A Study of Lifestyle Patterns Associated With Polycystic Ovarian Syndrome in Desert Region of India

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ABSTRACT

Background: Polycystic ovarian syndrome (PCOS) is characterized by an excess of male hormone, irregular menstrual cycles and cysts in the ovary. Besides genetic factors, lifestyle factors are also associated with PCOS. Life style factors vary from place to place and culture to culture. The objectives of this research were to study the life style factors like eating habits and physical activity levels among women with PCOS.

Patients and Methods: A case control study was conducted in Jodhpur, Rajasthan, India, between December 2021 and March 2022 involving 37 non-pregnant, non-lactating women aged 18-30 years suffering from PCOS recruited from hospital/clinics and 37 age matched controls recruited from the community. The data were collected using a semi-structured questionnaire, Food Frequency Questionnaire (FFQ), and Global Physical Activity Questionnaire (GPAQ).

Results: The mean (SD) age of cases and controls were 25.9 (3.5) and 25.4 (2.4) years respectively. Logistic regression revealed that low FFQ score, low GPAQ score, and high Waist-Hip ratio were significantly associated with increased risk of PCOS.

Conclusions: Dietary pattern and physical activity could increase risk of PCOS in adult women.

Keywords: Food habit, Physical activity, Waist-Hip ratio.

INTRODUCTION

Polycystic ovary syndrome (PCOS) is a hormonal disorder characterized by hyperandrogenism, ovulatory dysfunction, and polycystic ovarian morphologic features.[1] Although it is the most common endocrinopathy among women of reproductive age, it is still not recognized as an important global health issue. It affects 4% to 20% of women of reproductive age worldwide.[2] Typical clinical features include hirsutism, acne, irregular menses, chronic anovulation and infertility.[3,4] The development of PCOS is significantly influenced by a variety of genetic and environmental factors. Beyond its effects on the reproductive system, this illness has repercussions for the metabolic, cardiovascular, immunological, and psychological health of affected women.[2] In women with PCOS, lifestyle modifications have been recommended as the first line of treatment. Most of these interventions target dietary pattern, physical activity, and body weight.[3,5–7]

Studies evaluating the association between PCOS and dietary pattern, physical activity and obesity among Indian women, especially those from the desert belt of Rajasthan are very limited. Jodhpur is the second largest city in Rajasthan known for its food habits bordering on high fat and calorie content.[8] Traditional value systems do not encourage outdoor activities and there is little emphasis on physical fitness among girls.[9] Our survey had shown very little knowledge among the college going students about PCOS and its determinants. In a survey of 212 college students, 56% had no knowledge about PCOS. About 20% had more than normal BMI and Waist Hip ratios (Unpublished data). Considering this, the present study was conducted with the objectives of determining whether the eating habits and physical activity of women with PCOS were different from that of women without PCOS and to compare anthropometric parameters of women with PCOS with those of women without PCOS.

MATERIALS AND METHODS

A case control study was conducted among non-pregnant, non-lactating women aged 18-30 years in Jodhpur, Rajasthan, between December 2021 and March 2022. A case was defined as having PCOS as diagnosed by the treating gynecologist. Diagnosis of PCOS was based on Androgen Excess Society (AES) criteria which defines PCOS as a disorder primarily involving androgen excess along with other combinations of phenotypic features (hyperandrogenemia and/or hirsutism, oligo-anovulation and/or polycystic ovaries).[10] Age-matched (±2 years) healthy women not having PCOS were recruited from the neighborhood of the residence of cases, as controls for comparison. Women with androgen secreting tumors, congenital adrenal hyperplasia, Cushing syndrome, thyroid dysfunction, diabetes, hypertension, cardio-vascular disorders, and those using androgenic and anabolic drugs were excluded.

Prior approval for the study was obtained from the Institutional Ethics Committee, ICMR-NIIRNCD, Jodhpur (IEC-NIIRNCD-2021/trainee/1). An informed written consent was obtained from each of the study participants.

Confirmed cases of PCOS were recruited in the study from the Vasundhara Hospital, Medipulse Hospital and Kamla Nagar Hospital, located in Jodhpur city. All eligible participants made available by the consenting hospitals were approached for inclusion during the study period of 4 months. Gynecologists working in clinics or private hospitals were approached to help recruit cases of PCOS. The authors (RG and KG) contacted the patients in the clinics upon referral by the gynecologist, while taking due care to maintain their privacy, and then fixed up an appointment to visit their home for data collection. Data were collected by the interviewers (RG and KG) with the help of a semi-structured questionnaire. The information given by the respondent was not disclosed to anyone including her friends and other family members. Information on socio-demographic characteristics such as age, marital status, age at menarche, income, and education was collected. Weight of the participants was recorded using Salter's bathroom scale. Height, waist and hip circumference were measured using measuring tapes made of non-stretchable material following standard procedure. Body mass index (BMI) and waist-hip ratio (WHR) were calculated for each participant.

A semi quantitative food frequency questionnaire (FFQ) was prepared, based on locally prevalent food habits. The questionnaire included a limited selection of foods and beverages, together with response options that indicated the typical frequency of consumption during the time period under consideration. It also inquired about the frequency of intake and dosages of frequently used dietary supplements. Each response was coded numerically as 0, 1 or 2. All item scores were added to form a composite score. The maximum possible FFQ score was 66. FFQ score of < 26 (40% of maximum score) was considered as low, unhealthy score, whereas a FFQ score of > 26 was considered as high score indicating healthy food habits.

To assess the physical activity, Global Physical Activity Questionnaire (GPAQ) consisting of 15 items was used.[11] It was developed in 2002 by the WHO as part of the WHO STEPwise approach to non-communicable disease risk factor surveillance for physical activity observation. Participants were asked regarding how much time they spent engaging in various forms of physical activity on a weekly basis. Out of 15 items, eight relevant questions on vigorous-intensity or moderate-intensity activities were chosen and coded as 0 or 1 or 2. Scores obtained on all the 8 items were added to obtain a composite score (GPAQ score); maximum GPAQ score was calculated as 14. GPAQ score of < 6 (40% of maximum score) was considered as low score, whereas GPAQ score of > 6 was considered as high score. Low GPAQ scores indicated inadequate physical activity.

Sample size estimation No sample size was calculated for this study as the purpose was not to establish the risk factors, but to compare distribution of known risk factors in this population group of the defined geo-graphical area, that is the desert region of the state of Rajasthan.

Statistical analysis: Data were analyzed using IBM SPSS version 21.0 and expressed as percentage, mean, standard deviation, odds ratio, and 95% confidence interval. First, we used chi square test for comparison of non-parametric data. Variables found to have P value <0.05 were entered in the multivariable logistic regression model to identify the association of selected independent variables with PCOS. The level of two-tailed statistical significance was set at P <0.05.

RESULTS

A total of 43 confirmed cases of PCOS were approached. Of these 37 consented to participate in the study. An equal number of age-matched healthy controls were recruited from the neighbourhood of all patients. The mean (SD) age of the cases and controls was 25.9 (3.5) and 25.4 (2.4) years, respectively. The mean (SD) BMI of cases was 25.6 (4.3) compared to 21.2 (2.7) in controls. The mean (SD) WHR in cases was 0.8 (0.06) compared to 0.76 (0.04) in controls. **Table I** shows the general characteristics of cases and controls. Majority of women were married (51, 68.9%) and had higher education (60, 81.1%). Compared to 21.6% of controls, a higher proportion of cases (45.9%) attained

Table I Socio-demographic characteristics, dietary pattern, and physical activity of two study groups

Characteristics	Control (n = 37)	PCOS (n = 37)	P value
Age group (years)			
≤25	18 (48.6)	15 (40.5)	0.483
>25	19 (51.4)	22 (59.5)	
Marital status*			
Married	22 (59.5)	29 (78.4)	0.079
Unmarried	15 (40.5)	08 (21.6)	
Educational status*			
Intermediate and below	05 (13.5)	09 (24.3)	0.235
Undergraduate and above	32 (86.5)	28 (75.7)	
Monthly income (in rupees)			
≤30,000	14 (37.8)	10 (27.0)	0.321
>30,000	23 (62.2)	27 (73.0)	
Age at menarche			
≤13	29 (78.4)	20 (54.1)	0.027
>13	08 (21.6)	17 (45.9)	
Body mass index (kg/m^2)			
<25	34 (91.1)	19 (51.4)	<0.001
≥25	03 (8.1)	18 (48.6)	
Waist –Hip ratio			
≤0.8	33 (89.2)	18 (48.6)	<0.001
>0.8	04 (10.8)	19 (51.4)	
FFQ score			
<26 (low)	03 (8.1)	18 (48.6)	<0.001
≥26 (high)	34 (91.9)	19 (51.4)	
GPAQ score			
<6 (low)	04 (10.8)	26 (70.3)	<0.001
≥6 (high)	33 (89.2)	11 (29.7)	

Values expressed as mean (SD) or as *n (%); PCOS Polycystic Ovarian Syndrome.

menarche at age >13 years. A higher number of women with BMI ≥25 and WHR >0.8 belonged to cases compared to controls. Also, a higher proportion of women with PCOS (48.6%) had low FFQ score as opposed to only 8.1% of women in the control group ($P < 0.001$). Similarly, 70.3% of women with PCOS had low GPAQ score compared to 10.8% in the control group.

Multivariable logistic regression analysis revealed that higher age (>13 years) at menarche, increased WHR (>0.8), low FFQ score (<26), and low GPAQ score (<6) were significantly associated (P <0.05) with the higher risk of developing PCOS as shown in **Table II**.

DISCUSSION

We observed that women who attained menarche at age above 13 years were at higher risk of having PCOS as compared to those attaining menarche at a lower age. An earlier study has also shown similar result i.e. patients diagnosed with PCOS had a significantly older age at menarche.[12] The reason for this association may be due to the fact that age at menarche in women with PCOS is influenced by body weight and genetic variants.[13]

Although BMI was not significantly associated with PCOS in this study, the odds of having PCOS was 8 times higher among women with higher WHR (> 0.8) compared to women with low WHR (<0.8). This is consistent with results of previous studies.[14,15] This indicates that the presence of abdominal obesity is a risk factor for developing PCOS and thus weight management targeting fat stored around the waist might be an effective preventive strategy in women with PCOS.

The study also assessed the pattern of food habits among women suffering from PCOS and healthy controls.

Table II Multivariable logistic regression analysis showing association of FFQ score, GPAQ score and other factors with the risk of polycystic ovarian syndrome

	B (SE) (95% CI)	AOR	P value
Age at menarche (years)			
≤13^R	1		
>13	1.92	6.84 (1.22-38.43)	0.029
Body mass index (kg/m^2)			
< 25^R	1		
≥25	2.15	8.55 (0.84-87.09)	0.070
Waist –Hip ratio			
≤0.8^R	1		
> 0.8	2.10	8.18 (1.03-65.04)	0.047
FFQ score			
≥26 (high)^R	1		
< 26 (low)	2.12	8.31 (1.14 – 60.67)	0.037
GPAQ score			
≥6 (high)^R	1		
< 6 (low)	3.33	27.97 (4.66 – 167.93)	<0.001

R:Reference group, B:Unstandardized coefficients; AOR: Adjusted odds ratio; CI:Confidence Interval; Model Wald $\div^2$ statistic = 59.814, P <0.001 and Hosmer & Lemeshow (HL) P = 0.352 show that the model fits and supports the existence of the relationship between the independent variables and the dependent variable. Classification table reports that 90.5% of the cases can be expected to be classified correctly by the model.

It was found that women with low FFQ score (<26) had 8.3 times higher risk of having PCOS as compared to those with higher scores (≥26). In an earlier study, Hosseini, *et al* observed that the risk of PCOS declined in subjects who had healthiest diet [highest healthy eating index score (HEI)], compared to those who had lowest HEI score.[5] Based on these findings, it can be inferred that proper diet and maintenance of adequate nutritional status might be critical in preventing PCOS.[16]

Our study showed that the odds of developing PCOS were much higher in women with low GPAQ score (<6) compared to women were higher GPAQ score. The result is in accordance with the findings of previous studies.[3,17] Exercise therapy can be used as a first line approach for improving health outcomes in women with PCOS. Exercise has been shown to lower the risk of PCOS and improve patients' fertility and quality of life by normalizing testosterone and androstenedione levels in blood, preventing metabolic syndrome, lowering systemic inflammatory markers and boosting immunity.[18]

While interpreting the results, it is important to take into account the limitations of the current study. The number of cases was small as recruitment was done from a limited number of health care facilities in a limited time period, nonetheless our study reflects the lifestyle practices among the young women belonging to the desert belt of India. FFQ and GPAQ have limited recall value but the error is assumed to be randomly distributed in both groups. The findings of our study may not be generalized to women in different settings from a wider geographical region, as we have only focused on a small number of participants from a single city in Rajasthan. Even though the effects of several confounding factors were controlled for in the present study, residual confounding by unidentified or unmeasured confounders cannot be ignored. More research is warranted in diverse settings to further establish the effect of nutrition, physical activity and obesity on PCOS.

We conclude that the FFQ and GPAQ scores were low in women with PCOS reflecting their poor dietary choices and lesser physical activity. Also, central obesity was relatively higher among women suffering from PCOS. Based on the findings of this study, it can be inferred that healthy eating habits, regular physical activity and weight management strategies targeting reduction of WHR might be crucial in preventing PCOS in adult women.

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