A Comparative Analysis of Dermatoglyphic Traits on Patients with Chronic Kidney Disease

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Abstract:

Background:
Dermatoglyphic features have been associated with numerous medical disorders. This study is an effort to determine the association between dermatoglyphics and chronic kidney disease.

Objectives:
To record and compare the dermatoglyphic pattern in patients of chronic kidney disease and in control group.

Methods:
A case control descriptive study was conducted over six months period on 100 patients with chronic kidney disease and 100 individuals with no evidence of kidney disease in Hemodialysis Department of National Dialysis Centre situated in Kantipur General Hospital, Basundhara, Kathmandu. Patient’s hands were cleaned with soap and water. Once dried, black duplicating ink was applied on fingers and palm. Finger tips followed by palm were recorded on white A4 size paper. Frequency of each ridge pattern analysis was done and paired t-test was performed using SPSS version 16.

Results:
The distribution of frequency and percentage of ulnar loop pattern in right hand of patients with chronic kidney disease was 350(70%) whereas the distribution of ulnar loop pattern in left hand was 282(56.4%).

Conclusion:
The predominant fingerprint pattern in patients with chronic kidney disease was found as ulnar loop but the increased frequency of ulnar loop was recorded in right hand of chronic kidney disease patients as compared to the right hand of control group.

Key words: Arch; radial loop; ulnar loop; whorl.
**Introduction:**

The term “Dermatoglyphics” is the scientific term coined by Prof. Harold Cummins. The analysis of dermal ridges by studying prints of them is called Dermatoglyphics. Dermatoglyphic features develop during early stages of fetal life and do not change throughout postnatal life. Generally, the pattern of fingerprint is divided into three types namely arch, loop and whorl, the loop type is divided to two subgroups: radial and ulnar.

Chronic kidney disease is becoming a major cause of global burden with high mortality and morbidity. It is estimated that in Nepal, the number of new cases of end-stage renal failure is around 2800-4200 per year needing dialysis or transplantation.

Dermatoglyphics is used as a non-invasive diagnostic tool to predict different medical conditions. A limited number of studies have evaluated a dermatoglyphic relationship in chronic kidney diseases. Therefore, the study can help to identify dermatoglyphic variables associated with chronic kidney disease that can serve as a clue for its susceptibility.

**Methods:**

This cross-sectional study was conducted in Hemodialysis Department of National Dialysis Centre situated in Kantipur General Hospital, Basundhara, Kathmandu from April 2017 to September 2017. This study was conducted with the approval of Institutional review committee of Kantipur Dental College and Teaching Hospital. The patients were duly informed about the procedure and the written consent was taken prior to the procedure. Demographic information, medical history and other relevant information were obtained through questionnaire. 100 patients (80 males and 20 females), age ranging between 30-80 years with chronic kidney disease and 100 participants (80 males and 20 females) with no evidence of kidney disease as control group were included in the study. The patients without any scar and deformities of fingers and palm were included in the study. The fingerprints were taken after washing off the hands and drying with the use of soft cotton cloth to avoid dirt and dust. A uniform layer of Indian ink was applied on both the hands of patients. The fingerprints were taken by making an impression on the white A4 size white paper. Fingerprints were studied and observed with the help of magnifying glass. Frequency of each ridge pattern was analyzed and paired t-test was performed to find the p-value using SPSS version 16.

**Results:**

This study was done on patients of chronic kidney disease in Hemodialysis Department of Kantipur Dental College and Teaching Hospital. The fingerprint patterns were recorded on both right and left hands of patients with chronic kidney disease and of control group without disease.

The distribution of frequency and percentage of dermatoglyphic patterns in right hand of patients with chronic kidney disease were 350(70%) ulnar loop, 128(25.6%) whorl and 26(5.2%) arch whereas the distribution of dermatoglyphic pattern in left hand recorded were 282(56.4%) ulnar loop, 190(38%) whorl, 26(5.2%) arch and 2(0.4%) radial loop. The increased frequency of ulnar loop pattern was found in both right and left hands but the higher incidence of ulnar loop pattern was recorded in right hand than in left hand. Rest of the dermatoglyphic patterns, whorl and arch were found to be higher in left hand than in right hand. Radial loop finger pattern was observed in left hand of patients with disease in only two of the patients whereas radial loop pattern was completely absent in right hand of patients with the disease.

The order of prevalence of frequency and distribution of dermatoglyphic pattern in right hand of control group was 274(54.8%) ulnar loop, 190(38%) whorl, 38(7.6%) arch and 2(0.4%) radial loop. While in the left hand of control group, there were 272(54.4%) ulnar loop, 178(35.6%) whorl, 32(6.4%) arch and 18(3.6%) radial loop. Ulnar loop pattern was found to be predominant in both right and left hand followed by a slight increase in percentage of whorl and arch pattern in right hand than in left hand. But interestingly radial loop pattern was recorded to be higher in left hand than in right hand.

The difference of distribution of ulnar loop pattern in right and left hands between patients with chronic kidney disease and control or without disease was found statistically significant(p=0.017). Similarly the difference of distribution of ulnar loop in only right hand of patients with chronic kidney disease and in control group was 0.035(p<0.05) which was statistically significant.
Table 1: The frequency and percentage of type of fingerprints in case and control group

<table>
<thead>
<tr>
<th>Type of finger</th>
<th>Ulnar loop</th>
<th>Whorl</th>
<th>Arch</th>
<th>Radial loop</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Case</td>
<td>Control</td>
<td>Case</td>
<td>Control</td>
</tr>
<tr>
<td>Right hand thumb</td>
<td>72</td>
<td>52</td>
<td>28</td>
<td>40</td>
</tr>
<tr>
<td>Right hand forefinger</td>
<td>66</td>
<td>40</td>
<td>30</td>
<td>52</td>
</tr>
<tr>
<td>Right hand middle finger</td>
<td>70</td>
<td>60</td>
<td>20</td>
<td>32</td>
</tr>
<tr>
<td>Right hand ring finger</td>
<td>66</td>
<td>50</td>
<td>32</td>
<td>40</td>
</tr>
<tr>
<td>Left hand little finger</td>
<td>76</td>
<td>72</td>
<td>18</td>
<td>26</td>
</tr>
<tr>
<td>Total</td>
<td>350(70%)</td>
<td>274(54.8%)</td>
<td>128(25.6%)</td>
<td>190(38%)</td>
</tr>
</tbody>
</table>

Table 2: Descriptive statistics of ulnar loop pattern in only right and both hands of normal and diseased individuals

<table>
<thead>
<tr>
<th>Ulnar loop pattern</th>
<th>Frequency(f)</th>
<th>Mean±SD</th>
<th>Degree of freedom(df)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Right hand of Diseased</td>
<td>370</td>
<td>63.2 ± 9.6</td>
<td>9</td>
<td>0.035 (&lt;0.05)</td>
</tr>
<tr>
<td>Right hand of Normal</td>
<td>274</td>
<td>54.6 ± 10.7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Both hands of Diseased</td>
<td>642</td>
<td>70.0 ± 4.2</td>
<td>4</td>
<td>0.017 (&lt;0.05)</td>
</tr>
<tr>
<td>Both hands of Normal</td>
<td>556</td>
<td>54.8 ± 11.9</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Discussion:

Dermatoglyphics is correlated with genetic abnormalities and is useful in the diagnosis of congenital malformations and many other medical disorders. A dermatoglyphic study conducted at Avicenna Medical College, Lahore on patients with coronary heart disease showed the predominance of whorl pattern of finger print i.e., 90(57%) followed by number of patients belonging to Loop pattern as 40(29%) and arch and composite pattern as 10(7%) each. A decreased frequency of ulnar loops on all fingers of patients with Juvenile Periodontitis was noticed in a study done by Atasu et al. The whorl type of fingerprint pattern was found predominant in dental students with dental caries in Bhopal city. Thus the peculiar patterns of the epidermal ridges serve as a diagnostic tool in a number of diseases that have a strong hereditary background.

In this study, the most dominant ulnar loop pattern was noticed in both the hands of patients and control group besides the other finger print patterns but significantly a higher incidence of ulnar loop pattern was recorded in patients as compared to the control group.

This study clearly showed a consistent finding of an increased frequency of ulnar loop pattern in right hand compared to left hand of patients with chronic kidney disease which was similar to the study done on patients with chronic kidney disease by Sergii Kulishov and Oleksiy Iakovenko in Komissarenko Institute of Endocrinology and Metabolism, Ukraine. There have been no such studies related with dermatoglyphics in patients with chronic kidney disease conducted in Nepal and this is the only study conducted in Ukraine that I could find to correlate with.

The frequency of ulnar loop pattern was almost equal in right hand 274(54.8%) and left hand 272(54.4%) of control group but the ulnar loop pattern was drastically more in right hand 350(70%) than in the left hand 282(56.4%) in chronic kidney disease patients which had a strong correlation with the study done by Sergi and Olexander in Ukraine.

Whorl pattern was recorded to be more in left hand 190(38%) than in right hand 128(25.6%) of chronic kidney disease patients. In contrast, whorl pattern was found to be more in right hand 190(38%) than in left hand 178(35.6%) of control group.

Surprisingly, the frequency of arch pattern was observed to be equal in both hands 26(5.2%) of chronic kidney disease patients. The frequency of arch pattern was recorded to be higher in right hand 38(7.6%) than in left hand 32(6.4%) of control group which was in turn higher than the arch pattern of chronic kidney disease patients.

Complete absence of radial loop pattern was observed in right hand of chronic kidney disease patients. Only 2(0.4%) chronic kidney disease patients showed arch loop pattern in their left hand. 18(3.6%) individuals of control group were recorded to have radial loop pattern in their left hand which was higher than the arch pattern found in their right hand 2(0.4%).

The male patients with chronic kidney disease were relatively more in comparison to the female patients so that the impact of sexual dimorphism in dermatoglyphic pattern could not be studied. Sample size could have been larger to get more useful information.

Though dermatoglyphics do not play a major role in clinical diagnosis yet it can serve as a predictive tool to select individuals with susceptibility to the kidney disease from a larger population. Dermatoglyphics is a good inexpensive anatomic indicator and could be useful in early diagnosis of chronic kidney disease. Similar studies can be conducted on a larger sample at a national level so as to increase the accuracy of prediction of susceptibility to develop chronic kidney disease.

Conclusions:

This study resulted with the patients with chronic kidney disease having an elevated frequency of ulnar loop pattern than controls. Similarly, increased ulnar loop pattern was persistent in right hand of chronic kidney disease patients compared to their left hand which was statistically significant. However, at this time, it seems unwarranted to conclude that an intrinsic association between dermatoglyphic features and chronic kidney disease has been satisfactorily demonstrated.

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References:


