

## Dermatoglyphics: a study of finger tip patterns in bronchial asthma and its genetic disposition.

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### Abstract

Finger tip patterns of sixty patients of Bronchial Asthma were compared with that of 50 control cases. Higher frequency of whorls was observed in first digit of both generations of bronchial asthma patients in comparison to controls. In all digits the frequency of arches was reduced in both generations of bronchial asthma patients as compared to controls. These findings proved highly significant statistically (P value : < 0.001). There was no significant change in finger tip patterns in II, & III digit, but, IV & V digit showed significant reduction in frequency of loops in both generations of bronchial asthma patients as compared to controls. There is scope of more studies in this field and the significant findings can be included as part of clinical picture of bronchial asthma.

**Key words:** Dermatoglyphics; Arch; Whorl; Loop; Triradius & Core.

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**D**ermatoglyphics – the study of pattern traceries of fine ridges on fingers, palm and sole have been a useful tool for personal identification and determination of paternity for quite some time. It proved important due to the fact that (1) unlike most human traits; dermal ridges and the configurations formed by them are not affected by age. (2) Detailed structure of individual ridges is extremely variable and (3) throughout postnatal life they are not affected by environment.

Palmar creases develop during the 2nd and 3rd month of intrauterine life and are not influenced by movement of hand in utero (Alter, 1966). They are of considerable clinical interest because they are affected by certain abnormalities of early development including genetic disorders (Walkar 1958). Simian lines have been noted by Davis (1963) on rudimentary palms of infants whose limb development is affected by thalidomide teratogen.

Abnormal Dermatoglyphic patterns have been observed in several non chromosomal genetic disorders and other diseases whose etiology may be influenced directly or indirectly, by genetic inheritance (Bhanu 1973; Schauman and Alter 1976). A significant link has been established by pioneer workers between ridge pattern in congenital heart diseases (Brigendra 1996), Diabetes (Roopa Rabindranath 1990), Lung Tuberculosis (Nechava 1996), Leprosy (Nagar K. S. et al 1981; Natekar P.E.

1996) and Bronchial Asthma (M. Gupta et. al 1993; Ozkaragoz 1971)

In the present study we have tried to evaluate Dermatoglyphic changes in bronchial asthma with its genetic disposition.

### Material and method

Sixty patients of Bronchial Asthma comprising 30 patients of 1st generation (father-mother) and 30 patients of 2nd generation (son-daughter) were selected from outdoor & indoor Department of Medicine and Paediatrics of Govt. M.B. Hospital and Railway Hospital, Udaipur, Rajasthan India. Diagnosis of Bronchial Asthma patients was based on detailed history, clinical sign and symptoms. The age of the patients was 1 – 50 years. Fifty healthy subjects of control group not suffering from any respiratory disease were selected from R.N.T. Medical College (1st M.B.B.S. students) and Railway Zonal Training Centre, Udaipur.

The hands were washed with soap and water, the humidity was removed with the help of Ether, which also removed the greasy material. Instead of classical 'CUMMINS' (1961) ink method

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the stamp pad smeared with black ink was used for making finger prints. It proved to be an easier and better method. The thumb was placed with ulnar edge downward and rolled toward body and other digits were placed with radial edge downward and rolled away from body. The finger prints of both hands were taken.

Description of various Dermatoglyphic digital patterns of ridges

- The epidermal ridges form definite local design on the terminal segments of digit and various other sites on the palm. Galton, in 1892, classified them in; **arches, loops and whorls.**

**Whorl** - These are the patterns so constructed that the characteristic ridge courses follow circuits around the core. The shape of the pattern area may be either circular or elliptical. Whorls have two triradii and may have various shapes like whorl spiral, whorl double loop and whorl symmetrical. Sometimes whorls are single cored but mostly they are double cored.

1. Symmetrical whorls are composed of concentric ridges around a single centre (**Whorls concentric**)
2. Whorl with a single centre and spirally arranged ridges are twining either in clockwise or anticlockwise direction (**Whorl spiral**).
3. Double loop type whorls with two cores.

**Loop** - It is simple in contrast to the whorl. It possesses only one triradii. Twist site of ridges is called head of the loop. From the opposite extremity of the pattern, the ridges flow to the margin of digits. If the loop opens to the ulnar side, it is an ulnar loop and if to the radial margin, it is called a radial loop.

**Arch** - The plain arch is composed of ridges which pass across the finger with slight bow distally. There is no triradii.

The pattern of ridges in tented arch is almost similar but there is abrupt elevation of the transversely coursing ridges, forming the “tent” which gives the name to the pattern as Tented Arch.

Fixed points in impressions

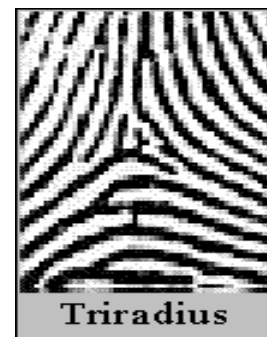
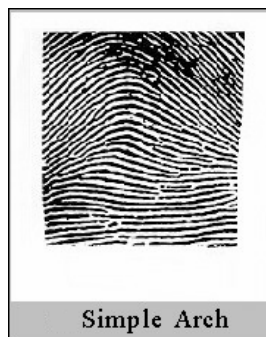
In above described pattern, there are fixed points which serve very useful purpose. These fixed points are

1. Outer terminus or delta or triradii
2. Inner terminus or point of core

The delta may be formed either by bifurcation of a single ridge or by abrupt diversion of two ridges that may run side by side.

**Triradius** - It is located at the meeting point of three opposing ridge systems. Triradius is taken as synonymous to delta but in actual sense delta is a triangle or plot and triradius is represented by ridge form, thus triradius may be present when there is no delta and triradius is formed by three ridges radiating from a common point. Triradius has dual importance in finger print analysis: first the ridges extending from it are tri-radiant, Second: it provides the landmark for ridge counting and tracing.

**Core** - It is described as internal terminus, which forms centre of the pattern area. It may be an encircling system and may appear as an island, a short straight ridge, a book shaped ridge, a circle, or an ellipse. The point of core or central point is the landmark for ridge counting. In a loop having a single rod-core, the distal tip of rod is the point of core. If there are two rods, one farther from the triradius is the point of core. If there are three or more rods, the meeting point of central pair is the point of the core.



### Observations

Observations were made with the help of magnifying lens. They are tabulated as under: - Distribution of finger tip patterns

Digit		Control Total (Rt50+Lt.50)= 100			I Generation Total (Rt.30+ Lt..30 )= 60			II Generation Total (Rt30+ Lt.30 )= 60		
		Whorl	Loop	Arch	Whorl	Loop	Arch	Whorl	Loop	Arch
I	Rt.	21	24	05	20	07	03	17	11	02
	Lt.	20	23	07	16	11	03	18	12	00
	Total	41	47	12	36	18	06	35	23	02
II	Rt.	19	26	05	11	17	02	09	18	03
	Lt.	21	25	04	14	15	01	12	15	03
	Total	40	51	09	25	32	03	21	33	06
III	Rt.	13	30	07	07	18	05	06	14	10
	Lt.	16	22	12	09	15	06	07	15	08
	Total	29	52	19	16	33	11	13	29	18
IV	Rt.	12	32	06	12	13	05	11	14	05
	Lt.	10	35	05	13	11	06	13	14	03
	Total	22	67	11	25	24	11	24	28	08
V	Rt.	08	39	03	10	13	07	08	14	08
	Lt.	09	37	04	07	15	08	05	21	04
	Total	17	76	07	17	28	15	13	35	12

### Discussion

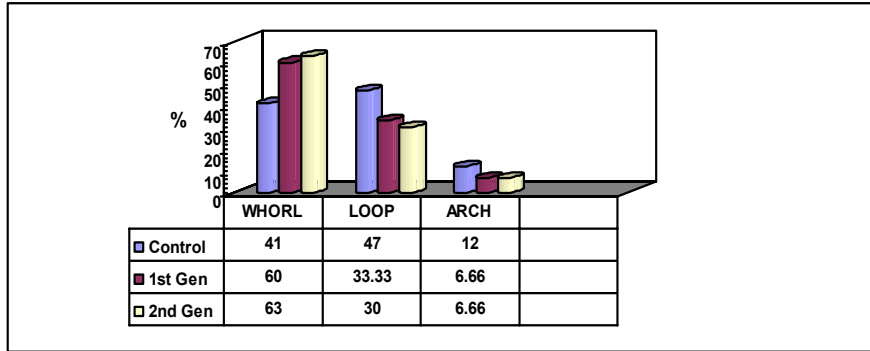
The present study was aimed to evaluate Dermatoglyphic changes in finger tip patterns in Bronchial Asthma and to see whether they are genetically transmitted or not.

The different patterns of controls were compared with that of 1<sup>st</sup> and 2<sup>nd</sup> generation patients of Bronchial Asthma.

**The distribution of finger tip patterns in first digit (Graph No.1)** shows higher frequency of whorls in Bronchial Asthma patients (1<sup>st</sup> generation: 60%, 2<sup>nd</sup>

generation 63%) as compared to control (41%). The frequency of loops and arches is reduced in both generations of Bronchial Asthma patients than control. (Loops: control 47%, 1<sup>st</sup> generation 33.33%, 2<sup>nd</sup> generation 30%; arches: control 12%, 1<sup>st</sup> and 2<sup>nd</sup> generation 6.66%). **P value is < 0.001**, which shows that whorls are highly significant statistically in both generation Bronchial Asthma patients as compared to control. These observations are in accordance with the study of M. Gupta et.al. (1993) and Ozkaragoz's (1971).

**Graph1.** Distribution of finger tip patterns in I Digit



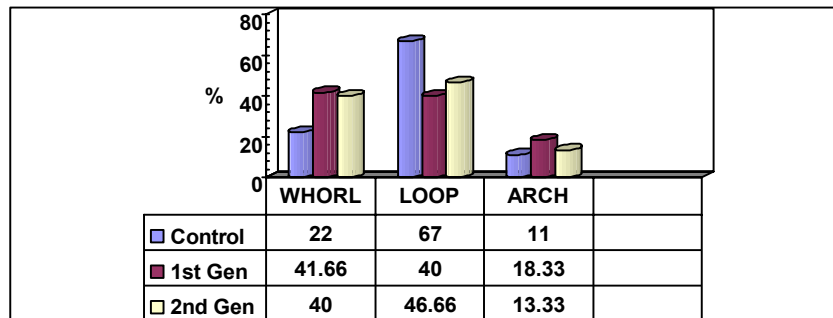
**Distribution of finger tip patterns in 2nd digit** shows no significant change in the frequency of whorls and loops (whorls: Control, 40%, 1<sup>st</sup> generation: 41.66% & 2<sup>nd</sup> generation 35% Loops: control, 51%, 1st generation, 53.33% and 2nd generation 55%). P Value>0.05. It corresponds with the observations of Ozkaragoz (1971).The frequency of arches is lower in 1<sup>st</sup> generations of Bronchial Asthma patients than controls & 2<sup>nd</sup> generation patients (control: 9%, 1st generation 5% & 2<sup>nd</sup> generation 10%). This is also not a significant change. **P Value>0.05.**

**Distribution of finger tip patterns in III digit** shows higher frequency of loops as compared to whorls and arches in control and both generations. (control : whorls-29%, loops-52% and arches-19%; 1<sup>st</sup> generation whorls-26.66%, loops-55% and arches-33%; 2<sup>nd</sup> generation whorls-21.66%, loops-48.33% and arches-30%)In whorls and Loops there is no

significant change in control& both generations, but frequency of arches is higher in 2<sup>nd</sup> generation than control and 1st generation . P value >.05.Statistically it is not significant.

**Distribution of finger tip patterns in IV digit (Graph No. 2).**shows higher frequency of loops in control as compared to both generation Bronchial Asthma patients; (control 67%,1st generation- 40% , 2nd generation- 46.66%).In control there is predominance of loops as compare to whorls and arches while in both generation Bronchial Asthma patients there is equally increase frequency of whorls and loops as compared to arches (whorls; control 22%,1<sup>st</sup> generation 41.66%,2<sup>nd</sup> generation 40%; arches; control 11%, 1<sup>st</sup> generation 18.33%, 2<sup>nd</sup> generation 13.33%). **P value is <0.05** which is significantly high statistically.

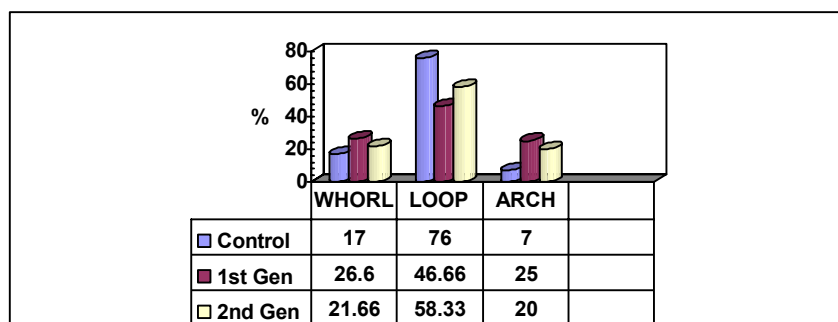
**Graph 2.** Distribution of Finger Tip patterns in IV Digit



**Distribution of finger tip patterns of V digit (Graph No.3)** shows predominance of loops in control as well as both generations of bronchial asthma patients. Though the frequency of loops is predominant in both generation of bronchial asthma

patient, it is significantly reduced in comparison to control. (Loops; control 76%, 1st generation 46.66%, 2nd generation 58.33%). **P value is <0.05** significantly high statistically.

**Graph 3.** Distribution of finger Tip patterns in V Digit



### Summary and Conclusion

- ❖ The present study was undertaken with an objective to evaluate the role of dermatoglyphics in early detection and genetic predisposition of Bronchial Asthma.
- ❖ The percentage of whorls in first digit was more in Bronchial Asthma patients in both 1st (60%) and 2nd (63%) generation as compared to controls (47%). P value is <0 .001, statistically it is highly significant.
- ❖ In all digits the frequency of arches was reduced in both generations of bronchial asthma patients as compared to controls. The IV digit showed significant reduction of loops in both generation Bronchial Asthma patients as compared to control. (Control 67%, 1<sup>st</sup> generation 40%, and 2nd generation 46.66%) P value is <0 .05.
- ❖ The V digit also showed significant reduction of loops in both generation Bronchial Asthma patients as compared to control. (Control 76%, 1<sup>st</sup> generation 46.66%, and 2nd generation 58.33%) P value is <0 .05.)

These parameters may help in early diagnosis and after more elaborate studies can be included as part of the clinical picture of bronchial asthma.

### References

1. Alter m. et al: Variation of palmar creases. Am. J. Dis. Child vol. 120, pp. 421-431, 1970.
2. Bhanu. Simian Crease in man. Same methodological consideration. Journal of human evaluation edition-2<sup>nd</sup> pp 153 – 160, 1973.
3. Singh B, Jain PM, Longia G.S., Thomas R.J. Dermatoglyphics in congenital heart diseases J. A.S.I.- vol. 45, PP 11-117, 1996
4. Cummins and Midlo: Finger Prints palm and soles - Introduction to Dermatoglyphics, Dover publication Inc. New York, 1961.
5. Cummins, H, and C. Midlo: Palmar and planter epidermal ridge configurations (dermatoglyphics) in European- Americans. Am. J. Phys. Anthropology., vol. 9, pp. 471-502, 1926.
6. Galton. Finger Prints. London, Macmillan & Co. 1892.
7. Gupta M., Sood A , Bharihoke V. Dermatoglyphics Pattern in patients of chronic
8. Nagar KS, Lata N, Sethi NC. A study of palmar Dermatoglyphics in leprosy (Indian Journal of Association of Physician of India- Vol. 29 –841-847, 1981) bronchial asthma, journal of ASI, vol. 42, pp-45.1993
9. Nechava: Dermatoglyphic study of genetic predisposition to the development of lung tuberculosis, 1996.
10. Ozkaragoz: A preliminary study of dermatoglyphics in children with Bronchial Asthma. The journal of Asthma research Vol. 8, PP 179-182, June 1971.
11. Natekar PE, Shukla P, Priolkar S. Axial triradii in Leprosy Journal of A.S.I. Vol., 45, pp 105-109 Dec. 1996.
12. Rabindranath R. and THOMAS I.M. Dermatoglyphic studies in Diabetes Mellitus ( Journal of A.S.I. Vol. 32,pp June 1990)
13. Schauman and Alter: Dermatoglyphic disorders New York, Springer Verlag. 1<sup>st</sup> edition, pp-7 1976.
14. Sidhu LS., Bhatnagar DP, Malhotra R: Association of finger ball dermatoglyphics with pulmonary tuberculosis, Anz 1977, Aug 36 (1); 36-42.
15. Wilder HH.: Palms and soles. Am. J. Anat., vol I pp. 423-441, 1897-1902.

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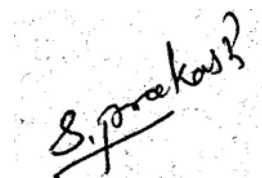
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