

A COMPARATIVE ANALYSIS OF DERMATOGLYPHIC PATTERN AMONG WOMEN WITH HYPOTHYROIDISM IN RELATION TO POLYCYSTIC OVARIAN SYNDROME

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Introduction

Dermatoglyphics is as old as the history of man. It is the study of patterns of dermal ridges in the palmar aspect of hands and digits and plantar aspect of foot and toes. Individual characteristic patterns of epidermal ridge are formed during the 3rd or 4th month of fetal life. Hypothyroidism (underactive thyroid) is a condition in which thyroid gland doesn't produce enough of certain crucial hormones. Hypothyroidism may not cause noticeable symptoms in the early stages. Over time, untreated hypothyroidism can cause a number of health problems, such as obesity, joint pain, infertility and heart disease. Polycystic ovary Syndrome (PCOS) is the most common endocrine disorder of women in reproductive age group. [8] It is a heterogeneous group of disorder with Hyperandrogenism (Ovarian), Hyperinsulinemia & chronic anovulation.

Materials and Methods

A total of 300 subjects will be used for the study. Out of total number of 300 subjects, out of these 150 was normal subjects and 150 was hypothyroidism with PCOS. Fingertip patterns of both right and left hands will be noted for the presence of following qualitative characteristics. The ridge patterns of the fingertips are of three types: 1. Arches, 2. Loops, 3. Whorls. Arches: It is the simplest pattern formed by more or less parallel ridges which traverse the pattern area and form a curve that is concave proximally. The curve is gentle sometimes at other times it swings more sharply. A series of ridges enter the pattern area on one side of the digit, recurve abruptly and leave the pattern area on the same side. Ulnar loop (UL) is composed of ridges that open on the ulnar side. Radial loop (RL) is composed of ridges that open on the radial side. Occasionally, transitional loops (TRL – Transitional radial loop) (TUL – Transitional ulnar loop) can be found which resemble whorls or complex patterns.

Results

In this study the mean age group of PCOS is 29.65 years and in control group 30.15 years. In Case Group (hypothyroidism with PCOS) mean of Right-hand Whorls patterns (2.27 with SD 1.55) was noticed and in controls was whorl patterns 2.40 with SD 1.51 was noticed. Mean Left-hand Whorls among Case was 2.20 with SD 1.56 and in control group Left-hand Whorls was 2.50 with SD 1.84. Mean Right-hand Arches among Case was 0.17 with SD 0.38 and in control group Right-hand Arches was 0.60 with SD 0.70. Mean Left-hand Arches among Case was 0.20 with SD 0.55 and in control group Left-hand Arches was 0.50 with SD 0.85. Mean Right-hand Loops among Case was 2.57 with SD 1.48 and in control group Right-hand Loops was 2.10 with SD 1.52. Mean left-hand Loops among Case was 2.63 with SD 1.54 and in control group left-hand Loops was 2.10 with SD 1.37.

Conclusion:

Present study shows that there is definite co-relation between dermatoglyphics and PCOS. Whorl pattern in finger tip patterns of both the hands is absent as well as Tibial loop in area V of ball region of left foot is absent in PCOS. Since dermatoglyphics is a cost effective, less time consuming and easier method for screening which can be used anywhere without stationary lab equipment's, it may be of great help in screening the population for PCOS.

Keywords: Dermatoglyphics, PCOS, Arches, Loops, Whorls

Introduction

Dermatoglyphics is as old as the history of man. It is the study of patterns of dermal ridges in the palmar aspect of hands and digits and plantar aspect of foot and toes. Individual characteristic patterns of epidermal ridge are formed during the 3rd or 4th month of fetal life. ^[1] The size of the pattern increases only parallelly but the size remains unchanged. This method was first put to use in India by Sir Willaim Herchel. In 1686, Marcello malphhigi, was the first to formally chronicle finger prints observed under microscope. In 1823, John. E. Purkinje was the first to classify the finger ridge pattern and introduce nine print categories. Sir Charles Bell, in 1833 studied the structure and functions of hands intrinsically. ^[2]

A triradius occurs where three ridge systems meet at a point, and occurs four times on the palm, at the base of each of the four digits (a, b, c, and d). ^[3] Dermatoglyphic indices include: fingertip patterns; finger ridge counts, which are the number of ridges between the center of the fingertip patterns and their corresponding triradius; palmar ridge counts, which are the number of ridges on the palm connecting two triradii; fluctuating asymmetries, which are the differences in ridge counts or pattern types between parallel structures on the left and right hands; and the ATD angle, which is the angle formed by lines drawn from the most remote triradius near the base of the palm, to triradii a and d, located close to the index and little fingers respectively. ^[4,5]

Hypothyroidism (underactive thyroid) is a condition in which thyroid gland doesn't

produce enough of certain crucial hormones. Hypothyroidism may not cause noticeable symptoms in the early stages. Over time, untreated hypothyroidism can cause a number of health problems, such as obesity, joint pain, infertility and heart disease. [6] Hypothyroidism is divided in primary, caused by failure of thyroid function and secondary (central) due to the failure of adequate thyroid-stimulating hormone (TSH) secretion from the pituitary gland or thyrotrophin-releasing hormone (TRH) from the hypothalamus. Secondary hypothyroidism can be differentiated in pituitary and hypothalamic by the use of TRH test. [7]

Polycystic ovary Syndrome (PCOS) is the most common endocrine disorder of women in reproductive age group. [8] It is a heterogeneous group of disorder with Hyperandrogenism (Ovarian), Hyperinsulinemia & chronic anovulation. The most common cause of chronic anovulation and hyperandrogenism is Polycystic ovarian syndrome. The term Poly cystic ovary is actually a misnomer, as there are only multiple unruptured immature follicles. [8] In 1935, Irving F. Stein and Michael L. Leventhal first published a case series of about 7 women with amenorrhoea, hirsutism, bilaterally enlarged ovaries, which was later known as POLYCYSTIC OVARIAN SYNDROME (PCOS). The definition of PCOS has undergone several revisions and still inconclusive. [9]

The burden of infertility in India is in the ascending trend and the expenditure per birth in infertile PCOS women has risen tremendously. Studies conducted in combining these two disorders show that they are significantly related. The ultimate finding in PCOS is hyperandrogenism which is aggravated in the presence of hypothyroidism. [9] Screening for hypothyroidism in PCOS patients in our population gives a better idea about the epidemiology of this disorder and the importance of evaluating thyroid function status in them.

Materials and Methods

Study Design: A total of 300 subjects will be used for the study. Out of total number of 300 subjects, out of these 150 was normal subjects and 150 was hypothyroidism with PCOS.

Inclusion criteria:

- Female subjects of 20 to 40 years age group among south Indian population.
- Patients diagnosed hypothyroidism and PCOD attending the tertiary care center will be used for this study.
- The individuals not suffering from hypothyroidism and PCOD without any family history of hypothyroidism and PCOD will be taken as control group.

Exclusion criteria:

- Patients suffering from skin conditions which would affect the proper recording of the dermal ridges will be excluded from the study.

- Patients suffering from pregnancy induced hypothyroidism and PCOD will be excluded.
- Patients suffering from
 - a) Anomalous development of the epidermis and its derivatives,
 - b) Excessive pigmentation of epidermis (Melanism),
 - c) Excessive production of cornified layer (Ichthyosis),
 - d) Naevus or mole (Benign proliferation of melanocytes),
 - e) Ectodermal dysplasia will be also excluded from this study.

Parameters Observed:

Qualitative parameters:

Fingertip patterns: Fingertip patterns of both right and left hands will be noted for the presence of following qualitative characteristics.

The ridge patterns of the fingertips are of three types: 1. Arches, 2. Loops, 3. Whorls.

1. Arches: It is the simplest pattern formed by more or less parallel ridges which traverse the pattern area and form a curve that is concave proximally. The curve is gentle sometimes at other times it swings more sharply. It may also be designated as a low or high arch respectively. The arch pattern is subdivided into two types:

- a) Simple arch (A) is composed of ridges that cross the fingertip from one side to the other without recurving.
- b) Tented arch (TA) is composed of ridges that meet at a point so that their smooth sweep was interrupted.

2. Loops: A series of ridges enter the pattern area on one side of the digit, recurve abruptly and leave the pattern area on the same side. The loop pattern is subdivided into two types:

- a) Ulnar loop (UL) is composed of ridges that open on the ulnar side.
- b) Radial loop (RL) is composed of ridges that open on the radial side.

Occasionally, transitional loops (TRL – Transitional radial loop) (TUL – Transitional ulnar loop) can be found which resemble whorls or complex patterns.

3. Whorls (W): Any ridge configuration with two or more triradii. One triradius is on radial and the other on the ulnar side of the pattern.

Subtypes of whorl patterns include:

a) Concentric whorl (CW): is composed of ridges that are commonly arranged as a succession of concentric rings or ellipses.

b) Spiral whorl (SW): is a configuration in which ridges spiral around the core in either a clockwise (SWCW – Spiral whorl clock wise) or an anti-clockwise (SWACW – Spiral whorl anti-clock wise) direction.

c) **Central pocket whorl (CPW):** is a pattern containing a loop within which a smaller whorl is located. Central pockets are classified as ulnar (CPUW – Central pocketed ulnar whorl) or radial (CPRW– Central pocketed radial whorl) according to the side on which the outer loop opens.

d) **Lateral pocket (LPULW – Lateral pocketed ulnar loop whorl) (LPRLW– Lateral pocketed radial loop whorl)** pattern is composed of interlocking loops.

e) **Double loop whorl (DLW)** pattern is composed of double loops and two triradii.

f) **Accidental whorl (ACC.W)** are one in which patterns cannot be classified as one of the above patterns. Some represent a combination of two or more configurations such as a loop and a whorl, triple loops and other unusual formations.

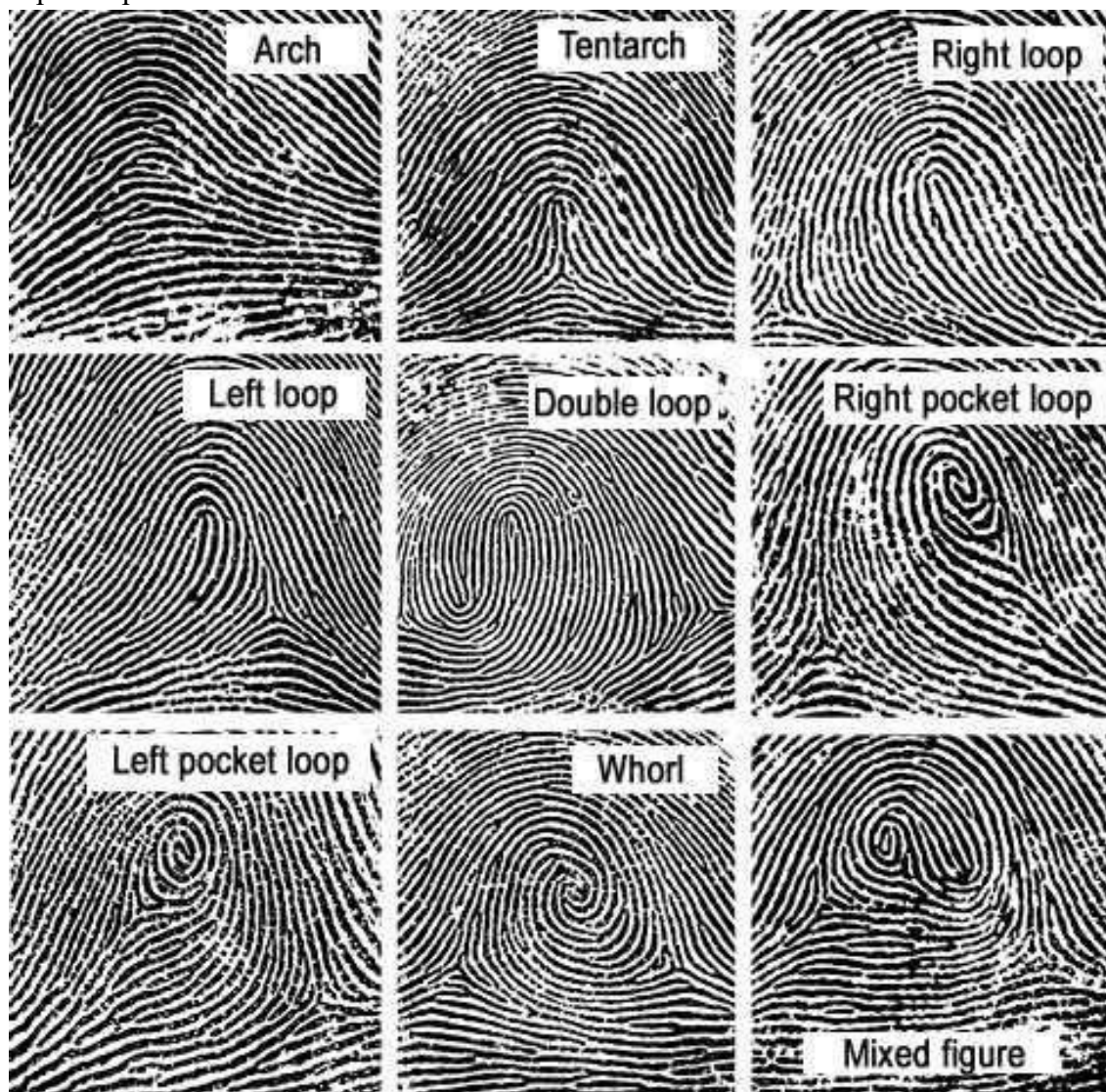


Figure 5. Fingertip dermal ridge patterns.

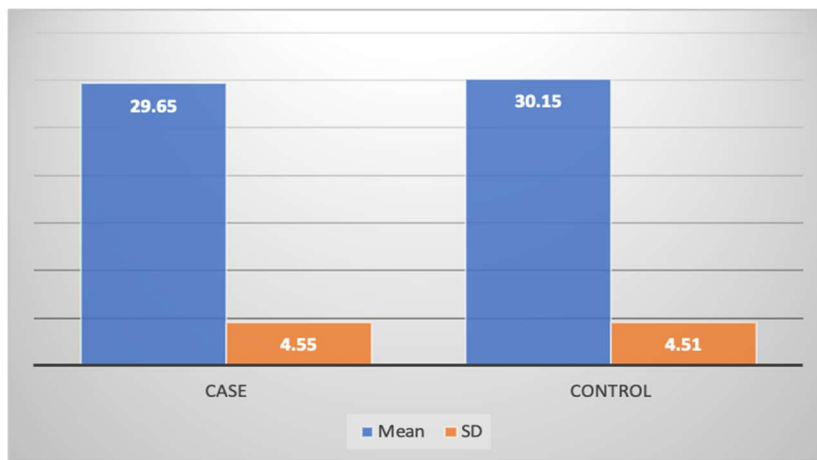
Statistical Analysis:

The values obtained by finger and palm print analysis were statistically analysed statically analysed with SPSS software version 25th

1. Mean, standard deviation of all descriptive data will be obtained.
2. Paired t test will be used to compare the mean d ridge counts, atd, dat and tda angles and total finger ridge counts of both right and left hands.

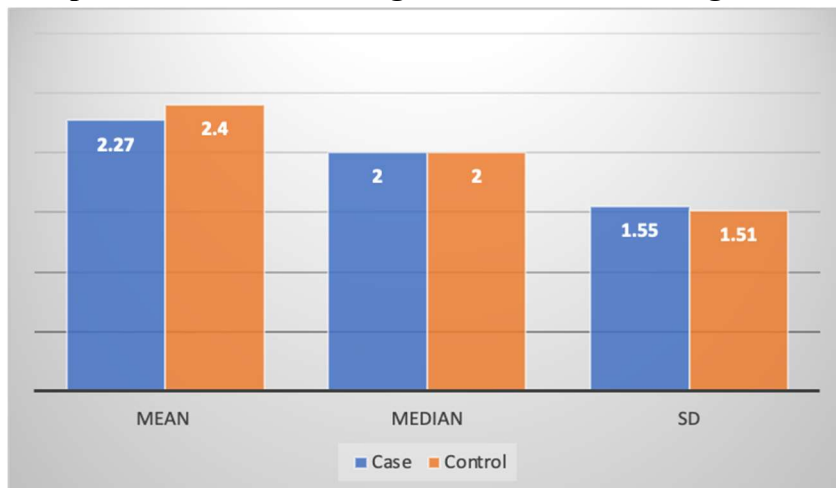
Results

Graph 1: Distribution of Age Group among Case and Control Group



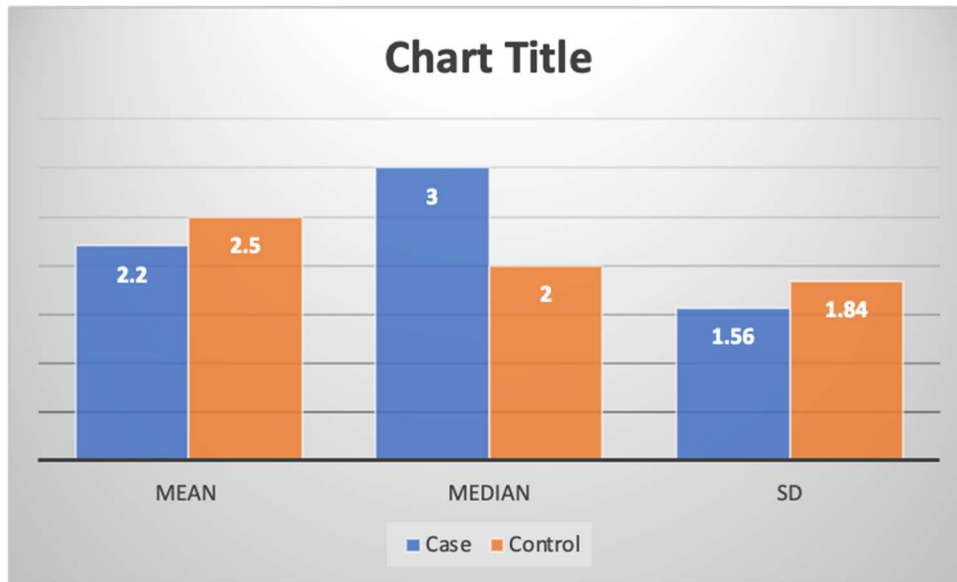
In this study the mean age group of PCOS is 29.65 years and in control group 30.15 years in Graph 1.

Graph 2: Distribution of Right-hand Whorls among Case and Control Group



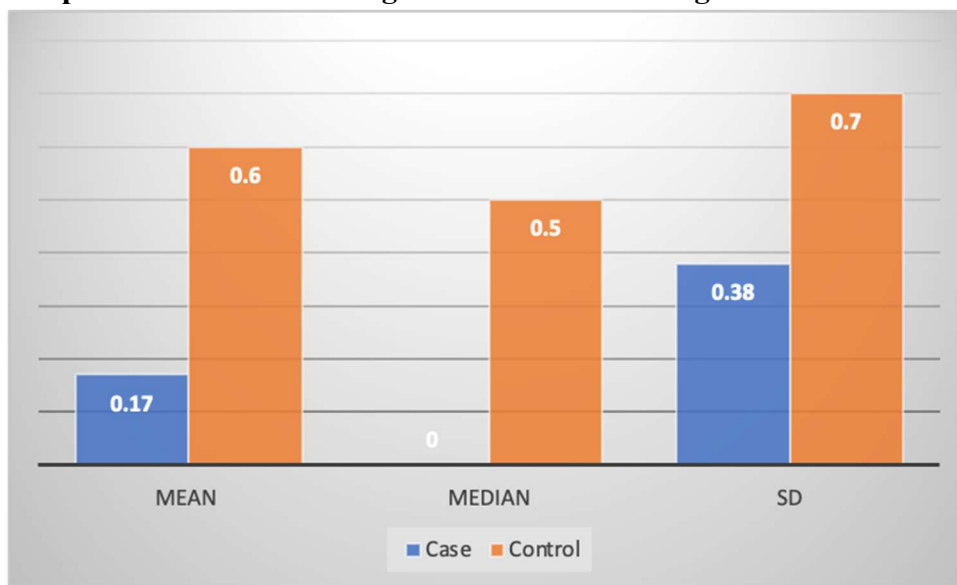
In Case Group (hypothyroidism with PCOS) mean of Right-hand Whorls patterns (2.27 with SD 1.55) was noticed and in controls was whorl patterns 2.40 with SD 1.51 was noticed in Graph 2.

Graph 3: Distribution of Left-hand Whorls among Case and Control Group



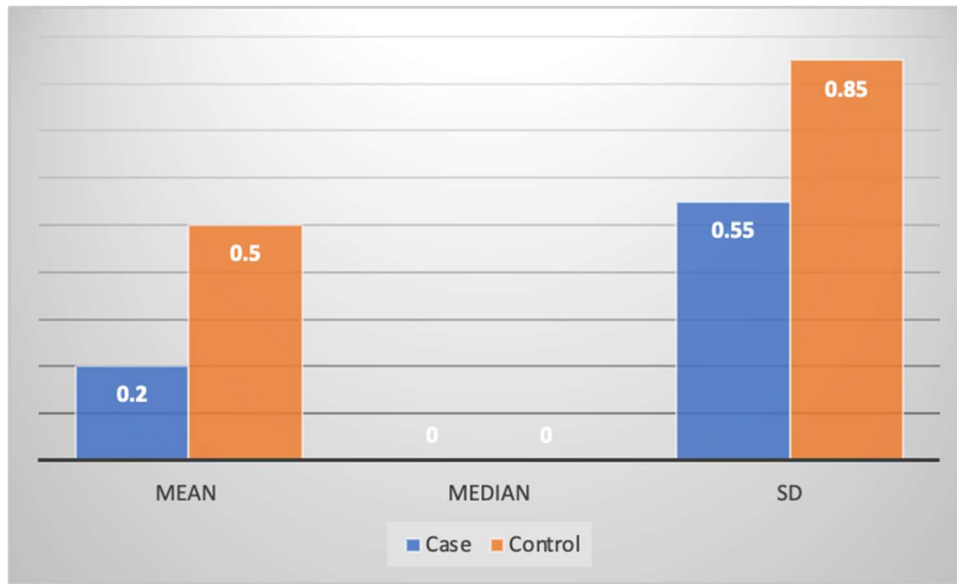
In table 3, Mean Left-hand Whorls among Case was 2.20 with SD 1.56 and in control group Left-hand Whorls was 2.50 with SD 1.84.

Graph 4: Distribution of Right-hand Arches among Case and Control Group



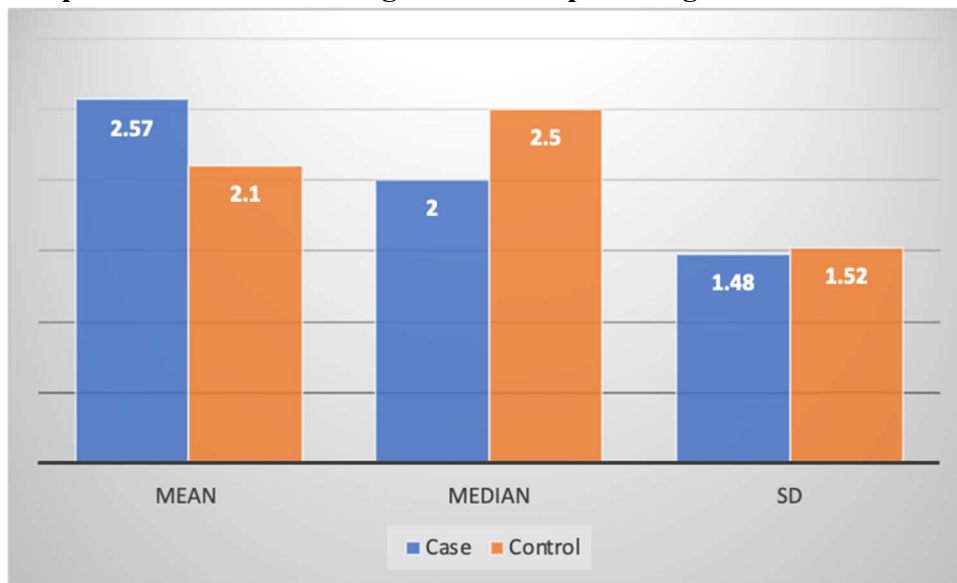
In Graph 4, Mean Right-hand Arches among Case was 0.17 with SD 0.38 and in control group Right-hand Arches was 0.60 with SD 0.70.

Graph 5: Distribution of Left-hand Arches among Case and Control Group

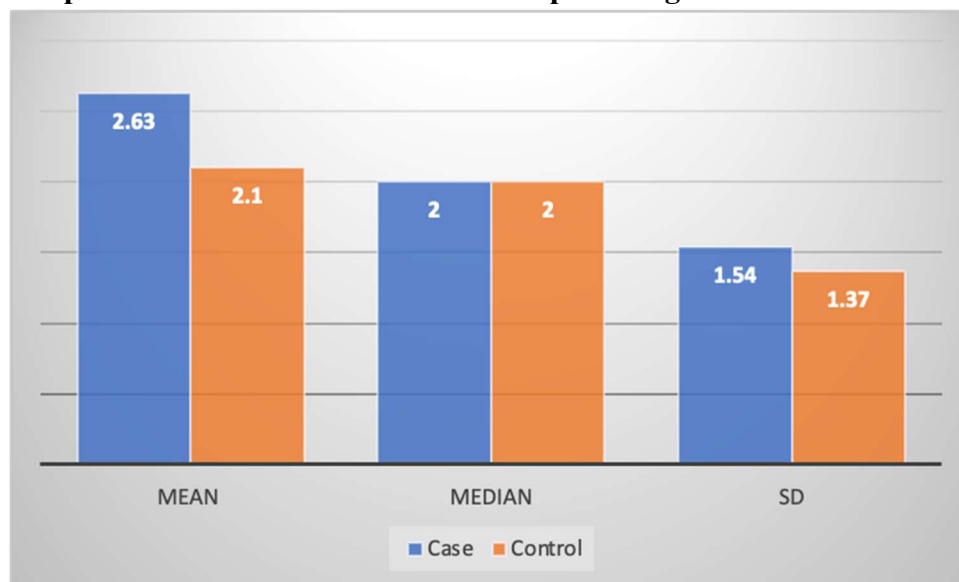


In Graph 5, Mean Left-hand Arches among Case was 0.20 with SD 0.55 and in control group Left-hand Arches was 0.50 with SD 0.85.

Graph 6: Distribution of Right-hand Loops among Case and Control Group



In Graph 6, Mean Right-hand Loops among Case was 2.57 with SD 1.48 and in control group Right-hand Loops was 2.10 with SD 1.52.

Graph 7: Distribution of Left-hand Loops among Case and Control Group

In Graph 7, Mean left-hand Loops among Case was 2.63 with SD 1.54 and in control group left-hand Loops was 2.10 with SD 1.37.

Discussion

As the incidence of infertility and its morbidity are increasing in the recent days, the root cause should be identified and treated accordingly. The leading cause for female infertility is menstrual irregularities apart from anatomical and genetic defects.^[10] Major contributing factors for this irregular menstruation are from local (ovarian) cause like polycystic ovarian syndrome and /or the systemic cause like Hypothyroidism, Hyperprolactinemia, Hyperinsulinemia. All the above said factors pose individual risk for anovulation. Often, they present in combination. PCOS and hypothyroidism are the most common endocrine disorders found in young reproductive age group women.^[11]

In this study the mean age group of PCOS is 29.65 years and in control group 30.15 years. Similar finding was documented by E. Gudovan et al. in virilizing PCOS where they found 31years compared to the normal^[12]. Ganie MA et al. conducted a dermatoglyphic study in PCOS showed evidence that women with Stein-Leventhal syndrome have hand dermatoglyphic characteristics similar to those of normal age^[13].

This may be due to the fact that, menstrual symptoms begin from puberty itself which leads to early presentation in the OPD. In a case control study conducted by Maryam et al. a non-significant of age group^[14] was reported. Sridhar et al reported a age group of 30-40 years of polycystic ovaries among hypothyroid patients.^[15]

In our study, Mean Right-hand Arches among Case was 0.17 with SD 0.38 and in control group Right-hand Arches was 0.60 with SD 0.70. The frequency of the Right-hand Arches was greater

than expected compared to the control group, as opposed to the projected frequency of the cycle, which was lower than expected compared to the control group. When applying the Kay square test to the community of women, it was found that the value of the calculated Kay square was 100.03 which is greater than the scale of 7.81 at the freedom level 3 and the significant level 0.05. [16]

In our study, Mean Right-hand Loops among Case was 2.57 with SD 1.48 and in control group Right-hand Loops was 2.10 with SD 1.52. The gene that controls the pattern of Radial Loop may be located near the location of the genes responsible for the production of sex hormones, so it is often observed that individuals with Radial Loop often have a disturbance in the production of sex hormones. [17] Because sex hormone disorder has the biggest role in the occurrence of PCOS, it is expected that there will be a relationship between the presence of the Radial Loop pattern and the incidence of PCOS. [18]

While the Whorls was low frequency in all fingers except the left hand ring finger of the syndrome patients compared to the control group. This is consistent with what he said, [19] indicating that individuals with Myopic were characterized by high frequencies of Radial Loop in two hands compared to the control group, while there was a decrease in frequency of Whorls for all fingers of the right hand except the pinky. As he pointed [20] that the features of natural Iraqi population have some patterns that attend to appear more often in some fingers than others. The whorls have the highest frequency on the thumb and ring finger. While radial loop and whorls are more frequency in the index finger. The pinky finger have the highest frequent of ulnar loop and the lowest frequent for the rest of patterns.

Conclusion:

Present study shows that there is definite co-relation between dermatoglyphics and PCOS. Whorl pattern in finger tip patterns of both the hands is absent as well as Tibial loop in area V of ball region of left foot is absent in PCOS. Since dermatoglyphics is a cost effective, less time consuming and easier method for screening which can be used anywhere without stationary lab equipment's, it may be of great help in screening the population for PCOS.

Dermatoglyphics could be used as a cost effective tool for the preliminary prediction of certain medical conditions like hypothyroidism & PCOS. Early detection of the problem could eventually lead to formulate an efficient treatment plan.

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