ORIGINAL ARTICLE

Family History of Diabetes: An Important Risk Factor for Developing PCOS

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ABSTRACT

Background and Aim: Polycystic ovary syndrome (PCOS) is a new rising disorder of reproductive, metabolic, and endocrine disorders of young females of reproductive age suffering from insulin resistance, increased levels of androgens, and altered morphology of ovaries with multiple cysts, and oligoanovulation. The burden of disease is significantly high with a global prevalence of 5% - 10% of reproducing females. Literature has reported a positive correlation between diabetes mellitus in the family and the resultant risk of developing PCOS among the female population. This study will aim to assess the correlation between the familial history of diabetes mellitus and concurrent risk of developing PCOS in a tertiary care hospital in Lahore, Pakistan.

Methodology: A cross sectional study was conducted in the Medicine and Gynecology department of Sir Ganga Ram Hospital, Lahore for duration of four months from October 2021 to January 2022. Participants were recruited following inclusion and exclusion criteria. Sample population was estimated to be 150 females. Participants were recruited by convenient sampling. After recruitment participants underwent physical, clinical, and serological assessment. Diagnosis of PCOS was made by following Rotterdam criteria. Data collection was done by 14 points questionnaire and history interview.

Results: This study showed that all participants diagnosed with PCOS have a history of early menarche, increased level of heartbeats, a large volume of ovaries, and a lesser volume of uterus. Patients also showed increased peripheral follicles. Serologic outcomes of participants showed a generalized increase in TT levels and a generalized decrease in SHBG levels with 1.71 (1.04-2.23) nmol/L and 45.39 ± 24.44 nmol/L respectively. About 56.2% (n= 83) of the participants gave a history of the abnormal menstrual cycle and 70.3% (n= 104) of the population agreed to abnormal hair growth on the body. When assessing the history of diabetes mellitus prevalence among families of the participants, the results showed that 19% of the population (n= 28) gave a positive history of diagnosed diabetes mellitus of both mother and father, 21.1% of the participants (n= 31) suggested that their parents were never tested for diabetes mellitus before, whereas remaining 43.8% (n= 89) gave no familial history of diabetes mellitus.

Conclusion: The study concludes that the most common characteristics of PCOS among the population of Pakistan is increased weight followed by abnormal hair growth, participants present with increased TT and decreased SHBG levels. Familial history of diabetes mellitus is considered a risk factor for developing PCOS.

Keywords: Familial diabetes, Diabetes mellitus, Polycystic ovary syndrome, Risk factors of PCOS

INTRODUCTION

Polycystic ovary syndrome (PCOS) is a new rising disorder of reproductive, metabolic, and endocrine disorders of young females of reproductive age suffering from insulin resistance, increased levels of androgens, and altered morphology of ovaries with multiple cysts, and oligoanovulation [1]. The burden of disease is significantly high with a global prevalence of 5% - 10% of reproducing females [2]. Due to the high prevalence and associated metabolic syndrome, PCOS have become a great interest for research. However, little seems to be known about the pathophysiology of the disease [3]. However, some authors have claimed PCOS to have a genetic correlation and are a hereditary disease [4].

One of the major characteristics of PCOS is insulin resistance which in turn become an essential component of igniting metabolic complication and endocrinal manifestations of the disease [5]. Evidence suggests that a history of diabetes mellitus and metabolic syndrome has found a positive correlation with the risk of developing PCOS [6]. Literature has reported a positive correlation between diabetes mellitus in the family and the resultant risk of developing PCOS among the female population [7]. This study will aim to assess the correlation between the familial history of diabetes mellitus and concurrent risk of developing PCOS in a tertiary care hospital in Lahore, Pakistan.

METHODOLOGY

A cross-section study was conducted in the Medicine and Gynecology department of Sir Ganga Ram Hospital, Lahore. The study took place from October 2021 to January 2022 with a total duration of 3 months. The study was conducted after ethical approval from the relevant committee. The consent form for the study was approved by the ethical committee.

Participants: The total number of participants for this study was calculated by employing Open Epi with a formula. The sample size was calculated after considering the epidemiological burden of PCOS within the country and by estimated prevalence, an approximate figure of 150 was considered for the sample size of the study. The participants were recruited after meeting strict inclusion and exclusion criteria. The inclusion criteria for the study required participants to be diagnosed with PCOS following Rotterdam criteria. The criteria included the following:

- Polycystic ovaries (either 12 or more peripheral follicles or increased ovarian volume of more than 10 cm³)
- Oligo-ovulation or anovulation
- Clinical and or biochemical signs of hyperandrogenism.

Other inclusion criteria included a positive familial history for diabetes and females of reproductive age ranging between 16 years to 40 years of age. The exclusion criteria for the study included females with current pregnancies, females who were diagnosed with diabetes, cause of irregular menstruation other than PCOS, and postmenopausal women. A written consent form was taken from participants after a written and verbal explanation of the study to participants. Females older than 18 years were asked to sign consent forms whereas females younger than 18 years were made eligible for the study after approval of the consent form by a parent or guardian. Failure to sign the study resulted in exclusion from the study. Participants were recruited by convenient sampling. After the recruitment of participants, data collection was done on a 14-point questionnaire with close-ended

answers. The questionnaire was divided into three segments. The first segment of the questionnaire assessed the demographics of the patient (name, age, marital status, and BMI), followed by a segment regarding PCOS signs and symptoms observed (irregular menstruation, abnormal body hair growth, and abnormal imaging test results). The last segment of the questionnaire was focused on assessing the familial history of diabetes mellitus among both parents. The questionnaire was made available in both English and Urdu for the feasibility of participants.

Participant's Examination: After the recruitment of participants, an extensive physical, clinical, and serum examination was conducted. Physical examination of participants included assessment of height, weight, calculation of Body Mass Index (BMI), and hip and waist circumference. Clinical examination of participants included assessment of blood pressure, collection of history regarding menstruation, and lastly pelvic ultrasound. Participants also underwent transvaginal ultrasonography for assessment of the volume of ovaries and uterus as well as assessment of antral follicles for assessment of PCOS. The serologic assessment included Total testosterone (TT), androstenedione (A), sex hormone-binding globulin (SHBG), and HbA1c. Patients were assessed for fasting glucose by glucometer within the hospital setting to eliminate diabetic participants. Patients were diagnosed to be positive for PCOS if two of the three Rotterdam characteristics. Patients were considered diabetic if fasting glucose and HbA1c were exceeding normal levels.
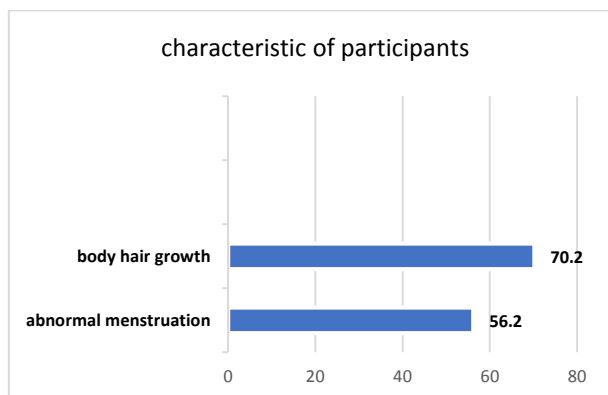
RESULTS

After meeting inclusion and exclusion criteria, 148 participants were recruited for the study. The mean age of participants was 23.7 ± 6.5 years and a mean BMI of 32.1 ± 5.9 kg/M². Following physical, clinical, and serological assessment of participants, it was acknowledged that all participants diagnosed with PCOS have a history of early menarche, increased level of heartbeats, a large volume of ovaries, and a lesser volume of uterus. Patients also showed increased peripheral follicles.
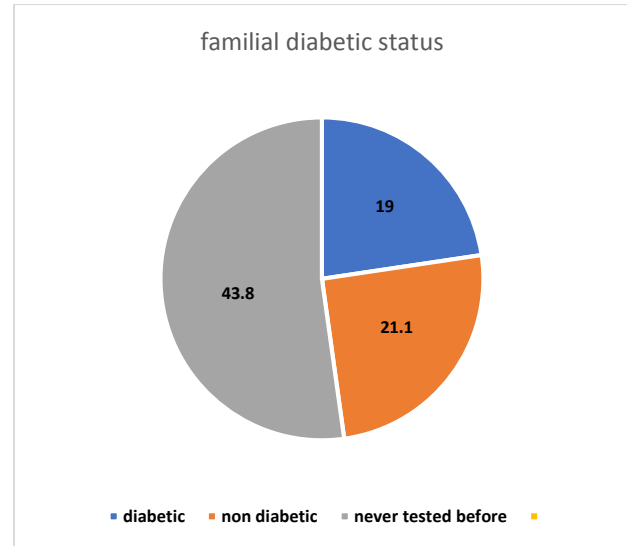
Table 1:

Demographic characteristics	Mean values
Age	23.7 ± 6.5 years
BMI	32.1 ± 5.9 kg/M²
Age at menarche	10.3 ± 0.8 years
Heartbeat	102 ± 13
Volume of ovary	(7.14– 13.67)
Volume of uterus	(68.80– 99.84)
Number of follicles	12 (9– 15)

Serologic outcomes of participants showed a generalized increase in TT levels and a generalized decrease in SHBG levels with 1.71 (1.04-2.23) nmol/L and 45.39 ± 24.44 nmol/L respectively. 56.2% (n= 83) of the participants gave a history of the abnormal menstrual cycle. 70.3% (n= 104) of the population agreed to abnormal hair growth on the body.

characteristic of participants

When assessing the history of diabetes mellitus prevalence among families of the participants, the results showed that 19% of the population (n= 28) gave a positive history of diagnosed diabetes mellitus of both mother and father, 21.1% of the participants (n= 31) suggested that their parents were never tested for diabetes mellitus before, whereas remaining 43.8% (n= 89) gave no familial history of diabetes mellitus.

familial diabetic status

DISCUSSION

This study showed that all participants diagnosed with PCOS have a history of early menarche, increased level of heartbeats, a large volume of ovaries, and a lesser volume of uterus. Patients also showed increased peripheral follicles. Serologic outcomes of participants showed a generalized increase in TT levels and a generalized decrease in SHBG levels with 1.71 (1.04-2.23) nmol/L and 45.39 ± 24.44 nmol/L respectively. 56.2% (n= 83) of the participants gave a history of the abnormal menstrual cycle. 70.3% (n= 104) of the population agreed to abnormal hair growth on the body. When assessing the history of diabetes mellitus prevalence among families of the participants, the results showed that 19% of the population (n= 28) gave a positive history of diagnosed diabetes mellitus of both mother and father, 21.1% of the participants (n= 31) suggested that their parents were never tested for diabetes mellitus before, whereas remaining 43.8% (n= 89) gave no familial history of diabetes mellitus.

The outcome of this study shows participants associated with a diagnosis of PCOS have increased BMI. All the participants were from overweight and obese groups on the BMI scale. These findings have been supported by a study conducted by Neubronner et al. 2021. The study assessed the correlation and influence of BMI and PCOS. The study included 389 participants and was divided into two groups case and control. The results of the study showed that in comparison to the control population, cases showed a 45.2% prevalence of BMI in the overweight and obese category [7]. Some studies suggest increased BMI to have a prevalence as large as 80% among the diagnosed population of PCOS [8]. These findings are similar to that of the outcomes of the study. These findings are further reported by the following studies [9], [10], and [11]. All these studies advocate the association between the increased prevalence of overweight and obesity among the PCOS population. The studies suggest the plausible reason for increased BMI is owing to inherent insulin resistance associated with PCOS however, a definite mechanism remains unidentified.

The study further showed that participants with PCOS had higher levels of TT on their serology reports. A study conducted by

Lerchbaum et al. studied the metabolic profiling of PCOS that affected women. The study recruited 707 participants who were a group as cases and 104 counterparts with similar physical characteristics. The outcomes of the study suggested that participants of the case group presented with increased levels of free testosterone levels in comparison to the control group [12]. Similar outcomes were also advocated by [13]. Furthermore, the majority of women recruited in this study responded positively to abnormal hair growth throughout the body. When assessing literature regarding this a meta-analysis was conducted by Amiri et al. 2021 to assess the prevalence of abnormal hair growth among PCO-affected females. The meta-analysis comprised 8346 research and the conclusion of the study showed that the prevalence of abnormal hair growth in PCOS can be appreciated as high as 13.05% [14]. Although these findings show a prevalence of less than that observed in our study, other clinical research in accordance with the findings of our study are [15], and [16].

The results when assessing the familial prevalence of diabetes mellitus among the PCOS population, the prevalence was appreciated to be 19%. The outcomes were compared with other studies. A study conducted by Rashid et al. studied the familial history of type 2 diabetes mellitus as a risk factor for the development of PCOS. The study population consisted of 240 participants who were divided into two groups case and control. The outcomes of the study showed that the case group showed a higher odds ratio for familial type 2 diabetes mellitus in comparison to the control group 3.86 and 1.90 respectively [17]. Another study conducted by Wang et al. 2021 also showed in their trial that type 2 diabetes mellitus in first-order relatives is a direct indicator of the risk of establishment of PCOS [18]. Other studies supporting these outcomes are [19], [20].

The study concludes that the most common characteristics of PCOS among the population of Pakistan is increased weight followed by abnormal hair growth, participants present with increased TT and decreased SHBG levels. Familial history of diabetes mellitus is considered a risk factor for developing PCOS.

CONCLUSION

This study aims to fill the literature gap in assessing direct risk factors for developing PCOS such as a familial history of diabetes mellitus. By appreciating diabetes mellitus as a risk of developing PCOS among young females, clinicians can provide a better diagnosis and management to the affected population and serve as a primary study to encourage research on tackling this correlation.

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