

STUDY OF PALMAR DERMATOGLYPHICS IN CASES OF ESSENTIAL HYPERTENSION

Anatomy

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ABSTRACT

Background: Persistent hypertension is main risk factors for stroke, myocardial infarction, heart failure and arterial aneurysm. Moderate increment of arterial blood pressure promotes to shortened life period. Aim of the present study was to measurement of the atd angle in the hypertensive patient and compare with control. **Material & Methods:** The present comparative case control study was conducted in the Department of Medicine, Saraswati Medical College & Hospital, Unnao. 100 clinically diagnosed chronic elevation in blood pressure $\geq 140/90$ mm Hg in study group HTN and compared with the same age and sex group of 100 with normal blood pressure patients as control. Patients with deformity of hand, Chromosomal abnormalities like Klinefelter's syndrome, Turner's syndrome etc. and diseases like congenital anomalies, neurological disorders, carcinomas and psychiatric diseases were excluded from the study. **Observation:** The mean atd angles in each hand was significantly lower in HTN group and mean dat angles were significantly higher in HTN group than controls whereas atd angles were significantly higher in left and significantly lower in right of the HTN group ($p < 0.05$). while mean values of a-b ridge count were significantly lower in both male and female diabetic patients than the control group. In both hand there was improved number of whorls and declined quantity of ulnar loops in hypertensive (HTN) group compared with normal population. But it was no statistical difference ($p > 0.05$) between the groups. **Conclusion:** The mean atd angles and a-b ridge count were significantly decrease in HTN group, angle 'atd' showed significant increase in left hands and mean dat angles were significantly increase in both right and left hands of the cases as compared to controls.

KEYWORDS

Dermatoglyphics, atd Angle, a-b, ridge count Diastolic blood pressure, Systolic blood pressure.

INTRODUCTION:

High blood pressure or hypertension is a chronic cardiac medical disorder in this situation the systolic arterial blood pressure is raised. This medical condition is reverse of hypotension (low blood pressure). High blood pressure is classified as either primary (essential) hypertension or secondary hypertension; about 90-95% of belongings are characterized as primary hypertension, that means hypertension with no noticeable medical cause.¹ The remaining 5-10% of cases (secondary hypertension) is triggered by other circumstances that distress the kidneys, arteries, heart or endocrine system.²

Persistent high blood pressure is a important risk aspects for stroke, myocardial infarction, heart failure and arterial aneurysm. Moderate raise of arterial blood pressure cause to reduced life anticipation. Changes in lifestyle and diet may be recover blood pressure normal and reduction in the risk of related health difficulties though medical treatment can prove essential in patients for whom routine changes show unsuccessful or inadequate.²

Dermatoglyphics were discovered back to 1892; when one of the most original biologists of that time Sir Francis Galton, a cousin of Charles Darwin, published his work on fingerprints (The study was later on termed as dermatoglyphics by Dr. Horal Cummins).³ From cradle to grave, 'Hastarika' the science of palmistry, is a inheritance donated to humanity by ancestoracles and saint of India. The origins of this science may be drawn to the Ancient East-according to "kunagusu Minakatas" transcripts in nature. Chinese histories reference the use of fingerprint is exact ancient aeras of India. Ancient system of Indian palmistry called "Samudrik Mudra" classified ridge patterns into: "padma" (lotus), "Sankha" (conch shell), and "chakra" (wheel). These matters are also initiate articulated on the palms, soles and digits of the graven pictures of lord Buddha, which is in Indian museum at Calcutta. Bidloo give a explanation of ridge feature in the 17th century. Since then, further evidence has been supplementary by anthropologist, biologists, geneticists, and anatomists.⁴

Mayoff JCA in 1780 was the first to write that basic Jenets of fingerprint analysis and concluded that dermatoglyphic pattern is never same in two individuals. It is also established by Galton that the skin ridge patterns are permanent. Genetic and ecological factors are found to influence the formation of dermal pattern.⁵ These factors are also involved in the multifactorial aetiology behind hypertension. Therefore, various researches are directed to establish the relationship among blood pressure and dermatoglyphic patterns, not only this association of dermatoglyphic pattern with many other diseases like Congenital Heart Disease, Leukemia and Idiopathic Mental Retardation has developed.⁴ Prehypertension and hypertension are

recognized as a leading cause of morbidity and mortality across the world. These are regarded as silent killers as they cause no symptoms or quite few in late stages.⁶ Only 30% of the individuals would have the disease are aware of it.⁷ If not detected or left uncontrolled, these can lead to life threatening complications like heart disease, stroke, kidney problems and blindness over a duration of years. Hypertension is not attributable to single cause rather it reflects the interaction of multiple genetics and environmental factors, so that siblings of affected parents have higher chances of developing it in later life.⁸ Several studies are nowadays showing association of dermatoglyphic traits with hypertension. This may be of excessive usefulness for clinical viewpoint if these dermatoglyphic symbols probably may be used to diagnosis of persons at advanced risk of evolving hypertension.^{9,10,11} Numerous studies description hypertension entities to be having greater ATD angles.^{2,12,13} Limited studies stated that lesser ATD angles also in hypertension patients.^{14,15,16} These differences can be because of the differences in the method employed, pressure applied during printing and whether fingers are closely approximated or splayed.¹⁷

Devi KS et al¹⁸ in a case-control study examined the decreased 'atd' angle; increased fingertip ridge count in first digit (D1) of the among right and left hands and in second digit (D2) of right hand. Second digit (D2) of the both hands exhibited more loops and least arches, and absent pattern was found more in hypothenar area of left hand. Akhtar Z et al¹⁹ observed the rate of left hand atd angle for the evaluation of hypertensive and non-hypertensive subjects was the statistically significant difference. Adu Ofori K et al²⁰ noted the control group having the significantly higher between the among groups for the palmar atd angle for both palms. In another study Sangeeth JM et al²¹ found reduced 'atd' angle in the both right and left hands of male and only right hand of female hypertensive subjects, as related to that of controls. They also stated that 'atd' angle may be used as dermatoglyphic indicators for early recognition of crucial hypertension.

HTN are major independent risk factors for accelerated atherosclerosis and ischemic heart disease. Importance of the dermatoglyphics is not only to identify, but also prevent a disease by forecasting, not for defining only a present disease, but it categorises individuals with genetic predisposition to advance confident diseases.²² There is scarcity of dermatoglyphic data on the prevalence of diabetes, hypertension and diabetes with hypertension in a population of India. This will be created an interest in attempting the present study. The aim of this study was to collect dermatoglyphic pattern in patients with hypertension and to compare same "atd angle" and pattern of figure ridge in control group.

MATERIAL & METHODS:

The present comparative case control study was performed to collect dermatoglyphic pattern in patients with chronic elevation in blood pressure and to compare same parameters in control group in the Department of Medicine, Saraswati Medical College & Hospital, Unnao. A total 200 patients of clinically diagnosed chronic elevation in blood pressure (100) in study group patients compared with the same age group of 100 normal blood pressure cases as control the group.

Inclusion Criteria: Study group HTN include those patients having age above 25 years with chronic elevation in blood pressure $\geq 140/90$ mm Hg. Control group include that case having age above 25 years having normal blood pressure level.

Exclusion Criteria: Patients with deformity of hand, Chromosomal abnormalities like Klinefelter's syndrome, Turner's syndrome etc. and diseases like congenital anomalies, neurological disorders, carcinomas and psychiatric diseases were excluded from the study.

Materials Used: The materials used in present study were whitepaper, a clip board, printing ink, hand roller, a flatbottom container, optical grade hand lens with 4X & 6X magnification, protractor, scale, spirit orturpentine oil and liquid soap. Dermatoglyphic printof palm was taken by the "Ink & paper Method" asdescribed by "Cummin (1936)" and "Cummin and Midlo (1961)".

Measurement of atd Angle: The position of "axial or t triradius" was identified first and then the "triradius a" and "triradius d" were located by the hand lens. Then the atd angle was drawn by joining lines from "triradius a" to "axial or t triradius" and from "triradius d" to "axial or t triradius". atd angle was measured with the help of a protractor in the palm. Atd angle was measured in right and left hand separately. Then two values were summed to get single value for an individual. Then the mean values were calculated for different group.²³ [Figure No. 1]

Measurement of Blood pressure: Blood pressure was recorded by using mercury sphygmomanometer and stethoscope. Subjects were made comfortable and relaxed. Appropriate cuff size was taken which was encircling around 80% of arm circumference. Two successive readings were taken with at least 5 minutes interval. Higher of the two readings was considered. Blood pressure reading was taken after 1 hour, if the reading turned out to be below or beyond the normal range. Patients were considered hypertensive based on their blood pressure recordings, present and past medical history, and history of medications.

Statistical Analysis: Data was analysed with SPSS (Statistical Package for the Social Sciences) software version 23.0 (IBM, New York, USA). Data was summarized with descriptive measures like mean and standard deviation. Independent Sample t test was used to test difference between atd angle in both groups. A p-value less than 0.05 ($P < 0.05$) was considered as statistically significant.

OBSERVATION:

Bar chart no. 1 shows the right-hand fingertip pattern in group HTN and control; and it was found that for thumb the majority of the chronic elevation in blood pressure patients were whorl followed by loop and arch and that for the controls the majority of the controls were having loop followed by whorl and arch. For middle finger the majority of the chronic elevation in blood pressure patients were having loop pattern (52.0%) followed by whorl (36.0%) and arch (12.0%); while in controls 75.0% were having loop pattern followed by whorl (16.0%) and rest 9.0% were arch pattern. For ring finger the majority of the 62.0% HTN patients were having whorl pattern followed by loop (32.0%) and rest 6.0% were arch and in thumb the 50.0% HTN cases were having loop pattern followed by whorl (38.0%) and rest 12.0% arch pattern. [Figure No 2]

Bar chart no 3 shows the left-hand Fingertip pattern in Group HTN and control and it was found that in chronic elevation in blood pressure whorl pattern was comparatively increase in thumb, middle, index and ring finger while whorl pattern was in majority in thumb and ring fingers whereas for controls the loop pattern was in majority in all the fingers followed by whorl and arch respectively. [Figure No 3]

Table no 1 and figure no 4 shows the mean values of a-b ridge count were lower in both male and female diabetic patients than the control group. Comparatively lower in female diabetic than the male diabetic patients. A significant difference was found in both right and left hand

of diabetes and control group ($P < 0.001$).

Table no 2 shows the association of angles of right and left among chronic elevation in blood pressure and control groups where it was observed that mean atd angles was significantly lower in HTN group and mean atd angles were significantly higher in HTN group than controls whereas atd angles were significantly higher in left and significantly lower in right of the HTN group ($p < 0.05$).

DISCUSSION:

Dermatoglyphics has emerged as a useful diagnostic aid in a number of diseases with strong hereditary basis. It is used as a valuable research tool to predict, compare, contrast, to predict the occurrence and risk of health issues related to genetics and medicine. Nowadays many studies have established dermatoglyphic patterns to be associated with various diseases where aetiology is obscure. The purpose is not to diagnose but to prevent by predicting a disease and identify the people with genetic predisposition to develop them. So, the present study was undertaken to find the correlation of atd angle with blood pressure in north Indian population.

In India the prevalence of hypertension is around 25.30% in urban and 10-20% in rural population.²⁴ As observed in 4th National Family Health survey overall prevalence of hypertension in Haryana is 13% with 9.2% in rural and 16.8% in urban areas.²⁵ In the study conducted by Malhotra et al a population-based survey in rural and non-industrial areas in the state of Haryana, India to determine the prevalence of hypertension 5.8% males and 3% females were hypertensive.²⁶ In another study of North India, 32.2% of population were hypertensive and 32.2% population had pre-hypertensive.²⁷ So in our study we include the 50.0% male hypertension patients and rest 50.0% were female. In control group also male and female were same (50.0%).

On analysis of blood pressure, it was noted that mean atd angles were significantly lower in HTN group and mean atd angles were significantly higher in HTN group than controls whereas atd angles were significantly higher in left and significantly lower in right of the HTN group ($p < 0.05$). Our findings are also in consensus with the result of study by Ahmad M et al²⁸ observed lower mean atd angle in hypertensive subjects in comparison to normotensive ones in both right (41.46 vs. 42.18) and left hand (41.15 vs. 42.47). In another study by Devi KS et al¹⁸ mean atd angle of hypertensive subject was lower compared to controls (45.22 vs. 47.57). Deepa G et al¹¹ also reported lower mean atd in hypertensive subjects compared to normotensive. In contrast to present findings, Setia A et al²⁹ who found raised atd angle with rising blood pressure. In their study the mean atd angle 37.7, 40.1 and 40.2; among normo-tensive, pre-hypertensive and hypertensive persons were respectively. Similarly in another study by Chakravathy GP et al³⁰ reported the mean atd angles in right and left hands was significantly higher in hypertensive subjects as compared to normal ones (38.26 versus 35.52) and (38.28 versus 35.31) respectively. Numerous researches reported hypertensive subjects raised atd angle with respect to normotensive persons, between persons with important hypertension.^{2,12,13} While comparable alterations have also detected in researches established on patients with juvenile hypertension.^{31,32} These differences observed are attributed to varying methods employed for measuring atd angle based on position of axis tri-radius. Further variations in atd angle may occur as a consequence of change in pressure functional throughout printing and whether fingers are faithfully approached or splayed.¹⁷

Our study noted that for both hand there was amplified quantity of whorls and reduced number of the ulnar loops in the hypertensive (HTN) subjects as associated with normal people. In similar study Pasha MI et al³³ reported that amplified number of the whorls and diminished number of the ulnar loops in crucial hypertensive cases compared with the normal persons. Chakravathy GP et al³⁰ reported that at every single level, whorls were extra common in hypertension than in controls one and that the spreading of dermatoglyphic patterns were significant common in hypertension than in normal. Wijerathne BTB et al³⁴ reported that an impartially reliable outcome of an improved occurrence of whorl patterns along with an advanced mean of the total ridge count in numerical dermatoglyphic consequences in hypertensive patients linked to normal one. While study Ahmad M & Pimpalkar DS²⁸ reported that in case of 5th finger the whorl patterns are similar percentage in among male and female of the hypertensive patient and normal healthy group. The reduction in percentage of the loops and amplified percentage of the arches. Bulagouda RS et al¹⁰ study also reported the both right and left hand of male normal group

showed increased number of the whorls than the study group, while in females' patients, the right hand showed more amount of the whorls than normal healthy individuals and the left-hand hypertensive group exhibited a smaller number of whorls as compared to normal healthy persons.

The mean values of a-b ridge count were lower in both male and female diabetic patients than the control group. Comparatively lower in female diabetic than the male diabetic patients. A significant difference was found in both right and left hand of diabetes and control group ($P < 0.001$). Bala, et al³⁵ reported that the mean values of a-b ridge count were found lower in male diabetic and higher in female diabetic than control and significant in the case of females. This was similar to the findings of Ziegler et al³⁶, Oladipo and Ogunnowo,³⁷ whereas Tarca et al³⁸, Dam et al³⁹, Verbov⁴⁰ found decrease a-b ridge count in diabetic patients.

Although a few studies have been undertaken to establish an association between HTN with dermatoglyphics (adt angle) and ridge pattern, the results obtained so far have been ambiguous. Contradictory results have been observed mostly from different populations due to a vast difference among the patterns in various populations.

Limitation and Recommendation:

Our study was single centre with small sample size; it was not a representative of entire population group. More extensive research is required for the establishment of dermatoglyphics as a screening tool. Findings of our study specify that there is a necessity for additional study on a greater sample size and extra miscellaneous population to shed light on the role of finger print pattern appearance as an aid to diagnostic approaches for HTN.

CONCLUSION:

The mean atd angles in both hands were significantly decrease in HTN group, angle 'adt' showed significant increase in left hand and mean dat angles were significantly increase in both hands of the cases as compared to controls. The dermatoglyphic study is completely cost-effective and no need of hospitalization and it may help in identifying the phenotype of a promising future illness. Our study would be supportive to frame counselling messages behalf on dermatoglyphic pattern predominant (adt angle) among young generation and their probable stimulation to regulate the young people's likelihood to grow HTM in their later age. It may be used for mass screening program for stoppage of chronic elevated blood pressure.

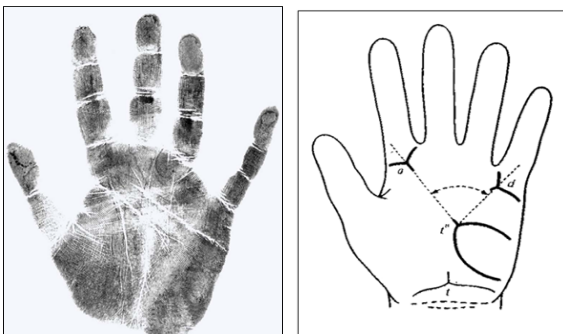


Figure No. 1: Showing the measurements of angles in palm

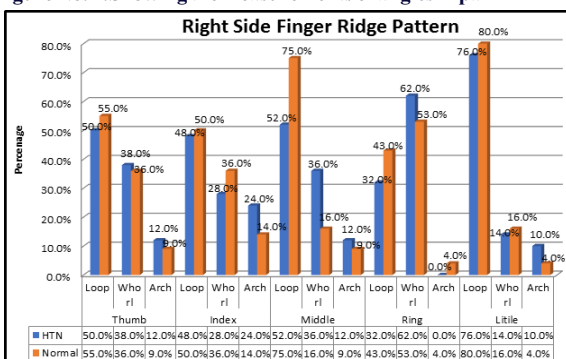


Figure No. 2: Bar chart shows the Right-hand Fingerprint pattern in Group HTN and control

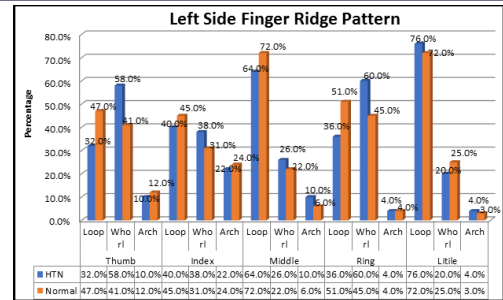


Figure No. 3: Bar chart shows the Left-hand Fingerprint pattern in Group HTN and control

Table No. 1: Mean a-b ridge count & SD of Study Group HTN and Control

a-b ridge count	HTN (N=100)	Normal (N=100)	P value*
Right hand			
Male	21.20±3.154	31.04±9.31	<0.001 (S)
Female	17.92±5.90	31.40±10.20	<0.001 (S)
Left hand			
Male	20.76±3.88	48.86±6.92	<0.001 (S)
Female	20.52±13.53	48.62±7.02	<0.001 (S)

*Independent Sample t test

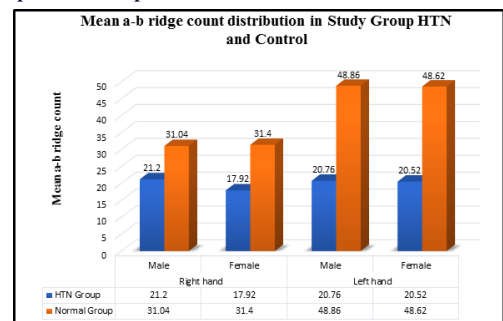


Figure No. 4: Mean a-b ridge count distribution in Study Group HTN and Control of both hand and both sex

Table No. 2: Mean angle & SD of Study Group HTN and Control

		HTN (N=100)	Normal (N=100)	P value*
Angles Right	atdAngles	47.20±7.80	51.38±7.24	<0.001 (S)
	adtAngles	69.02±11.04	74.19±9.13	<0.001 (S)
	datAngles	60.14±7.90	56.35±6.88	<0.001 (S)
Angles Left	atdAngles	45.56±5.18	72.56±11.57	<0.001 (S)
	adtAngles	75.78±7.59	58.82±4.92	<0.001 (S)
	datAngles	60.64±7.29	31.75±10.77	<0.001 (S)

*Independent Sample t test

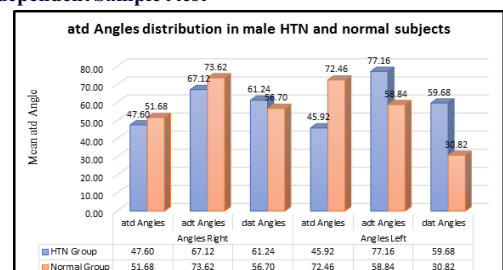


Figure No. 5: Mean atd angledistribution in Study HTN and Control Group of both hand in male subjects

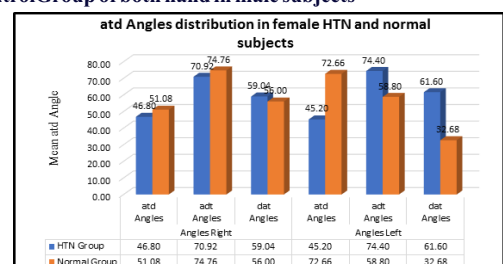


Figure No. 6: Mean atd angledistribution in Study HTN and Control Group of both hand in female subjects

Control Group of both hand in female subjects**REFERENCES**

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