Is Prolonged Stress Causes Poly Cystic Ovarian Syndrome? A Survey from Delhi, National Capital Region

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ABSTRACT

BACKGROUND

Poly cystic ovarian syndrome (PCOS) is a common endocrine ovarian disorder found to be affecting 6-26% of female respondents globally.[1] Symptoms include hirsutism, anovulation and psychological factors like severe mood swings, depression etc. Stress, which is majorly caused by unhealthy lifestyle, especially in prolonged cases alters the metabolism of body and causes severe diseases like PCOS and decreases the efficiency of females. This study aims to evaluate as to whether stress is one of the major hidden reasons for PCOS in the females of Delhi-NCR (National Capital Region).

METHODS

120 female students had given their consent to fill an online questionnaire made on Google forms and were distributed via WhatsApp. The form consisted of 31 questions distributed over stress and symptoms of PCOS.

RESULTS

Efficiency of 54.5 % of the respondents had decreased in the absence of sound sleep as they mostly experienced 'situational stress'. Recurrence of sleeplessness had led to anger in 71 % of above respondents. It was also observed that 55 % of the respondents had a sign of early reproductive / late adolescence and they experienced irregular menstrual cycle along with facial hair, stretch marks, acne and severe hair fall.

CONCLUSIONS

57 % of the respondents had both stress and symptoms of PCOS. Modifications in their lifestyles / dietary habits could control and improve the situation. Healthy lifestyle certainly helps in the treatment but is not a complete cure for PCOS.

KEY WORDS

Stress, PCOS, Lifestyle, Psychological Analysis

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BACKGROUND

PCOS was first described in 1935 as a 'triad of amenorrhea, obesity and hirsutism' by Irvin Stein and Michael Leventhal,[2] when they detected the relation between obesity and reproductive disorders.[3] It is also called "Stein-Leventhal syndrome" or "Hyperandrogenic Anovulation" (HA)[1] as increased levels of androgen are also seen in the patients.

HA is most common endocrine ovarian disorder found to be affecting 6-26% of females manifesting an incidence rate of 9.13 %,[4,5,6,7,8,9] affecting women of age group of 15 to 44 or the 'reproductive age group'.[10]

Symptoms consist of a combination[11] of metabolic and psychological factors with metabolic derangements[8] consisting of insulin resistance,[9] compensatory hyperinsulinemia,[12] 3 times increased risk of type II diabetes mellitus,[11] which is generally found in 60 - 80 % of female with PCOS,[21] some studies even suggest that there may be an 'eight-fold' increase in risk of getting T2DM,[13] gestational diabetes,[14] chronic low grade inflammation[15] & obesity. The psychological factors being various mood swing disorders,[16] chronic stress, social fears, reduced quality of life,[17] depression[18] and sleep apnoea,[19] which is 5-10 times higher in women with obesity issues.[20] The main observable characteristics are as follows.[21]

Ovulatory Dysfunction

(Extremely Irregular Cycle) - Ovulation may or may not occur - [anovulation].[22] oligomenorrhea, infertility and dysfunctional uterine bleeding disorders,[22] and increased risk of Endometrial Cancer.[23]

Polycystic Ovaries

Seen in pelvic ultrasounds of numerous patients with PCOS [24] and hyperandrogenism (abnormal increase of androgen hormone in blood).[22]

Other Symptoms

- Acne.
- Seborrhoea.
- Hirsutism.
- Alopecia.
- Frank virilisation.[24]

Often called most common cause of an ovulatory infertility in women,[22,25] not a perfect causal factor known, but there are evidence proving that both environmental as well as genetic factors, play a role in its aetiology,[26] however obesity and stress does exacerbate many aspects of phenotype, especially cardiovascular risk factors such as glucose intolerance and dyslipidemia. Whereas, it also has been observed from various patients that symptoms of depression and chronic stress, account for risk factors for cardiovascular morbidity and mortality as well as for T2DM, particularly in the presence of other risk factors and/or pre-existing morbidity.[27]

Till date, the treatment of PCOS is done on the basis of symptoms only.[28] Nowadays, with increasing number of cases, symptomatic treatment alone has not emerged as efficient method and doctors have started taking the line of treatment, which consists of advising patients with a change in 'lifestyle'. These changes may include, making dietary regulations and devoting some time to exercise as well so as to reduce weight. Various studies have also revealed that reducing even 8-10 % of the body weight can aid in regulating a patient's menstrual cycle and enhance symptoms of PCOS.[29]

Studies have shown that 30 minutes of moderate intensity exercise at least 3 days/week can help women with PCOS lose weight. Losing weight by exercising also improves ovulation and insulin levels.[30] Exercises prove to be even more beneficial when combined with a healthy diet. Diet, with some routine based exercises help a female to lose more weight and it lowers risks for diabetes and heart diseases as well.

Studies comparing diets for PCOS have found that low carb diets[31] are effective for both weight loss and lowering insulin levels. A low glycemic index diet that gets most carbs from fruits, vegetables and whole grains helps regulate the menstrual cycle better than a regular weight loss diet.

Medication

Doctors worldwide seem to favour 2 main medicines,[32] as for the treatment of PCOS.

Birth Control Pills

Birth Control Pills and other red medicines can help regulate menstrual cycle and treat PCOS symptoms like hair growth and acne, caused as an effect of hyperandrogenism.

Metformin (Glucophage, Fortamet)

It is a drug used to treat type 2 diabetes mellitus. It also aids in treating PCOS by lowering insulin levels.

One such study on PCOS found that having metformin, while making certain changes in diet and exercise, seems to improve weight loss, lowers blood sugar and restores a normal menstrual cycle, better than changes to diet and exercise alone.[33]

Under normal conditions, the pituitary gland secretes FSH and LH every month, required for the normal process of menstruating. These hormones on reaching ovaries, start maturing eggs, expanding follicle size and secreting oestrogen. During PCOS, the secretion of LH seems to increase due to decrease in GnRH and LH inhibitory neurotransmitters namely Serotonin, Dopamine, GABA and Acetylcholine, and certain increase in major stimulatory hormone called Glutamate.

Research also shows an increase in GnRH and LH activity in PCOS condition, which is likely the result of constant effect of altered LH stimulatory and inhibitory neurotransmitters in hypothalamic–pituitary centre. Thus, it is assumed that this can be the reason, responsible for depression, stress and anxiety-like mood disorders which are commonly encountered with women having PCOS.

During any kind of stress, amygdala recognises the threat, sends message to hypothalamus which releases Corticotropin-Releasing Hormone (CRH) which then signals pituitary gland to release Adreno Cortico Tropic Hormone (ACTH), which further stimulates adrenal glands to produce cortisol. Thus,

forming the Hypothalamus-Pituitary-Adrenocortical (HPA) axis.[34]

If the above phenomena occur for a very long duration, the cortisol starts affecting other systems like suppressing the immune system, increase blood sugar levels causing hyper glycemia, (in response to which, insulin is secreted from pancreas) produces acne and contributes to obesity etc.

Stress → Cortisol → Blood Sugar Increased → Insulin

In PCOS,
Abnormal amount of LH+ Insulin→ Hyperandrogenism[35]

As a combination of above two responses, androgen is produced which, due to abnormal mechanisms of the body, cannot be changed into oestrogen. Therefore, it can be stated that-'The symptoms that occur under PCOS are half of hyperandrogenism[36] and the other half of hypercortisolism.[37]

High Androgenic	High Cortisol
Irregular menstrual cycle	Acne
Too much hair on face (hirsutism)	Weight gain
Thinning hair	
Darkening of skin (A. nigricans)	
Skin tags	

Table 1. Symptoms in High Androgenic and High Cortisol States

PCOS is a life-long disease which currently, seems that can never be cured but the only way to manage this unpleasant and distressing disease, is to continue the medications for the rest of patients' life. But, if the medication is not taken properly or if it is misdiagnosed or dealt with a negligent attitude, it may cause some serious diseases, namely, endometrial cancer, diabetes type II,[18] heart disease,[18] sleep disorders,[19] mood-anxiety disorders,[16] depression[18] and, the most common, infertility.[22]

METHODS

The study, in the form of survey, was conducted after taking approval from institutional head. A cross-sectional survey of female respondents in the age group of 15 to 25 years was carried out in 'Manav Rachna Educational Institute (MREI), Faridabad', a university of Delhi / NCR to corroborate the reasons for PCOS caused due to prolonged stress. A questionnaire was prepared and tested on peer group female students to carry out a pilot study and validate the questions.

The study was conducted during the Covid-19 pandemic period, during which it was decided to circulate the questionnaire through online WhatsApp / social media. A total number of 120 females were approached with their consent. All of them were provided with brief introduction about the survey. The confidentiality of the person's identity was maintained. Incomplete responses were excluded from data capturing and data analysis thus the effective respondents for the study were 100 female students. A self-constructed, close ended questionnaire of 31 questions was prepared on Google forms and circulated via WhatsApp and Gmail to all the female respondents which consisted of 3 parts – a) General information on profile and lifestyle habits b) Stress related issues and 3) PCOS symptoms.

Statistical Analysis

Statistical analysis was done using frequency distribution of responses by using Statistical Package for Social Science Software (SPSS). Stress reported by the respondents was analysed by the online stress assessment tool 'Stress Coping Resources Inventory'.

RESULTS

A total of 120 respondents had participated in survey, which consisted of female respondents in the age group of 15 to 25 years. Group was further divided as 'adolescents' in the age of 15 - 20 years and 'Reproductive' in the age group of 21 - 25 years. Out of 120 participants, 100 respondents responded by filling the form completely, hence, 100 respondents were included in inclusion criteria. Out of the 100 participants, 34 % were 15 to 20 years age group and 66 % were 21 - 25 years age group. P value < 0.05 was taken significant.

Among the respondents, 52.95 % in adolescents and 39.41 % in reproductive age group were of science stream. Among these students, 29.42 % in adolescents and 36.37 % in reproductive age group had opted for medical. In the remaining respondents, 11.77 % in adolescents and 34.85 % in reproductive age group were from commerce, 8.83 % in adolescents and 12.13 % in reproductive age group were from humanities and balance 26.48 % in the adolescents and 13.64 % in reproductive age group were from other courses.

8.83 % respondents in adolescents and 12.13 % in reproductive age group had more than 8 hrs. of study in the college while the rest- 23.53 % in adolescents and 53.04 % in reproductive age group, had less than 8 hrs. of study in college. 52.95 % in adolescents and 27.78 % in the reproductive age group had a sleep of less than 8 hours and 47.07 % in adolescents and 72.72 % in reproductive age group had sufficient sleep of 8 hours or more.

Survey had shown that the stress was also one of the major factors affecting young generation among students and had affected significantly lives of 47 % of the adolescents and 24.24 % reproductive age group population.

Survey also showed the type of stress faced by these students. 76.47 % in the adolescents and 48.49 % in reproductive age group mentioned that the type of stress as causal situational stress, which resulted due to emergencies or certain situations creating burden. 11.76 % of adolescents and 22.73 % reproductive age group population mentioned that the cause for stress was time (time stress) and were affected due to deadlines or from schedule. 5.88 % of adolescents and 21.22 % of reproductive age group had confessed that they were having 'other reasons' for stress.

44.11 % of adolescents and 72.73 % of reproductive age group population notice increase in anger commonly while 32.35 % of adolescents and 7.58 % of reproductive age group crowd stated that anger increased only on some occasions or otherwise remained clam, while 23.52 % of adolescents and 19.7 % of reproductive age group people said that they haven't experienced any such increase.

8.83 % in adolescents and 25.15 % in reproductive age group population responded that physical activity in the form of exercise on daily routine basis was dependent upon time availability as they were busy in their study, work schedules

and day to day activity. 52.95 % in adolescents and 63.63 % in reproductive age group of the students responded in negation. Though 38.24 % in adolescents and 10.6 % in reproductive age group population agreed to have exercise as part of their routine.

Sl. No.	Question	Responses	Age Group 15 - 20* yrs	Age Group 21 - 25^ yrs	χ^2	P Value
1	Age group		34 %	66 %		
2	Stream	Science (med) Science (non med) Commerce Humanities others	10 (29.42 %) 8 (23.53 %) 4 (11.77 %) 3 (8.83 %) 9 (26.48 %)	24 (36.37 %) 2 (3.04 %) 23 (34.85 %) 8 (12.13 %) 9 (13.64 %)	16.4	0.002
3	Average Hours of study	Less than 8 More than 8	8 (23.53 %) 36 (8.83 %)	35 (53.04 %) 31 (46.97 %)	7.96	0.004
4	Average Hours of sleep	Less than 8 hrs 8 - 10 hrs More than 8 hrs	18 (52.95 %) 14 (41.18 %) 02 (5.89 %)	18 (27.28 %) 17 (25.76 %) 31 (46.96 %)	17.3	0.0001
5	Involvement in Physical activity	Yes No Occassional	13 (38.24 %) 18 (52.95 %) 03 (8.83 %)	07 (10.6 %) 42 (63.63 %) 17 (25.15 %)	12.21	0.002
6	Consumption of Balanced diet	Yes No Occassional Not possible (circumstaintial)	2 (5.89 %) 15 (44.12 %) 3 (8.83 %) 13 (38.24 %)	13 (19.69 %) 41 (62.12 %) 4 (6.06 %) 8 (12.12 %)	11.7	0.008
7	Consumption of Junk Food	Never Occassionally Regularly	9 (26.48 %) 7 (20.59 %) 18 (52.95 %)	4 (6.06 %) 41 (62.12 %) 21 (31.82 %)	17.8	0.0001

Table 2. General Information on Profile and Lifestyle Habits

*adolescents' population ^reproductive population

Sl. No.	Question	Responses	Age Group 15 - 20 yrs	Age Group 21 - 25 yrs	χ^2	P Value
1	Is stress effecting life?	Yes No Occassionally Don't know	16 (47 %) 4 (11.7 %) 7 (20.5 %) 6 (17.6 %)	16 (24.24 %) 28 (42.42 %) 8 (12.13 %) 14 (21.22 %)	11.55	0.009
2	Reasons for stress	Time mgmt Situational Others	4 (11.76 %) 26 (76.47 %) 4 (11.76 %)	15 (22.73 %) 32 (48.49 %) 19 (28.8 %)	7.83	0.04
3	Observation of increase in Anger	Yes No Little bit	15 (44.11 %) 8 (23.52 %) 11 (32.35 %)	48 (72.73 %) 13 (19.7 %) 5 (7.58 %)	11.6	0.002

Table 3. Stress Related Issues

44.12 % in adolescents and 62.12 % in reproductive age group, believed in taking balanced diet and followed as far as possible. 26.48 % in adolescents and 6.06 % in reproductive age group, consumed junk food occasionally whilst, 52.95 % in adolescents and 31.82 % in reproductive age group population responded that by stating that it was not possible to exclude from their routine.

None of the participants went through a blood test recently to check the level of hormones (LH- Luteinizing hormone and FSH- Follicular-stimulating hormone). 70.58 % of people in adolescents and 48.49 % of people in reproductive age group population, attained menarche by 15 years or below and 52.94 % in adolescents and 21.22 % in reproductive age group population in respondents faced irregular periods during their menstrual cycles right from the beginning. The survey results also showed that 29.41 % in adolescents and 59.1 % in reproductive age group population, had their cycle lasting for more than a week. 32.35 % in adolescents and 56.07 % in reproductive age group respondents experienced light flow, 8.82 % in adolescents and 56.07 % in reproductive age group population followed very light or scanty flow and a few experienced a very heavy flow i.e., 20.58 % in adolescents and 7.58 % in reproductive age group population. Since lower abdominal pains are common during menstruation, 47 % in adolescents and 71.22 % in reproductive age group population encountered pain in pelvic region during their periods and 32.35 % in adolescents and 51.52 % in reproductive age group population had the pain throughout their bleeding phase.

Sl. No.	Question	Responses	Age Group 15 - 20 yrs	Age Group 21 - 25 yrs	χ^2	P Value
1	Menarche	< 15 yrs 16 - 18 > 19 yrs	24 (70.58 %) 6 (17.64 %) 4 (11.76 %)	32 (48.49 %) 8 (12.13 %) 26 (39.4 %)	8.15	0.01
2	Menstrual Cycle	Regular Irregular (since begi.) Irregular (from past few yrs)	8 (23.52 %) 18 (52.94 %) 8 (23.52 %)	42 (63.64 %) 14 (21.22 %) 10 (15.16 %)	14.4	0.0007
3	Length of cycle	3 days 3 - 5days > 1 week	15 (44.11 %) 8 (23.52 %) 10 (29.41 %)	14 (21.2 %) 13 (19.7 %) 39 (59.1 %)	8.3	0.01
4	Type of periods	Heavy Very heavy Light Very light	13 (38.2 %) 07 (20.58 %) 11 (32.35 %) 03 (8.82 %)	14 (21.22 %) 5 (7.58 %) 20 (3.3 %) 37 (56.07 %)	8.31	0.03
5	Abdominal pain during periods	Yes No Sometimes	16 (47.0 %) 6 (17.64 %) 12 (35.29 %)	47 (71.22 %) 2 (3.04 %) 17 (25.76 %)	7.20	0.02
6	When does the pain start, if observed?	By onset By end In between All the time Only at beginning or end	6 (17.64 %) 7 (20.58 %) 2 (5.88 %) 11 (32.35 %) 8 (23.52 %)	3 (4.55 %) 6 (9.1 %) 11 (16.67 %) 34(51.52 %) 12 (18.2 %)	10.7	0.02
7	Does it radiate to posterior part of limbs?	Yes No Maybe	19 (55.89 %) 4 (11.77 %) 11 (32.36 %)	14 (21.22 %) 8 (12.13 %) 14 (21.22 %)	12.9	0.001
8	Do u need any painkillers?	Yes No Sometimes	15 (44.11 %) 6 (17.65 %) 13 (32.24 %)	25 (37.88 %) 03 (12.13 %) 38 (57.58 %)	6.14	0.04
9	Does ever period occurs twice a month?	Yes No Initially Since begin.	14 (41.18 %) 03 (8.83 %) 05 (14.7 %) 12 (35.3 %)	10 (15.16 %) 14 (21.22 %) 10 (15.16 %) 32 (48.49 %)	9.24	0.02
10	Presence of Facial hair	Yes No	24 (70.59 %) 10 (29.42 %)	31 (46.97 %) 35 (53.04 %)	5.05	0.02
11	Presence of Acne	Yes No Sometimes	28 (82.36 %) 04 (11.77 %) 02 (5.89 %)	39 (59.1 %) 19 (28.79 %) 08 (12.13 %)	5.51	0.06
12	Presence of Stretch marks	Yes No Maybe	12 (35.3 %) 15 (44.12 %) 07 (20.59 %)	40 (60.7 %) 15 (22.73 %) 11 (16.17 %)	6.37	0.04
13	Is Skin darkening around neck?	Yes No	28 (82.35 %) 10 (29.42 %)	59(89.4 %) 07(10.7 %)	4.35	0.03
14	Any other psycological effected during periods.	Depression Mood swings	14 (41.18 %) 20 (58.8 %)	47 (71.22 %) 19 (28.79 %)	8.50	0.003

Table 4. Menstrual Cycle and P.C.O.S. Related Issues

55.89 % in adolescents and 21.22 % in reproductive age group population respondents mentioned that they had experienced pain radiating to the posterior part of lower limbs. 62.4 % of the respondents felt that the confronted pain was severe and there was a need of taking painkiller. 44 % respondents had been experiencing periods twice a month for couple of months.

29.42 % in adolescents and 53.04 % in reproductive age group population respondents answered that they did not experience any increased or abnormal facial hair growth whilst 70.59 % in adolescents and 46.97 % in reproductive age

group population of them experienced such a growth in facial hair.

82.36 % in adolescents and 59.1 % in reproductive age group responded in affirmation about having history of acne. 35.3 % in adolescents and 60.7 % in reproductive age group respondents noticed stretch marks on their bodies, especially near the areas of neck or stomach. 82.35 % adolescents and 89.4 % in reproductive age group population responded by stating that they encountered skin darkening near their neck region.

Almost in all adolescents and reproductive age group faced depression and severe mood swings.

DISCUSSION

Along with increased workload and less hours of sleep, the human efficiency is reduced, and brain starts losing its attentiveness and sharpness. The situation is called the 'situational stress'. In the survey, 76.47 % in adolescents and 7.58 % in reproductive age group population of respondents showed the situational stress, which is a cause of concern. With inefficiency leaping and ability to complete targets on time diminishing, a person is bound to develop "anger issues". In the present survey too, 44.11 % in adolescents and 72.73 % in reproductive age group population of total respondents experienced the same phenomenon. As proved by various post research too, stress mainly triggers the HPA axis and thus causes an abnormal release of hormone LH, which triggers the problems like hyperandrogenism. When in an abnormal amount it causes anovulation as ovaries fail to produce matured ovum. Due to some underlying unknown factors, the ovaries may produce ovum, maybe after a long time of stoppage or maybe twice a month. Now, the periods which are occurring may be normal or maybe very light or very heavy.

As seen in Table 4, 52.94 % in adolescents and 21.22 % in reproductive age group population of the respondents had stated for having an irregular cycle since menarche, 8.82 % in adolescents and 56.07 % in reproductive age group population had mentioned for having very light periods and 20.58 % in adolescents and 7.58 % in reproductive age group population had very heavy menses. 41.18 % in adolescents and 15.16 % in reproductive age group population even mentioned that they had periods twice a month.

As LH level is increased abnormally and also as one of its main features is to convert into oestrogen with insulin, which is now, not being fulfilled because of hyperandrogenism, body shows some symptoms such as facial hair (or hirsutism), acne, stretch marks, skin darkening (acanthosis nigricans, mostly near armpits or neck).

In our survey, 70.59 % in adolescents and 46.97 % in reproductive age group population respondents responded 'Yes' facial hair, 82.36 % in adolescents and 59.1 % in reproductive age group population had stated that had acne. 35.3 % in adolescents and 60.7 % in reproductive age group population respondents by stating that they had developed stretch marks and 82.35 % in adolescents and 89.4 % in reproductive age group population confirmed, that they experienced abnormal skin darkening.

Normally during situation of panic or stress, the brain stimulates adrenal glands to release hormone cortisol, which regulates the body fluids, BP and blood sugar levels. An increased cortisol secretion level increases the blood glucose level. In prolonged stress, the normal amount of insulin is released, which falls short to cope up with the increased blood glucose. Thus, patients of PCOS often complain of diabetes mellites type 2.

During our survey, it was found that many females were unable to figure out the reasons for developing various symptoms that were occurring to them and the remedial action for the same. Through the survey, a brief introduction on PCOS was given which made the doubts in the mind of certain respondents clear.

The limitation of the study was that the sample size was restricted to a small number mainly due to restrictions prevailing in Covid pandemic period. The study could have been made on large scale in the normal circumstances to bring in sharper results.

On analysing data received from our respondents, it can be stated that along with all the other factors, stress is a major (or catalytic) factor for causing PCOS and that PCOS can be treated very effectively without use of medicines by simply prescribing amendments or changes in person's lifestyle. a daily routine of yoga, meditation/exercise etc. Effects of various exercises can be described on regulating the effect of PCOS as under -

Yoga or Meditation – May calm stressed mind

Exercise – May reduce weight

Regulating diet – Will prevent the person from having more of fats, guiding towards more natural foods, having all the items of more nutritional value.

CONCLUSIONS

Aetiology of PCOS is yet to be completely understood. Modifications in lifestyles / dietary habits could control and improve the situation. Healthy lifestyle certainly helps in the treatment but is not a complete cure for PCOS.

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