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ORIGINAL RESEARCH

Factors associated with polycystic ovarian syndrome (PCOS): A hospital based case control study

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ABSTRACT

Background: Polycystic ovary syndrome (PCOS) is a worldwide prevalent endocrine disorder in women of reproductive age. It can be due to morphological or biochemical changes and there may be increased secretion of male hormones (mainly androgen) in the female body. The aim of the study is to determine the factors affecting PCOS. **Methods:** This is a hospital based case control study, done by the medical students in Gulf Medical University, Ajman. The study included women of the reproductive age group who were asked to fill out a questionnaire made by the students which was validated by three medical experts. There were a total of 187 participants out of which 63 were cases and 124 were controls. The study was conducted over a period of 6months in the thumbay clinics and hospitals. The results were analysed using SPSS after being entered into EXCEL. The results were obtained using descriptive statistics and an association between variables was given by the Chi square test. Odds ratio was given by logistic regression. **Results:** After a thorough analysis, it was found that PCOS was found higher in married women and among 20-29 yrs age group. Women who had panic attacks, mood swings, sleep disturbances, slept less than six hours, menstrual irregularities, high cholesterol level, gestational diabetes, with high or low levels of thyroid, family history of PCOS were all factors in women which made them at a higher risk of developing PCOS. Women who suffered from receding hairline, hair loss, excessive hair growth, and acanthosis nigricans were at a high risk of having PCOS. **Conclusions:** PCOS is one of the most common endocrine disorders. It is recommended to get an early diagnosis for women having factors that prove to be of a higher risk. Early detection can help the women pave their way to a better future and saving them from complications involved with PCOS.

Keywords: PCOS, Factors Associated, Family History, Mood Swings, Gestational Diabetes, Hair Growth.

INTRODUCTION

Polycystic ovary syndrome (PCOS) is a worldwide prevalent endocrine disorder in women of reproductive age. It can be due to morphological or biochemical changes and there may be increased secretion of male hormones (mainly androgen) in the female body. It usually presents at puberty with irregular menstrual cycles, signs of hyperandrogenism, such as acne, hirsutism and insulin resistance.The ovaries may develop numerous small collections of fluid (follicles) and fail to regularly release eggs.[1] As the name suggests women with PCOS may have numerous cysts in their ovaries but there are also cases reported without ovarian cysts. Stein Leventhal syndrome is the other name used clinically for this syndrome. The hormones that play a major role in PCOS includes Androgen otherwise called male hormone, but women have them, too. Women with PCOS tend to have it in higher levels. Secondly, in women with PCOS their body might not react to insulin (hormone that manages blood glucose levels) the way it should. Thirdly progesterone, women with PCOS may not have enough of this hormone in their body and so they might miss their periods for a long time or have a trouble in predicting their menstrual cycle or flow.[2] Although the exact cause of PCOS is unknown, it was observed that it may be due to defect in hypothalamic-pituitary axis, function of ovaries and secretion of insulin is considered to be the primary reason for PCOS.[3] PCOS is linked to various physiological impairments mainly of infertility, hyperandrogenism, hirsutism, diabetes mellitus, increased risk for ovarian cancers, high chances for cardiovascular disorders including many other metabolic syndromes and psychological aspects like depression, anxiety, eating disorders, panic attacks and so on.[1]

Diagnosis and treatment is not a single, short or easy

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procedure. It depends on the symptoms, medical history, laboratory investigations of hormonal and metabolic profiles, and ultrasound done to measure the uterus lining and also to check cysts, tumours if any.[2] However the treatment must cordial with the dietary and lifestyle modifications to be most effective.

A case control study with 44 controls and 80 cases was conducted on women in relationship to their lifestyle. Women who were taking either metformin or oral contraceptives, did not have a significant change in result with the change in dietary modification and workout.[4]–A study assessed the association of exercise with heat shock protein 72 expression in females with and without PCOS. It was concluded that women without PCOS had elevated levels of heat shock protein 72 with a proposition to the amount and intensity of workout, whereas for females with PCOS did not show increased expression of heat shock protein 72 despite the exercise.[5] A total of 57 women with PCOS were taken into study to check for hirsutism and it was proved that most females who had PCOS also had hirsutism, which improved after treatment although it was greatly affected by ethnicity.[6]

A survey was conducted with 47 women with PCOS to check for DM in the Diabetes Clinic of Virginia University Hospital. Out of the subjects chosen for the study, 8 menstruating women suffered from polycystic ovary syndrome (resulting in a prevalence of 26.7%) had type 2 DM.[7] In a study conducted in China to detect the prevalence with a sample size of 15924 samples, falling under the age group of 19-45 years, it was noted that the incidence was 5.6%.[8] A study was conducted to analyze the presence of metabolic syndrome in Ahmadi Hospital, Kuwait where 220 sterile women were chosen and 67 of them were diagnosed with metabolic syndrome, nearly 30.5%.[9]

A few of the reviews of the literature quoted above show that diet and lifestyle, drugs, diabetes and insulin resistance, metabolic syndrome, abnormality in hormonal profiles, malignant and fatal disorders, dermatological issues, psychosocial problems, quality of life, sleep disturbances, sexual dysfunction and several other factors are linked with PCOS and it is paramount important to resolve the issues in the early stages to stop its further progression.

Since the incidence of this problem and its risk factors has increased several fold (1/10 women of childbearing age suffer this syndrome) in recent days due to multiple reasons[10] Only a few studies have been done on this topic in UAE owing to several ethnic and cultural aspects, we felt, it would be good to take this initiative to conduct a study on this topic and assess the response of our target population.[11] Our study aimed to determine the factors affecting and symptoms associated with PCOS.

MATERIALS & METHODS

It was a hospital-based case-control study in which menstruating women above the age of 18 with PCOS were taken as cases and menstruating women above the age of 18 without PCOS were considered as controls. The sample size was calculated using the formula. The total samples collected were 63 cases and 124 controls from Thumbay clinics and hospitals in 6 months of the study period. After a thorough review of the literature, a self-administered questionnaire was prepared and it was validated by three experts of the field. Ethical consent was obtained from the IRB (Institutional Review Board) of Gulf Medical University (GMU). Then the questionnaires were distributed to the participants and the data was collected only after getting informed consent from them. Then the data was entered into EXCEL and it was transferred into SPSS (Statistical Package for Social Sciences).

Descriptive statistics was used to obtain the results. The chi-square test was used to find an association between the variables. A Logistic Regression was used to find the Odds ratio. This data would be stored in the community medicine department for 3 years. The whole study was feasible since no cost was involved.

RESULTS

Section 1: socio demographic profile

Fig 1: Marital status (cases)

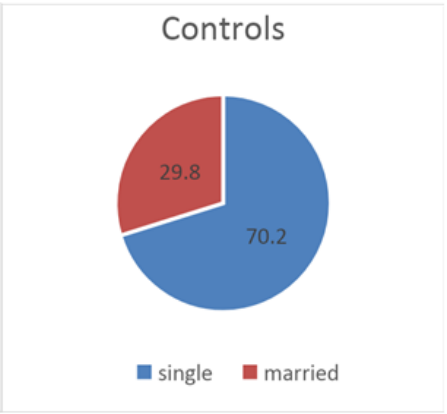

Fig.2: Marital status (controls)

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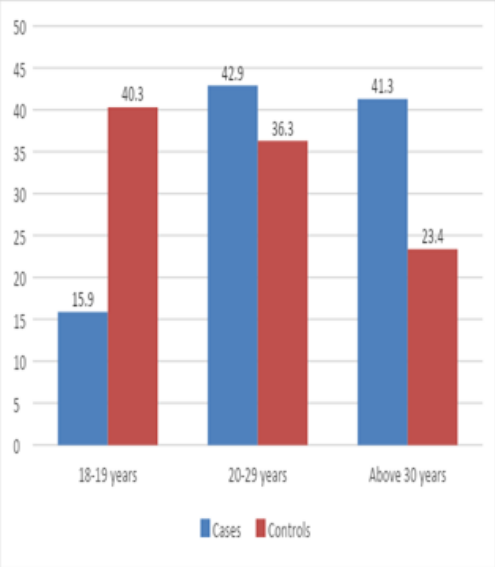

Fig.3: Age

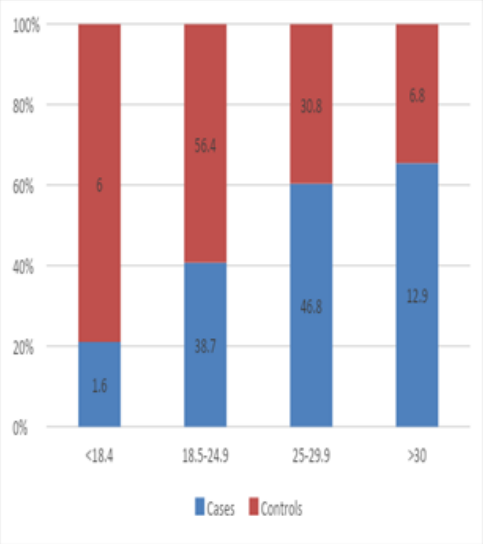

Fig.4: BMI

From the figures 1, 2, 3, 4 above, it could be seen that the diagnosis of PCOS is significantly more among married women (49.2%) compared to 29.8% of the age group 20-29 years, with a percentage of 42.9. The BMI analysis showed that 46.8% of women are obese (25-29.9 kg/m2).

Section 2: Quality of life

Table 1: Mood swings

VARIABLE	GROUP	CONTROL		CASE		TOTAL	P-value
		No.	%	No.	%		
Mood swings	No	68	54.8	23	36.5	91	<0.05
	Yes	56	45.2	40	63.5	96	

Table 2: Sleep disturbance

VARIABLE	GROUP	CONTROL		CASE		TOTAL	P-value
		No.	%	No.	%		
Sleep disturbance	No	88	76.5	37	58.7	125	<0.05
	Yes	27	23.5	26	41.3	53	

The tables 1 and 2 traces that mood swings and sleep disturbances with percentages 63.5 and 41.3, which are highly prevalent than the other significant factors (including panic attacks, depression, eating disorder, sleep duration) under the category of quality of life.

Section 3: Reproductive life

Table 3: Regular menses

Variable	Group	Control		Case		Total	P-value
		no	%	no	%		
Regular menses	No	12	9.8	31	49.2	43	<0.05
	Yes	111	90.2	32	50.8	143	

Table 4: Type of flow

VARIABLE	GROUP	CONTROL		CASE		TOTAL	P-value
		No.	%	No.	%		
Type of flow	Normal	104	88.9	43	69.4	147	<0.05
	Abnormal	13	11.1	19	30.6	32	

Tables 3,4 evidenced that 50.8% women had regular menses and others didn't while only69.4% had a normal type of flow.

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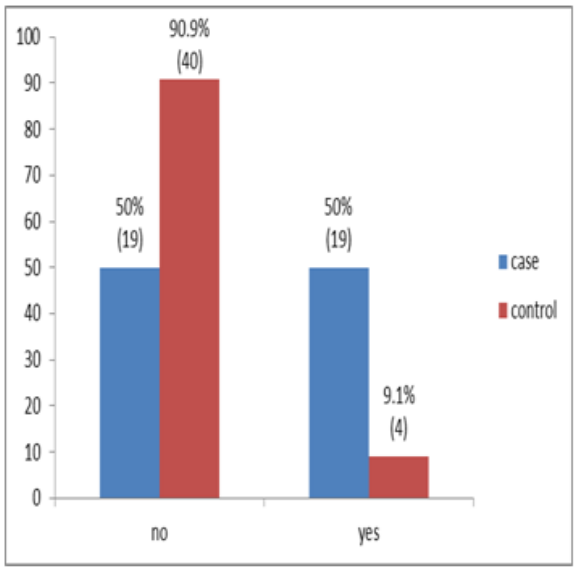

Fig.5: problem in conceiving

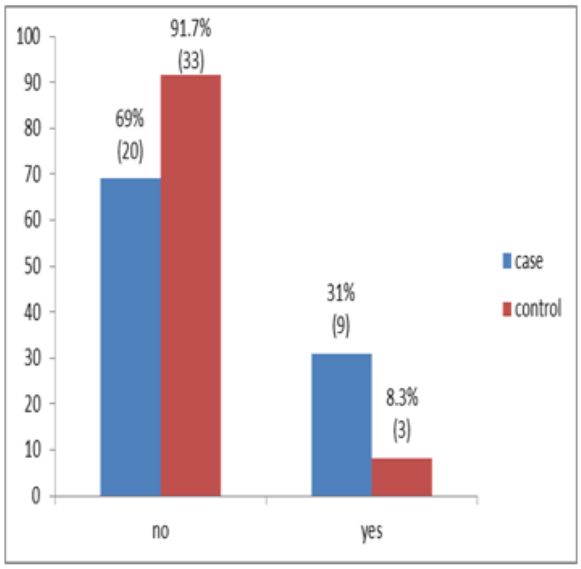

Fig.6: Gestational diabetes

Figures 5, 6 displays that 50% of cases had problems in conceiving and 31% suffered gestational diabetes.

Section 4: Medical health

Table 5: Blood sugar level

Variable	Group	Control		Case		Total	P-value
		no	%	no	%		
Blood sugar level	Normal	87	91	47	82.5	134	<0.05
	Low	6	6.3	2	3.5	8	
	High	2	2.1	8	14	10	

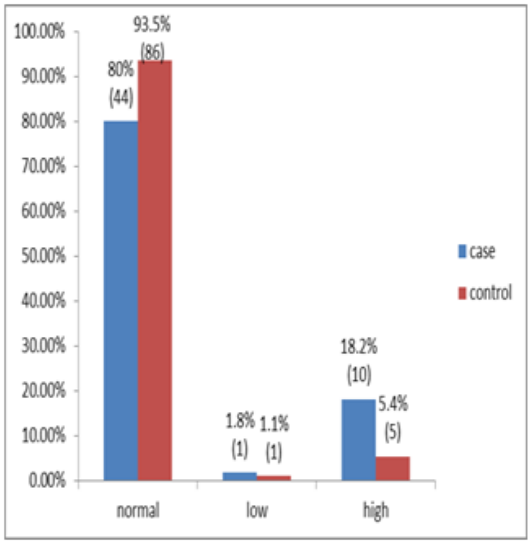

Fig.7: cholesterol level

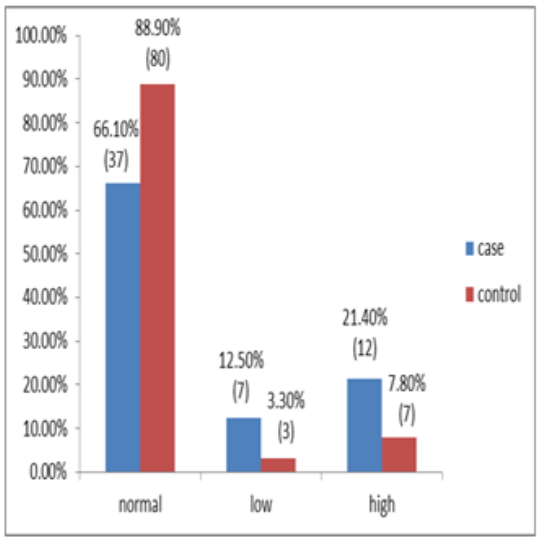

Fig.8: Thyroid hormone level

Table 5, figures 7 and 8 shows that 82.5%, 80% and 66.1% of the cases had their blood sugar, cholesterol and thyroid hormone levels under normal reference ranges respectively.

Section 5: Family history

Table 6: Family history for PCOS

Variable	Group	Control		Case		Total	P-value
		no	%	no	%		
PCOS	No	104	86.7	34	54.8	138	<0.05
	Yes	16	23.3	28	45.2	44	

This table proves that 44 women had a positive family history for PCOS and 134 women didn't.

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Section 6: Physical characteristics

Table 7: Hair loss

Variable	Group	Control		Case		Total	P-value
		no	%	no	%		
Increased Hair Loss	No	76	62.9	21	33.9	99	<0.05
	Yes	46	37.3	41	66.1	87	

According to table 7, 66.1% of the cases and 37.3 controls had excessive hair loss. Hair loss seems to be highly prevalent characteristic which makes it more significant than the other significant physical characteristics (including hair growth and its pattern, dark velvety patches) of PCOS.

DISCUSSION

When a logistic regression was done, it was seen that married people have a 2.2 times higher chance of being diagnosed with PCOS than single ones in unadjusted OR. Age was classified into three categories, keeping 18-19 years as reference, it was found that women between the age group 20-29 years has 3 times higher chance and women above 30 years had 4.4 higher chance of developing PCOS. Marital status and age were taken as the reference for adjusted OR.

According to UNICEF, 35.4% of women in South East Asia were married or in union before the age of 18 years.[12] (The number of participants in our study were mostly from South East

Asia) 5.6% of Chinese women aged 19-45 years had PCOS according to the Rotterdam diagnostic criteria.[13]

Women having panic attacks with an unadjusted OR had 4.5 times (95%, CI: 1.8-11.3) and in adjusted OR 6.2 times (95%, CI:2.2-17.1) higher risk of developing PCOS. Women having depression with an unadjusted OR had 2.5 times (95% CI: 1.2-5.0) and in adjusted had 3.7 times (95%, CI: 1.7-8.0) higher risk of developing PCOS. Women having mood swings with an unadjusted OR had 2.1 times (95%, CI:1.1-3.9) and in adjusted OR 2 times (95%, CI: 1.0-3.8) higher risk of developing PCOS. Women having sleep disturbances with an unadjusted OR had 2.2 times (95%, CI:1.1-4.4) and in adjusted had 2.3 times (95%, CI :1.1-4.6) higher risk of developing PCOS. Sleep duration was classified into three categories, keeping 7-9 hours as reference, we found that women having a sleep duration of 6 hours have 1.5 times (95%, CI: 0.7-3.2) of high risk of developing PCOS with an unadjusted OR and was found to be insignificant in adjusted OR. In unadjusted OR, women with having a sleep duration of less than 6 hours have 4 times (95%, CI: 1.7-9.5) and in adjusted 4.2 times (95%, CI: 1.7-10.6) higher risk of developing PCOS. A cross sectional study was conducted in 639 participants from ADDITION-Leicester dataset between depressed and non-depressed women. It was found that women with depressive symptoms had 28.7% higher Homeostatic Model Assessment of Insulin Resistance (p=0.026) i.e increased risk of type 2 diabetes than non-depressive women.[14]—Women reporting fewer than 6 hours of sleep were more likely to report abnormal (short or long) menstrual cycle lengths (OR = 2.1; 95% CI, 1.1 to 4.2) and increased fasting insulin levels (difference in means = 2.13; 95% CI, 0.27 to 3.99 mU/L) and higher odds of insulin resistance (OR = 2.58; CI, 1.16 to 5.76).[15]

According to an article published by PekkaPinolaThe presence of menstrual irregularities and overweight is associated with the worst metabolic risk profile, for example insulin resistance and hypercholesterolemia at a young age. Menstrual irregularities represent a good marker of hyperandrogenemia and may predict the development of PCOS.[16]

Women with irregular menstruation with an unadjusted OR had 8.9 (95%, CI: 4.1-19.4) and adjusted OR had 8.7 times (95%, CI: 3.9-19.6) higher risk of developing PCOS. Women having abnormal menstrual flow with an unadjusted OR had 3.5 times (95%, CI: 1.6-7.7) and in adjusted OR had 3.5 times (95%, CI: 1.5-8) higher risk of developing PCOS. Women having problem in conceiving in unadjusted OR had 10 times (95%, CI: 2.9-33.4) and in adjusted OR had 12.2 times (95%, CI: 3.3-44.3) higher risk of developing PCOS. Women having gestational diabetes with an unadjusted OR had 4.9 times (95%, CI: 1.1- 20.4) and in adjusted OR had 4.8 times (95%, CI: 1.1-21.1) higher risk of developing PCOS. As mentioned in the previous article, menstrual irregularities represent a good marker of hyperandrogenemia and may predict the development of PCOS.[16]—According to Medical News Today, irregular menstruation can lead to infertility issues and thereby problems in conceiving.[17]—Women with the metabolic syndrome were at high risk of GDM (RR=3.17; 95% CI: 1.06– 9.50). Among the components of the metabolic syndrome, the most significant risk factors were impaired fasting glucose (RR=4.92; 95% CI: 1.41–17.23) and pre-pregnancy obesity (RR=2.65; 95% CI: 1.23–5.70).[18]–Metabolic syndromes can cause menstrual irregularities which is a risk factor for developing PCOS.[16]

Cholesterol levels were classified into three categories, keeping normal as the reference, it was found that women having a low cholesterol level have 1.9 times (95%, CI: 0.1-31.9) of developing PCOS with an unadjusted OR and was found to be insignificant in adjusted OR. In unadjusted OR, women having high cholesterol level have 3.9 times (95%, CI: 1.2-12.1) and in adjusted 4.6 times (95%, CI: 1.3-15.8) higher risk of developing PCOS. Thyroid levels were classified into three categories, keeping normal as the reference, it was found that women having a low thyroid level have 5 times (95%,

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CI: 1.2-20.6) of developing PCOS with an unadjusted OR and 7.9 times (95%, CI: 1.4-42.6) in adjusted OR. In unadjusted OR, women having high thyroid level have 3.7 times (95%, CI: 1.3-10.1) and in adjusted 3.3 times (95%, CI: 1.1-9.4) higher risk of developing PCOS. Women having high levels of cholesterol had a high chance of having menstrual irregularities and hyperandrogenism, which in turn lead to the development of PCOS.[16] According to NeerjaPuri it was found acanthosis nigricans causes hyperandrogenism and thyroid dysfunction.[19] Hyperandrogenism is one of the criteria for diagnosis of pcos.[20] Thyroid disorders, specifically Hashimoto's Thyroiditis (HT) and PCOS are undoubtedly associated with each other, as observed from prevalence studies. However, with respect to etiology, pathogenesis, and clinical consequences, a much broader investigation is yet to be performed.[21]

Women having a positive correlation with family history of PCOS with an unadjusted OR had 5.3 times (95%, CI: 2.5-11.0) and adjusted OR had 6.4 times (95%, CI: 2.9-14.3) had a higher risk of developing PCOS. A prospective study was conducted by interview, clinical examination and biochemical evaluation for the relatives of 195 consecutive PCOS patients found that the heritability of PCOS is probably more complex, similar to that of diabetes mellitus type 2 and cardiovascular disease. In absence of molecular diagnostic markers, a positive family history appears to be the most informative risk factor for the development of PCOS.[22]

Women having excessive hair growth with an unadjusted OR had 3.7 times (95%, CI: 1.9- 7.0) and adjusted OR had 4.8 times (95%, CI:2.3-9.8) had a higher risk of developing PCOS. Women having acanthosis nigricans with an unadjusted OR had 4.7 times (95%, CI: 2.2-9.8) and adjusted OR had 6 times (95%, CI: 2.7-13.6) had a higher risk of developing PCOS. Women having receding line or hair loss with an unadjusted OR had 3.3 times (95% CI: 1.7- 6.3) and adjusted OR had 3.5 times (95%, CI: 1.7-6.8) had a higher risk of developing PCOS. Women having abnormal hair growth pattern with an unadjusted OR had 7.3 times (95% CI:3.5-15.0) and adjusted OR had 7.4 times (95% CI: 3.4-15.9) had a higher risk of developing PCOS. Hyperandrogenism, insulin resistance, high cholesterol levels can cause hirsutism and receding hairline/hair loss in women.[23] All these components that have been discussed above, can lead to the development of PCOS.[16,19] AN is most commonly associated with disorders associated with insulin resistance, including obesity, type 2 diabetes, and further lead to the development of PCOS.[18]

LIMITATIONS

The women, we were able to give out the questionnaires to, can't be taken as a true representation of the entire female population of UAE, as we only got to question the women attending Thumbay clinics and hospitals. They could be women travelling, visiting or those settled here. Also, many females were not comfortable in answering the questionnaires after they knew what the topic was about.

CONCLUSION

The results showed that women who had depression, panic attacks, mood swings, sleep disturbances, menstrual irregularities, problems in conceiving, hypercholesterolemia, gestational diabetes, thyroid issues, positive family history, abnormality in hair growth, hirsutism, acanthosis nigricans had a higher risk of developing PCOS. It was also seen that married women were more prone to PCOS.

RECOMMENDATIONS

A regular follow up with the gynaecologist and tracking the health status often for other issues is advisable. Lifestyle modification like exercising regularly, having a healthy diet and good sleep are highly recommended. Taking medications as per the doctor's advice is mandatory. Getting a suggestion from the psychologist or counsellor to cope up with mental and emotional obstacles can be helpful in managing the issue.

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