Original Research Article

The relationship between lifestyle and the frequency of polycystic ovary syndrome in Saudi female residing in Riyadh

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ABSTRACT

Background: Polycystic Ovary Disorder (PCOS) is perceived as the most widely recognized endocrinopathy in reproductive women. This study aimed to assess the relationship between the lifestyle and frequency of polycystic ovary syndrome in Saudi Arabia.
Methods: This is a case-control study conducted on females at princess Nourah University (PNU), King Fahad Medical City (KFMC) and malls in Riyadh city, Saudi Arabia. The study included females in the reproductive age including 401 controls and 122 PCOS cases.
Results: History of pregnancy related disorders was higher among the PCOS women in comparison to controls, while abortion represented the highest percentage in both cases and controls. Family history of polycystic ovary syndrome was doubled in cases than controls. There was significant increase in the percentage of hypothyroidism and hyperlipidemia in polycystic ovary syndrome patients (P <0.001). Snoring, use of oral contraceptives, high prolactin level, incidence of menorrhagia and urinary tract infection were significantly higher in cases than controls (P <0.001). In addition, there was no difference between controls and polycystic ovary syndrome cases regarding their dietary intake. On the other hand, physical activity was significantly higher in controls compared to polycystic ovary syndrome group.
Conclusions: This study supports previous studies that revealed a relation between polycystic ovary syndrome and endocrinological disorders such as hypothyroidism, hyperprolactinemia, and obesity. On the other hand, there is no relation between dietary intake and PCOS, however exercising regularly can decrease the possibility of having the disease.

Keywords: Diet, Exercise, Endocrinopathy, Life style, PCOS

INTRODUCTION

Polycystic ovary syndrome (PCOS) is recognized as the most common endocrinopathy in reproductive women, frequently becomes manifest during adolescence. The etiology of PCOS is unknown, but research suggests that PCOS is a result of a complex trait that usually appears around the onset of puberty.[1,2] The symptoms of polycystic ovary syndrome vary with age, race, weight, family history and medications. It is associated with irregular menses, hyperandrogenism, hirsutism, acne, pattern of alopecia, obesity, insulin resistance and polycystic ovaries.[1] The prevalence of PCOS and its symptoms vary with different ethnics and races. Several

biochemical pathways have been linked with the pathophysiology of PCOS, many genes from these pathways have been examined, including genes involved in biosynthesizing and metabolizing steroid hormones.[3]

Family history of PCOS is the main risk factor. The chance of getting PCOS is higher if other women in the family have the disease, irregular menstrual cycle or diabetes mellitus. PCOS can be inherited from either the mother's or father's side.[4] Moreover, a history of premature adrenarche may pose a moderately increased risk for PCOS. These ladies appear to carry 15-20% risk of developing PCOS. These observations suggest that premature adrenarche may be an early manifestation of the steroidogenic dysregulation.[5] In addition, medications can also increase the risk of having the disease, like the long-term use of the seizure medication valproate (such as Depakote).[1]

Four to ten percent of women attending Gynecology clinics in resourceful nations are diagnosed with PCOS, but these numbers may not reflect the true prevalence due to lack of specificity in population based-studies and the variability in the criteria used for diagnosis.[3] An international consensus defined a set of criteria for PCOS diagnosis. Since then, studies suggest an increase in incidence and prevalence of PCOS in overweight and obese women (>20%).[6] Ultrasonography is one of the main investigations that helps in the differential diagnosis and may demonstrate the polycystic ovaries that have recently been vetted as an alternative to oligo-anovulation as a diagnostic criterion.[2] Management of PCOS is determined by symptomatology. For women not seeking pregnancy, the most common therapies are oral contraceptive pills, antiandrogens (contraindicated in the absence of adequate contraception), and insulin-lowering treatments which have little effect on hirsutism.[2]

The prevalence of PCOS is largely unknown in Saudi Arabia. Therefore, we aimed to study the relationship between the new life style and the increased incidence of polycystic ovary syndrome in the kingdom. This study aims to determine the possible risk of PCOS development in relation to the new life style in the Saudi Arabian population, as well as to estimate the frequency of common PCOS symptoms.

METHODS

A case control study was conducted among females at princess Nourah University (PNU), King Fahad Medical City (KFMC), Prince Mohammed Bin Abdulaziz and malls in Riyadh city, Saudi Arabia between October 2014 and march 2015. The Study was approved by the Research and Ethical Committee at PNU. Females in the reproductive age (age between 14-45) including 401 controls and 100 PCOS cases. The objectives of the study were explained to participants and a verbal consent was obtained from each participant before participation.

Data collection

A self-administered close-ended questionnaire consisting of 52 questions was developed, guided by study objectives and review of literature. The questionnaire included three sections: the first section comprises the socio-demographic data (e.g. age, BMI, education, marital status and history of pregnancy). The second section included nine items for assessment of PCOS symptoms regarding history of menstrual cycle, presence of acne, hirsutism, and frontal alopecia. The third section involved questions related to the risk factors of polycystic ovary syndrome including family history, chronic illnesses, dietary intake and physical activity. The last section compromises suspected risk factors of PCOS such as stress, smoking, drug use and medical conditions like cervical hemorrhage, SLE, UTI and cancer. The response to these questions was by yes, no, and sometimes. Initially, the questionnaire was tested on 15 patients from our hospital to determine whether the questions were clear, understandable, and logical. Research professionals were asked to criticize the content of the questionnaire. A validated questionnaire focused on key indicators evaluating PCOS related factors. The indicators were adopted from pre-tested patient questionnaires used in accredited hospitals and was further validated by benchmarking against similar ones in the literature. Institutional review board was obtained to undergo the said study.

Data analysis

Data were compiled, checked for completeness, and analyzed using the Statistical Package for Social Sciences (SPSS Inc., Chicago, IL, USA) version 16. The results were presented as number and percentage. Univariate analysis and differences between groups was assessed using the Student's t-test or Chi-square (χ^2) test when appropriate.

RESULTS

A total of 523 out of 580 questionnaires were collected from women in the reproductive age for both control and cases (response rate: 90.17%). 401 of the total were collected from the control women, and 122 women with PCOS have successfully responded.

The age of the participants was divided into three categories, the highest category for cases and control ranges from (20-30 years). Yet the analysis revealed that the percentage of the cases in the age group (31-45) was significantly higher than the controls (Table 1). In addition, most of the participants received education till high school (Table 1). The number of working women was 47 in PCOS patients and 53 in controls, therefore the percentage of non-workers, including students was higher in both groups (Table 1). Regarding the marital status, percentage of married women was higher in the patient group than controls (59.8%, 21.9%, respectively).

Moreover, 45.1% of the case group are multipara indicating that PCOS has no significant effect on fertility. According to BMI, obese patients were significantly higher in PCOS group compared to controls as expected (30.3%, 11.2%, respectively).

Table 1: Socio demographic of study population.

	Control (n=401)	Control (n=401)	Case (n=122)	Case (n=122)	
	n	**(%)**	**n**	**(%)**	**P value**
Age/years					
14-19	113	28.2	10	8.2	<0.001
20-30	258	64.3	78	63.9	
31-45	30	7.5	34	27.9	
BMI (kg/m^2)					
Underweight (<18.5)	44	11	3	2.5	<0.001
Normal (18.5-24.9)	224	55.9	47	38.5	
Overweight (25-30)	88	21.9	40	32.8	
Obese (> 30)	45	11.2	32	26.2	
Education					
Less than high school	79	19.7	5	4.1	<0.001
High school	213	53.1	58	47.5	
Bachelor degree	109	27.2	59	48.4	
Occupation					
Workers	53	13.2	45	36.9	<0.001
Non-workers	348	86.8	77	63.9	
Marital status					
Married	88	21.9	73	59.8	<0.001
Single	313	78.1	49	40.2	
Kids	62	15.5	55	45.1	
Number of kids					
1-4	50	12.5	51	41.8	<0.001
5-8	12	3.0	4	3.3	
9<	1	0.2	1	0.8	

Table 2 shows that the history of pregnancy related problems was higher in patients group than control group and abortion represented the highest percentage in both groups. Most of the patients and controls had knowledge about PCOS. Friends represented the highest resource of knowledge in the control group, whereas the physicians were the highest in the case group (P <0.001) (Table 2).

Family history of PCOS was doubled in PCOS group than the control group. Sisters were the most affected family members (P <0.001). The age of menarche was divided into three categories, the highest category for cases and control ranged from 11-14 years. Menstrual irregularities (once/two months or more) showed higher percent in cases than controls (P<0.001). The amount of menstrual bleeding varied between large, medium and little amount; there was significant difference between the two groups at the medium bleeding amount with higher percentage in the case group (P <0.001).

The hair density in the face, breast and abdomen varied between dense, normal and little. There was significant difference between the two groups at dense hair category, with higher percentage in the case group (P <0.001). However, frontal hair loss percentage was significantly higher in case group compared to controls. Regarding the association with other diseases, there was significant increase in the percentage of with hypothyroidism and hyperlipidemia in PCOS patients (Table 2).

Table 3 shows that snoring, use of oral contraceptives, increase in prolactin level, incidence of uterine hemorrhage and UTI were significantly higher in cases than controls. Specifically, the use of oral contraceptives in cases is more than double in PCOS patients compared to controls (63.1% and 24.2%, respectively) and the level of prolactin is 4 times elevated in cases than controls.

Table 4 represents a comparison between the frequency of food intake and exercise between case and control groups. There was no significant difference in fat food, fried food, red meat, chicken, sea food, fruits and vegetables, diary intake, caffeine beverages, and sweet and chocolate. However, the intake of energy and soft

drinks was significantly higher in controls than cases. Performing exercises showed to be significantly higher in controls than cases. While cases reported that they never

had exercise in about double the controls percentage (50% and 25.7%, respectively).

Table 2: Distribution of symptoms and risk factors of PCOS in the study population.

	n	(%)	Control N	Case (%)	P value
Pregnancy problems					
Did you face any pregnancy problems?	23	5.7	47	38.5	<0.001
Abortion	11	2.7	7	5.7	
Hemorrhage	2	0.5	2	3.3	
Polycystic ovarian syndrome knowledge					
Do you have an idea about PCOS?	246	61.3	104	85.2	<0.001
from friends	114	28.4	14	11.5	
from a physician	26	6.5	69	56.6	
Family history					
is there a family member affected with PCOS?	127	31.7	75	61.5	<0.001
first degree relative	58	14.5	51	41.8	
second degree relative	31	7.7	10	8.2	
Age in menarche					
How old were you in menarche?					
(8-10)	31	7.7	18	14.8	0.028
(11-14)	293	73.1	84	68.9	
(15<)	77	19.2	20	16.4	
Symptoms of PCOS					
Menstrual irregularity (once in two months or more)	40	10.0	23	18.9	<0.001
Amount					
little	331	82.5	81	66.4	0.940
medium	30	7.5	18	14.8	
large	122	30.4	36	29.5	
How many days of period?					
3-5 days	250	62.3	78	63.9	0.109
6-8 days	29	7.2	8	6.6	
9 days and more	220	54.9	57	46.7	
Is your menstrual cycle associated with severe pain?	123	30.7	16	13.1	
Hair density					
Little	61	15.2	66	54.0	0.854 <0.001
Normal	177	44.1	52	42.6	
Dense	159	39.7	71	58.1	
Do you have acne?	11	2.7	16	13.1	<0.001
Do you suffer from loss of hair in the front of head	18	4.5	2	1.6	<0.001
Disease					
Hypothyroidism	5	1.2	10	8.1	<0.001
Hypertension	11	2.7	2	1.6	<0.001
Hyperlipidaemia	28	7.0	8	6.6	
Osteoporosis					
Asthma					

Table 3: distribution of associated features of PCOS in the study population.

Environmental	Control		Case		Total		P Value
	N	(%)	n	(%)	N	(%)	
Snoring	57	(14.2)	43	(35.2)	100	(19.1)	(<0.001)
Oral contraceptives	97	(24.2)	77	(63.1)	174	(33.3)	(<0.001)
Prolactin	24	(6.0)	35	(28.7)	59	(11.3)	(<0.001)
Uterine hemorrhage	17	(4.2)	19	(15.6)	36	(6.9)	(<0.001)
UTI	97	(24.2)	53	(43.4)	150	(28.7)	(<0.001)

Table 4: Comparison of food intake and exercise between case and control.

Per week	1-2 times		3 times		4 times or more		Never		p-value
	Case	Control	Case	Control	Case	Control	Case	Control	
Fast food	64.8%	56.1%	15.6%	20.4%	9.8%	15.7%	9.8%	7.5%	NS
Fried food	52.4%	59%	24.2%	18.9%	11.5%	12.5%	10.7%	11%	NS
Red meat	54.1%	49.1%	14.8%	14.5%	13.1%	10%	18%	26.4%	NS
Chicken	23.8%	28.4%	32.8%	24.7%	39.3%	41.6%	4.1%	5.2%	NS
Seafood	46.7%	47.9%	6.6%	8%	4.9%	5%	41.8%	39.2%	NS
Fruits and vegetables	40.2%	37.2%	16.4%	27.4%	35.2%	29.9%	8.2%	5.5%	NS
Diary product	37.7%	34.9%	11.5%	21.9%	41%	36.2%	9.8%	6.7%	NS
Energy and soft drinks	35.2%	31.7%	11.5%	19.2%	14.8%	27.2%	38.5%	21.9%	<0.05
Caffeine beverages	26.2%	20.2%	8.2%	12%	61.5%	58.4%	4.1%	9.5%	NS
Sweet and chocolate	23.8%	22.2%	22.1%	24.4%	50.8	48.9%	3.3%	4.4%	NS
Exercise	31.1%	36.9%	7.4%	18.2%	11.5%	19.2%	50%	25.7%	<0.05

DISCUSSION

PCOS was originally described in 1953 by Stein and Leventhal as an association between amenorrhea and polycystic ovaries. Five of the original seven cases had hirsutism or acne and four had obesity. However, it is now recognized that PCOS encompasses a spectrum of variably associated features that are not otherwise explained.[2] It could occur due to genetic factors, but the exact mechanisms are unclear.[6] Two studies found some evidence of familial aggregation of hyperandrogenemia (with or without oligomenorrhea) in first-degree relatives of women with PCOS. In the first study, 22 percent of sisters of women with PCOS fulfilled diagnostic criteria for PCOS. In the second study, patients' mothers and sisters were evaluated clinically and 24 % of the mothers and 32% of the sisters had PCOS.[6]

In 1910, Fogue and Massabuau described three potential mechanisms of PCOS: inflammation, congestion, and dystrophy. The inflammation theory proposed that the microcystic ovary was the result of infection either of internal or external provenance. The congestion theory suggested that the lesion was the result of pressure, partial torsion, or other interruption in circulatory flow to the ovary. Finally, the dystrophy theory proposed that the abnormalities were caused by modifications or abnormalities in the nutrition of the ovary.[5]

PCOS is becoming a common syndrome among Saudi females in the reproductive age. However, there are no previous studies in Saudi Arabia estimating the relationship between the patient's lifestyle with the different symptoms of PCOS between women with and without PCOS. This case-control study investigates the pattern of physical activity, daily dietary intake, the frequency of PCOS symptoms and other previously diagnosed diseases in normal women with and those having PCOS. It aimed to identify the possible unproven risk factors in relation to the disease as well as to estimate the level of general knowledge about PCOS in Saudi Arabia.

Age, BMI, pregnancy problems, knowledge, family history, menstrual irregularity, amount, body hair density, frontal hair loss, hypothyroidism, hyperlipidemia, snoring, OCPs, hyperprolactinemia, menorrhagia and finally UTI were the main point investigated in our study. There are several ways to measure the body built such as, Dual-energy X-ray absorptiometry (DEXA), waist circumference and body mass index (BMI). BMI is a simple index of weight-for-height and is widely used by medical, health and fitness professionals to classify underweight, overweight and obesity in adults. In this study there was a significant difference in BMI between cases and controls. Obesity showed higher frequency in the cases than controls as expected. In a study published

in USA by Wright et al, there was a significant difference in BMI average between controls and cases where the patients showed a higher frequency. The study showed no significant difference between control and case groups of PCOS in dietary intake.[7] Present finding is in agreement with Wright et al study who stated that both cases and controls in their study had no significant differences between their average daily food intake.[7]

In this study, there is a significant difference between control and PCOS patients regarding the level of physical activity. This disagrees with the study of Wright et al study where non-PCOS participants were doing more physical activity than PCOS participants, however the difference was not significant.[7] In addition, the associated diseases reported herein were self-reported by the participants without further laboratory confirmation. Thyroid diseases and PCOS are two of the most common endocrine disorders in the general population.[8] Present results revealed a significant relationship between hypothyroidism and PCOS. Previous studies showed that there is a relationship between these two entities even though they have a complete different etiopathogenesis, yet both diseases share common clinical features. Sinha U et al study revealed that PCOS have higher mean TSH level than that of the control group.[8,9]

In the present study, most of the participants were young adults, which might be inconsistent with the presence of hypertension and osteoporosis. This explains why the frequency of hypertension was insignificant in contrast to results in other studies showing significant relation between hypertension and women with PCOS.[10,11] In addition, in these studies, obesity is that is common in PCOS was a factor that might have complicated the interpretation of the results.

Regarding osteoporosis, there was no direct relation with PCOS in our study or the other studies. In a study conducted by Tehrani HG et al the authors demonstrated an effect of calcium and vitamin D supplemental therapy in the treatment of PCOS.[12] Results of hyperlipidemia show significant difference between case and control in relation with BMI. Wild revealed significant relation between dyslipidemia and PCOS.[13] In weight-matched study, results of women with PCOS documented less HDL cholesterol, and higher non-HDL cholesterol. LDL-cholesterol concentrations as well as higher triglycerides levels than age-matched non PCOS women.[13] In carefully matched age study, by calculating the lipids levels triglyceride levels were twice as high, and non-HDL-cholesterol levels were twice as high in PCOS women compared to normal women.[14]

Real et al showed that women with oligomenorrhea had reduced lung function including asthma, particularly allergic asthma. In disagreement with this study, asthma show insignificant relation with PCOS in this study.[15] Furthermore, prolactin levels appear to be significantly high in patients with PCOS. This disagrees with Filho et al who conducted a study in Brazil on PCOS women; their study showed no direct relationship of prolactin levels with PCOS, unless the patient is having a pathological cause of hyperprolactinemiasuch as: pituitary tumor, drug-induced etc.[16]

In this study, the snoring showed significant difference with higher percentage in PCOS cases than controls. Taking into consideration that snoring is one of the sleep disordered breathing (SDB), we compared with other study which was conducted between 2007 and 2009 at Children's Hospital at Montefiore among 13-18-year-old females, the study results demonstrates that PCOS group had a higher prevalence of SDB.[17]

Regarding oral contraceptive, a significant difference with higher percentage in PCOS cases than controls. There were no studies done before that reported a significant difference or relationship between the incidence of OCP and PCOS. Although OCP's is the first choice of treatment for PCOS cases, many studies have reported effect of long term use of OCP's on many system especially cardiovascular system.[18,19]

No previous study revealed that there is a relation between UTI and PCOS. In this study there was a significant difference with a higher percentage of PCOS cases than controls. Nevertheless, it's difficult to accurately assess the incidence of UTI, nearly 1 in 3 women will have had at least one episode of UTI that require antimicrobial therapy.[20]

A limitation of the present study was the relatively small sample size of cases compared to the controls. In addition, some of the control group had some symptoms, but never been checked for PCOS.

In conclusion, the results of this study support previous studies that reveled a significant relation between PCOS and other endocrinological disorders such as hypothyroidism, hyperprolactinemia, and obesity. On the other hand, the result showed that there is no significant difference between control and case groups of PCOS regarding their dietary intake.

CONCLUSION

As the results revealed that several participants didn't have knowledge about PCOS, we recommend that awareness about PCOS must be raised by awareness campaigns and educational programs. We also would like to recommend further studies and investigations of the additional risk factors such as: increase prolactin level, uterine hemorrhage, osteoporosis, hyperlipidaemia, OCP use, and UTI. As the prevalence of PCOS patients is still unknown, we would like to recommend a study that measures the exact prevalence of PCOS patients in Saudi Arabia. Also, we would like to recommend a study of the psychological effect of PCOS in women as it causes pregnancy problems, hirsutism and acne.

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