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Dermatoglyphics: A Diagnostic Tool

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Abstract

Dermatoglyphics includes the study of ridge pattern on the pulp of fingers, lips and foot prints etc. Finger prints proved their uniqueness in identification. Besides this the finger print pattern indicates future risk of certain diseases like Cancer, Diabetes and Hypertension. This paper is aimed at looking such relationship between major finger print patterns and diseases like Diabetes and Hypertension.

Keywords: Finger Prints; Diabetes; Hypertension.

Introduction

Like any other living being, each human differs from others (Quetelets law) [1]. So also the finger prints.

In 1858 Sir William Herschel used finger prints for the first time in India to prevent impersonation. Sir Francis Galton systematized it for identification, which was officially adopted in England in 1894 and was further modified by Sir Edward Henry [2].

The study of finger print patterns is called as "Dactylography" where as the term "Dermatoglyphics" not only includes finger print patterns but all patterns of skin folds like foot prints, lip prints, palate prints etc.

Apart from the usage of finger prints in identification, studies were conducted to know association between *dermatoglyphics* and diseases like breast cancer, Alzheimer's disease, tuberculosis, Diabetes and Hypertension [3].

The present study is to correlate such relationship between diseases like Diabetes, Hypertension and major finger print patterns and also to assess the frequency of occurrence of any one major prints like Archs, Loops, Whorls and Composite types in Diabetes, and Hypertension.

Developmental Anatomy

Different people will have different finger print ridge patterns and pores.The pattern of finger prints and pores also differ from finger to finger of the same individual.While it seems that the general pattern of friction ridges may be genetic, the specific pattern or fine details called "*minutiae*" is unique.

Human skin contains hair follicles and oil glands and is smooth. However certain areas like digits, palms and soles are devoid of hair follicles and oil glands. Instead these areas show sweat pores and friction ridges that take various forms and shapes. The study of pattern of these friction ridges is known as "*dermatoglyphics*".

Homozygous twins have similar general patterns of ridges but the fine details or '*minutiae*' differ. The development of minutiae is epigenetic in nature. They are due to environment and external stresses and pressures while foetus is in the womb [4].

The development of primary ridges is dictated by overall geometry and topography of the volvar pad. If the primary ridges appear while the volar pad is still quite pronounced, the individual will develop a Whorl pattern. If the primary ridges appear while the volar pad is less pronounced, the individual will develop a Loop pattern. Finally, if the primary ridges appear while the volar pad is

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nearly absorbed, the individual will develop an Arch pattern. The timing of these events is genetically linked.

Materials and Methods

This study is conducted among the parents of Medical students studying in Narayana Medical College, Nellore residing in the state of Andhra Pradesh. Plain finger prints were obtained from the parents by using ink pad on the given proforma. Finger Prints were obtained after taking informed consent. Finger prints of the parents were obtained by the students at their homes as parents were residing all over the state.

The material included.

1. Blue/ Black ink pad
2. Proforma
3. Consent form
4. Magnifying glass with light source.

Parents of Sixty students (Thirty male and Thirty female) for taken for this study the finger prints of parents included normal (normotensive and normoglycemic) Diabetic and Hypertensive.

Collection of the Prints

The subjects were asked to wash their hands. Ink pad is used to smudge their fingers. Then the smudged fingers were applied carefully in the respective spaces of the proforma. Only plain prints are obtained. No roll prints.

Prints of only four fingers, namely left index finger, left thumb, right index finger and right thumb are used for this study. These four fingers are chosen because thumb print is the commonly used one for identification and the index finger commonly used in biometrics. Personal and family history of Diabetes mellitus and Hypertension was noted in the pro forma. The finger prints thus obtained are categorized into various patterns like Loops, Whorls, Arches and Composites.

This study has approval of institutional ethical committee.

Observations and Results

Plain finger prints of one hundred and twenty parents (60+60) were obtained with informed consent. The finger prints of right thumb, right index finger left thumb and left index finger were acquired in the printed pro forma. Family history of Diabetes mellitus and Hypertension was also obtained.

A total 480 finger prints thus obtained,[four finger prints acquired from 120 individuals (father and mother of 60 medical students)] were categorized into four primary ridge patterns namely Loops, Whorls, Arches and Composites. This categorization was done by three different individuals to avoid observer errors. Then the data is analyzed for predominance of any particular major ridge pattern in hereditary diseases like Diabetes mellitus and Hypertension.

The comparative analysis is made between finger print patterns of normal parents (control group) and with that of Diabetic mellitus and Hypertensive parents (subject group) respectively. For this purpose the finger print pattern of all the parents (120 individuals) were fed into computer by using Microsoft Excel sheet and then the continuous data was presented as mean ± S.D, categorical data as proportions.Categorical data was analyzed by Chi Square Test. A 'P' value of less than 0.05 in the above data is considered as significant.

Table 1 indicates, there is significant increase of Whorls in Diabetes mellitus patients when compared with normal individuals. The P value is significant (0.04). Though there is slight increase in Arches in Diabetes mellitus patients when

Table 1: Normal vs Diabetics (P value)

	L	W	A	C
N vs DM	0.14	0.04	0.81	AB

Table 2: Normal vs Hypertensives (P value)

	L	W	A	C
N vs H	0.29	0.15	0.45	0.50

L-Loops, W-Whorls, A-Arches and C-Composites, AB-absent

compared to normal individuals. The P value is not significant (0.81).

Table 2 shows the correlation between normal individuals and Hypertensive patients. Though there is an increase of Whorls in Hypertensives, the P value is not statistically significant (P value 0.15). There is also increased percentage of Composites in Hypertensives when compared with normal.

Discussion

This study indicates individuals with increased number of Whorls and Arches in their finger prints have increased risk of Diabetes mellitus.

This study also indicates individuals with increased number of Whorls in their finger prints have increased risk of Hypertension.

These findings are compared with similar studies in relation to Diabetes and Hypertension.

Diabetes

The study conducted by Manoj Kumar Sharma and Hemalatha Sharma reveals that there is an increased tendency of Whorls in Diabetic when compared to normal individuals. Similar results were also observed by the study conducted by Sant S.M. et al and Vera et al (1995) [6].

The studies conducted by M. Pramila Padmini et al and Verbav showed an increased percentage of Arches also in Diabetic patients [7].

Hypertension

The studies conducted by doctors at the Southampton General Hospital related to systolic blood pressure in a group of 139 (both sexes) found that the average systolic pressure was 8 mm higher in people who had a Whorl pattern in their finger print in one or more fingers as compared to people who had a simple Arch pattern. They opined that the Whorl pattern and narrow palm are indications of impaired foetal development and are associated with raised blood pressure in adults [8].

Studies conducted by Oladipo G S et al on rivers Indigenes also reveal similar results [9].

Studies conducted by Dike Eberechi U et al reveal an increased percentage of Whorls in Hypertensive patients [10].

Study conducted by department of Anatomy St. John's medical college, Bangalore indicates that there was a significant correlation between the incidences of Hypertension in those with Arch type pattern in comparison to the control groups, particularly in the left middle finger [11].

Limitations and Recommendations

The limitations of this particular study include;

- Small sample size - parents of only sixty medical students were included. The sample size is limited due to difficulty in obtaining finger prints from parents, single/both (non availability / refusal of either or both parents etc,).
- The sample size of Diabetes mellitus and Hypertensive parents was too small. Out of one hundred and twenty parents, eighteen individuals are Diabetic and eighteen individuals are Hypertensive.
- The Diabetics and Hypertensive among parents were identified only after acquiring their details through pro forma. (No clinical or Laboratory correlation)
- Study group restricted to a small geographical area, the state of Andhra Pradesh.
- The following recommendation is made with above limitations a larger group including more Diabetics and Hypertensive involving a larger geographical area is necessary to arrive at a conclusion.

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