

# Assessment of Risk Factors for development of Polycystic Ovarian Syndrome

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## ABSTRACT

**Introduction:** Polycystic ovary syndrome (PCOS) is a common endocrine disorder mostly due to hormonal imbalances. There could be more than one predisposing factors that can contribute for development of PCOS. However there is no literature that explained the association of common factors with PCOS.

**Material and Methods:** We tested few common variables such as family history of PCOS, fast food diet habits, involvement in physical exercise, body mass index and waist circumference of study participants as probable risk factors for development of PCOS.

**Results:** We found that individuals with a positive family history of PCOS [RR 1.07 (CI 0.709-1.619)], fast food diet habits [RR 1.725 (CI 1.014-2.933)], and obesity [RR 1.741 (CI 1.054-2.877)] are at higher risk of PCOS compared to participants without these predisposing factors.

**Conclusion:** Majority of the predisposing factors identified in our study participants were modifiable hence careful monitoring and proper corrective steps may help in prevention and adequate management PCOS.

**Keywords:** Polycystic Ovarian Syndrome (PCOS), Predisposing Factors, Family History, Fast Food Diet Habits, Physical Exercise, Body Mass Index, Waist Circumference.

## INTRODUCTION

Polycystic ovary syndrome (PCOS) is a common endocrine disorder with a global prevalence of 5-10% and is an important cause of chronic anovulation in young women. PCOS is characterized by menstrual irregularity, signs of hyperandrogenism such as acne, excess body hairs, male-pattern baldness and infertility. In addition, PCOS is linked to many long term health problems such as cardiovascular diseases and diabetes.<sup>1,2</sup>

Though the exact cause of PCOS is unknown but it is thought to be multifactorial. Mostly due to hormonal imbalances that is elevated luteinizing hormone (LH) and normal or suppression of follicle stimulating hormone (FSH) resulting in altered LH/FSH ratio. Also the clinical features of hyperandrogenism are related hyperinsulinemia and insulin resistance. It not clear what are the factors that may predispose a women for development of PCOS, however it was observed in some cases that PCOS is genetic in nature and obesity was found to contribute for hyperinsulinemia there by predisposing individuals for PCOS.<sup>3-5</sup>

There are many published studies that assessed the prevalence and common clinical features of PCOS in different geographic area but there is no literature that explained the association of common factors with PCOS.<sup>6-10</sup> Through this study we have made an attempt to understand and explain the factors that may predispose a woman for development of PCOS. The main objective of the study was to assess the prevalence of

PCOS among Ras Al Khaimah Medical and Health Sciences University (RAKMHSU) students and results of this objective have been published earlier.<sup>11</sup> This article mainly emphasize on the results of our secondary objective that is to test few common variables such as family history of PCOS, fast food diet habits, involvement in physical exercise, body mass index and waist circumference of study participants as probable risk factors for development of PCOS.

## MATERIAL AND METHODS

This cross sectional study was conducted at RAKMHSU, Ras Al Khaimah, United Arab Emirates, after obtaining approval from RAKMHSU Research and Ethics Committee. The female students aged between 18 and 24 years, studying at RAKMHSU and willing to participate were included in the study after obtaining their written informed consent.

A structured data collection form was developed and was validated for its content by experts. Through data collection form, information such as demographic details, information on diet habits, fast-food consumption, involvement in physical exercise, symptoms of PCOS (if any), signs of PCOS (if any), family history of PCOS (if any), and data related to anthropometric measurements (such as height, weight and waist circumference) were collected from all the study participants. Thus collected data was later entered into the data base.

Individuals were categorized into PCOS-group and non-PCOS-group based on NIH criteria. According to NIH, PCOS is diagnosed based on presence of both chronic anovulation (ANOVU) and clinical hyperandrogenism (CH). ANOVU is defined as vaginal bleeding episodes more than 35 days intervals or < 8 cycles/year to complete absence of menses and CH is defined by the presence of hirsutism, androgenic alopecia, acne and acanthosis.<sup>12-14</sup> The percentages of participants with and without PCOS were calculated descriptively.

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### STATISTICAL ANALYSIS

Relative Risk (RR) was calculated between PCOS and non-PCOS group with respect to presence of family history of PCOS, body mass index, waist circumference, fast-food diet habits and physical exercise. Relative risk more than 1 indicates risk of PCOS is more likely to occur in the presence of any of the tested factors, RR less than 1 indicates risk of PCOS is less likely to occur in the presence of any of the tested factor whereas RR equal 1 suggests equal risk or no difference in risk of developing PCOS among PCOS and non-PCOS groups.

### RESULTS

A total of 250 female students participated in the study. The mean age of participants was 19.76 ± 1.68 years. Sixty-nine participants satisfying NIH criteria for PCOS were categorized under PCOS-group and remaining 181 participants were in non-PCOS-group. In our study, the prevalence of PCOS was estimated to be 27.6% (69 participants).

#### Clinical features of PCOS among subjects in PCOS and non-PCOS groups

All the participants in PCOS-group had ANOVU with one or more features describing CH. On the other hand only eight participants in non-PCOS-group had ANOVU (but not CH) and 119 had one or more features of CH (but not ANOVU), however as they did not satisfy the NIH criteria for diagnosed to be PCOS they were categorized under non-PCOS group. There were 54 participants who did not have any features of either of ANOVU or CH and were also categorized as non-PCOS individuals. The clinical features suggesting

ANOVU and CH among study participants are described in Table 1.

#### Assessment of risk factors among subjects in PCOS and non-PCOS groups

The number of study participants who had a positive family history of PCOS in PCOS group and non-PCOS group are 42 (60.8%) and 106 (58.5%) respectively. It was observed that the participants with family history of PCOS carry a little higher risk [RR 1.07 (CI 0.709-1.619)] of development of PCOS compared to participants without a family history.

Majority of the participants in PCOS [60 (86.9%)] and non-PCOS [170 (93.9%)] groups were consuming fast food diet less than or equal to 3 days in a week and only 9 and 11 participants were consuming fast food diet more than 3 days in a week in each PCOS and non-PCOS group. It was observed in our study that participants consuming fast food diet for more than 3 days/week have 1.7 times more risk of developing PCOS compared to those consume fast food diet for less than 3 days/week also this risk is statistically significant (p=0.044).

Majority of study participants in both the groups were involved in physical exercise as less as one day in a week to maximum of all the seven days of the week. It was observed that there was no statistically significant difference (p=0.998) exists between the individuals who are engaged in physical exercise less than 3 days in week with that of individuals engaged in physical exercise for more than 3 days in a week. The risk was found to be almost equal between the two groups for development of PCOS.

The BMI of study participants both in PCOS and non-PCOS groups was calculated and further categorized into normal (BMI 18.6 – 24.9 kg/m<sup>2</sup>), overweight (BMI 25-29.9 kg/m<sup>2</sup>) and obese (BMI 30 – 40 kg/m<sup>2</sup>) following World Health Organization criteria. There was no statistically significant difference between individuals with normal BMI and overweight; however a statistically significant difference (p=0.030) was observed between individuals with normal BMI and obese, with 1.74 times more risk of PCOS among obese participants.

Participants in both the groups were categorized as individuals with waist circumference ≤80 centimeters and with >85 centimeters. It was observed that there was no statistically significant difference was found between these two groups

PCOS group (N=69)		Non-PCOS group (N=181)	
Clinical features	Number (%)	Clinical features	Number (%)
ANOVU	69 (100%)	ANOVU	08 (4.4%)
Hirsutism	39 (56.5%)	Hirsutism	41 (22.6%)
Alopecia	30 (43.5%)	Alopecia	64 (35.3%)
Acne	34 (49.3%)	Acne	60 (33.1%)
Acanthosis	29 (42.0%)	Acanthosis	50 (27.6%)
		None	54 (29.8%)

**Table-1:** Clinical features of PCOS among subjects in PCOS and non-PCOS group.

Variable	Category	PCOS		No. of patients	Relative Risk (95% CI)	P value			
		Yes	No						
Family history of PCOS	Yes	42	106	148	1.072 (0.709-1.619)	0.740			
	No	27	75				102		
Fast food diet habit	≤ 3 days/week	60	170	230	1.725 (1.014-2.933)	0.044*			
	>3 days/week	09	11				20		
Physical exercise	≤ 3 days/week	61	160	221	0.099 (0.533-1.871)	0.998			
	>3 days/week	08	21				29		
BMI	Normal	45	126	171	1 (Reference)	-			
	Overweight	13	42				55	0.898 (0.524-1.536)	0.695
	Obese	11	13				24	1.741 (1.054-2.877)	
Waist circumference	≤80 centimeters	45	111	156	0.885 (0.579-1.352)	0.572			
	>80 centimeters	24	70				94		

P<0.05 is considered statistically significant

**Table-2:** Details of Risk Factors of PCOS among study participants

with respect to development of PCOS. The details of the assessment of all the risk factors tested are summarized in table 2.

## DISCUSSION

The presence of a genetic component to PCOS and familial clustering of reproductive and metabolic abnormalities results in increased risk of PCOS among first-degree relatives of PCOS patients.<sup>1,2,18-20</sup> This is evident from our study results where participants with a positive family history of PCOS carried little higher risk of development of PCOS.

Participants with more frequent consumption of fast food have 1.7 times greater risk of development of PCOS. Fast food usually contains high amounts of saturated fats and steroids frequent consumption of fast food and irregular eating habits leads to fluctuations in glucose levels, insulin resistance and increases hormonal imbalance such as hyperandrogenism adding to the risk for development of PCOS.<sup>21-23</sup>

When physical exercise is considered the risk of PCOS development among PCOS and non-PCOS group in our study was almost equal. This could be because though our study participants were involved in physical exercise (as less as one day in a week) but it was not consistent with their eating habits. Ideal way of achieving good control would be restricting both fast foods and involving in physical exercise. Many published literature emphasize weight-loss strategies along with calorie-restricted diet for better control of PCOS.<sup>24,25</sup>

We observed that obese participants are at 1.74 times more risk for development of PCOS compared to participants with normal BMI. This is probably because of aggregation of factors that were discussed earlier that is lack of physical exercise and unhealthy diet habits. Also it was observed that obesity augments the severity of hyperinsulinemia in women with PCOS. For this reason, exercise therapy is the mainstay of PCOS management.<sup>25-29</sup>

Central obesity characterized by increased waist circumference is another add-on risk factor for development of metabolic diseases. It mainly happens due to excessive consumption of fast food, irregular eating habits leading to large fluctuations in blood glucose levels thereby hormonal imbalance posing higher risk for development of PCOS.<sup>23,25,30</sup> However in our study we did not observe any added risk for PCOS development among participants with more than 80 centimeters of waist circumference.

## CONCLUSION

In our study participants, family history of PCOS, Obesity and fast food diet habits are found to be the predisposing factors for development of PCOS. The risk of PCOS increases with presence of one or more identified predisposing factors. Most of the factors tested as predisposing factors in our study are interlinked to each other and are mostly modifiable. Hence careful monitoring and proper management of identified predisposing factors not only delays but also helpful in adequate management of the disease.

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