26.88$, df = 2, p = 0.00000145, p< 0.05

Table 3 shows a higher frequency of loop fingerprint pattern which was significantly higher in the hypertensive (70.90%) than in the normotensive (64%). This was also true for the whorl fingerprint pattern which was also higher in the hypertensive (25.61%) than in the normotensive (21.2%) but in the arch pattern, the frequency of the normotensive (14.8%) was higher in the hypertensive (4.30%).

Table 5; Association between fingerprint pattern on the left hand of hypertensive and normotensive for both male and female (overall left hand)

	Loop	Whorl	Arch
Normotensive	400 (63.49%)	155 (24.60%)	75 (11.90%)
Hypertensive	400 (67.79%)	163 (27.62%)	27 (4.57%)

$X^2 = 21.50$, df = 2, p = 0.0000214, p< 0.05

On the above table, the frequency of loop fingerprint was significantly higher in the hypertensive (67.79%) than in the normotensive (63.49%). This was also true for the whorl pattern with the frequency in the hypertensive as 27.62% and that of the normotensive as 24.60%. However, the frequency of the arch pattern was significantly higher in the normotensive (11.90%) than in the hypertensive (4.57%).

Table 6; Association between fingerprint pattern on the right hand of hypertensive and normotensive for both male and female (overall right hand)

	Loop	Whorl	Arch
Normotensive	406 (64.44%)	167 (26.51%)	57 (9.05%)
Hypertensive	416 (70.50%)	147 (24.92%)	27 (4.58%)

$X^2 = 10.81$, df = 2, p = 0.004, p< 0.05

The table shows the overall fingerprint pattern on the right hand with a higher frequency of loop in the hypertensive (70.50%) than on the normotensive (64.44%) but the patterns of the whorl and arch were higher in the normotensive with 26.51% and 9.05% respectively than in the hypertensive with 24.92% and 4.58% respectively.

Table 7; Association between lip print pattern of hypertensive and normotensive male

	Branched	Reticular	Long vertical	Intersected	Undifferentiated
Normotensive	157(51.64%)	92(30.26%)	10(3.29%)	31(10.19%)	14(4.61%)
Hypertensive	14 (31.81%)	12 (27.27%)	0(0%)	18 (40.9%)	0(0%)

$X^2 =$130.78, df = 4, p<0.001

The table shows higher frequencies for the branched and reticular lip print patterns in the normotensive (51.64% and 30.26% respectively) when compared to the hypertensive's which were (31.81% and 27.27% respectively). This was also true for the frequency for the long vertical in normotensive (3.29%) compared to hypertensive which had none (0%). However, the reverse was the case for Intersected where frequency was much higher in hypertensive's compared to normotensives (40.9% and 10.19% respectively).

Table 8. Association between lip print pattern of normotensive and hypertensive female

	Branched	Reticular	Long vertical	Intersected	Undifferentiated
Normotensive	113 (56.5%)	48 (24%)	24 (12%)	15 (7.5%)	0 (0%)
Hypertensive	280 (65.42%)	66 (15.42%)	14 (3.27%)	52 (12.15%)	16 (3.74%)

X^2 = 34.66, df = 4, p = 0.000000545, p<0.05

The table shows a higher frequency of branched lip print in the hypertensive (65.42%) than in the normotensive (56.5%) as opposed to the other patterns. The reticular and long vertical patterns were higher in the normotensive (24% and 12% respectively) than in the hypertensive (15.42% and 3.27% respectively) but the frequencies of the intersected and undifferentiated patterns were higher in the hypertensive (12.15% and 3.74% respectively) than in the normotensive (7.5% and 0% respectively).

Table 9. Association between lip print pattern of hypertensive and normotensive for both male and female (overall lip print pattern)

	Branched	Reticular	Long vertical	Intersected	Undifferentiated
Normotensive	270 (53.57%)	140 (27.78%)	34 (6.74%)	46 (9.13%)	14 (2.78%)
Hypertensive	294 (62.29%)	78 (16.53%)	14 (2.97%)	70 (14.83%)	16 (3.34%)

X^2 = 31.10, df = 4, p = 0.00000296, p<0.05

From the table above, branched lip print pattern showed a higher frequency in both groups but was significantly higher in the hypertensive (62.29%) than in the normotensive (53.57%). The frequencies of the reticular and long vertical patterns were higher in the normotensive (27.78% and 6.74% respectively) than in the hypertensive (16.57% and 2.97% respectively) but that of the intersected and undifferentiated patterns were higher in the hypertensive (14.83% and 3.34% respectively) than in the normotensive (9.13% and 2.78% respectively).

V. Discussion

Most studies have shown ulnar loop as having the highest percentage in normal population followed by whorl, arch and radial loop (Oladipo and Akanigha, 2005; Oladipo 2007). Our observation in this study was in agreement with most of these earlier studies as the loop pattern was predominant followed by whorl and the least was arch Tables 1-6. Table 1 and 3 shows the comparison between the fingerprint patterns on the left hand of male and female hypertensive and normotensive respectively, the results showed a higher frequency of loop pattern in both normotensive and hypertensive followed by the whorl and arch fingerprint patterns. In the males however there was no association between the print pattern and hypertension in the males, while for the females there was significant association at p<0.05. Tables 2 and 4 shows the comparison between the fingerprint patterns on the right hands of male and female hypertensive and normotensive respectively, the results is similar to the left as it showed a higher frequency of loop pattern in both normotensive and hypertensive followed by the whorl and arch fingerprint patterns. Also observed was there was no association between the print pattern and hypertension in the males, while

for the females there was significant association at $p<0.05$. Tables 5 and 6 which shows the total fingerprint patterns for right and left hands for both sex shows a similar patterns as above. For the combined group, there was significant association between the print pattern and hypertension at $p<0.05$and this is attributable to the very high association by the females. The findings of this study is in contrast to several others studies done elsewhere. The study by Pervez *et al.,* in 2012 using 100 hypertensive patients attending outpatient clinic in Lahore showed whorl pattern of finger prints having 67%, patients with Loop pattern were twenty eight (28%) and pattern of composite was 5%, no patient had arch pattern. A similar study by Dike using 80 essential hypertensive patients attending clinic at the University of Port Harcourt teaching hospital Rivers State Nigeria showed highest frequency as 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%). The two studies however did not use non hypertensive group for comparison. This was also in contrast to the work of Jain *et al.,* 1984 who worked on essential hypertension and revealed that the whorl fingerprint pattern was more common in hypertensive than the loop. In another study done by Oladipo *et al*., in 2010 the findings where partially similar. They studied fingerprint pattern amongst the indigenes of Rivers state. Their study of both left and right hands of patients with essential hypertension revealed whorl as having the highest frequency in most digits of the right and left hands of the patients, while in normal individuals ulnar loop had the highest frequencies of occurrence in the right hand. However, on the left hands of normal subject radial loop had the highest frequency. Their studies also revealed that the frequency of loops were higher in the normotensives when compared with that of the hypertensive's. However, the results obtained was not statistically significant.

Table 7 shows the association between lip print patterns of hypertensive and normotensive in males. It revealed a higher frequency of branched lip print pattern in the normotensive (51.64%) than in the hypertensive (31.38%). However, the reverse was the case for Intersected where frequency was much higher in hypertensive's compared to normotensives (40.9% and 10.19% respectively). In this group there is statistical significant association between the lip print patterns of hypertensive and normotensive subjects. Tables 8 presents data of female hypertensive's and normotensives. The table shows a higher frequency of branched lip print in the hypertensive (65.42%) than in the normotensive (56.5%). Unlike in the males, the intersected was higher in the hypertensive's (12.15%) when compared to normotensives (7.5%). Also significantly different was the undifferentiated which had 4.61% in normotensive males and 0% in females while the hypertensive's males had 0% and the females had 3.74% respectively. Literature search did not reveal similar studies on the lip print patterns on hypertensive patients, but for the normotensives, this work agrees with the work of Magda *et al.,* 2010 who worked on morphological patterns of lip prints in Saudi Arabia and showed that the branched pattern had a significantly higher value in the males than in the females. For the different sexes there exit a significant association between print pattern and hypertension.

Tables 9 which shows the association of lip print patterns of hypertensive and normotensive females and overall respectively reveals a higher frequency of the branched lip print pattern in the hypertensive (65.42% and 62.29% respectively) than in the normotensive (56.5% and 53.57% respectively). This work also agrees with that of Magda *et al.,* 2010. Tsuchihashi found that Type III was predominant among the Japanese subjects (Tsuchihashi, 1974), while in India, Vahanwalla and Parekh studied lip prints from 50 male and 50 female subjects from Mumbai, They found that type I (branched) was predominant in the lower lip among the females and that the male subjects tended to have different types in all quadrants of the lips (Vahanwalla and Parekh, 2000).

VI. Conclusion

The result from the present study indicates a significant association between fingerprint pattern and hypertension and as well as lip print pattern and hypertension in the females subjects. While for the males there is no association between fingerprint patterns hypertension, however the lip print pattern showed significant association hypertension. It may therefore be possible to predict risks of developing this disease in sexes with very significant association from the fingerprints and lip prints. It can therefore serve as a non-invasive predictive tool in determining those people who are at risk of developing hypertension so that clinicians and the general public at large can be informed and habits which could predispose one to hypertension can be avoided.

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