International Journal of Advance and Applied Research
www.ijaar.co.in
ISSN – 2347-7075 Impact Factor – 7.328
Peer Reviewed Bi-Monthly
Vol.10 No.2 Nov – Dec 2022

Analysis and Correlation of Dermatoglyphic patterns with Diabetes

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DOI- 10.5281/zenodo.7466616

Abstract
Dermatoglyphics (derma, "skin", and glyph, "carving") is the chief scientific study of fingerprints, lines, mounts and shapes of hands. It is as distinct from the superficially similar pseudoscience of palmistry. In the present study, correlation and analysis of diabetes with dermatoglyphic patterns was studied. The study involved people, aged between 40 – 75 years. Both genders were included in the study, which belonged to South India. The dermatoglyphic patterns of type 1 and type 2 diabetic patients were studied. The types of dermatoglyphic patterns were observed with the 'atd' angle of each person. In the present study, 90% of them were type 1 diabetic patients with minimum of family history of diabetics. The 'atd' angle of type 1 diabetic patients ranged from 30° to 45° which is a normal range. It was found that number of loops was greater than the whorls and arches in type1 diabetic patients. The ratio for Arch: whorl: loop is 28:81:107. It was analyzed that 10% of them were type 2 diabetic patients with minimum of family history of diabetics. The 'atd' angle of type 2 diabetic patients ranged from 30° to 43° where it is normal range. It was evident that numbers of loops were greater than the whorls and arches in type1diabetic patients. The ratio for Arch: whorl: loop is 4:22:64. The total mean 'atd' angle was higher in right hand of patient than left hand of patient with the p-value lesser than 0.05. So, it was statistically significant. The dermatoglyphics features of the present study may be used as a suggestive diagnostic tool to make a provisional diagnosis and to identify the persons who are at risk, but it requires more extensive studies in a large number of the patients.

Keywords: Dermatoglyphics, atd angle, Type 1 & Type 2 diabetes, Diagnostic tool.

Introduction

Dermatoglyphics (Greek Derma=skin, glyph=Carving) is the sophisticated scientific study of the epidermal ridge patterns of the hairless surface of the skin [1]. Dermatoglyphics are formed by the epidermis of skin during early intrauterine life between 14th to 21st weeks of gestation [2]. Genetic and environmental factors like – UV-rays, X-rays, Rubella virus, etc. have an influence over alteration of normal dermatoglyphics [3, 4]. The term 'dermatoglyphic' was first used by Dr. Harold Cumin in 1926 [5]. The dermatoglyphic patterns of human palms and soles are individually unique. The fingerprints of identical twins may be similar in appearance but truly not identical. Dermatoglyphic patterns are not distorted in superficial injuries that produce scar in the epidermis. Dermatoglyphic patterns are distorted in severe injuries like-deep burn, electric injury which produce scar in the dermis. In 1892 Sir Francis Galton classified dermatoglyphics of human fingertips into loop 60-70%, whorl 25-35% & arch pattern 6-7% [6]. The dermatoglyphics of palm contains a great deal of information which is of great research and clinical application value [7].

Dermatoglyphics is superficially similar pseudoscience of palmistry and is the scientific study of fingerprints, lines, mounts and shapes of hands. Dermatoglyphics also includes naturally occurring ridges on certain body parts, namely palms, fingers, soles, and toes. In a 2009 report, the scientific basis behind the dermatoglyphics was questioned by the National Academy of Sciences, for the discipline's reliance on subjective comparisons instead of conclusions drawn from the scientific method. Dermatoglyphics can be correlated with genetic abnormalities, aids in the diagnosis of congenital malformations at birth or soon after. Such abnormalities are Edward's syndrome, Klinefelter's syndrome, Cri du chat, congenital blindness, Patau syndrome, Down's syndrome, schizophrenia, Diabetes. etc. [8]

Diabetes, Diabetes mellitus, commonly known as diabetes, is a metabolic disorder that causes high blood sugar. The hormone insulin transports sugar from the blood into the cells to be stored or used for energy. With diabetes, the body either doesn't make enough insulin or can't effectively use the insulin it does make. Diabetes patients can be analyzed by the dermatology studies.

Mainly there are two types of diabetes:

Type 1: Is an autoimmune disease. The immune system checks and destroys cells in the pancreas, where insulin is made. It's unclear what causes this attack. About 10% of people with diabetes have this type. This condition is usually diagnosed in children and young people, so it used to be called juvenile diabetes.

Type 2: Is a lifelong disease that keeps our body from using insulin the way it should. The type 2 diabetic people are said to have insulin resistance. People who are middle-aged or older are most likely to get type 2 diabetes, so it used to be called adult-onset diabetes. But type 2 diabetes also affects kids and teens, mainly because of childhood obesity [10]

Dermatoglyphic patterns

Study of Loops: Loops can be either ulnar or radial. A finger possesses a radial loop if its tri-radius is on the side of the little finger for that hand, and the loop toward the thumb. A finger has an ulnar loop if its tri-radius is on the side of the thumb, and the loop opens toward the little finger.

Study of Arches: The arches are the simplest and least frequent pattern, which pass across the finger with slight bow distally. They may be sub classified as "plain" when the ridges rise slightly over the middle of the finger or "tented" when the ridges rise to a point. The loop pattern possesses a tri-radius and a core.

Study of Whorls: The whorls are the patterns so constructed that the characteristic ridge courses follow circuits around the core. The pattern area shape may be either circular or elliptical. This pattern has two tri-radii with ridges forming various patterns inside. Whorls have two tri-radii yielding two counts.

Study of Ridges: Ridges found on certain body parts namely palms, fingers, soles and toes as a consequence of continuous friction which occurs in these areas. These are areas where hair usually doesn't grow and this area enhances contact while preventing slippage [9]

Objectives:

- *To analyze the different dermatologlyphic patterns with reference to diabetes.*
- *To understand the correlation between dermatologlyphic patterns and the type1, type2 diabetes.*
- *The interpretation of 'atd' angle of diabetic patients.*

Materials And Methods

Location of the present study: The present study analysis and sample collection were done in the geographical area of Kengeri Satellite Town (Shirke) which is a suburb in Bangalore city. It is located on the western corridor along Mysore Road, bordered by Nagarbhavi

and Rajarajeshwari Nagar; with a large number of population around 42,386 (2001) and in Chamarajanagar, which is the southernmost district in the state of Karnataka, India and it is the third least populous district in Karnataka (out of 30), after Kodagu and Bangalore Rural.

MAP: Depicting the present study, Kengeri Satellite town in the left and chamarajnagar in the right side.

Methodology: The people aged between 40-75 years were included in the study. Among them 50% were female and 50% were males and belonged to South India. The types of Diabetic patients included in the Dermatoglyphics study were type1 and type2. The types of Dermatoglyphic patterns were observed with the 'atd' angle

of the each person. The Dermatoglyphics prints of samples in the present study were taken by ink method.

The figure 1 graphical representation represents the lists of people surveyed for type 1 diabetes with their atd angle were reported. The graph explains the range of atd angle in type1 diabetes patients, where the range was from 30° to 45°.

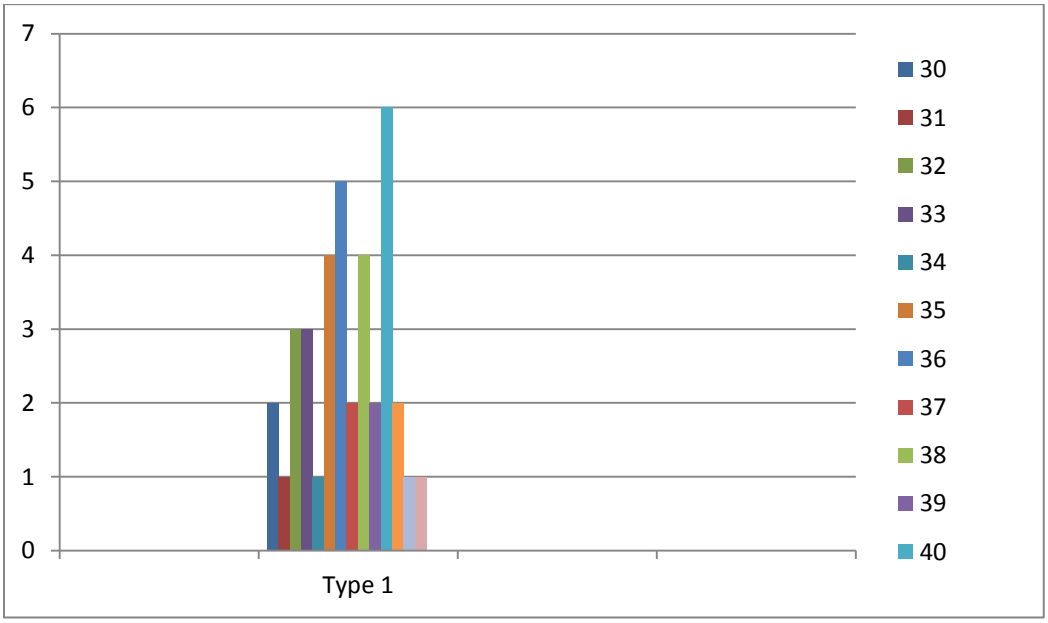


Figure 1: Range of atd angle in type 1 diabetic patients

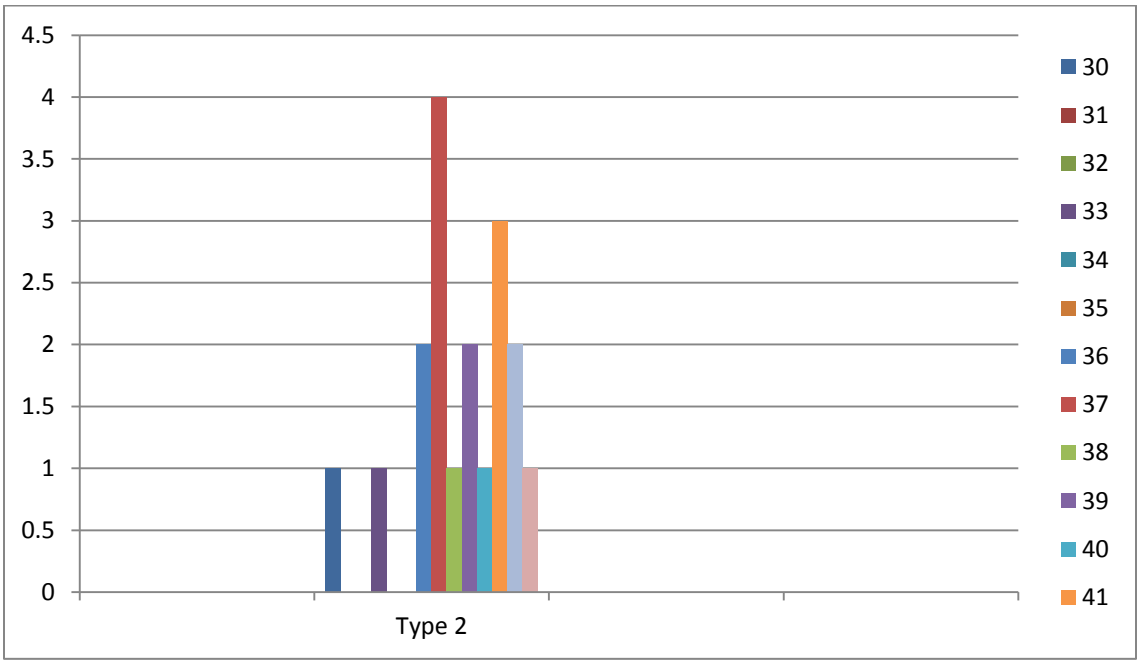


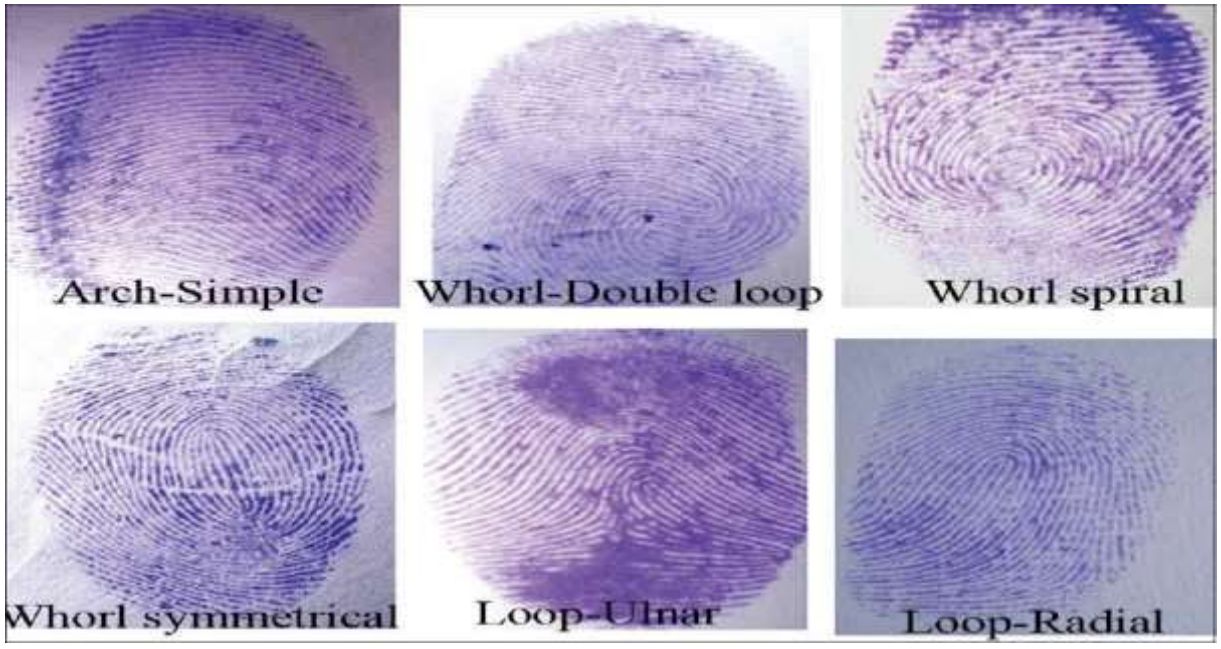
Figure 2: Range of atd angle in type 2 diabetic patients

The figure 2 graphical representation depicts the lists of people surveyed for type2 diabetes with their 'atd' angle. The graph explains the range of atd angle in type2 diabetes patients, where the range was from 30° to 43°.

Photographic plate 1: Showing atd angle and Dermatoglyphics pattern in right hand of the person.

EXPERIMENTAL RESULTS

The experimental results were recorded to get the qualitative Dermatoglyphics features from the hand prints of the diabetic patients.



Photographic plate 2: Basic fingerprint patterns.

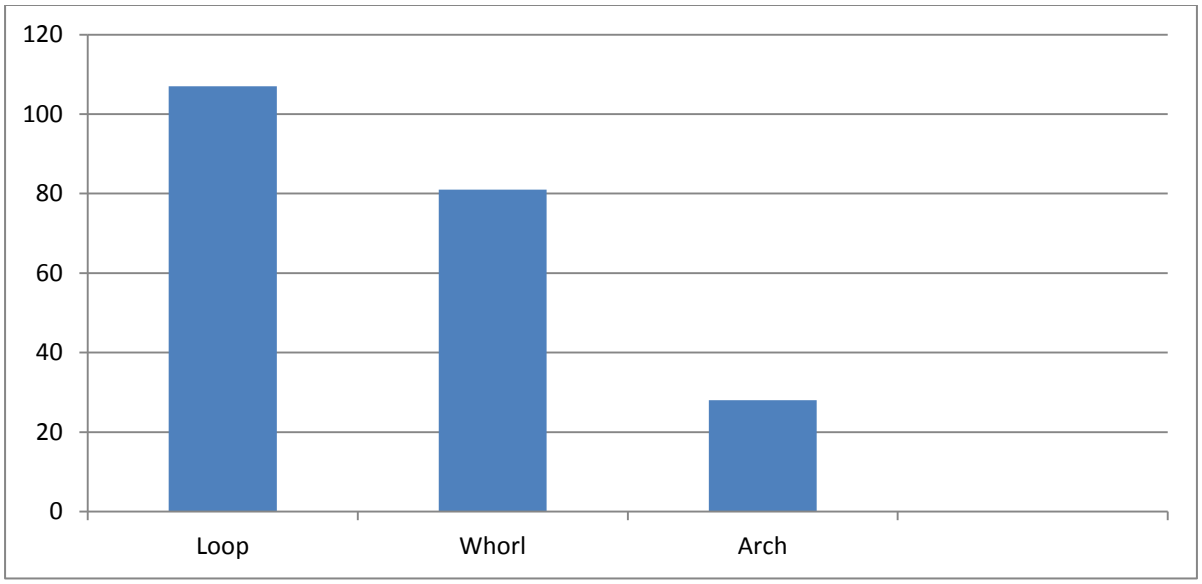


Figure 3: Depicting the number of Diabetic patients with Dermatoglyphic patterns in type 1 diabetic patient.

The figure 3 graphical representation depicts the type1 diabetes patients with maximum number of loops with the frequency of 49%, whorls with the frequency of 37.50% and arches with the frequency of 12.96%. The loop patterns were mostly distributed in the area where the sample was collected followed by whorls and arches respectively.

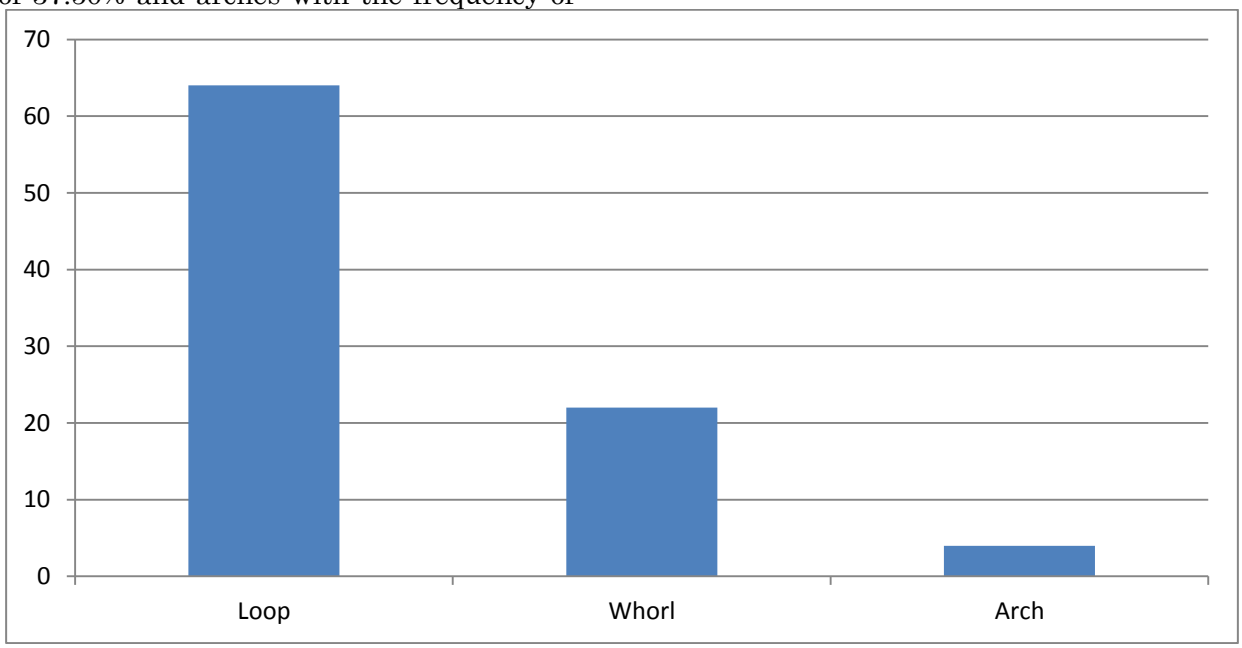


Figure4: Depicting the number of Diabetic patients with Dermatoglyphic patterns in type 2 diabetic patients.

The figure 4 graphical representation represents the type2 diabetes patients with maximum number of loops with the frequency of 71.11%, whorls with the

frequency of 24.44% and arches with the frequency of 4.44%. The loop patterns were mostly distributed in the area where the sample was collected followed by whorls and arches respectively.

In the present study, 'atd' angle had been measured in the diabetic patients, out of them 50% belongs to male category and 50% female category and of age groups between 40-75 years and results were statistically analyzed and 70% people were with type1 diabetes and 30% with type 2 diabetes.

	Type of diabetes	Mean± SD		P Value		Significance	
atd angle		Rt	Lt	Rt	Lt	Rt	Lt
	Type 1	34±5.03	33±4.51	<0.05	<0.05	S	S
	Type 2	39±11	38±12.13	<0.05	<0.05	S	S
	Total	35±4.5	34.23±4.24	<0.05	<0.05	S	S

Table 5: Showing 'atd' angle in the type 1 and type 2 diabetic patients and its statistical analysis.

In the table 5, it is depicted that the mean atd angle was higher in right hand of type 1 patients than left hand of type 1 patients with the P- value lesser than the 0.05. So, it was statistically significant. Whereas, from the same table with the mean atd angle was higher in right hand of type 2 patients than left hand of type 2 patients with the P-value lesser than the 0.05. So, it was statistically significant.

The total mean atd angle was higher in right hand of patients than left hand of patients with the p-value lesser than 0.05. So, it was statistically significant.

In the present study, the variation in findings and other studies may be due to variation in population.

DISCUSSION

The 'Dermatoglyphics' is a Greek word which is derived from 'derma' meaning skin and 'glyphae' meaning carving. The Dermatoglyphics is one predominant field which gets affected by genetic changes. The Diabetes is a hereditary disease with a multi-factorial inheritance type. Hence the heredity of the Dermatoglyphic features obeys to the polygenic system with an additive effect for its prediction, whether a person is prone or not.

Study on correlation between atd angle and diabetics have been done by statistical analysis, where the P- value is lesser than 0.05 which was statistically significant.

In the present study, 90% of them were type 1 diabetic patients with minimum of family history of diabetics. The atd angle of type 1 diabetic patients ranges from 30° to 45° which is a normal range. It was found that number of loops was greater than the whorls and arches in type1 diabetic patients. The ratio for Arch: whorl: loop is 28:81:107.

It was analyzed that 10% of them were type 2 diabetic patients with minimum of family history of diabetics. The atd angle of type 2 diabetic patients ranges from 30° to 43° where it is normal range. It was evident that numbers of loops were greater than the whorls and arches in type1diabetic patients. The ratio for Arch: whorl: loop is 4:22:64.

The Dermatoglyphics features of the present study may be used as a suggestive diagnostic tool to make a provisional diagnosis and to identify the persons who are at risk, but it requires more extensive studies in a large number of the patients.

CONCLUSION

The present study reveals that there is significant difference in atd angles of samples collected. Therefore atd angle can be useful to find out the risk of the individuals to diabetes, if the sample size would be more. Therefore, primary prevention can be done in the high risk individuals, which will help in decreasing in the prevalence rate of diabetics in future.

Impression: According to the present study, Diabetes has been linked to Dermatoglyphics. Since the atd angle of the sample used was significant. It may be inferred that the atd angle can be utilized as a diagnostic tool to aid in the reduction of diabetic prevalence rates in the future.

REFERENCES

1. Rashida H.A., Dharati K., Nagar S.K. &Bhaskar P., Palmar dermatoglyphics in patients of thalassemia major. National journal of medical research. 2012;2(3): 287-290.
2. Mulvihill J.J. & Smith D.W., The genesis of dermatoglyphics. Journal of Pediatrics. 1969;75(4):579-89. 3. Kumbnani H.K., Dermatoglyphics : A Review, Anthropology Today : Trends Scope and Applications. Anthropologist Special. 2007b;3:285-95.
3. Elsaadany H.M. et al., Can Dermatoglyphics be used as an Anatomical Marker in Egyptian Rheumatoid Patients? Journal of American Science. 2010;6(11):457-66.
4. Cummins H. & Midlo, Palmar & Plantar epidermal ridge configuration in European Americans. American journal of physical anthropology. 1926; 9:471-502.
5. Reddy K.S. &Murty O.P.,The essentials of Forensic Medicine and Toxicology. ed33rd. New Delhi:Jaypee Brothers Medical Publishers (Pvt.) Ltd;1973.
6. Zhou Y., Zeng Y.Z., Lizhen& Hu W., Application and development of palm print research. Technology and Health Care. 2002;10:383-390.
7. *Andrzej Grzybowski, Krzysztof Pietrzak., Jan Evangelista Purkynje (1787–1869): First to describe fingerprints.* Clinics in Dermatology, Volume 33, Issue 1, *January–February 2015, Pages 117-121*
8. Cummins H, Midlow C (1961). Finger prints palmer and soles; an introduction to Dermatoglyphics, Dover Publications, New York.
9. Akram T Kharroubi and Hisham M Darwish, 2015). Diabetes mellitus: The epidemic of the century. World J Diabetes, Jun 25;6(6):850-67. doi: 10.4239/wjd.v6.i6.850.
10. Sant S.M, Care A.M, Fukhuruden S (1983). Dermatoglyphics in diabetes mellitus, journel of the anatomical society of India, 32:127-30.
11. Manoj Kumar Sharma,Hemalata Sharma. Dermatoglyphics: a diagnostic tool to predict diabetes
12. Pranav Kumar and Usha Mina. Pathfinder, Life Sciences, Fundamentals and practice-1.
13. Peter J. Russell. iGenetics-A molecular approach, third edition.
14. Malawi Med.J (2004). Palmar and digital dermatoglyphic features of hypertensive and diabetic Malawian patients.
15. Penros LS. Finger prints, palms and chromosomes. Ann Hum Genet. 1963; 197; 933-8.
16. Julian L. Verbov. Dermatoglyphics in early onset diabetes mellitus. Hum Hered. 1973; 23:535-42.
17. Berg JM. The study of td dermal ridge count on the human palm. Hum Biol. 1968; 40:375-85.
18. Dam PK, Vinod Joshi, Anil Purohit, Himmat Singh. Dermatoglyphic

pattern in diabetes mellitus patients and non-diabetics. Annual Report 2009-2010. DMRC. 2006:66-76.
19. Oladipo GS, MB Ogunnowo. Dermatoglyphic patterns in diabetes mellitus in South Eastern Nigerian population. Afr J Appl Zool Environ Biol. 2004;6: 6-10.