

## **Palmar Dermatoglyphics in Essential Hypertension**

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### **I. Introduction**

Dermatoglyphics is the Greek term coined by Prof. Harold Cummin and Midlo in the year 1926, which means Skin Carvings. Study of fingerprints by analyzing ridges and their configurations is called Dermatoglyphics.<sup>1</sup> Widespread medical interest in epidermal ridges developed only in the last few decades when it became apparent that many patients with chromosomal aberrations had unusual ridge patterns. Inspection of skin ridges therefore promised to provide a simple, inexpensive means of information to determine whether a given patient could have a particular chromosomal defect.<sup>2</sup>

Considerable clinically useful information about groups of individuals with chromosomal defects has been discovered and therefore, a knowledge of the type of deviations associated with various medical disorders can add appreciably to the diagnostic armamentarium of the clinician. Dermatoglyphics of many genetically inherited diseases have been studied. The present attempt is to study the correlation between hypertension and dermatoglyphics.

There are thousands of diseases known to be caused by abnormal genes. If there is any abnormality in the genetic makeup of parents, it is inherited to the children and is reflected in dermatoglyphic patterns. It has been observed that dermatoglyphic shows definite diagnostic changes in those disorders which show genetic basis.<sup>3</sup> Hence explanation of the aggregation of a disease in a family, will usually include genetics, environmental influences and interaction between the two i.e., multifactorial inheritance. Twin studies have shown that genetic factors play an important role in the pathogenesis of essential hypertension.

Essential hypertension is defined as sustained high blood pressure not attributable to a single cause but reflecting the interactions of multiple genetic and environmental influences such that siblings of hypertensive parents stand a higher chance of developing hypertension in later life<sup>4</sup>. In about 80-95% of cases cause of hypertension (chronic elevation in blood pressure >140/90) is idiopathic or primary and these cases are referred as essential hypertension<sup>5</sup>. Its incidence vary markedly in different regions with rates as low as 3.4% (men) and 6.8% (women) in rural India.

The purpose of Dermatoglyphics is not to diagnose, but to prevent by predicting a disease, not for defining an existing disease but to identify people with the genetic predisposition to develop certain diseases.

### **II. Materials & Methods**

Essential hypertensive patients attending out-patient and in-patient medicine department at S.V.S. Medical College and Hospital, Mahabubnagar, (T.S) were selected. The data was collected in a pretested proforma including various parameters meeting the objective of the study. 100 patients [50 Males and 50 Females] were taken up for the study.

Another 100 healthy Subjects (50 male and 50 female) from teaching and non-teaching staff of S.V.S. Medical College matched for gender, life style and economic status as that of patients were included as members of control group.

### **III. Materials used**

Materials used for the study include are black duplicating ink, stamp pad, bond paper, preinked strips, roller, hand lens and a protractor.

### **IV. Method**

The modified Purvis-Smith method was applied. After taking informed consent from the patients, they were asked to wash their hands with soap water, so as to remove any oil or dirt. Black duplicating ink was smeared on their hands and prints were taken by rolling the hands from wrist crease to fingertips on the roller covered with bond paper. The procedure was repeated with the other hand on a separate paper. The same procedure was adopted for the controls<sup>6</sup>. (Fig 1+2)

For the present study, only major flexion creases are included. The three basic dermatoglyphic landmarks found on the fingertip patterns are the triradii, cores and radiants. A triradius is formed by the

confluence of three ridge systems. Core is the approximate centre of the pattern. The radiants are ridges that emanate from the triradius and enclose the pattern area.

**Quantitative Analysis**

The quantitative analyses include Total Finger Ridge Count (TFRC), Absolute Finger Ridge Count(AFRC), ridge count of individual fingers, a-b ridge count, angles atd, dat, adt and main line index.

**Qualitative Analysis**

To analyse finger pattern frequency, the fingertip pattern configurations were classified as arches (A), loops (L) or whorls (W). Arches were further recorded as simple (A) or tented arches (At) depending on the presence or absence of a triradius. For statistical purpose, both were grouped together as arches only.

**V. Results**

Various dermatoglyphic parameters were considered in the palms and fingers of 100 hypertensives and compared the same with 100 control subjects (50 Hypertensive Males, 50 Hypertensive Females; 50 control Males, 50 control Females).

VARIABLES	PATIENT		CONTROL		TOTAL	F Values	Significance
	Male & Female	Mean SD	Male & Female	Mean SD			
	AFRC	131.21 44.38	132.29 44.92	131.75 44.60			

The parameters include TFRC (Total Finger Ridge Count), AFRC (Absolute Finger Ridge Count), Ridge count of individual fingers, a-b ridge count, angles (atd, dat, adt) and Main line index for quantitative analysis and finger print patterns(whorls, loops, arches), palmar patterns, C-main line termination type, main line terminations, palmar flexion creases (major creases) and t-axial triradii position are included for qualitative analyses.

VARIABLES	PATIENT		CONTROL		TOTAL	F Values	Significance
	Male & Female	Mean SD	Male & Female	Mean SD			
	TFRC	97.49 22.92	101.97 24.21	99.74 23.65			

**Absolute Finger Ridge Count in both Hypersensitive and Controls (Hands Combined)**

**Total Finger Ridge Count in both Hypersensitive and Controls (Hands Combined)**

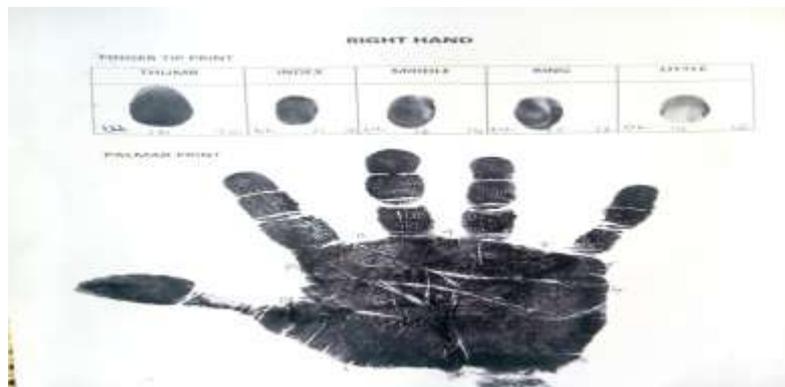
In TFRC & AFRC, no difference was observed between patients and controls; between males and females and lastly the interaction effect between group and gender as all the F values obtained for group differences, gender differences were found to be non-significant.

**a – b ridge counts in both Hypersensitive and Controls (Hands Separate)**

GROUPS	HAND	SEX	MEAN	SD	F-VALUES	SIGNIFICANCE
TOTAL	Left	Male	21.30	4.56	F (hand X sex) = 0.749	P<0.387
		Female	20.50	7.94		
		Total	20.90	6.47		
	Right	Male	21.66	4.43	F (interaction) = 2.874	P<0.091
		Female	19.90	4.97		
		Total	20.78	4.78		
Total	Male	21.48	4.49			
	Female	20.20	6.61			
	Total	20.84	5.68			

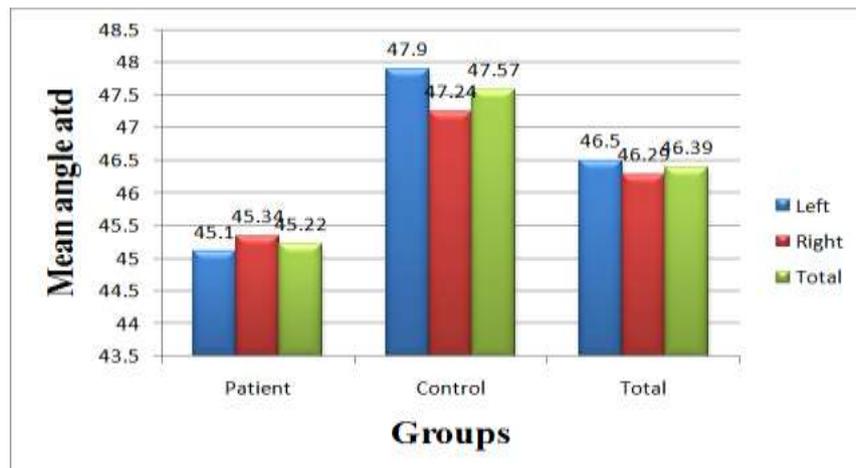
A significant difference was observed between patient and control group in their a-b ridge counts. (F=14.89; P < 0.000) where control group (Mean = 21.91) found to have significantly higher a-b ridge counts than patients. No difference was observed between left and right hand a-b ridge counts (Mean = 19.77). However, significant difference was observed between males and females (F=5.329; P < 0.021) as males had significantly higher a-b ridge counts compared to females (Means 21.48 and 20.20 respectively). All the

interaction effects like group X hand, group X sex, hand X sex and group X hand X sex were all found to be non-significant.



**Angles atd, dat, adt in 50 Male hypertensives and 50 Male controls (Hands Separate)**

A significant difference was observed between patient and control group ( $F = 3.846; P < 0.050$ ) wherein controls have higher 'atd' value than patients (Means = 47.57 and 45.22 respectively). No significant difference was observed between groups and hands (left and right) for mean of 'dat' and 'adt' angles along with interaction effects which is shown in the following bar diagram.



**Mean atd angle of Male patients and controls**

## VI. Discussion

There are various studies mentioned about the dermatoglyphic pattern in various diseases like pulmonary tuberculosis, Diabetes Mellitus Type II Essential Hypertension, Eczema, psoriasis and alopecia areata and even in healthy Indian children<sup>7-8</sup>. The prevalence of hypertension is 59.9 and 69.9 per 1000 in males and females blood pressure in hypertensive's even by 2mm can reduce the overall mortality by 3%<sup>9</sup>.

### Total and absolute finger ridge counts:

The present study showed that in first digit (D1) and fifth digit (D5), hypertensive had higher ridge count value than control. In second digit (D2), in left hand control had higher ridge count value and in right hand, hypertensive had higher ridge count value than control group. In a study by Reed T, hypertensive co-twins showed lower ridge counts on the left hand than the controls<sup>10</sup>. Pursnani ML et al. reported increased TFRC in hypertensives compared to controls<sup>11</sup>.

### a-b ridge counts:

It was not included in any of the previous studies. In this study, a significant difference was observed between patient and control group.

### Ridge Counts of individual fingers:

In hypertensives, there was increased fingertip ridge count in D1, D2, and D5 of right hand compared to left hand. But, in the study by Reed T, hypertensive co-twins showed lower ridge counts on the left hand than the controls<sup>10</sup>.

### Angles (atd, dat, adt):

In our study, controls are found to have higher 'adt' angle value than patients. Godfrey KM et al. analysed people with long hands and a narrow palmar angle are found to have higher systolic pressures<sup>12</sup>. Jain PK et al. reported decreased 'atd' angle in hypertensive cases in both sexes as compared to controls<sup>13</sup>. Kulkarni DU revealed the same result in their study<sup>14</sup>.

## VII. Conclusion

The subject selected were 100 hypertensive patients (50 Males, 50 Females) and their finger prints were compared with 100 controls (50 Males, 50 Females). The detailed study of the palm prints revealed interesting informations which was supported by earlier studies. When the findings in Male hypertensives were compared with controls, it revealed decreased a – b ridge counts and decreased 'atd' angle; increased finger tip ridge count in first digit (D<sub>1</sub>) of both the hands and in second digit (D<sub>2</sub>) of right hand. Second digit (D<sub>2</sub>) of both the hands showed more loops and least arches, and absent pattern was found more in hypothenar area of the left hand. In addition to dermatoglyphic study in essential hypertension, cytogenetic study should be carried out to rule out genetic abnormality.

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