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Original Research Article

Dermatoglyphics- A Marker of Obesity?

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ABSTRACT

Background: Dermatoglyphics and obesity both are genetically affected and so there may be a correlation between pattern of fingerprint and body mass index. This study aims at finding such correlation if it persists which can be an effective predictor tool for development of obesity in future.

Material and Methods: This study was done on 167 patients coming to general OPD of G K General Hospital, Bhuj. After taking informed consent finger print pattern of all fingers and thumb of both the hands was taken and their BMI was measured. Data was entered in Microsoft excel and statistical analysis was done.

Results: In this study the loop pattern was most common in all the 167 participants in both the hands followed by whorl pattern and the least common was arch pattern. The patterns in the individual fingers of the right and left hand were almost similar. In the participants with normal weight, whorl was the most common pattern seen in the thumb compared to thumb of obese and overweight participants who had loop as the common pattern.

Conclusions: In our study, no significant correlation was found between any fingerprint pattern and body mass index. This study can be carried out on larger scale with a greater number of participants to establish any correlation in future.

Keywords: Dermatoglyphics, BMI, Correlation

INTRODUCTION

Dermatoglyphics is a study of configurations of epidermal ridges on certain body parts, namely, palms, fingers, soles, and toes.[1] Dermatoglyphics is a term derived from Greek word and coined by Cumins and Midlo.[2]

Dermatoglyphic patterns started developing in the 10th week of gestation which gets completed approximately by the 24th week. Fingerprints of both hands are not the same and persist lifelong unless dermis is damaged. It is under genetic control and can be used in the diagnosis of congenital malformations.[3]

Dermatoglyphics has been studied in various malformations caused by autosomal aberrations such as Patau's syndrome, Down's syndrome, and Edward syndrome, sex chromosomal aberrations including Turner's syndrome and Klinefelter's syndrome, inherited or genetic malformations (hypohidrotic ectodermal dysplasia, schizophrenia, psychosis, autism, carcinoma of breast, leukemia, congenital

heart disease, and psoriasis), systemic disorders (diabetes mellitus, hypertension, and rheumatoid arthritis), and others.[4]

Fingerprints have basic three types: whorls, loops and arches.[5]

Whorl(W) Loop(L) Arch(A)

Figure-1 : Fingerprint patterns[6]

Obesity is a chronic complex disease defined by excessive fat deposits that can impair health.[7] The diagnosis of overweight and obesity is made by measuring people's weight and height and by calculating the body mass index (BMI).

Body mass index (BMI) is categorized in accordance with the Asia-Pacific classification.[8]

Category	BMI (kg/m^2)
Normal	18.5-22.9
Overweight	23.0-24.9
Obese	≥25.0

Figure-2 : BMI Classification

Obesity as a disease itself is multifactorial and occurs due to complex interactions occurring between genetics and the environment.[9]

As both fingerprint and obesity are genetically determined factors, current study is intended to find any correlation between one's fingerprint pattern and chances of development of obesity in future. Being cost effective, convenient and no requirement of any hospitalization, study of Dermatoglyphics can become a very good predictor of person's future health condition.

MATERIAL AND METHODS

Type of study- Cross Sectional

This study was done on 167 patients (89 males and 78 females) coming to the registration counter of the OPD of the GK GENERAL HOSPITAL, BHUJ after taking the ethical clearance from IEC. After taking the informed consent from participants, the fingerprints were taken and then, they were analyzed and further the BMI was calculated and the data was tabulated.

Material used-
For fingerprints- Ink, ink pad, soap, water, towel, white A4 size paper.
For BMI calculation – Weighing machine and Stadiometer.

Inclusion criteria- Patient in age group of 30-50 years. who are willing to participate in the study.

Exclusion criteria- To avoid effect of external factor which can affect weight, patient who are involved in any regular exercise program or following any diet regimen for reduction of weight were excluded from study. Patient having any injury in hands, where clear fingerprints are not visible. Patient with history of any ink allergy were excluded.

Fingerprinting method-
The fingerprints of both the hands of the participants were recorded by the ink and roller method, as was suggested by Cummins et al.[10]

The demographic information of the participants was recorded on the form along with their signature. The hands were first cleansed thoroughly with soap and water and were dried properly with towel before recording the fingerprints. The fingers of right hand of the participants were placed on the ink pad and pressed gently. Then the fingers were pressed on clean white paper and removed immediately. The same process was repeated with the left hand.

BMI Measurement-
The weight and height of the individual was measured and the BMI was calculated by the formula: weight(kg)/height². The participants were categorized into three categories: Normal, Overweight and Obese.

Data Analysis-
All the data were entered into to Excel sheet and analysis was done using SPSS software version 22.0 (IBM Corp. 2013. Armonk, New York). The quantitative data of the study was tabulated into qualitative data. The chi-square test was used to examine the relationship between the fingerprint and obesity.

RESULTS

Table-1: Distribution of participants based on BMI

	Normal	Overweight	Obese
Total	64	25	78
Percentage	38.32	14.97	46.70

Table-2: Distribution of fingerprint patterns in all fingers of both the hands among male and female participants

	Loop		Whorl		Arch	
	Male n (%)	Female n (%)	Male n (%)	Female n (%)	Male n(%)	Female n (%)
Thumb	86 (48.3)	87 (55.7)	85 (47.7)	59 (37.8)	7 (3.9)	10 (6.4)
Index	114 (64.0)	81 (51.9)	50 (28.1)	49 (31.4)	14 (7.8)	26 (16.6)
Middle	125 (70.2)	113 (72.4)	46 (25.8)	28 (17.9)	7 (3.9)	15 (9.6)
Ring	96 (53.9)	95 (60.9)	80 (44.9)	53 (33.9)	2 (1.1)	8 (5.1)
Little	125 (70.2)	127 (81.4)	51 (28.6)	20 (12.8)	2 (1.1)	9 (5.7)

Table-3: Distribution of fingerprint patterns in all fingers of both the hands in all cases

	Loop		Whorl		Arch	
	Right n(%)	Left n(%)	Right n(%)	Left n(%)	Right n(%)	Left n(%)
Thumb	91 (54.5)	84 (50.3)	71 (42.5)	72 (43.1)	5 (2.9)	11 (6.6)
Index	102 (61.1)	93 (55.7)	49 (29.3)	49 (29.3)	16 (9.6)	25 (14.9)
Middle	124 (74.2)	117 (70.1)	33 (19.7)	39 (23.3)	10 (5.9)	11 (6.6)
Ring	88 (52.7)	100 (59.8)	74 (44.3)	62 (37.1)	5 (2.9)	5 (2.9)
Little	124 (74.2)	126 (75.4)	39 (23.4)	33 (19.7)	4 (2.4)	8 (4.7)

Figure-3 Distribution of fingerprint patterns in thumb of both the hands of both the sexes according to BMI

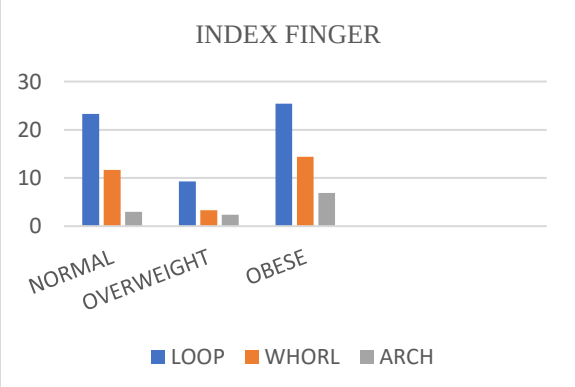

Figure-4: Distribution of fingerprint patterns in index finger of both the hands of both the sexes according to BMI

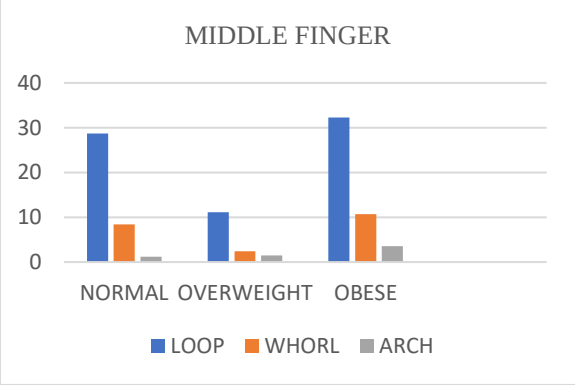

Figure-5: Distribution of fingerprint patterns in middle finger of both the hands of both the sexes according to BMI

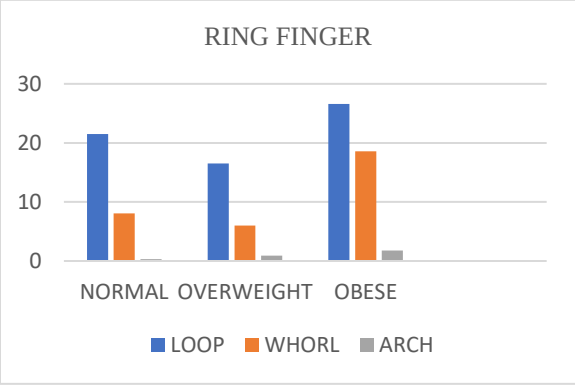

Figure-6: Distribution of fingerprint patterns in ring finger of both the hands of both the sexes according to BMI

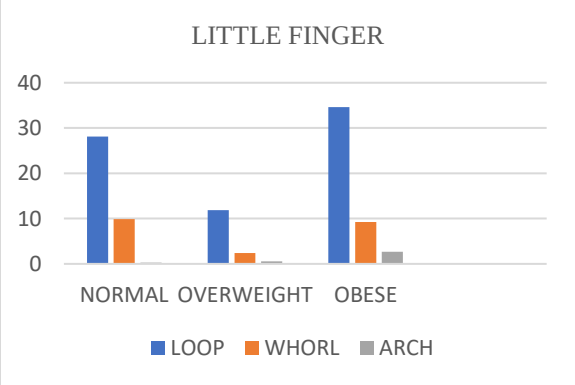

Figure-7: Distribution of fingerprint patterns in little finger of both the hands of both the sexes according to BMI

DISCUSSION

Dermatoglyphic patterns of every individual are different and unique and hence can be helpful in the identification of various genetic and systemic disorders such as obesity.[11, 12, 13]

In the present study out of total 167 participants, 64(38.32%) individuals were normal (BMI =18.5-22.9), 25(14.97%) individuals were overweight (BMI=23.0-24.9) and 78(46.70%) individuals were obese (BMI=>25) including both male and female.

In this study the loop pattern was most common in all the 167 participants in both the hands followed by whorl pattern and the least common was arch pattern. The patterns in the individual fingers of the right and left hand were almost similar.

Loop-The distribution of the loop pattern in the right thumb (54.5%) was more as compared to left thumb (50.3%). The loop pattern in left ring finger (59.8%) was more than the right ring finger (52.7%). The loop pattern in rest of the fingers i.e. the index, middle, and little finger had almost similar percentage of distribution at both the sides.

Whorl was the second most repetitive pattern in the individuals with almost equal distribution in both the right and left hands

Arch was the least common of all, further in the participants with arch pattern left index (14.9%) had more arch as compared to the right index finger (9.6%). Similarly, the left thumb arch pattern (6.6%) was more compared to the right thumb arch pattern (2.9%). Rest of the fingers of both the hands of the participants with arch pattern had equal percentage of distribution.

Distribution of fingerprint patterns in individual finger of both the hands of both the sexes according to BMI:

The whorl pattern (20.1%) was most common in the thumb of the individual with normal weight followed by loop (17.06%) distribution. The arch was least commonly distributed, only found in 1.97% normal weight people.

The overweight individuals had loop as the most common pattern with 8.08% distribution rate as compared to whorl and arch with 5.38% and 1.49% distribution rate.

Individuals with obesity had loop as the most common pattern in the thumb with distribution rate of 27.2% followed by whorl and arch.

In the normal individuals, the loop pattern (23.3%) was the most common pattern compared to whorl and arch. Similarly, in overweight and obese loop pattern was the most common. In all the other fingers i.e. middle, ring and little finger loop had the maximum percentage of distribution compared to the other fingerprint patterns.

Dermatoglyphic patterns were analyzed in obese individuals of the Nigerian Ibibio population by Oladipo et al.[16] The authors concluded that arch pattern was common in the first right digit in obese males (54.5%) and females (42.33%), while ulnar loop was more common in normal controls. The difference in the data could be due to variation in sample size, type of fingers and ethnic group studied. Also, the fingerprint patterns of the right and left hand were considered together and no such distinct ulnar and radial loops were analyzed, they were categorized together as loop.

Shivakumar et al.[17] reported only fingerprints of thumb and index finger, the obese participants had the most common whorl pattern in the thumb on both hands (51% in the right and 79% in the left), and in the index finger loop was highly distributed on the right side (83%) and the arch was more common on the left side (74%). In normal-weight participants, whorl was the most common pattern in the right thumb (73%) and left index finger (53%), while the loop was the most common pattern in the left thumb (73%) and the arch was the most common in the right index (48%) finger.

CONCLUSIONS

In the participants with normal weight, whorl was the most common pattern seen in the thumb compared to thumb of obese and overweight participants who had loop as the common pattern. The loop was the most common pattern in all the other fingers in normal, overweight and obese participants. The loop pattern was most commonly seen in all the fingers of both male and female participants. The right and left side fingers of all the 167 participants had loop as the most common pattern. Thus, we can conclude that the loop pattern is the most common fingerprint pattern in the individual irrespective of their gender, different side of hand or their weight except in the thumb where there was difference in the pattern observed between normal and obese participants. Similar studies with a larger sample size compared to the present study in the same population may provide further information regarding the relation between the fingerprints and the obesity.

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