



QUALITATIVE STUDY: DERMATOGLYPHIC PATTERN IN PATIENTS WITH TYPE II DIABETES MELLITUS

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ABSTRACT **Aims and objectives:** To study the dermatoglyphic patterns in healthy and Type II diabetes mellitus subjects. To study the arches, Ulnar loop, Radial loop and Whorl patterns **Methods:** The present study was conducted in the Department of Anatomy, Index Medical College, Indore (M.P.), India. Subjects of the age group 35-65 years was chosen from North Indian Population. Patients and controls were selected randomly from Index Medical College and Hospital, Indore (M.P.) India. The bilateral rolled finger and palm prints of 100 Diabetes Mellitus II patients were compared to 100 controls. Results: Shows that the comparison of right ulnar loop, right whorl, left ulnar loop, left radial loop, and left whorl in male between healthy subjects and type II diabetes mellitus patients, which are statistically significant. ($p < 0.001$). whereas right arch, right radial loop, and left arch is not statistically significant. **Conclusions:** Fingertip ridge count of right ulnar loop, right radial loop and left ulnar loop, is increased in healthy male subjects as compared to type II diabetes mellitus. While right arch, right whorl, left arch, left radial loop, and left whorl is decreased.

KEYWORDS : T2DM, Arches, Ulnar Loop, Radial loop, Whorl pattern

INTRODUCTION

Diabetes is a dangerous and chronic condition that arises when either the pancreas does not make enough insulin or the body does not utilise insulin adequately¹. It is characterised by excessive amounts of hyperglycemia in the blood, which can cause gradual damage to most tissues and organs of the body, including the heart, blood vessels, eyes, kidneys, skin, and nerves. According to the International Diabetes Federation, there were 425 million diabetics in 2017, with more than 629 million projected by 2045. Diabetes mellitus is divided into two types: type I and type II diabetes².

Dermatoglyphics (Fingerprints) refers to the study of all features of ridged skin³. Cummins and Midlo first formulated this term in 1943, derived from the Greek words "dermato" which means skin and "glyphics" means carvings⁴. The ridged skin (also known as the friction ridges skin) is located on the digit and palmar surface of the hands (known as fingerprints and palm prints) and on the plantar surface and the toe of the feet. It is believed that the mechanical function of these ridges conveys a firmer grip and prevents slippage⁵, and is also believed to enhance the sense of touch⁶.

Early detection and treatment are critical for avoiding long-term disease consequences (e.g., retinopathy, neuropathy, and nephropathy). Prediction of patients at high risk of developing type II diabetes is beneficial not only for disease prevention, but also for disease complications prevention.

METHOD AND MATERIALS

This is an observational descriptive comparative study. The present study was conducted in the Department of Anatomy, Index Medical College, Indore (M.P.), India. Subjects of the age group 35-65 years was chosen from North Indian Population. Patients and controls were selected randomly from Index Medical College and Hospital, Indore (M.P.) India, and other Hospitals or Clinics. Cases were selected as clinically diagnosed patients of Diabetes Mellitus II. The bilateral rolled finger and palm prints of 100 Diabetes Mellitus II patients were compared to 100 controls.

Inclusion Criteria:

- Subjects included in the study should be between 35- 65 years of age both sexes.
- Cases should be diagnosed with Diabetes Mellitus II.
- The study population should belong to North Indian Population

Exclusion Criteria:

- Individuals suffering from any skin disease like eczema, leprosy etc. will be excluded.
- Subjects with congenital malformation of hand, apparent hand anomalies, inflammation, trauma, deformities and with the surgery of hands will be excluded from the study.

- Patients with deformed finger and palm prints, infection, and injuries of fingers and palms, scars of burns of fingers and palms of both hands.

Method:

The Cummins and Midlo (1961) method were used to recorded fingerprints and palmar prints.

This approach has the following advantages:

- Simple approach,
- Print transparency
- Less time consuming, and
- Less expensive.

Materials used: Blue Stamp Pad Ink, Stamp Pad, A4 Size Paper, Magnifying Lens, Roller or Round bottle, Soap/Hand wash and towel – wash and dry the hands, Scale, Pencil or Pen and Eraser, Masks and hand Sanitizer, A Protractor - to measure atd angle and Needle - for ridge counting.

Procedure

1. Participants were instructed to wash and dry their hands with soap and water. The oily layer was carefully removed.
2. A drop of ink was applied to the palm. The whole palmar area, including the fingers, was coated with ink. The uniformity of the ink distributed across the palm was confirmed. Cotton puffs were used to fill up the gaps.
3. A spherical bottle was placed on the side of the table. The bottle was covered with the A4 paper sheet.
4. By putting the fingertips of the right hand over the A4 paper sheet, the upper end of the paper was arranged to remain in contact with the bottle.
5. The fingers and palm also were rolled over with minimal pressure, forcing the bottle and paper to move forward. The palmar and finger prints were collected in this manner.
6. The rolled fingerprints were also entered in the boxes given on the A4 paper sheets.
7. Using cotton puffs, the fingers were covered with ink and gently rolled. The thumb was rolled from the medial to the lateral side, and the rest of the fingers were rolled from the lateral to the medial side
8. The prints received were examined for clarity and were reprinted if required.
9. The participants were then instructed to wash their hands.

10. The same method was followed for the left hand as well.

11. The prints have been scanned and stored.

12. A magnifying glass was used to examine the fingerprints. On the same paper, the qualitative and quantitative parameters were examined and recognized.

Parameters

Qualitative Analysis: To analyse finger pattern frequency, the fingertip pattern configurations will be classified as arches (A), loops (L) or whorls (W).

Arches: The arch is the simplest configuration, does not have a triradius. Simple horizontal lines called as simple arch and the tented horizontal lines are called tented arch.

Loops: loops are single sided half circle. These are of two types Ulnar and Radial. Loop has one triradius.

- a. Ulnar Loop (Lu): In Ulnar Loop, ridges open on the ulnar side.
- b. Radial Loop (Lr): In Radial Loop, ridges open on the radial side.

Whorl: These are the circles on fingertip which are three type symmetrical, spiral and double loops. The whorl forms a concentric design having two triradii.

Statistical Analysis

The Arithmetic mean and standard deviation were calculated. t-test was applied. Software used is SPSS 16.0 for statistical analysis. To describe about the data descriptive statistics, the mean & standard deviation was used for continuous variables. To find the prevalence between the Type II Diabetes mellitus and Healthy subjects in male and female the p value was used. The level of significance was setup at p value <0.05.

RESULT

Table No. 1: Comparison of Fingers tip Ridge Count between the Type II Diabetes mellitus & Healthy subjects in male and female.

Parameters	Male subjects					Female Subjects				
	Healthy		Type II DM		P value	Healthy		Type II DM		P
	Mean	SD	Mean	SD		Mean	SD	Mean	SD	
Right Arch	3.4	2.70	3.8	2.17	0.2496	4.2	1.30	4.2	1.64	0.6333
Right Ulnar Loop	27.6	7.67	24	3.46	0.0001	26.6	7.13	25.8	3.83	0.3241
Right Radial Loop	1.8	0.84	1.6	1.34	0.2075	2	1.22	1.8	1.30	0.2633
Right Whorl	17.2	6.10	20.6	4.67	0.0001	17.2	6.53	19.6	2.30	0.0006
Left Arch	3.8	3.77	4.6	2.30	0.0716	3.2	2.59	5.6	1.52	0.0001
Left Ulnar Loop	29	9.30	24	4.64	0.0001	29	4.64	23.8	3.49	0.0001
Left Radial Loop	0.6	0.89	1.8	1.30	0.0001	0.8	1.30	1.6	1.14	0.0001
Left Whorl	16.6	9.71	19.6	2.88	0.0034	17	4.80	19	4.47	0.0026

According to table no. 1. shows Fingers tip Ridge Count between the Type II Diabetes mellitus & healthy subjects in male and female. Shows that the comparison of right ulnar loop, right whorl, left ulnar loop, left radial loop, and left whorl in male between healthy subjects and type II diabetes mellitus patients, which are statistically significant. (p <0.001). whereas right arch, right radial loop, and left arch is not statistically significant. [Table 1.] Shows that the comparison of right whorl, left arch, left ulnar loop, left radial loop, and left whorl in female between healthy subjects and type II diabetes mellitus patients, which are statistically significant. (p <0.001). whereas right arch, right ulnar loop, and right radial loop is not statistically significant. (Table 1.)

DISCUSSION

Comparison of fingerprint patterns between healthy subjects and previous studies in males: Park KS et al studied on 804 healthy subjects in 1984, where the fingertip pattern of loop, whorl, arches is (44.5%, 51.2%, 2.1%)⁷. In the study by penhalber EF et al, the fingertip pattern of loop, whorl & arches are (64.07%, 21.67% & 3.3%)⁸. Igbigbi P S worked on 164 healthy subjects (Naiobi), where the fingertip pattern of loop, whorl, arches is (78.96%, 16.05%, 4.99%)⁹. Igbigbi PS et al observed many fingertips pattern of loop is 74.08% of their 270 healthy subjects (Dar-es-Slaam)⁹, whose fingertip pattern of whorl & arches is 21.03% & 4.89%. Narahari S et al studied on 547 healthy subjects in 60, where the fingertip pattern of loop, whorl, arches is (48.34%, 43.83%, 3.5%)¹⁰. According to Ghosh et al, the fingertip pattern of loop, whorl & arches is (18.23%, 36.45% & 2.85%)¹¹.

The present study was conducted on 50 healthy Indians whose fingertip pattern of loop, whorl, arches is (59.00%, 33.8%, 7.2%). Shows Comparison of fingerprint patterns between healthy subjects and previous studies in Females: Park KS et al studied on 804 healthy subjects in 1984, where the fingertip pattern of loop, whorl, arches is (51.4%, 45.7%, 2.9%)⁷. According to penhalber EF et al, (1994)⁸ the fingertip pattern of loop, whorl & arches is 64.24%, 20.17% & 6.43%. Igbigbi P S worked on 164 healthy subjects (Naiobi), where the fingertip pattern of loop, whorl, arches is (76.36%, 20.75%, 2.89%)⁹. Igbigbi PS et al, observed many fingertips pattern of loop is 82.50% of their 120 healthy subjects (Dar-es-Slaam)⁹, whose fingertip pattern of whorl & arches is 14.17% & 3.3%. Narahari S et al studied on healthy subjects in 90, where the fingertip pattern of loop, whorl, arches is (48.66%, 40.89%, 7%)¹⁰.

Khadri SY et al, worked on 500 Indian healthy subjects, where the fingertip pattern of loop, whorl, arches is (46.24%, 18.24%, 8.64%)¹².

The present study was conducted on 50 healthy Indians whose fingertip pattern of loop, whorl, arches is (55.6%, 34.2%, 7.4%). Shows Comparison of males ulnar and radial loop pattern between healthy subjects and previous studies: Park KS et al studied on 804 healthy males in 1984, where the loop pattern of ulnar and radial is (41.6%, 2.9%)⁷. Crawford MH et al studied on healthy male's subjects in 90, where the fingertip pattern of ulnar loop, and radial loop is (48.6%, 2.45%)¹³.

According to penhalber EF et al, (1994)⁸ the loop pattern of ulnar & radial is 59.30% & 4.77%. Igbigbi P S worked on 164 healthy subjects (Naiobi), where the fingertip pattern of ulnar loop and radial loop is (72.62% & 6.34%).

Igbigbi PS et al, observed fingertips pattern of ulnar loop is 67.22% of their 180 healthy male's subjects (Dar-es-Slaam)⁹, whose fingertip pattern of radial loop is 6.86%. Banik et al studied on healthy subjects in 104, where the fingertip pattern of ulnar and radial loop is (43.96%, 3.36%)¹⁴. Rosa A et al, worked on 50 Spanish healthy male's subjects, where the fingertip pattern of ulnar and radial is (60.4%, 3.8%)¹⁵.

The present study was conducted on 50 healthy Indians whose fingertip pattern of ulnar and radial loop is (56.6% and 2.4%).

Comparison of female ulnar and radial loop pattern between healthy subjects and previous studies: Park KS et al studied on 2121 healthy females in 1984, where the loop pattern of ulnar and radial is (49.2%, 2.2%)⁷. Crawford MH et al studied on healthy female subjects in 83, where the fingertip pattern of ulnar loop, and radial loop is (56.8%, 2.2%)¹³.

According to penhalber EF et al, (1994)⁸ the loop pattern of ulnar & radial is 60.37% & 3.87%. Igbigbi P S worked on 140 healthy subjects (Kenyan), where the fingertip pattern of ulnar loop and radial loop is (69.65% & 6.71%). Igbigbi PS et al, observed fingertips pattern of ulnar loop is 75.00% of their 120 healthy female's subjects (Tanzanians)⁹, whose fingertip pattern of radial loop is 7.50%. Banik et al studied on healthy subjects in 103, where the fingertip pattern of ulnar and radial loop is (40.58 and 1.94%)¹⁴.

The present study was conducted on 50 healthy Indians whose fingertip pattern of ulnar and radial loop is (55.6% and 2.8%).

Comparison of fingerprint patterns in male Type II diabetes mellitus subjects and previous studies: The present study was conducted on

Type II diabetes mellitus subjects whose fingertip pattern of ulnar loop, radial loop, whorl, and arches is (48.00%, 3.40%, 40.20% and 8.40%). Ojha P et al studied-on Type II diabetes mellitus subjects in 2014, where the fingertip pattern of ulnar loop, radial loop, whorl and arches is (46.2%, 0.4%, 46% and 3.6%)¹⁶. According to Srivastava S et al, (2014)¹⁷ the fingertip pattern of ulnar loop, radial loop, whorl & arches is 43.5%, 0.8%, 43.7% & 7.5%. Nayak T et al worked on Type II diabetes mellitus subjects, where the fingertip pattern of ulnar loop, whorl, and arches is (57.66%, 30.25%, 6.83%)¹⁸. Marera DO et al studied-on Type II diabetes mellitus subjects in 2015, where the fingertip pattern of ulnar loop, radial loop, whorl, and arches is (14.6%, 11.87%, and 2.73%)¹⁹. In the study by Sangeeta et al, (2019)²⁰ the fingertip pattern of ulnar loop, radial loop, whorl & arches are 40.8%, 0.8%, 46% & 9.6%.

Shows that the comparison of fingerprint patterns in female Type II diabetes mellitus subjects and previous study.

In present study 2023, 50 Type II diabetes mellitus females were used as a participant where the fingerprint pattern of Ulnar Loop, Radial Loop, Whorl & Arches are 49.6%, 3.2%, 37.4% & 9.8%.

According to Ojha P et al, (2014)¹⁶, fingerprint pattern of Ulnar Loop, Radial Loop, Whorl & Arches are 50%, 1.2%, 46%, & 2.8%. As claimed by Srivastava S et al, the fingertip pattern of Ulnar loop, Radial Loop, Whorl & Arches are (37.9%, 3.2%, 43.7%, & 15.2%)¹⁷. Nayak T et al, worked on Indian diabetic females (2015)¹⁸, where the fingertip pattern of Ulnar Loop, Whorl, Arches is (60.75%, 30.25%, 9%). Marera DO et al studied on Uganda diabetic females in 2015, where the fingertip pattern of Ulnar Loop, Radial Loop, Whorl, Arches is (20.6%, 11.8%, 21%, 6%)¹⁹. Sangeeta et al, studied on Indian diabetic females in 2019 and observed that the fingertip pattern of Ulnar Loop, Radial Loop, Whorl & Arches is (49.6%, 3.2%, 37.49%, & 8%)²⁰.

CONCLUSION

Fingertip ridge count of right ulnar loop, right radial loop and left ulnar loop, is increased in healthy male subjects as compared to type II diabetes mellitus. While right arch, right whorl, left arch, left radial loop, and left whorl is decreased. Fingertip ridge count of right ulnar loop, right radial loop, and left ulnar loop is increased in healthy female subjects as compared to type II diabetes mellitus. While right whorl, left arch, left radial loop and left whorl is decreased. Right arch in healthy female and type II DM female is equal.

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