

# Estimation of Psychological, Physical and Hormonal Bio-indicators of stress in PCOD Victims in Bilaspur District

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## Abstract

Polycystic ovarian syndrome (PCOS) is the most common endocrine disorder in women of reproductive age worldwide. The prevalence ranges from 5% to 15%, depending on the diagnostic criteria. It is generally accepted in speciality society guidelines that the diagnosis of PCOS should be based on the presence of at least two of the following three criteria: chronic non-ovulation, hyperandrogenism (clinical or biological), and polycystic ovaries. It is a diagnosis of exclusion and disorders mimicking the clinical features of PCOS should be excluded. These include thyroid disease, hyper-prolactinemia, and non-classical congenital adrenal hyperplasia.

## Key Facts about PCOD-

- Polycystic ovary syndrome (PCOS) affects an estimated 8–13% of reproductive-aged women worldwide.
- Up to 70% of affected women remain undiagnosed worldwide.
- PCOS is the most common cause of an-ovulation and a leading cause of infertility.
- PCOS is associated with a variety of long-term health problems that affect physical and emotional well-being.
- PCOS runs in families, but there are ethnic variations in how PCOS manifests itself and how it affects people.

Polycystic ovarian syndrome (PCOS) is the most common endocrine disorder in women of reproductive age worldwide. The prevalence ranges from 5% to 15%, depending on the diagnostic criteria. It is generally accepted in speciality society guidelines that the diagnosis of PCOS should be based on the presence of at least two of the following three criteria: chronic non-ovulation, hyperandrogenism (clinical or biological), and polycystic ovaries. It is a diagnosis of exclusion and disorders mimicking the clinical features of PCOS should be excluded. These include thyroid disease, hyper-prolactinemia, and non-classical congenital adrenal hyperplasia. If clinical features suggest other causes, selected patients may require more extensive investigation. Despite its high prevalence, PCOS is underdiagnosed and usually requires multiple visits or visits to different doctors, over a period of more than a year. It is a very frustrating process for the patient. A delay in diagnosis may increase co-morbidity, making it more difficult to implement lifestyle interventions, which are important to improve the characteristics and quality of life of PCOS. Many, including infertility, metabolic syndrome, obesity, impaired glucose tolerance, type 2 diabetes, cardiovascular risk, depression, obstructive sleep apnea (OSA), endometrial

cancer and non-alcoholic fatty liver disease/alcoholic fatty liver disease/non-alcoholic syndrome. Diseases associated with PCOS. Hepatitis (NAFLD/NASH). There are different screening recommendations for each of these disorders, but PCOS patients should have a lower threshold for screening if they have some symptoms. Polycystic ovary syndrome (PCOS) is a common hormonal condition that affects women of reproductive age. It usually starts in adolescence, but symptoms can change over time. PCOS can cause hormonal imbalances, irregular periods, excess androgen levels, and ovarian cysts. Irregular periods, usually accompanied by a lack of ovulation, can make it difficult to conceive. PCOS is a leading cause of infertility. PCOS is a chronic condition and cannot be cured. However, some symptoms can be improved with lifestyle changes, medications, and fertility treatments.

**METHODOLOGY-** Meta Analysis was done with following estimations-

**Physical Examination**-All physical examinations were done for the physical symptoms of stress and PCOD.

**Psychological Testing** – The stress level was first assessed by Eight mental State Questionnaire (8 SQ Scale) developed by (Curran & Cattell, 1976)

- Hamilton Psychological test (HAM-A) was also used, along with SIS-MAP and SIDAS tests.
- We applied all the tests and the results were analyzed to observe for the existence of a correlation in results of all the tests.
- The subjects who scored high score for levels of stress and anxiety in the applied psychological tests were picked as study subjects.
- A secondary goal was set to address possible effects of various corrective measures on stress responses, and therefore PCOD patients received treatments were also compared to their previous parameters before treatments.
- **Statistical Analysis-** The statistical analyses was performed using SPSS 21.0 for Windows 10. All variables were presented as mean  $\pm$  standard deviation (SD). Categorical variables were presented as the raw number and percentage (%). To compare total cholesterol, LDL-c, HDL-c and triglycerides, we used to the analysis of covariance (r) and the student *t* test. The analysis for biological variables was used to find cutoff points, sensitivity, specificity, and positive and negative predictive values. The Pearson's correlation coefficients were calculated to evaluate the correlations between biological and clinical variables. Differences were considered as significant if the *p* value was  $<0.05$ .

**Inclusion criteria-**

1. Women aged between 18 - 48 years and plus.
2. Diagnosis of PCOD according to the modified Rotterdam criteria.
3. At least 2 years after menarche.
4. BMI  $\geq 23$  kg/m<sup>2</sup>.
5. Presence of Insulin Resistance that was not previously identified.
6. With no desire for children within 9 months.

PCOD was defined by the modified Rotterdam criteria: oligomenorrhea or amenorrhea, together with the presence of  $\geq 12$  antral follicles ( $\leq 9$  mm) and/or ovarian volume  $>10$  mL on trans-vaginal scanning, and/or clinical/biochemical hyper-androgenism. Oligomenorrhea was defined as an inter-menstrual interval  $>35$  days and  $<8$  menstrual bleedings in the past year. Amenorrhea was defined as an inter-menstrual interval  $>90$  days.

**Exclusion criteria-**

1. Administration of other medications known to affect reproductive function or metabolism within the past 3 months, including oral contraceptives, gonadotropin-releasing hormone agonists and antagonists, anti-androgens, gonadotropins, anti-obesity drugs, Chinese herbal medicines, anti-diabetic drugs such as Metformin and thiazolidinediones, somatostatin, diazoxide and calcium channel blockers.
2. Patients with other endocrine disorders including 21-hydroxylase deficiency, hyper-prolactinemia due to another cause, uncorrected thyroid disease, suspected Cushing’s syndrome.
3. Patients with known severe organ dysfunction or severe mental illness like Schizophrenia.

**Observation, Results and Discussion-**

**Table-1 Types of PCOD in Studied Subjects**

Age range	Cases		Type OF PCOD
13-22	14	14/14	2 ( Insulin Resistant)
23-27	10	6/4	Inflammatory, IR
28-32	10	5/5	Inflammatory , Post Pill
33-38	15	6/10	Adrenal Type, Post Pill
39-43	10	10/10	2 ( Insulin Resistant)
44-48	13	6/7	Inflammatory and IR
49 +		2	Adrenal Type

**Discussion**

- The subjects showed different possible types of PCOD as reported by gynecologists.
- Maximum subjects showed Insulin Resistance type (35/75), where as Adrenal type was not common ( 8/75), Inflammatory type was seen in 17/75 cases , Post Pill was seen only in 15/75 cases.
- Many previous researches already showed the PCOD raises the risk of type 2 diabetes mellitus. Diseased women displayed resistance to insulin, independent of fat percent. PCOD was assumed to occur from functional ovarian hyper-androgenism (FOH) generated by insufficient production of androgen. PCOD uplifts major complications like diabetes mellitus in females. The etio-pathological link between PCOD and Insulin Resistance was proved by the work of Anjali Agrawal, Apoorva Dave and Arpita Jaiswal in 2023.
- A rise in glucose levels might stimulate oxidative stress and as a result of oxidative stress a troubling reaction started from mononuclear cells (MNC) of females with PCOD, which normally did not depend on body fat, because MNC-derived macrophages were the major source of cytokine synthesis in big adipose tissue and similarly encourage adipocyte cytokine production. The present study also revealed the substantial risks of insulin resistance in studied obese subjects. The findings of this specific factor indicated that individuals with the conventional PCOD had obesity and higher insulin levels due to insulin resistance. These data showed that insulin resistance was the most significant patho-physiological trait in people with PCOD. The findings matched with the work done by Ananya Purwar and Shailesh Nagpure in 2022. Higher level of Serum c-peptide, bio indicator of Insulin, had confirmed the presence of Insulin resistance in subjects in this study.
- Some previous studies stated that chronic low-grade inflammation had emerged as a key contributor to the pathogenesis of Polycystic Ovary Disease (PCOD). A dietary trigger such as glucose was

capable of inciting oxidative stress and an inflammatory response from mononuclear cells (MNC) of women with PCOD, and this phenomenon was independent of obesity. Even low grade inflammation triggered increased production of Androgen along with oligo-ovulation or an-ovulation by Theca cells in the ovary, this in turn drive the development of PCOD.( Chelsea W Fox, 2019) Some researchers also evaluated the effects of two well-characterized pro-inflammatory agents: lipopolysaccharide (LPS) and IL-1 $\beta$  in PCOD cases. These had chosen because they were frequently used to induce low-grade systemic inflammatory responses both *in vitro* and *in vivo* experimental model systems. LPS was a key pathogenic component of the cell wall of gram-negative bacteria. It also induces inflammation primarily via activation of macrophages and intracellular pathways in other cells, leading to the production of pro-inflammatory cytokines. LPS activates cells by binding to Toll-like receptor 4 (TLR4). This leads to a plethora of responses, including up-regulation of the inflammasomes and activation of pathways related with inflammation, with consequent effects on cellular proliferation and apoptosis. Inflammasomes are multi-protein complexes, belonging to the innate immune system, responsible for the activation of inflammatory responses via proteolytic processing of pro-inflammatory cytokines such as IL-1 $\beta$ . IL-1 $\beta$  was first synthesized as an inactive precursor protein, pro-IL-1 $\beta$ , and cleaved by caspase-1 into active IL-1 $\beta$  as a result of inflammasomes activation. The ovarian IL-1 $\beta$  system plays a major role in ovulatory processes; thus, imbalance of these inflammatory mediators might disrupt this tightly regulated process contributing to ovulatory disruption and anovulation (Chelsea W Fox, Lingzhi Zhang, 2019).

- To assess the presence of inflammation based on above cited study, the C-reactive protein (CRP) level of subjects and controls was estimated. A significant high level of CRP (C-reactive protein) was observed in subject's serum as inflammatory biomarker. This observation was in accordance with the above cited study.
- Also, some previous researchers found that low doses of LPS and IL-1 $\beta$  elicited increased expression of androgen biosynthesis genes in theca-interstitial cells (TICs) with increased androgen production in them. These pro-inflammatory agents also had surprisingly widespread effects on gene expression in TICs, which included not only androgen biosynthesis pathways but also many other biochemical pathways, as revealed by RNA sequencing (RNAseq) analysis. LPS and IL-1 $\beta$  regulated hundreds of the same genes but also regulated distinct sets of genes, consistent with their known overlapping, but distinctive functions. ( Fox CW, Stanhiser J, Quass AM 2020)
- Adrenal PCOD occurs when any subject has abnormal stress response. Typically, when someone is under chronic stress, DHEA-S (a type of androgen created by the adrenal glands) becomes elevated. Higher level of cortisol proves the presence of this type of PCOD.
- Some people experience PCOD symptoms after stopping hormonal birth control. The informal name for this is post-pill PCOS. These symptoms are typically temporary and resolve without medical intervention. Polycystic ovarian syndrome (PCOS) was a common disorder that affects around 10% of the PCOD cases. It can cause hormonal disequilibrium, that leads to a variety of symptoms. "The pill" was a broad term referring to oral contraceptive medications that help to prevent pregnancy. There are many types of pills containing different combinations of hormonal ingredients.
- The medical history of Post Pill PCOD cases recorded after discontinuation of birth control pills by the victims. 17 studied subjects had such medical history.

**Table-2 Estimation of Level of Stress (Subjects)**

**n=75**

Age range	Subjects	SQ Scale of Quran & Cattle	HAMILTON (HAM-A)	SIS-MAP	SIDAS
18-22	7	6	19	27	28
23-27	10	4	17	28	41
28-32	10	6	19	25	36
33-38	6	5	18	24	30
39-43	10	4	16	23	40
44-48	8	5	17	28	34
49+	4	6	19	26	37
Average Age 24 Years	Total 75 subjects		18	26	35

### Discussion

- It was a randomized case-control longitudinal study.
- We have had selected total 75 subjects, and divided them in 7 age groups, with the age difference of 5 years in each age group.
- 7 subjects were contacted via State Mental Hospital, Sendri, Bilaspur, all were outdoor patients.
- 42 subjects were contacted via contacting various clinics dealing with psychological problems, during the study period.
- 26 subjects were randomly selected from the society, including 11 subjects from the Govt Bilasa Girl’s College, as they contacted in counsellingcentre of the college.
- The subjects were selected on the basis of stress and anxiety level primarily; their level of depression and their total mood profile was also assessed by using various psychological tests.
- Thus, after taking written consent from the subjects, the tests used to assess their level of anxiety and depression was 8 SQ Scale of Quran & Cattle, Hamilton Test, SIS-MAP test and SIDAS test.
- The average score obtained by subjects were - 8 SQ SCALE of Quran & Cattle was 5, showing high to moderate level of Major deep depression, stress and Anxiety.
- The average score by using HAMILTON (HAM-A) was 18, showing moderate to high level of anxiety.
- The scores by SIS-MAP test was 26 on average, showing moderately high level of depression, with suicidal tendency with mental stress.
- We also scaled the subjects on the basis of Suicidal Ideation Attributes scale (SIDAS) , the test included stress, anxiety, depression, insomnia , schizophrenia or non-affective psychosis with suicidal tendency .
- The average score by SIDAS was 35, showing high to moderate level of suicidal tendency with stress and depression.
- The level of correlation between these various psychological tests was estimated, to assess whether the results of these tests were in same trend or not.
- The level of correlation ( r ) between 8 SQ scale of Quran & Cattle and HAM-A was **0.936** , while the level of correlation between HAM-A and SIS-MAP was **0.430** and between SIS-MAP and

SIDAS was **0.918**, as all these tests showed same trend of results with significant level of correlation between them, thus after conformation of presence of mental stress in subject group , they were included in the study.

**Table-3 Estimation of Level of Stress (On Healthy Controls)**  
n = 75

Age range	Controls	SQ SCALE (Quran & Cattle)	HAMILTON (HAM-A)	SIS-MAP	SIDAS
18-22	4	3	7	13	1
23-27	0	3	6	11	0
28-32	0	4	10	15	1
33-38	5	3	8	12	4
39-43	0	3	6	13	0
44-48	3	3	7	10	4
49+		4	10	12	0
Average age ± years	Total 75 Controls			<b>12</b>	<b>21</b>

**Discussion-**

- The healthy controls were 75 in count.
- They were also divided in seven age groups, with age difference of 5 years .
- They were selected randomly from the society, 15 students from Govt Bilasa Girl’s college were picked as healthy controls as proved by taking their psychological tests, the same tests used to assess the mental profile of the subjects.
- Demographically matched controls with subjects were chosen, some of them were the family members of the subjects (12/75). Others were picked randomly from the society.
- After taking written consent from the controls, psychological tests were applied on them. The results of all the applied psychological tests showed presence of no signs of significant level of stress, anxiety and depression with suicidal tendency in all selected controls.
- After conforming having healthy mental profile of all the selected controls, they were included in the study.
- The level of correlation among the results obtained from various psychological tests were assessed to conform that the results were in same trend, the level of correlation between 8 SQ scale of Quran & Cattle and HAM-A was **0.916**, while the level of correlation between the result obtained by HAM –A and SIS-MAP was **0.461**, and the value of “r” between HAM-A and SIDAS was **0.541**.
- As a significant level of correlation between the results of all the psychological tests applied, was observed, thus it can be concluded that all the applied psychological tests were showing the same trend of result.

**Table-4 .Physical Parameters of the Subjects**  
n=75

Age range	Subjects	Height	Weight in Kgs	BMI	Education
18-22	4	160	53	20.96	High school

18-27	0	1	19.44	18.93	Graduate
18-32	0	2	16.89	16.86	High School
18-38	5	3	12.88	13.13	Postgraduate
19-43	0	1	19.53	18.97	Primary school
44-48	3	2	14.67	19.98	Graduate
18 +		3	19.28	16.74	High School
Average age 4 years	Total subjects	75 Average height 5'1	19.60 Kgs	19.41 Kg/ m <sup>2</sup>	

### Discussion-

- The average height of the selected subjects was 5' 1 inches, that was near normal height of the Indian girls.
- The estimated weight of subjects in an average was near 71 Kgs , this was much more than the normal value of weight in relation with height and age of the studied subjects.  
o ( [www.https://healthifyme. Com](https://healthifyme.com))
- The problem of over-weightiness was expected in subjects as chronic stress is known to alter the pattern of food intake, dietary preference and the rewarding properties of foods. Also related co-morbid condition like PCOD resulted in obesity as concluded by many previous studies. (Eline S. van der Valk, Mesut Savas, and Elisabeth F. C. van Rossum, 2018)
- Also, Stress coincides with an increase in factors that enhance cortisol production, such as consumption of food with a high glycemic index, and a reduced amount of sleep. This suggests a vicious circle, where increased action of gluco-corticoid, obesity, and stress interact and amplify each other. (Knutson KL, Van Cauter E, Rathouz PJ, DeLeire T, Lauderdale DS 2010 and Cohen S, Janicki Deverts D.2012). The same trend of obesity pattern was observed in studied stressed subjects.
- Stress driven high levels of cortisol can, increase appetite with a preference for “comfort food” and cause white adipose tissue to redistribute to the abdominal region, which may ultimately lead to abdominal obesity. Interestingly, it had been observed that gluco-corticoids decrease the sensitivity to adrenergic stimulation of brown fat. Furthermore, exogenous gluco-corticoid administration increases the intra-hepatic conversion of cortisone to cortisol thereby potentially contributing to the vicious circle. (Fardet L, Feve B. 2014, van Rossum EF,2017 and Barclay JL, Agada H, Jang C, Ward M, Wetzig N, Ho KK, 2015). Thus, observed stress driven obesity might be the result of increased secretion of cortisol in studied subjects as confirmed by the above cited studies.
- The calculated average BMI was 29.41 kg/ m<sup>2</sup>; it was much more than the normal value for the age and height. ( [www.https://healthifyme. Com](https://healthifyme.com))
- As most of the studied subjects were obese, those girls and women were having also having stress due to their bad shape. Most of them contacted gynaecologists initially only for the correction of their state of obesity.
- A significant positive correlation was observed between level of stress assessed by SIDAS and Body weight of the studied subjects ( r = 0.498)

- Also, a significant positive correlation was observed between level of stress assessed by SIDAS and BMI of the studied subjects (  $r = 0.405$  ), means more the level of stress, higher the level of obesity with increased waist, hip circumference and higher BMI level was observed in the studied subjects .

**Table- 5. Physical Parameters of the Controls**  
n=75

Age range	Number of Controls	Height	Weight in Kgs	BMI	Education
18-22	1	2	41.22	6.55	Graduate
18-27	4	0	38.09	3.65	Graduate
18-32	2	1	47.19	9.66	School
18-38	4	4	42.28	5.77	Post graduate
19-43		0	49.25	1.32	School
14-48	3	1	40.18	0.90	Graduate
18+		2	38.27	1.39	Middle School
Average 23 years	Total 75 subjects	Average height 5'14"	46.64 Kgs	19.19 Kg/ m <sup>2</sup>	

**Discussion-**

- The average height of the selected subjects was 5'14, which was normal height for the Indian girls.
- The estimated weight of subjects in an average was within normal range of weight for height and age that was 46.64 Kgs .
- The calculated BMI of the studied controls was 19.19 Kg/ m<sup>2</sup>, which was within healthy, normal range.

**Table-6 Comparison of the BMI between Subjects and Controls**  
n=75

Age range	Subject BMI	Control BMI	Level of Significant Difference (p value)
18-22	0.96	6.55	09 **, **
18-27	3.93	3.65	30 **, **
18-32	6.86	9.66	39 *
18-38	3.13	5.77	31 **, **
19-43	3.97	1.32	89 **, **
14-48	9.98	0.90	49 **, **
18+	6.74	1.39	48 **, **
	19.41 Kg/ m <sup>2</sup>	19.19 Kg/ m <sup>2</sup>	90 **, **

\*\*0.01, \* 0.05 level of significance

**Discussion-**

- A significant level of difference was observed among each age group between Subjects and Controls in the case of BMI in every age group.
- These parameters proved the presence of stress-driven Obesity in studied subjects.

**Table- 7 Statistical Analysis of differences among Physical parameters between Subjects and controls**

Sample	Sample size	Average weight	BMI
Controls	5	56.64 Kgs	29.19Kg/ m <sup>2</sup>
Subjects	5	90.60 Kgs	39.41Kg/ m <sup>2</sup>
Percentile Difference		1.37 % ↑ in subjects	3.25 % ↑ in subjects
Level of significant Difference (t)		79 *,**	90*,**

Significant at \*0.01 level, \*\* significant at 0.05 level

**Discussion-**

- On comparison of Body weight between studied subjects and controls, it was observed that in comparison to controls, the body weight of subjects was 51.37 percent higher.
- Also, in case of BMI between studied subjects and controls, it was observed that in comparison to controls, the BMI of subjects was 33.25 percent higher.
- A level of significant difference was observed among both the groups, in the case of Body weight and BMI both. The Subject group showed significantly higher body weight and BMI in comparison with controls.
- These results are in alignment with the studies done by V Insler , Z Shoham, A Barash, 1993.
- The present study was in alignment with previous studies concluded on this matter, that there was an increase in the production of adipose tissue or fat cells which release the hormones to create a hormonal imbalance. This hormonal imbalance resulted for the development of symptoms of PCOS/PCOD or vice versa. (Salma Alomran and Edric D Estrella, 2023)
- The PCOD driven hyper-insulaenemia and higher serum level of Prolactin was observed as the root cause for the obesity in PCOD by a study done by Joselyn Rojas, Mervin Chávez, 1994.
- We also observed higher serum level of C-peptide and prolactin in studied subjects.

**Table-8. Estimation of Physical Parameters of Stress on Subjects n=75**

Age range	Subjects	Stomach Upset Frequent Diarrhea/ Constipation	Nausea	Tachycardia (Increased Heart Rate)	Insomnia	Frequent attacks of cold & cough
18-22	4	14	14	1/14	14	10
23-27	10	7/10	10	0/10	0/10	10
28-32	10	9/10	10	1/10	10	10
33-38	15	11/16	16	4/16	19	16
39-43	10	6/10	10	1/10	10	10
44-48	13	7/13	13	0/13	1/13	13

3 +		2/2	2	2	2	2
Average age 4 years	total 75 subjects	1/75	4/75	1/75	6/75	4/74

**Discussion-**

- Some physical parameters related with stress were estimated, for conforming the results of psychological tests.
- Out of total 75 studied subjects, 51 were having frequent attacks of stomach upsets (68%). According to Southern Iowa Mental Health Center’s report in 2023, stomach upset was one of the prominent symptoms of stress and anxiety.
- According to the study published in 2023 by American Academy of Paediatrics, nausea was common symptom of stress. But, the problem of Nausea as co-morbid condition of stress was observed as less frequent symptom in the studied group of subjects (32% ) .
- By a work published by Anjum Datta, Sandeep Choudhary, Sunaina Soni, Rajesh Mishra, and Kiran Singh in 2023 , Bradycardia was a most common problem in stressed persons, nearly 82 % of studied subjects showed problem of increased heart rate , even during rest among the studied subjects.
- By a study conducted by Kuem Sun Han, Lin Kim, Insop Shim in 2012, stated that Insomnia observed in stressed subjects was due to disturbed activity of the hypothalamic-pituitary-adrenal (HPA) axis, stress-induced insomnia was a common problem during stress, about 75 % of the studied subjects were having the problem of insomnia as symptom of stress as observed in this study.
- By a report published in Medicine Net, written by Dr Steven Doerr in 2022, repeated attacks of Cough and cold was a common physical symptom in stressed persons, in this present study, it was observed that this was not a very common problem in studied subjects, only 32 % of the subjects showed presence of this physical symptom.
- Acanthosis Nigricans (velvety, brown skin markings usually on the neck, under the arms or/and in the groin) was observed in 83% of the subjects, but not seen in any of the controls. This might be due to hormonal imbalances, specially due to hyperinsulinemia as proved by the work done by Mohammad Abid Keen, Iffat Hassan Shah, 2017.

**Table-9. Estimation of Physical Parameters of Stress on Controls**  
n=75

Age range	Controls	Stomach Upset (Frequent Diarrhea Constipation)	Nausea	Bradycardia (Increased Heart Rate)	Insomnia	Frequent attacks of cold & cough
3-22	1	1/1	1/1	1/1	1/1	1/1
3-27	4	1/4	2/4	1/4	2/4	0/4
3-32	2	3/2	1/2	0/2	0/2	0/2
3-38	4	2/4	1/4	0/4	0/4	0/4
3-43		1/9	1/9	1/9	1/9	1/9
4-48	3	2/3	0/3	0/3	3/3	0/3
3 +		2/2	0/2	0/2	1/2	0/2

verage	otal 75	3/75	75	/75	/75	/75
ge	subjects					
3 years						

**Discussion-**

- The control showed no physical symptoms related with stress in significant level, stomach upset was observed in 21 % of the controls , may be due to some another reasons.

**Table-10. Estimation of Physical Parameters of Stress (On Subjects)**

n=75

Age range	Subjects	Hyperventilation with elevated Tidal Volume ml	Blood Pressure S/D/P mm of Hg	Respiration Rate	O <sub>2</sub>	Body Temperature C <sup>0</sup>
18-22	4	530 ± 11	138/94	29/min	91%	37.9
23-27	10	545 ± 9	141/92	31/min	90%	38
28-32	10	540 ± 6	139/94	33/min	92%	38
33-38	5	540 ± 6	144/96	32/min	90%	38
39-43	10	530 ± 5	137/98	31/min	90%	38
44-48	3	550 ± 10	143/90	33/min	91%	38
49 +		530 ± 9	150/96	32/min	95%	38
Average	otal 75	534 ± 8	142/94	31/ min	90%	38 C <sup>0</sup>
Age	subjects					
4 years						

**Discussion-**

- According to Lawrence M Schleifer, Ronald Ley, Thomas W Spalding in 2002, hyperventilation with elevated Tidal Volume was commonly observed in stressed subjects. In studied subject group, the estimated Tidal Volume was 534 ml/min, it was nearly 7 % higher than the normal value. This might be due to stressed respiratory muscles, obesity, increased sympathetic tone and hormonal imbalances during stress. (Kazunari Nohara, Rizwana S. Waraich, 2013)
- The systolic blood pressure not much elevated above the normal range, but slight elevation in systolic blood pressure was observed above the normal systolic blood pressure for the age. Likewise diastolic blood pressure was also observed higher than the normal value for the selected age group of the subjects. The results are in co-ordinance with the work done by Sehar Toosy, Ravinder Sodi, 2018.
- The respiration rate was observed slightly above the normal rate, which was 21 times/ min; it was nearly 16 % above the normal rate. This observation was in harmony with the work done by Devy Widjaja, Michele Orini, 2013.
- A study done by Steven D Aeschliman, Mark S Blue, Karen B Williams, Charles M Cobb, Simon R Mac Neill in 2003 stated that lower Oxygen saturation was observed in stressed subjects. The Oxygen saturation was 90 % on an average in studied subjects, it was within normal range, but the age group above 48 years showed lesser PO<sub>2</sub>.

- A work done by Takakazu Oka on Psychogenic Fever published in 2015, high temperature was noted in stressed subjects, in the present work the observed temperature was 40 C<sup>0</sup> in subject group. It was higher than the normal body temperature of 37 C<sup>0</sup>, higher temperature was especially observed in the age group between 39-48 years .

**Table- 11. Estimation of Physical Parameters of Stress (On Controls) n=75**

Age range	Controls	Normal Tidal Volume (ml)	Blood Pressure	Respiration Rate	O <sub>2</sub>	Body Temperature C <sup>0</sup>
18-22	1	450 ± 8	110/72	14/min	99%	36
23-27	4	500 ± 5	118/78	15/min	100%	38
28-32	2	495 ± 10	111/74	15/min	98%	37
33-38	4	510 ± 5	120/82	14/min	99%	37
39-43		500 ± 15	122/82	15/min	100 %	37
44-48	3	515 ± 10	118/80	15/min	99%	36
49 +		500 ± 5	122/84	15/min	99 %	37
Average age 4 years	total 75 subjects	495 ± 8	117/ 79	15/min	99%	37 C <sup>0</sup>

**Discussion-**

- The physical parameters of controls were all within the normal range.
- The Tidal volume 500 ml is normal; the observed value was within normal range .
- Also, blood Pressure, rate of respiration, Partial Pressure of Oxygen, Body temperature were all within the normal range.

**Table-12. Statistical Analysis of differences among Physical parameters between Subjects and controls- n=150**

Sample	Tidal Volume	Blood Pressure	Rate of Respiration	O <sub>2</sub>	Body Temperature
Controls	495 ± 8	117/ 79	15	99	37°C
Subjects	34 ± 8	142/94	11	100	39° C
Percentile Difference	74 % ↑ in subjects	1.36 % ↑ in subjects	100% ↑ in subjects	100% ↓ in subjects	100% ↑ in subjects
Level of significant Difference	0.87 ns	0.38 *,**	0.0029 ns	0.009 ns	0.010 ns

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\*\*0.01, \* 0.05 level of significance

**Discussion-**

- Although the differences among both the groups was obvious in their physical parameters, but statistically the difference was insignificant, except difference in Blood Pressure measures, which was observed significant.

**Table-13. Estimation of Hormonal status as bio-indicator of Stress**

Age Range	Subject's Parameters			Control's Parameters		
	Serum Thyroid Level μg/dL n= 7	Serum level of Prolactin ng/L n= 7	TSH mIU/L n= 7	Serum Thyroid Level μg/dL n= 7	Serum level of Prolactin ng/L n= 7	TSH mIU/L n= 7
18-22	4	9	24	1	7	02
23-27	1	1	33	6	0	93
28-32	7	8	58	2	9	11
33-38	9	2	04	2	2	88
39-43	3	9	71	7	5	67
44-48	5	8	69	9	1	81
49 +	0	7	46	4	8	79
Average age ± years	74 μg/dL	5.57 ng/L	578 mIU/L.	72 μg/dL	9 ng/mL	17 IU/L.
Percentile difference	Serum Thyroid Level 4.34% ↓ in subjects		Serum level of Prolactin 4.57 % ↑ in subjects		Serum Level of TSH 1.28 % ↓ in subjects	
Significant level of difference between subjects and Controls	Serum Thyroid Level 3.23*,**		Serum Level of Prolactin 3.16 *,**		Serum Level of TSH 2.92*,**	

\*\*0.01, \* 0.05 level of significance

**Discussion**

- Stress affects hormonal profile , many previous studies have proved it (Salam Ranabir and K. Reetu, 2011)
- Serum TSH (Thyroid Stimulating Hormone) is bio-indicator of stress (Hua Hong and Jeonghun Lee, 2022) , we also observed lower TSH level in studied subjects , as indicated by many previous studies that stress inhibits the thyroid-stimulating hormone (TSH) secretion through the action of glucocorticoids on the central nervous system.
- ( Helmreich et al. 2011).

- The average level of Thyroxin in subjects was 3.47mcg/dL, whereas the same for the control group was 6.72 mcg /dL. Many previous studies already indicated that lower serum Thyroxin (T<sub>4</sub>) was observed in stressed persons- (Chaudhuri, Arunima; Koner, Samarjit,2020). The observed results were in the same trend.
- Thus, the estimated parameters showed the condition of moderate hypothyroidism, over all the Thyroid function was observed down-regulated during stressful conditions; might be due to the cause that stress inhibits the thyroid-stimulating hormone (TSH) secretion through the action of gluco-corticoids on the central nervous system. (Ranabir, Salam; Reetu, K, 2011)
- The subject group had average TSH level 0.578 mIU/L., which was slightly towards lower side of the normal value, but the Control group had average level of TSH 1.17 mIU/L., which was within normal level, with a significant level of difference between both the groups.
- Depending on the local regulatory environment at the time of stress, prolactin level can either increase or decrease. Vasopressin and peptide containing histidine, isoleucine may be involved in the secretion of prolactin during stress. However, the teleological significance of change in the prolactin level is uncertain. It may affect the immune system or some aspect of homeostasis. ( Agata Faron-Górecka, Katarzyna Latocha et al 2023). We also observed state of higher serum prolactin ( Hyperprolactinemia) in subjects . These results were in alignment with the above cited studies.
- A significant level of difference was observed for serum Prolactin level between both the groups.

## References

1. Keen,M.A.,Hassan, I.,Shiekh,G.(2017).Cutaneous manifestations of polycystic ovary syndrome :a cross-sectional clinical study.*Indian Dermatology Online Journal*.8(2),104-10. DOI:10.4103/2229-5178.202275
2. Khan, A., Karim, N., Ainuddin, J. A., & Fahim, M. F. (2019). Polycystic ovarian syndrome: correlation between clinical hyperandrogenism, anthropometric, metabolic and endocrine parameters. *Pakistan Journal of Medical Sciences*, 35(5), 1227–1232. <https://doi.org/10.12669/pjms.35.5.742>
3. Khomami, M.B., Teede, H.J., Joham, A.E., Moran, L.J., Piltonen, T.T., Boyle, J.A.(2022). Clinical management of pregnancy in women with polycystic ovary syndrome: an expert opinion, *Clinical Endocrinology*,97(2),227-236. <https://doi.org/10.1111/cen.14723> 222
4. Kim, J., Choung, S.H., Choi, Y.M., Yoon, S.H., Kim, S.H., Moon, S. Y.(2008). Androgen receptor gene CAGrepeat polymorphism in women with polycystic ovary syndrom. *Fertility and Sterility*,90(6),2318-23. , DOI:10.1016/j.fertnstert.2007.10.030
5. Kim, J.J.,&Choi,Y.M.(2013).Dyslipidemia in women with polycystic ovary syndrome. *Obstetrics & Gynecology Science*, 56(3), 137–142. <https://doi.org/10.5468/ogs.2013.56.3.137>
6. Kim, H. H., DiVall, S. A., Deneau, R. M., & Wolfe, A. (2005). Insulin regulation of GnRH gene expression through MAP kinase signalling pathways. *Molecular and Cellular Endocrinology*, 242(1-2), 42–49. <https://doi.org/10.1016/j.mce.2005.07.002>
7. Kite, C., Atkinson, L., McGregor, G., Clark, C.C.T., Brown, J.E., Kyrou, I.,&Randeve, H. S. (2021). Sleep disruption and depression, stress and anxiety levels in women with polycystic ovary syndrome (PCOS) during the lockdown measures for COVID-19 in the UK. *Frontiers in Global Women's Health*, 2, 649104. <https://doi.org/10.3389/fgwh.2021.649104>

8. Knutson, K. L., Van Cauter, E., Rathouz, P. J., DeLeire, T., & Lauderdale, D. S. (2010). Trends in the prevalence of short sleepers in the USA: 1975-2006. *Sleep*, 33(1), 37–45. <https://doi.org/10.1093/sleep/33.1.37>
9. Kshetrimayum, C., Sharma, A., Mishra, V.V., & Kumar, S. (2019). Polycystic ovarian syndrome: environmental/occupational, lifestyle factors; an overview. *Journal of the Turkish German Gynecological Association*, 20(4), 255–263. <https://doi.org/10.4274/jtgga.galenos.2019.2018.0142>
10. Lal, L., Bharti, A., Parween, A. (2017). To study the status of LH: FSH ratio in obese and nonobese patients of polycystic ovarian syndrome. *IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)*, 16(1), 20-23. [www.iosrjournals.org](http://www.iosrjournals.org) DOI: 10.9790/0853-1601012023
11. Lashen H. (2010). Role of metformin in the management of polycystic ovary syndrome. *Therapeutic Advances in Endocrinology and Metabolism*, 1(3), 117–128. <https://doi.org/10.1177/2042018810380215>
12. Legro, R. S., Kunesman, A. R., & Dunaif, A. (2001). Prevalence and predictors of dyslipidemia in women with polycystic ovary syndrome. *The American Journal of Medicine*, 111(8), 607–613. [https://doi.org/10.1016/s0002-9343\(01\)00948-2](https://doi.org/10.1016/s0002-9343(01)00948-2)
13. Legro R. S. (2003). Polycystic ovary syndrome and cardiovascular disease: A premature association? *Endocrine Reviews*, 24(3), 302–312. <https://doi.org/10.1210/er.2003-0004>
14. Levine, S., & Muneyyirci-Delale, O. (2018). Stress-induced hyper prolactinemia: pathophysiology and clinical approach. *Obstetrics and Gynecology International*, 2018, 9253083. <https://doi.org/10.1155/2018/9253>