



Original Research Article

Palmar & digital dermatoglyphic patterns in essential hypertension – A study in Puducherry population

Anitha Nancy^{1,*}, Harisha P, Vijaykishan B¹, Chandra Philip X¹

¹Dept. of Anatomy, Mahatma Gandhi Medical College & Research Institute, Sri Balaji Vidhyapeeth (Deemed to be University), Puducherry, India



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ABSTRACT

Hereditary factor plays a major role in the aetiopathogenesis of essential hypertension. Aging and positive family history increase the risk of hypertension. Development of dermatoglyphic patterns are regulated by genetic factors. So, in this study, we made an attempt to study the co-relation between palmar, digital dermatoglyphic patterns in essential hypertensive patients and normal persons in the Puducherry population. 50 patients with essential hypertension who were attending medicine OPD & 50 healthy volunteer controls were taken for the study under the age group of 30-60years. Digital and palmar dermatoglyphic impressions of both hands in cases and controls were taken using the modified Purvis Smith method along with their complete personal details for further analysis. The documents were analyzed using a hand lens for fingertip pattern, “atd” angle, and Sydney(S) line. The study results were found to have significantly increased ($p=0.018$) in loop patterns in (R) hand and insignificant ($p=0.056$) in (L) hand of cases compared to controls. Arch patterns were significantly higher in (R) ($p=0.030$) & (L) ($p=0.000$) hands of cases then controls. Whorls patterns were found to be significantly higher in (R) & (L) hands of controls ($p=0.001$). Mean ‘atd’ angle was significantly increased ($p=0.000$, $p=0.020$) in both hands of cases. Presence of Sydney line was seen rarely & equally in cases and controls. Increased frequency of loops & arches pattern with increased ‘atd’ Angle can be used as an external marker in early detection of hypertension and to plan for effective preventive strategies in the Puducherry population.

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1. Introduction

One of the most common & modifiable health disorders prevalent today is hypertension. This occurs when the pressure inside the blood vessels is higher than the normal expected values for age and gender. The blood pressure needs to be taken at least two times, and each reading must be from a different day. If the average of these blood pressure readings is more than 140/90mmHg, hypertension can be diagnosed. A single reading that is more than 140/90mmHg doesn't necessarily confirm hypertension but requires further monitoring. The primary cause of hypertension is not identifiable in 90% of patients, hence known as “primary” or “essential” hypertension. Even when

symptoms are noticeable they are vague like blurred vision, dizziness, headache, and nausea. Most of those patients before becoming aware of the condition, ended up having serious damage to their heart, eyes, brain, blood vessels or kidney giving it the name “the silent killer.” In less than 10%, the cause of hypertension is known and so it is called secondary hypertension.¹ Hypertension is a third major cause of disease burden in both developed and developing countries. In India, the prevalence of hypertension has been estimated to be 3% to 34.5% in males and 5.8% to 33.5% in females among 1.1 billion populations.²

Dermatoglyphics (Derma = Skin + Glyphe = Carve) is the scientific study of fingerprint and palmar patterns which are imprints of epidermal ridges. The epidermal ridges and their unique patterns begin to form during the early stages of fetal life i.e., 10th to 16th week. It remains

* Corresponding author.

E-mail address: ancyjean2010@gmail.com (A. Nancy).

unchanged throughout life and gives a unique identification to all individuals.³ Dermatoglyphics is a non-invasive and cost-effective method. The study of co-relation between dermatoglyphics and hypertension can help in the early identification of people with the genetic predisposition to develop essential hypertension because both have genetic etiology.⁴ Hence this study is undertaken to find out whether dermatoglyphics can be used as one of the noninvasive diagnostic methods in the early detection of essential hypertension in the Puducherry population.

2. Materials and Methods

50 patients with essential hypertension who were attending medicine OPD in MGMCRI, Pondicherry excluding patients with diabetes, hypothyroidism, Ischemic heart disease, skin diseases like psoriasis, eczema, Hansen disease, congenital disorders of the upper limb and pregnancy & 50 healthy volunteer controls were taken for the study under the age group of 30-60 years.

2.1. Sample size

2 groups with 50 subjects in each group.

1. Group 1: Newly detected and old cases of essential hypertension.
2. Group 2: Healthy individuals with systolic blood pressure < 140 and diastolic blood pressure < 90 mmHg.

2.2. Methodology

Written informed consent was obtained from all participants after explaining to them the purpose and nature of the study in their language. The project was presented before the ethical committee and got approved before conducting the study.

Both case and control groups were asked to give their digital and palmar dermatoglyphic impression of both hands on a plain white paper using the black ink method which is a modified Purvis Smith method.^{5,6} In this method, there is a glass plate on which black ink is rolled to make a thin film by a hand roller. Then the subjects were asked to firmly press their palm and fingers on the glass plate and then on the white paper slowly and firmly. The fingertips were rolled from side to side to ensure the "complete area" being imprinted. Knuckles and interdigital areas were gently pressed on the dorsum of the hand so that the concavity of the palm touched the paper.⁷ Thus the impression of their palmar, digital ridges and patterns was documented on the sheet with their complete personal details for further analysis. Then the black ink was easily washed off with soap & water. The documents were analyzed using hand lens for fingertip pattern, and Sydney(S) line. "atd" angle was measured by finding the a,t,d, triradius point, where 'a'

triradius was seen at the base of the index finger, 'd' triradius was found at the base of the little finger and 't' triradius was seen as distal triradius in the palm region. After marking the points line is drawn from 'a' triradius to 't' triradius and from 't' to 'd' triradius point. Keeping 'at' line as base and 't' triradius as center the angle is measured using goniometer.⁸

2.3. Data collection

All data were entered into a Data Collection Proforma Sheet and entered into Excel (MS Excel 2011). Privacy and Confidentiality were strictly maintained. All cases & control identifiable numbers and information were stripped and replaced by anonymous numbers.

2.4. Statistical methods

Based on the distribution of data, the Chi-square test and Independent student t-test were used. All statistical analysis was carried out at 5% level of significance and the p-value < 0.05 was considered as the significance

3. Results

Study parameters such as 1) Fingertip patterns & 2) Sydney (S) Line were analyzed using Hand lens:

3.1. Fingertip patterns

There are 3 basic types of fingertip patterns – whorls, loops & arches.

The fingerprints of both hands were taken in a white A4 sheet separately. The number of loops, arches & whorls pattern present in both hands were observed and entered in an excel sheet and the data was analyzed.

In Figure 1 the loop pattern in the right hand of patients with hypertension were found to have higher percentage compare to the controls which were also statistically significant but in Figure 2 the loop pattern in the left hand which was higher in percentage than controls but not statistically significant (p=0.056).

In Figures 3 and 4 the arch pattern in right & left hand of patients with hypertension were found to have higher percentage compare to the controls which were also statistically significant (p=0.030, p=0.000).

In Figures 5 and 6 the whorls pattern in right & left hand of controls without hypertension were found to have higher percentage compare to the cases which were also statistically significant (p=0.001, p=0.001).

3.2. Sydney line

Table 1 results showed no significant proportion of individuals with Sydney line where only 2 cases and controls were having Sydney line.

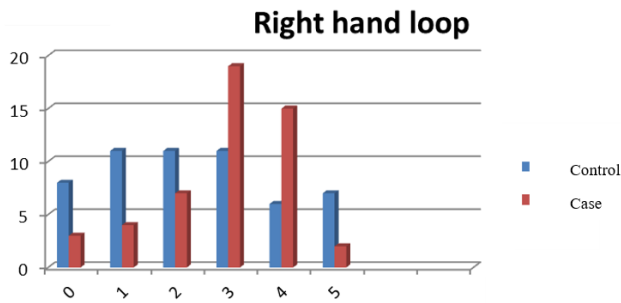


Fig. 1: Frequency distribution of loop pattern in Rt hand of cases and controls

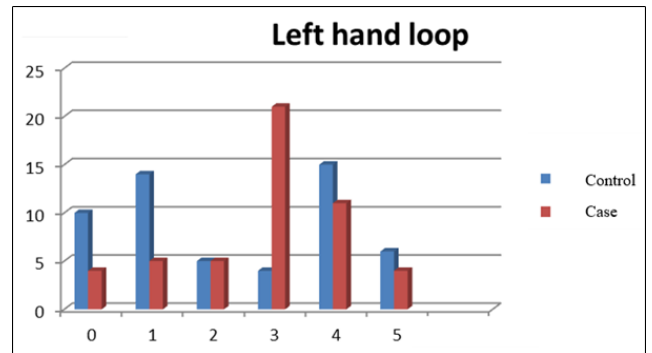


Fig. 4: Frequency distribution of loop pattern in Lt hand of cases and controls

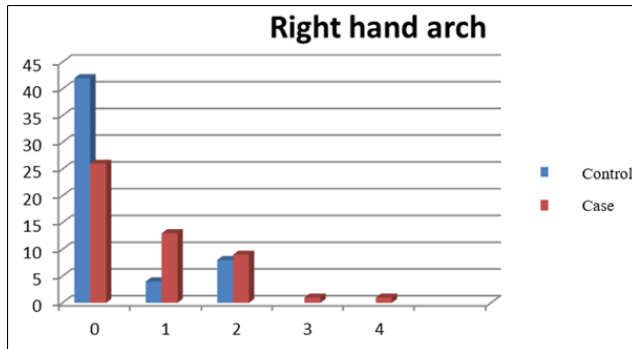


Fig. 2: Frequency distribution of arch pattern in Rt hand of cases and controls

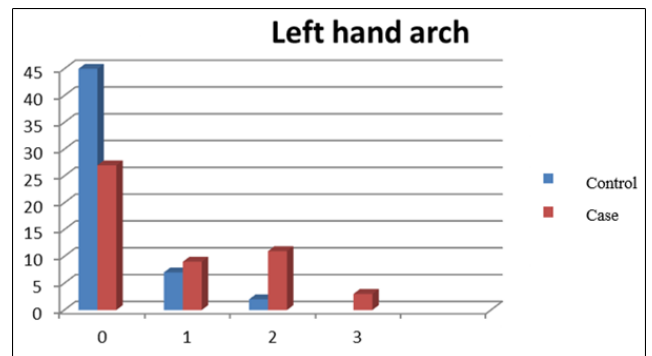


Fig. 5: Frequency distribution of Arch pattern in Lt hand of cases and controls

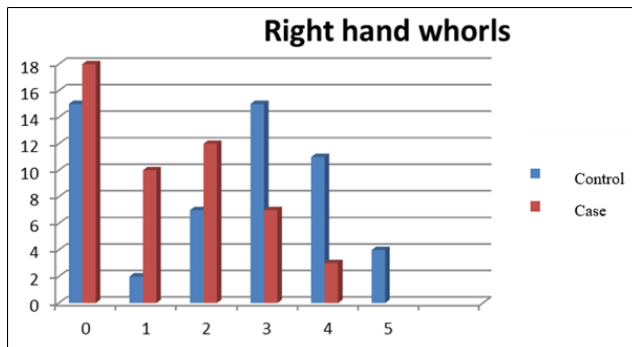


Fig. 3: Frequency distribution of whorls pattern in Rt hand of cases and controls



Fig. 6: Frequency distribution of whorls pattern in Lt hand of cases and controls

3.3. "atd" Angle

Table 2 shows the result of the "atd" angle which was measured by goniometer and the angles were entered in a data-sheet in a separate column for both hands. The mean "atd" angle in hypertensive patients of both hands (Rt "atd" angle= 49.480 & Lt "atd" angle= 49.880) was found to be statistically significant compared to controls.

4. Discussion

Harold Cummins coined the term dermatoglyphics in 1926. Genetic factors influence the development of ridges and it is explained by the mechanisms in two of the studies that the volar pad shape on the fingertips and palms of the fetus during the I trimester are critical to different types of pattern formation, ridges will form whorls on more elevated pads, hemispherical pads or arches on a lower, flatter shaped pad. It may be due to the occurrence of edema in these pads

Table 1: Proportion of individuals with Sydney line in cases (hypertension +ve) & controls (hypertension –ve) in both hands

	Sydney line		Total	P value
	Present	Absent		
Case % of count	4.0%	96.0%	100%	P=1.000*
Control % of count	4.0%	96.0%	100%	P=1.000*

*P=1.000, not significant

Table 2: Mean value of 'atd' angle of cases (hypertension+ve) and controls (hypertension –ve) in both hands

	Hypertension	Mean	Std.deviation	P value
"atd" angle right hand	Present	50	49.480	P=0.000*
	Absent	50	45.370	P >0.05
"atd" angle left hand	Present	50	49.880	P=0.002*
	Absent	50	46.360	P >0.05

In Rt. Hand* p=0.000, in Lt Hand *p=0.002, which shows that *p<0.05, statistically significant

or increased blood pressure and/or flow to them that could have led to a higher frequency of whorl patterns, one of the major findings in hypertensive patients.^{9,10} But in our study, we found that loops & arches pattern was found to be in higher percentages in both hands of patients with hypertension compared with controls. This result was in accordance with the study done by Rudy et al., (2016)¹¹ where the author found that hypertensives were found to have more ulnar loops. Lahiri et al., (2013)¹² stated that the statistically significant increase in the percentage of loops & arch patterns in hypertension patients compared to controls. In most studies like Oladipo et al., (2010)¹³ done in Nigeria, Kulkarni et al., (2005)⁷ done in western Maharashtra population, Ganesh et al.,(2018)¹⁴ done in Mangalore population were found to have a higher frequency of whorls patterns followed by arch and least is loop pattern. Our study findings are not supporting this, it may be due to the ethnic & racial difference among the populations.¹⁵

One of the quantitative parameters for palmar dermatoglyphics is the "atd" angle. Tafazoli et al.,(2013),¹⁶ Oladipo et al.,(2010),¹³ Palyzova et al.,(1991)⁹ and Lahiri et al.,(2013)¹² studies showed an increase in "atd" angle in hypertensive patients compared to controls are in accordance with our study where the mean "atd" angle of both hands in cases were found to have a statistically significant increase in the angle. This may be due to the presence of axial triradius was most positioned in the palm due to more hypothenar patterns seen in hypertension patient suggestive of broader "atd" angle.

According to Bulagouda et al.,(2013)¹⁷ the Sydney line was found to be significantly present in cases with hypertension than controls and it is commonly seen in hypertensive women. As we search the literature very few studies stated the relation of the presence of Sydney line in essential hypertension. But in our study, we found that the presence of the Sydney line has nonsignificant proportions

among cases and controls.

5. Conclusions

The study results showed more loop and arch patterns in hypertensive individuals compare to controls. The controls were found to have a higher frequency of whorls pattern. "atd" Angle was found to be more in cases and no significant difference in the presence of Sydney line in both hands of cases and controls. Hence, this result of dermatoglyphic patterns can be used as an external marker in early detection of hypertension and to plan for effective preventive strategies in the Puducherry population.

6. Limitations

The study limitation was the lesser sample size and few quantitative, qualitative study parameters were analyzed. It can be overcome by taking more samples for cases and controls to justify their demographic representation. More study parameters can be observed and measured to find the role of dermatoglyphic digital & palmar patterns as an early diagnostic tool in the detection of essential hypertension.

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8. Source of Funding

None.

9. Conflict of Interest

None.

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Author biography

Anitha Nancy Assistant Professor

Harisha P Undergraduate Medical Student

Vijaykishan B Assistant Professor

Chandra Philip X Professor

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