



## A COMPARATIVE FOOT PRINT STUDY AMONG DIABETIC AND NON DIABETIC INDIVIDUAL

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### ABSTRACT

Diabetes is an endocrinal metabolic disorder with long term complications and also causes problems in circulation of blood, ulcer formation in foot etc., there are many methods known to prevent and control diabetes one among them which is gaining popularity these days is reflexology.<sup>[2,8]</sup> Foot reflexology has been proven to be effective against diabetes in recent days. As diabetes is caused by variation in insulin production and blood glucose levels.<sup>[3,4]</sup> This study aims to determine whether the diabetic individual achieve a required pressure in those target areas in foot which controls the organs of carbohydrate metabolism. **Aim and Objective:** to compare and describe the foot pressure spots between diabetics and healthy individuals using foot imprinter (semiquantitative foot imprint mat). **Materials and Methods:** control group composed 25 healthy individuals, test group 25 diabetic individual. **Result:** (+)-areas of high pressure, (-)-areas of moderate pressure, (□)-areas that indicate mild or poor pressure. Test group showed highly significant ARCH(□) when compared to control groups.

**KEYWORDS:** Diabetes, carbohydrate metabolism, foot reflexology, adequate, significant arch, target areas.

### INTRODUCTION

Reflexology is in practice for centuries, which has been proved that reflexology has been remedy for various disease.<sup>[1,2]</sup> Modern reflexology is the ancient form of foot and hand therapy being practiced in china as long ago as 2330 B.C recently it is gaining popularity, it is the very effective and essential for both physical and mental cures.<sup>[2]</sup> It has influence on few organs of the body. Most of the reflex points are found in our feet, there are more than 7000 nerve endings in the human foot.<sup>[9]</sup> These areas are considered to be index of the human body. Reflexology is very effective for treatment of diabetics.<sup>[1,2,9]</sup> Diabetic is considered as endemic disease with increasing number of new patients every year.<sup>[3]</sup> According to WHO there are 150 million diabetic patient throughout the world. It is estimated that around 2025 this number will reach more than 300 million. This study compares the difference in pressure spots in foot during normal gait between diabetic and normal individual.

### DIABETES AND REFLEXOLOGY

WHO states definition of diabetes as a “chronic form of metabolic disease characterized by elevated blood glucose levels, which leads over time to serious damage to heart, blood vessels, eyes, kidneys and nerves”.

Diabetes is of 2 types, **TYPE I**-(cause is mainly of genetics and is unpreventable most often), **TYPE II**-(associated with poor diet, obesity, and other lifestyle decisions).<sup>[3,4,5]</sup> The effect of diabetes lead to poor blood circulation, occurrence of foot ulcers etc., there are many methods to manage and control diabetes.<sup>[5]</sup> One of the popular method with tremendous result is foot reflexology. Foot reflexology is a proven effective methodology to manage and control diabetes.<sup>[1,2]</sup> It results due to variation in insulin production and elevated blood sugar levels, points focussing on endocrine metabolism is found to be beneficial. application of regular pressure on the organism responsible for carbohydrate metabolism will aid in normalizing blood sugar levels.<sup>[2]</sup> Reflexology for diabetes provides an effective treatment as it aid in controlling blood sugar levels. Organs involved in carbohydrate metabolism are pancreas, small intestine, liver. Applying regular pressure in these targeted area in the foot gives the promising results in controlling diabetes.<sup>[6,7]</sup> We aimed to determine whether the patient with diabetes achieve required pressure in these target areas in their dynamic position.

**PROCEDURE:** A total of 50 samples consisting of 25 diabetic and 25 non-diabetic individual observations were taken for analysis. Samples were asked to walk and their foot imprints were collected. Patient foot prints were measured in a dynamic state using a specialized equipment harris mate fm1111.



Figure 1: Foot prints recorded in a dynamic state.

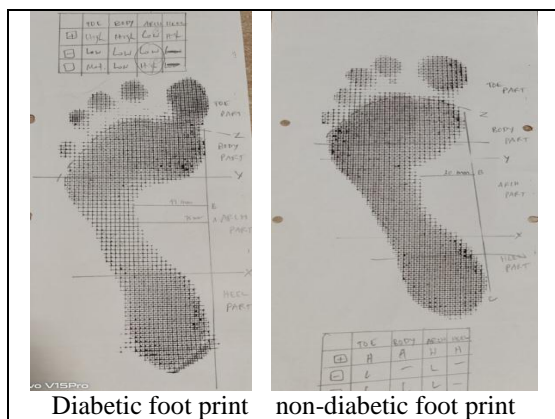


Figure 2

#### DESCRIPTION ABOUT EQUIPMENT

HARRIS MATE (foot imprint mat) is simple, inexpensive and practical foot imprint measurement device intended for looking clinical views. It is a semiquantitative mat which quantifies foot pressure by visual comparison between the greyness of the foot print.

#### ARMAMENTARIUM OF THE EQUIPMENT

##### FM1111 KIT INCLUDES

- FOOT IMPRITER
- RUBBER ROLLER
- Paper pad
- BARRIER SHEET
- DYE PAD

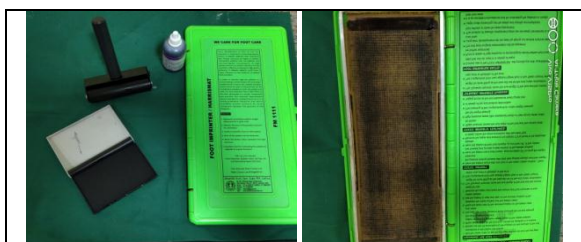


Figure 3: Semi quantitative foot imprint mat.

#### USES

- Measures and displays the pressure spots in grey scale
- To examine the area of greatest concern for ulceration
- Useful to identify the charcoat arthropathy
- Arch of the patient foot can be detected
- More the darker colour represents the higher pressure

#### INFERENCE

A total of 50 samples consisting of 25 diabetic and 25 non-diabetic individual observations were taken for analysis. Statistical analysis was performed using SPSS software version 26.0. Among the population 22 were male and 28 were female under the study showing a mean age of **58.12 years** with S.D of 10.292 showing S.E with 1.45564.

On analysis of diabetic individual under each parameter of equally distributed samples individuals **high diabetic category show significant ARCH (□)** on both sides compare to ARCH (+) group. Chi square test was performed among the groups showed chi-square statistic is 28.742. **The p-value is < 0.00001.** The result is significant at  $p < .05$ . (Table 1) On converse by analysis of non- diabetic individual under each parameter of equally distributed samples individuals' **high non diabetic category show significant ARCH (+)** on both sides compare to ARCH (□) groups. Chi square test was performed among the groups showed chi-square statistic is 101.0287. The p-value is  $< 0.00001$ . The result is significant at  $p < .05$ . (Table 2).

Chi square test was performed to compare between the groups of diabetic and non-diabetic category. The chi-square statistic was found to be 101.9287. The p-value is  $< 0.00001$ . The result is significant at  $p < .05$ . **Pearson Correlation Coefficient analysis** was performed to determine the interrelation. The value of  $R^2$ , the coefficient of determination, is 0.0179 with the **P-Value of .020341**. The result is significant at  $p < .05$ . Hence by statistical analysis of diabetic and Non-diabetic groups, a significant correlation at **R=0.1339** was observed by the individuals with **high diabetic category with ARCH (□)** group and **Non-diabetic category with ARCH (+)** group.(Table 3, chart 1).

**ANALYSIS CHART**

**TABLE 1:**

DIAB STAT		ARCH +	ARCH -	ARCH (□)	ROW
HIGH		16 (14.33) [0.19]	2 (14.33) [10.61]	25 (14.33) [7.94]	43
MED		16 (20.67) [1.05]	29 (20.67) [3.36]	17 (20.67) [0.65]	62
LOW		18 (15.00) [0.60]	19 (15.00) [1.07]	8 (15.00) [3.27]	45
	COLUMN	50	50	50	150

The chi-square statistic is 28.742. The p-value is < 0.00001. The result is significant at p < .05. (DIAB –DIABETES)

**TABLE 2:**

NONDIAB STATS		ARCH+	ARCH -	ARCH (□)	ROW
HIGH		39 (14.67) [40.37]	1 (14.96) [13.03]	4 (14.37) [7.49]	44
MED		10 (7.67) [0.71]	5 (7.82) [1.02]	8 (7.51) [0.03]	23
LOW		1 (27.67) [25.70]	45 (28.22) [9.98]	37 (27.11) [3.61]	83
	COLUMN	50	51	49	150

The chi-square statistic is 101.9287. The p-value is < 0.00001. The result is significant at p < .05.

**TABLE 3:**

DIAB VS NON DIAB		HIGH	MED	LOW	ROW
DIAB		43 (43.50) [0.01]	62 (42.50) [8.95]	45 (64.00) [5.64]	150
NON DIAB		44 (43.50) [0.01]	23 (42.50) [8.95]	83 (64.00) [5.64]	150
	TOTAL	87	85	128	300

The chi-square statistic is 29.1869. The p-value is < 0.00001. The result is significant at p < .05.

**PEARSON CORRELATION COEFFICIENT**

X Values: -  $\Sigma(X - M_x)^2 = SS_x = 520$

Y Values: -  $\Sigma(Y - M_y)^2 = SS_y = 2597.556$

**R Calculation**

$$r = \frac{\Sigma((X - M_x)(Y - M_y))}{\sqrt{((SS_x)(SS_y))}}$$

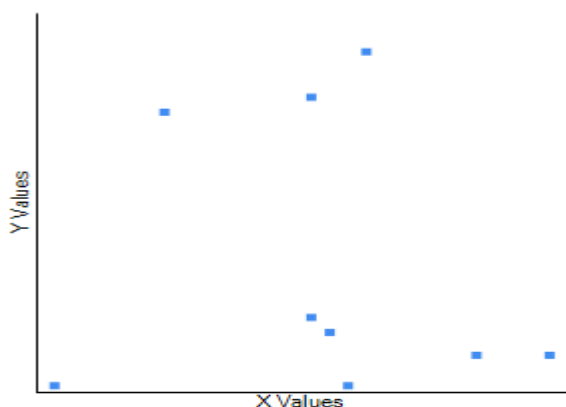
$$r = -155.667 / \sqrt{((520)(2597.556))} = 0.1339$$

The value of R is: 0.1339.

The value of R<sup>2</sup>, the coefficient of determination, is 0.0179.

The P-Value is .020341. The result is significant at p < .05.

**CORRELATION CHART**



The value of R is: 0.1339.

**DISCUSSION**

From the details furnished above we come to know that the diabetic category showed highly significant ARCH (□) on both sides when compared to the control groups. Whereas the high non diabetic category show significant ARCH (+) on both sides compare to ARCH (□) groups. This study strongly reveals that the cases with diabetes does not achieve required pressure in the target areas of the carbohydrate metabolism. Once the required pressure is achieved in these areas of that individual it may further help them to control and manage the diabetes and will be able to prevent the complications that rise from diabetes. Foot reflexology may provide them with suprising results in controlling diabetes.

(+)	Areas of required pressure
(-)	Areas of moderate pressure
(□)	Areas that indicate mild or poor pressure

**CONCLUSION**

As diabetes may lead to long term complication like cardiovascular disease, neuropathy, nephropathy, retinopathy, foot damage and depression. Reflexology for diabetes is the most effective form of treatment as it helps to control blood glucose levels. Application of regular pressure in the targeted areas may control the organs of carbohydrate metabolism thus controls the variation in the insulin levels.<sup>[3,4,5]</sup> Thus to conclude in future a material devised customly with pressure spots to those targeted areas provided to these diabetic individual

may come up with promising results in controlling and managing diabetes.

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