**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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Dermatoglyphics – 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 triradi 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

<table>
<thead>
<tr>
<th>Digit</th>
<th>Control</th>
<th>I Generation</th>
<th>II Generation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Total (Rt50+Lt.50) = 100</td>
<td>Total (Rt.30+ Lt..30 ) = 60</td>
<td>Total (Rt30+ Lt.30 ) = 60</td>
</tr>
<tr>
<td></td>
<td>Whorl</td>
<td>Loop</td>
<td>Arch</td>
</tr>
<tr>
<td>I</td>
<td>Rt.</td>
<td>21</td>
<td>24</td>
</tr>
<tr>
<td></td>
<td>Lt.</td>
<td>20</td>
<td>23</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>41</td>
<td>47</td>
</tr>
</tbody>
</table>

| 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 1st and 2nd 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(1st generation: 60%, 2nd 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%, 1st generation 33.33%, 2nd generation 30%, arches: control 12%, 1st and 2nd 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).
Graph 1. Distribution of finger tip patterns in I Digit

<table>
<thead>
<tr>
<th></th>
<th>Whorl</th>
<th>Loop</th>
<th>Arch</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>41</td>
<td>47</td>
<td>12</td>
</tr>
<tr>
<td>1st Gen</td>
<td>60</td>
<td>33.33</td>
<td>6.66</td>
</tr>
<tr>
<td>2nd Gen</td>
<td>63</td>
<td>30</td>
<td>6.66</td>
</tr>
</tbody>
</table>

Distribution of finger tip patterns in 2nd digit shows no significant change in the frequency of whorls and loops (whorls: Control, 40%, 1st generation: 41.66% & 2nd 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 1st generations of Bronchial Asthma patients than controls & 2nd generation patients (control: 9%, 1st generation 5% & 2nd 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%; 1st generation whorls-26.66%, loops-55% and arches-33%; 2nd 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 2nd generation than control and 1st generation. P value >0.5. 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%, 1st generation 41.66%, 2nd generation 40%; arches; control 11%, 1st generation 18.33%, 2nd generation 13.33%). P value is <0.05 which is significantly high statistically.

Graph 2. Distribution of Finger Tip patterns in IV Digit

<table>
<thead>
<tr>
<th></th>
<th>Whorl</th>
<th>Loop</th>
<th>Arch</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>22</td>
<td>67</td>
<td>11</td>
</tr>
<tr>
<td>1st Gen</td>
<td>41.66</td>
<td>40</td>
<td>18.33</td>
</tr>
<tr>
<td>2nd Gen</td>
<td>40</td>
<td>46.66</td>
<td>13.33</td>
</tr>
</tbody>
</table>

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.
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%, 1st 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%, 1st 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

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