



DERMATOGLYPHICS IN PRIMARY HYPERTENSIVE PATIENTS

**SRI KRISHNA GANESH KULKARNI¹, AVINASH SS², SREEKANTHA*³,
REMYA⁴ AND VINODCHANDRAN⁵.**

1-Department of Anatomy, SIMS, Shimoga.

2-Department of Biochemistry, FMMC, Mangalore.

*3- Associate Professor, Department of Biochemistry,
NMC, Raichur-584103. Karnataka*

4- Department of Anatomy, KSHEMA, Nitte University, Mangalore.

5- Department of Biochemistry, KMC, Manipal University, Mangalore.

ABSTRACT

Dermatoglyphics is influenced by heredity and abnormality in it are associated with chromosomal anomalies. Primary hypertension is polygenic and the scientific dermatoglyphic pattern analysis are rare, which could be used as a diagnostic and screening aid. The present was done to study the frequency distribution of scientific ridge pattern in primary hypertensives. The study was carried out in 200 primary hypertensives with 200 normal controls. The hand imprinting was done using a slight modification of conventional ink flab method. Data were analysed using t test. The primary hypertensive male and female had significantly high frequency of whorls and TFRC and decreased ulnar loops and "atd" angle in both hands. Dermatoglyphics can be considered as a simple, inexpensive aid for screening and diagnosing primary hypertension.

KEY WORDS: Dermatoglyphics, hypertension, screening and diagnosing.



SREEKANTHA

Associate Professor, Department of Biochemistry,
NMC, Raichur-584103. Karnataka

INTRODUCTION

Dermatoglyphics is a scientific ridge pattern analysis used to designate the patterns formed by epidermal ridges where each pattern are unique. Once formed in intrauterine life, these will not change throughout the life but are strongly affected by genetic as well as environmental factors. Dermatoglyphics can be used as a supportive evidence in the diagnosis of hereditary disorders. Down's syndrome is associated with high frequency of occurrence of D-pattern ridge (1). Several other chromosomal anomalies are also associated with increased frequency of abnormal ridge patterns (2). Aetiopathogenesis of Primary hypertension suggests influence of hereditary factor. Studies involving association of abnormal ridge pattern in primary hypertensives are rare. The objective of this study was to compare the dermatoglyphics of persons (male and female) suffering from primary hypertension with that of healthy normal age and sex matched control group.

MATERIALS AND METHODS

This study included 200 patients suffering from primary hypertension (104 male and 96 female) and 200 healthy normal age and sex matched control group (104 male and 96 female). Persons were categorised as primary hypertension when a person had blood pressure above 120/80 mm Hg, had no other secondary diseases that could cause hypertension and who was not suffering from any genetic disorder. The normal control group included persons who were 30-40 years of age group with blood pressure below 120/80 mm Hg, with no family history of hypertension and not suffering from any genetic illness. The first degree relatives of the normal control group persons were also clinically screened for any genetic disorder. The blood pressure was measured using a sphygmomanometer. The persons were asked to wash both the hands and dry them under air to ensure clear imprinting patterns. Sufficient amount of ink was spread uniformly on inverted T shaped pad made out of ball of cotton covered by three layers of 2x2 soft cotton. This allowed the uniform spread of ink to the hollow of the palm

and to the uneven surfaces of fingers also and thus avoiding the non uniformity of ink spread seen in conventional flat ink slab method. The inked hands of the persons were then kept slowly and firmly, one by one on a separate gazed drawing paper kept on a hard flat surface and the finger tips were rolled from side to side to ensure "complete area" being imprinted. Knuckles and inter digital areas were gently pressed and pressure was applied to the middle of the dorsum of the hand so that concavity of the palm touched the paper (3). The prints from both the hands were immediately observed and any doubtful patterns in the prints were confirmed by actual observation of patient's hand. Complete personal data of the patient were recorded on each paper. The prints were studied using hand lens for Finger tip pattern, Total finger ridge count (TFRC), "atd" angle, C-Line types, Patterns in thenar, hypothenar and inter digital areas.

Ethics: The study was conducted with the permission from institutional ethical committee approval and proper informed consent from the subjects.

Statistics: Percentage frequency of various Pattern distributions on finger tips, Percentage frequency of C-line type, Percentage frequency of patterns of thenar, hypothenar and four interdigital areas, in the left hand, right hand and both the hands were calculated. "atd" angle of right and left hand and Total finger ridge count (TFRC) were also calculated. Calculations were done in primary hypertensive and normal healthy control group, separately in males as well as females. The significance of difference in percentage frequencies between primary hypertensive and control group in males as well as females were calculated using t test. The significance of difference in "atd" angle and TFRC between primary hypertensive and control group in males as well as females were calculated using t test.

RESULTS

Hypertensive females and males have significantly high whorl and low ulnar loop

pattern in right hand, left hand as well as both hands combined when compared to that of normal control females and males respectively. (Table No. 1 and 2) No significant difference in C-line pattern between normal control and hypertensive females and males in right hand, left hand as well as both hands combined. (Table No. 3 and 4) No significant difference in pattern frequency of Th, I1, I2, I3, I4 and hypo thenar area between normal control and hypertensive females and males in right hand,

left hand as well as both hands combined. (Table No. 5 and 6) "atd" angle was significantly lower in right hand and left hand of hypertensive females as well as males when compared to normal control females and males respectively. (Table No. 7) TFRC was significantly higher in hypertensive females as well as males when compared to normal control females and males respectively. (Table No. 8)

Table No 1
Pattern distribution on finger tips of controls and hypertensive females

Pattern	Females Right Hand		Females Left Hand		Females Both Hand	
	Control No. and %	HTN No. and %	Control No. and %	HTN No. and %	Control No. and %	HTN No. and %
Whorl	133 (24.85%)	333 (62.24%)	129 (24.11%)	353 (65.98%)	262 (24.48%)	686 (64.11%)
Ulnar Loop	364 (68.06%)	163 (30.48%)	359 (67.1%)	145 (27.1%)	723 (65.57%)	308 (29.71%)
Radial Loop	8 (1.49%)	4 (0.74%)	7 (1.3%)	3 (0.56%)	15 (1.4%)	7 (0.65%)
Arch	30 (5.60%)	35 (6.54%)	40 (7.47%)	34 (6.35%)	70 (6.54%)	69 (5.51%)

No.-Absolute number of patterns; HTN-Hypertensives; vhs-very highly significant ($p<0.001$); ns-non significant ($p>0.05$). Hypertensive females have significantly high whorl and low ulnar loop pattern in right hand, left hand as well as both hands combined when compared to that of normal control females.

Table No 2
Pattern distribution on finger tips of controls and hypertensive males

Pattern	Males Right Hand		Males Left Hand		Males Both Hand	
	Control No.and %	HTN No.and %	Control No.and %	HTN No.and %	Control No.and %	HTN No.and %
Whorl	139 (26.73%)	331 (63.65%)	119 (22.88%)	311 (59.8%)	258 (24.8%)	642 (61.73%)
Ulnar Loop	341 (65.57%)	161 (30.96%)	352 (67.69%)	162 (31.15%)	693 (66.6%)	323 (31.05%)
Radial Loop	5 (0.96%)	7 (1.34%)	6 (1.15%)	8 (1.53%)	11 (1.05%)	15 (1.44%)
Arch	35 (6.73%)	21 (4.03%)	43 (8.26%)	39 (7.5%)	78 (7.5%)	60 (5.76%)

No.-Absolute number of patterns; HTN-Hypertensives; vhs-very highly significant ($p<0.001$); ns-non significant ($p>0.05$). Hypertensive males have significantly high whorl and low ulnar loop pattern in right hand, left hand as well as both hands combined when compared to that of normal control males.

Table No 3
Percentage frequency of C-line type in Females

Pattern	Females Right Hand		Females Left Hand		Females Both Hand	
	Control No. and %	HTN No. and %	Control No. and %	HTN No. and %	Control No. and %	HTN No. and %
CR	72(67.28%)	77(71.96%)	49(45.79%)	50(46.72%)	121(56.34%)	127(59.34%)
CU	32(29.9%)	29(27.1%)	55(51.4%)	56(52.33%)	87(40.65%)	85(39.77%)
CP	3(2.8%)	1(0.93%)	3(2.8%)	1(0.93%)	4(2.8%)	2(0.93)

No.-Absolute number of patterns; HTN-Hypertensives; ns-non significant ($p>0.05$). No significant difference in C-line pattern between normal control and hypertensive females in right hand, left hand as well as both hands combined.

Table No 4
Percentage frequency of C-line type in Males

Pattern	Males Right Hand		Males Left Hand		Males Both Hand	
	Control No and (%)	HTN No and (%)	Control No and (%)	HTN No and (%)	Control No and (%)	HTN No and (%)
CR	72 (69.23%)	69 (66.34%)	56 (53.84%)	58 (55.76%)	128 (61.53%)	127 (61.05%)
CU	30 (28.84%)	34 (32.69%)	46 (44.23%)	45 (43.26%)	76 (36.53%)	79 (37.98%)
CP	2 (1.92%)	1 (0.96%)	2 (1.92%)	1 (0.96%)	4 (1.92%)	2 (0.96%)

No.-Absolute number of patterns; HTN-Hypertensives; Non significant ($p>0.05$). No significant difference in C-line pattern between normal control and hypertensive Males in right hand, left hand as well as both hands combined.

Table No 5
Pattern frequency on thenar, hypothenar and four interdigital areas of controls and hypertensive Females

Pattern	Females Right Hand		Females Left Hand		Females Both Hand	
	Control No and (%)	HTN No and (%)	Control No and (%)	HTN No and (%)	Control No and (%)	HTN No and (%)
Th/I1	1(0.93%)	1(0.93%)	2(1.86%)	1(0.93%)	3(1.4%)	2(0.93%)
I2	6(5.6%)	3(2.8%)	4(3.73%)	1(0.9%)	10(4.67%)	4(1.87%)
I3	66(61.68%)	64(59.81%)	42(39.25%)	55(51.4%)	108(50.46%)	119(55.6%)
I4	46(42.99%)	44(41.12%)	57(53.27%)	53(49.53%)	103(48.13%)	97(45.32%)
Hypo-Thenar	27(25.23%)	22(20.56%)	33(30.84%)	26(24.29%)	60(28.03%)	48(22.42%)

No.-Absolute number of patterns; HTN-Hypertensives;Th-Thenar area; I1, I2, I3, I4- First, Second, Third and Fourth interdigital area respectively; ns-non significant ($p>0.05$). No significant difference in pattern frequency of Th, I1, I2, I3, I4 and hypo thenar area between normal control and hypertensive females in right hand, left hand as well as both hands combined..

Table No 6
Pattern frequency on thenar, hypothenar and four interdigital areas of controls and hypertensive Males

Pattern	Males Right Hand		Males Left Hand		Males Both Hand	
	Control No and (%)	HTN No and (%)	Control No and (%)	HTN No and (%)	Control No and (%)	HTN No and (%)
Th/I1	1 (0.96%)	1 (0.96%)	1 (0.96%)	2 (1.92%)	2 (0.96%)	3 (1.44%)
I2	5 (4.80%)	5 (4.8%)	7 (6.73%)	6 (5.76%)	12 (5.76%)	11 (5.28%)
I3	47(45.19%)	52 (50%)	69 (66.34%)	71 (68.26%)	116(55.76%)	123(59.13%)
I4	59 (56.73%)	54(51.92%)	40(38.46%)	35(33.65%)	99 (47.59%)	89 (42.78%)
Hypo-Thenar	28 (26.92%)	28 (26.92%)	29 (27.88%)	23 (22.11%)	57 (27.4%)	51 (24.51%)

No.-Absolute number of patterns; HTN-Hypertensives;Th-Thenar area; I1, I2, I3, I4- First, Second, Third and Fourth interdigital area respectively; ns-non significant ($p>0.05$). No significant difference in pattern frequency of Th, I1, I2, I3, I4 and hypo thenar area between normal control and hypertensive Males in right hand, left hand as well as both hands combined.

Table No 7
"atd" angle in Normal control and Hypertensive Females and Males

Pattern	Control	HTN	p
"atd" angle-Females Right Hand	47.02	40.44	vhs
"atd" angle-Females Left Hand	47.17	40.03	vhs
"atd" angle-Males Right Hand	45.21	36.1	vhs
"atd" angle-Males Left Hand	45.01	35.89	vhs

atd- area "a" to area "d" angle; vhs- very highly significant ($p<0.001$); "atd" angle was significantly lower in right hand and left hand of hypertensive females as well as males when compared to normal control females and males respectively.

Table No 8
TFRC in Normal control and Hypertensive Females and Males

Table No 8: TFRC in Normal control and Hypertensive Females and Males			
	Control	HTN	p
TFRC in Females	84.97	155.86	vhs
TFRC in Males	92.31	158.46	vhs

TFRC- Total finger ridge count; vhs- very highly significant ($p<0.001$); TFRC was significantly higher in hypertensive females as well as males when compared to normal control females and males respectively.

DISCUSSION

Development of dermatoglyphics pattern is under genetic control which is evident by the closer resemblances of the dermatoglyphics among close relatives and from the fact that abnormal dermatoglyphic patterns are strongly associated with chromosomal abnormalities. But it is unknown whether the effect is directly related to chromosomal abnormality or indirectly related to the skin or limb anomalies associated with it. The effect is polygenic with each gene contributing to a small additive effect. Dermatoglyphics is used for personal identification, to evaluate population variability (4,5) and as a diagnostic aid in clinical medicine since it is readily accessible, can be recorded quickly, is inexpensive, can be studied immediately after birth, non invasive and useful for screening a large population. Primary hypertension is a disease with polygenic inheritance. Previous studies have reported significant decrease in frequency of ulnar loops and radial loops, increased frequency of radial loops and arches in primary hypertension. But the male and female pattern were not studied in detail (6). In another study non significantly increased frequency of whorls and decrease in ulnar loop was reported maybe due to small sample size. But some studies done with large sample size have reported significantly increased frequency of whorls (7,8,9,10) and decreased frequency of ulnar loops (8). But a study also has reported no significant difference in the finger tip patterns in primary hypertension (11). The wide difference observed in the previous studies could be due to varying sample size, inclusion of secondary hypertension, racial and ethnic differences. In our study we observed that hypertensive females and males have

significantly high whorl and low ulnar loop pattern in right hand, left hand as well as both hands combined when compared to that of normal control females and males respectively. (Table No. 1 and 2) In the present study the C-line pattern (Table No. 3 and 4) and Thenar, interdigital, Hypothenar pattern frequencies (Table No. 5 and 6) showed no significant difference in primary hypertensive males as well as females. However none of the previous studies have evaluated these patterns. In our study we also found that "atd" angle in right hand as well as left hand in males and females were significantly lower among primary hypertensives. Similar findings have also been reported by several studies (7,9). But certain studies have also reported a non significant difference in the "atd" angle (6,11)(). (Table No. 7) In the present study the TFRC was seen to be significantly higher in primary hypertensive males as well as females which is in corroboration with the findings of several studies (6,7,8) (Table No. 8) However in one study the difference was not significant(11).

CONCLUSION

An increased frequency of whorls, decreased frequency of ulnar loops, increased TFRC and decreased "atd" angle in males as well as female primary hypertensives was observed in our study. This indicates that dermatoglyphics which is simple, and inexpensive technique can be considered for usage as a screening tool for primary hypertension. It can also be used to predict the development of the disease, since the imprinting of the patterns is right from the birth and is affected by heredity.

REFERENCES

1. Cummins H. Morphology of palmar, hypothenar, dermatoglyphics in man. *Human Biology*. 1936;7(1).
2. Uchida I.A, Miller J.R and Soltan H.C. Dermatoglyphics associated with XXYY chromosome complement. *American Journal of Human Genetics*. 1964;16:284.
3. Strong A. An improved method of palm printing. *Science*. 1929;69:250.
4. Holt S.B. Dermatoglyphic patterns in genetic variation in human populations. (ed. Harrison, G. A.), Pergamon Press., Oxford, 1966.
5. Plato C.C, Cereghino J.J and Steinberf F.S. Variation and distribution of

- dermatoglyphic features in different populations. Penrose memorial colloquium, Berlin. 1973
6. Jain. P.K, Sharma B.K and Mathur B.D. Dermatoglyphics in essential hypertension. Journal of association of physicians India. 1984;Apr:32(4):335-337
 7. Pursnani M.L, Elhence G.P and Tibrewal. Palmar dermatoglyphics in essential hypertension. Indian Heart journal. 1989;41:119-122.
 8. Polyzova D, Kuklik M, Berankova M and Schaumann B. Dermatolyphic signs in juvenile hypertensives. Antropol Anz. 1991;49(4): 361-366.
 9. Godfrey K.M, Barker DJ, Peace J, Cloke J and Osmond C. Finger print, fetal growth and adult blood pressure, Finger print paterns probably inherited. BMJ. 1993;Oct 16:307 (6910): 1006.
 10. Wheeler T, Godfrey K, Atkinson C, Badger J, et al. Disproportionate fetal growth and finger print pattern. British journal of obstetrics and gynaecology. 1998; May 105 (5):562-564
 11. Reed T. An association between adult blood pressure and dermatoglyphics as prenatal markers of development. Journal hypertens. 1995; June 13 (6): 595-601.