

## Prevalence and comparison of polycystic ovarian syndrome (PCOS) between Assamese and Bihari community of Assam, Northeast

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### ABSTRACT

**Background:** Polycystic ovarian syndrome (PCOS) is a multifaceted lifestyle disorder among women in their reproductive cycle. By nature, it adversely affects the fertility and reproductive health of the affected women. Clinical manifestations are diverse including oligomenorrhea, anovulation, serum insulin and hirsutism. Prevalence rate is estimated at 4% to 25% depending on the diagnostic criteria used. The determinants of PCOS have linked with the environmental surrounding and the lifestyle of the women. The prevalence of polycystic ovarian syndrome is although thought to be 4% to 25% but it is widely unknown for specific population based on race and ethnicity. **Aim:** The objective of the study hypothesizes to compare the prevalence of PCOS among Assamese women with Bihari women. **Methods:** A total sample of 100 women has been taken out of which 50 are recruited from among Assamese community and rest 50 from Bihari community visiting Goenka Nursing Home, Guwahati, Assam. The relevant data were collected through self-administered schedules and interview method. **Results:** A higher prevalence of PCOS is found among the Assamese caste women in comparison to Bihari caste women. Oligomenorrhea with recent weight gain is found to be the most common symptom of PCOS associated with raised serum insulin. **Conclusion:** A long term personalized management program is required for effectively treating individuals with PCOS which can help in regulating the symptoms like menstrual irregularities, various dermatological issues like hirsutism, acne, improving fertility, lowering the burden of obesity, diabetes and various other metabolic complications.

**Keywords:** Polycystic ovarian syndrome, oligomenorrhea, serum insulin, luteinizing hormone, follicle stimulating hormone.

## INTRODUCTION

Polycystic ovarian syndrome (PCOS) is a common endocrine disorder affecting up to 13% of women (Ee *et al.*, 2021). The syndrome is a complex and heterogeneous disorder that may have various clinical manifestations, mainly including hyperandrogenism, oligo/anovulation and polycystic ovaries morphology (Aversa *et al.*, 2020; Ramezani-Tehrani *et al.*, 2021). Although the exact etiology of PCOS remains unclear, emerging evidence suggested that insulin resistance (IR) appears to be implicated in its pathogenesis (Behboudi-Gandevani *et al.*, 2016; Marchesan *et al.*, 2021). Further, PCOS reported symptoms complex with amenorrhea, hirsutism and enlarged ovaries with multiple cysts (Zahid *et al.*, 2016; Mehreen *et al.*, 2021; Soneja 2021). The clinical manifestations of PCOS include hirsutism, oligomenorrhea, excessive acne and hair loss and in adolescence it also causes many psychological disturbances such as anxiety and depression (Ganie *et al.*, 2019). At present, some abnormalities in metabolic pathways such as insulin signaling and steroid hormone regulations pathways have been proposed in the underlying pathophysiology of PCOS (Zhao *et al.*, 2012). However, many studies also show that PCOS could be linked to hereditary, lifestyle and environmental factors that include early age of puberty, premature fetal development, family history of PCOS among first-degree relatives, physical inactivity, stress and obesity among others (Heidarzadehpilehrood *et al.*, 2022; Parker *et al.*, 2022). PCOS among the adolescents and young girls is generally undiagnosed and underreported. Moreover, untreated patients develop complications such as infertility, pregnancy-related issues, metabolic disorders and cardiovascular diseases (Armanini *et al.*, 2022; Liu *et al.*, 2021).

The diagnosis of PCOS can be performed by using various guidelines/criteria as recommended by the National Institute of Health (NIH), Rotterdam criteria and the Androgen Excess PCOS Society (AE-PCOS) criteria (Wolf *et al.*, 2018). Recently, the international evidence-based guidelines suggested that the Rotterdam criteria are superior to others in diagnosing PCOS (Teede *et al.*, 2018). Several studies postulated PCOS as a lifestyle disorder which is linked to their environmental and standard of living of the women (Radha *et al.*, 2016; Bharathi *et al.*, 2017). This study was postulated to assess and compare the prevalence of polycystic ovarian syndrome between two communities i.e. Assamese and Bihari community residing in Guwahati city, Assam, Northeast India.

## MATERIALS AND METHODS

A study has been done in Goenka Nursing Home, Kamrup (M), Assam, Northeast India. The study was conducted after taking approval from the department of Gynecology. The present investigation focused upon reproductive women who suffered from PCOS and other reproductive issues and sought medical assistance in the hospital. The present study sample consists of 100 reproductive women within the age group of (18-35) years out of which 50 women are recruited from among Assamese community and rest 50 women from Bihari community. All the participants were enrolled after obtaining an informed consent to participate in this study. The participants were interviewed to obtain necessary data separately. All the factors were undertaken based on Rotterdam criteria (2004). Rotterdam criteria are the most widely-used tool for diagnosing PCOS includes the presence of irregular menstrual cycle (Oligomenorrhea) or no menstruation (Amenorrhea), hyperandrogenism (signs of hirsutism) and polycystic ovaries on ultrasonography (Perla 2021). The objectives and nature of participation were explained to the participants before the participation in the present study. The data were obtained by using semi-structured questionnaires and anthropometric assessment is done by using measuring tape, weighing machine and anthropometric rod. As the present study is hospital-based, therefore the data on anthropometric measurements includes height and weight and various biological parameters which include oligomenorrhea, serum testosterone, serum insulin, serum follicle stimulating hormone (FSH), and ultrasonography was recorded from the reports of the study participants after taking proper consent from each patient. Women having the symptoms of oligomenorrhea (inter-menstrual interval > 35 days or 8 menstrual cycles per year) were considered. Women with clinical signs of hirsutism, acne, and polycystic ovarian morphology with 12 or more follicles are observed in at least one ovary and these symptoms were record-based studies along with interviews. And through the studied reports based on ultrasonography, women with PCOS was categorized as PCOS group and without PCOS as Non-PCOS group. Among Assamese women group out of 50 participants total 31 PCOS cases was studied and among Bihari women group out of 50 participants total 20 PCOS cases was studied and rest were taken as NON-PCOS group. For the anthropometric measurements of weight and height, the participants were asked to be without footwear and wearing light clothes. Waist circumference (WC) and hip circumferences (HC) were measured by using measuring tape nearest 0.1 cm. For WC superior part of the hip bone was palpated and then measurement tape was encircled around the stomach just above this point and the umbilicus interiorly. The HC was measured by encircling the measuring tape in the broadest

part of the hip of the participants. During the time of measurements, the participants were asked to stand in the eye-ear plane, height was measured by using an anthropometric rod nearest to 0.1 cm and weight was measured by using a weighing scale nearest to 0.1 kg. Body Mass Index (BMI) of individual participants was calculated by dividing weight (kg) by height in square meters (WHO 2000). BMI that was found to be greater than  $30.00 \text{ kg/m}^2$  categorized as obese and less than  $29.9 \text{ kg/m}^2$  was categorized as non-obese (WHO 2000). Work activity levels were also obtained utilizing the self-reported responses based on their physical activity using the self-administered schedule method. Socio-demographic data were collected by utilizing a pre-structured schedule which includes age, family structure and educational level of the participants. Work activity levels were also obtained utilizing the self-reported responses based on their physical activity using the self-administered schedule method.

### **Statistical Analysis**

The collected data were entered into Microsoft Excel and analyzed in the Statistical Package for Social Sciences. The Chi-square analysis was performed to determine the frequency differences in categorical variables. A p-value  $< 0.05$  was considered to be statistically significant.

### **RESULTS**

*Table 1* showed socio-economic and demographic profile of the studied communities. The results showed highest percentage of PCOS women within the age group of (24-29) years both among the Assamese and Bihari community i.e. ( $61.29\%$ ,  $25.79 \pm 1.96$ ) and ( $52.63\%$ ,  $26.73 \pm 1.81$ ) respectively. In case of family types, the highest number of women with PCOS among the Assamese women group ( $83.87\%$ ) i.e. 26 out of 31 women are from nuclear family structure than those who belongs to PCOS Bihari women which is found to be ( $90.00\%$ ) i.e. 18 out of 20 belongs to nuclear family structure. Similarly, joint family structure is also estimated to be higher among the Assamese women group ( $16.12\%$ ) i.e. 5 out of 31 PCOS women lives in a joint family than Bihari women group ( $10.00\%$ ) i.e. 2 out of 20 PCOS women lives in a joint family. The results on the educational level shows highest percentage of PCOS women in the Assamese women group have passed bachelor's degree ( $80.64\%$ ) i.e. 25 out of 31 PCOS women as compared to Bihari PCOS women ( $30.00\%$ ) i.e. 6 out of 20 PCOS women belongs to the category of HSSLC to Bachelor's degree. Among the Bihari PCOS women, most of the women have passed primary to HSLC level ( $60.00\%$ ) i.e. 12 out of 20 PCOS women. Women in the category of Post graduate and others is found to be higher in number among Assamese

PCOS women group than Bihari PCOS women group i.e. (9.67%) i.e. 3 out of 31 PCOS women and (5.00%) i.e. 12 out of 20 PCOS women respectively. The present study showed no participants to be found in the pre-literate category among Assamese PCOS women group whereas out of 20 only 1 PCOS woman is found to be pre-literate among the Bihari women group.

*Table 2* attempted to show the percentage of recent weight gain, the proportion of individuals with obesity and the work activity level of the two communities studied. The results therefore, reported highest proportion of women with recent weight gain is estimated at (52.00%) among the Assamese women group i.e. 26 women out of 50 have recorded weight gain as compared to Bihari women group which is found to be (20.00%) i.e. 10 out of 50 women have recorded weight gain. Estimating the proportion of obesity where, ( $BMI \geq 30 \text{ kg/m}^2$ ) among the individuals, highest proportion is observed among Assamese women group (22.00%,  $32.18 \pm 2.05$ ) within an age group of (30-36) years, as compared to Bihari women group which is estimated at (8.00%,  $32.68 \pm 1.68$ ) within age group of (30-34.2) years. Proportion of non-obese women where, ( $BMI \leq 29.9 \text{ kg/m}^2$ ) found to be higher among Bihari women group (92.00%,  $22.14 \pm 2.18$ ) within the age group of (19-28) years as compared to Assamese women group (78.00%,  $22.72 \pm 2.09$ ) within (19.1-28.5) age group. The results from the study showed working activity level to be higher among the Bihari women group which is estimated at (78.00%) as compared to Assamese women group which is found to be (50.00%).

*Table 3* showed the biological parameters like hirsutism, oligomenorrhea, serum testosterone, serum insulin, serum luteinizing hormone (LH), serum follicle stimulating hormone (FSH) and ultrasonography. The findings showed higher percentage of hirsutism is found among the Assamese women group which is estimated at (32.00%) as compared to Bihari women group (12.00%) which indicates higher androgen activity among the women of Assamese community. Oligomenorrhea or irregular menstruation reported to be higher among Assamese women group (50.00%) as compared to Bihari women group (14.00%). The proportion of women showing raised level of serum testosterone ( $>70 \text{ ng/dl}$ ) among Assamese women group is (62.00%,  $78.50 \pm 6.86$ ) lower than the Bihari women group (76.00%,  $76.08 \pm 5.52$ ). Estimating the testosterone level within the normal limit ( $\leq 70 \text{ ng/dl}$ ) Assamese women are found to show the highest percentage as compared to Bihari women i.e. (38.00%,  $55.21 \pm 5.95$ ) and (24.00%,  $54.57 \pm 5.02$ ) respectively. Serum insulin which is found to be a common factor in PCOS and it can be considered as an integral part of the syndrome. The present study showed serum insulin level to be highest among the Assamese women group (40.00%,  $19.73 \pm 5.39$ ) as compared to

Bihari women group (20.00%, 18.29±6.20). Estimating serum insulin level within the normal limit, Bihari women showed higher percentage as compared to Assamese women i.e. (80.00%, 8.41±2.94) and (60.00%, 9.03±3.33) respectively. Serum luteinizing hormone (LH) beyond the normal range (10-20) mIU/mL is found to be highest among the Assamese women group (30.00%, 12.44±2.67) in comparison to Bihari women group (12.00%, 12.32±3.10). Within the normal limit range (5-9.9) mIU/mL, serum luteinizing hormone (LH) is found to be higher among Bihari women group (88.00%, 7.43±1.52) as compared to Assamese women group (70.00%, 7.85±1.48). Similarly, estimating serum follicle stimulating hormone (FSH) in the raised limit ( $\geq 9.9$ -21.5) mIU/mL, highest proportion is found to in the Assamese women group i.e. (40.00%, 14.34±3.34) in comparison to Bihari women group which is found to be (30.00%, 13.38±2.96). Within the normal limit (1.4-9.9) mIU/mL, FSH level is found to higher among Bihari women group i.e. (70.00%, 5.67±2.10) as compared to Assamese women group, which is found to be (60.00%, 5.48±2.16). The proportion of patients diagnosed with PCOS through ultrasonography (follicles  $\geq 12$ ) among Assamese women group and Bihari women group is found to be 62.00% and 40.00% respectively which shows that Assamese women showed a higher percentage of PCOS cases as compared to Bihari women.

Table 1: Socio-economic and Demographic Profile of the studied Communities:

Variables assessed	Assamese Women (50)				Bihari Women (50)				Chi-square value	p – value
	PCOS Group (31)		NON-PCOS Group (19)		PCOS Group (20)		NON-PCOS Group (30)			
	Number Mean $\pm$ SD	%								
<b>Age Groups (years)</b>										
(18 – 23)	04 20.75 $\pm$ 1.48	12.90	03 20.33 $\pm$ 2.05	15.78	02 22.00 $\pm$ 1.00	10.00	05 21.60 $\pm$ 1.50	16.66	1.16667	0.28008
(24 – 29)	19 25.79 $\pm$ 1.96	61.29	10 26.70 $\pm$ 1.73	52.63	11 26.73 $\pm$ 1.81	52.38	16 26.69 $\pm$ 2.05	53.33	3.45092	0.06322
(30 – 35)	08 33.25 $\pm$ 1.56	25.80	06 33.50 $\pm$ 1.71	31.57	07 32.86 $\pm$ 1.81	35.00	09 33.00 $\pm$ 1.63	30.00	0.53571	0.46421
<b>Types of families</b>										
Nuclear Family	26	83.87	17	89.47	18	90.00	29	96.66	4.41593	<u>0.03561</u>
Joint Family	05	16.12	02	10.52	02	10.00	01	3.33	0.02268	0.88030
<b>Education level</b>										
Primary to HSLC	03	9.67	01	5.26	12	60.00	15	50.00	0.03088	0.86050
HSSLC to Bachelor's Degree	25	80.64	16	84.21	06	30.00	05	16.66	0.14895	0.69954
Post Graduate Degree & Others	03	9.67	02	10.52	01	5.00	03	10.00	3.91741	0.04779
Pre-literate	--	--	--	--	1	5.00	07	23.33	--	--

(Significant level calculated at &lt;0.05)

**Table 2: Comparison between Assamese and Bihari women based on Recent Weight Gain, Obese, Non obese and Work Activity:**

Characters	Assamese Women (50)		Bihari Women (50)		Chi-square value	p – value
	No. of patients Mean $\pm$ SD [Spread]	%	No. of patients Mean $\pm$ SD [Spread]	%		
<b>Recent weight gain</b>	26	52.00	10	20.00	7.11111	0.00766
<b>Proportion of Individuals with Obesity</b>						
<b>Obese (BMI<math>\geq</math>30 Kg/m<sup>2</sup>)</b>	11 32.18 $\pm$ 2.05 [30 – 36]	22.00	4 32.68 $\pm$ 1.68 [30 – 34.2]	8.00	3.26667	0.07070
<b>Non obese (BMI<math>\leq</math> 29.9 Kg/m<sup>2</sup>)</b>	39 22.72 $\pm$ 2.09 [19.1 – 28.5]	78.00	46 22.14 $\pm$ 2.18 [19 – 28]	92.00	0.57647	0.44770
<b>Work Activity</b>	25	50.00	39	78.00	3.06250	0.08012

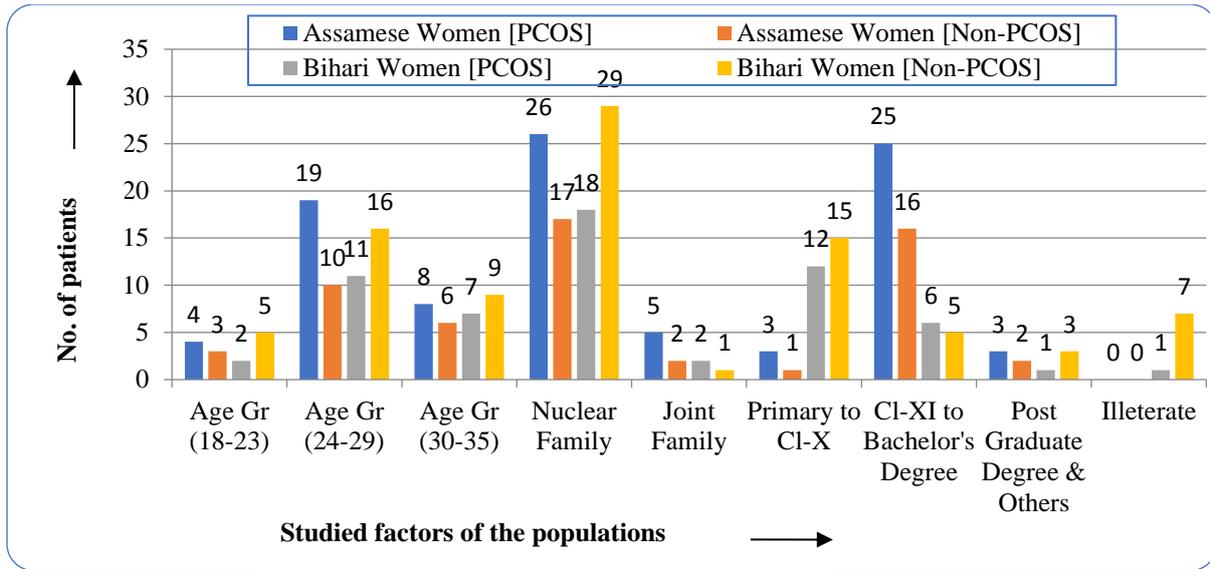
(Significant level calculated at &lt;0.05)

**Table 3: Comparison between Assamese and Bihari women based on Hirsutism, Oligomenorrhea, Serum testosterone, Serum Insulin (raised and normal limit), LH and FSH levels and Ultrasonography reports:**

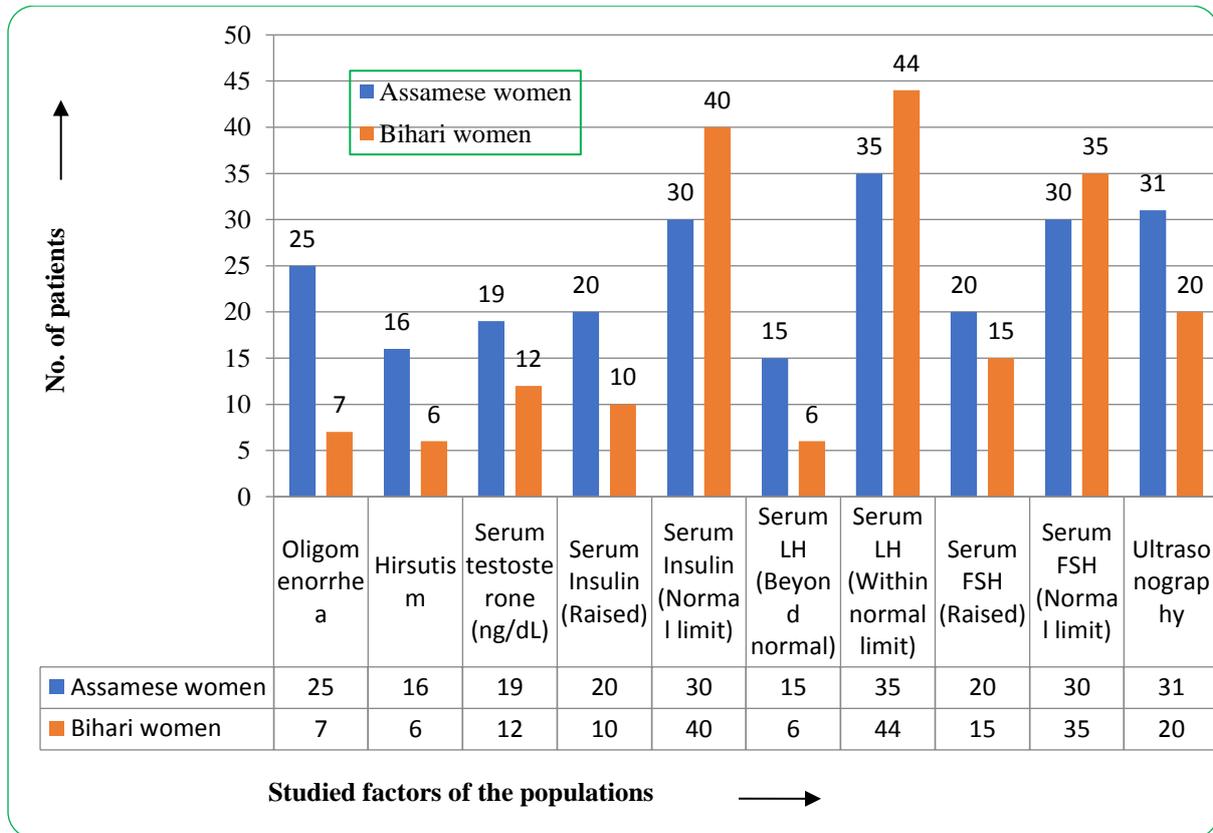
Characters	Assamese Women (50)		Bihari Women (50)		Chi-square value	p – value
	No. of patients Mean $\pm$ SD [Spread]	%	No. of patients Mean $\pm$ SD [Spread]	%		
	16	32.00	6	12.00	4.54545	0.03301
<b>Oligomenorrhea</b>	25	50.00	7	14.00	10.12500	0.00146
<b>Serum testosterone</b>						
<b>Within Normal Limit (<math>\leq 70</math> ng/dL)</b>	19 55.21 $\pm$ 5.95 [43 – 63.7]	38.00	12 54.57 $\pm$ 5.02 [43 – 63]	24.00	1.58045	0.20867
<b>Raised (<math>&gt;70</math> ng/dL)</b>	31 78.50 $\pm$ 6.86 [70.1 – 99.5]	62.00	38 76.08 $\pm$ 5.52 [70.2 – 95.3]	76.00	0.71014	0.39939
<b>Serum Insulin (mIU/mL)</b>						
<b>Raised</b>	20 19.73 $\pm$ 5.39 [4.2 – 25.0]	40.00	10 18.29 $\pm$ 6.20 [3.5 – 24.9]	20.00	3.33333	0.06789
<b>Within normal limit</b>	30 9.03 $\pm$ 3.33 [3.2 – 14.2]	60.00	40 8.41 $\pm$ 2.94 [3.2 – 14.5]	80.00	1.42857	0.23200
<b>Serum Luteinizing Hormone (LH)</b>						
<b>Beyond Normal (10 – 20) mIU/mL</b>	15 12.44 $\pm$ 2.67 [10.0 – 19.2]	30.00	6 12.32 $\pm$ 3.10 [10.0 – 18.5]	12.00	3.85714	0.04953
<b>Within Normal limit (5 – 9.9) mIU/mL</b>	35 7.85 $\pm$ 1.48 [5.0 – 9.9]	70.00	44 7.43 $\pm$ 1.52 [5.1 – 9.5]	88.00	1.02532	0.31126
<b>Serum Follicle Stimulating Hormone (FSH)</b>						
<b>FSH Within Normal limit (1.4 – 9.9) mIU/mL</b>	30 5.48 $\pm$ 2.16 [2.0 – 9.8]	60.00	35 5.67 $\pm$ 2.10 [1.6 – 9.9]	70.00	0.38462	0.53514
<b>FSH Raised (<math>\geq 9.9</math> – 21.5) mIU/mL</b>	20 14.34 $\pm$ 3.34 [10.2 – 20.4]	40.00	15 13.38 $\pm$ 2.96 [10.0 – 19.6]	30.00	0.71429	0.39802
<b>Ultrasonography (follicles <math>\geq 12</math>)</b>	31	62	20	40	2.37255	0.12349

(Significant level calculated at  $<0.05$ )

**Figure 1: Histogram showing Socio-economic and Demographic Profile of the studied Communities in respect of PCOS Women:**



**Figure 2: Histogram showing Oligomenorrhea, Hirsutism, Serum testosterone, Serum Insulin (raised and normal limit) and Ultrasonography reports of the Studied Communities:**



## DISCUSSION

Life brings multiple changes in the reproductive stage of women which includes: physiological, anatomical and psychological factors (Radha *et al.*, 2016, Bharathi *et al.*, 2017, Mukherjee *et al.*, 2020). PCOS has become a serious concern in the world today. PCOS results in hormonal, gynecological, metabolic, and cosmetic disorders (Jebeen *et al.*, 2022). PCOS impacts women of all races and ethnicities within their reproductive age (Wolf *et al.*, 2018) and in unspecified populations the prevalence of PCOS has a reported incidence rate of (3-10) % (Knochenhauer *et al.*, 1998; Kauffman *et al.*, 2002). According to the International Classification of disease (ICD. 2022), PCOS is a complex condition that manifests as infertility, hirsutism, obesity and menstrual disturbances such as oligomenorrhea, amenorrhea and anovulation (Jabeen *et al.*, 2022). It is associated with bilateral enlarged ovaries studded with small follicles and evidence of fluid-filled cysts as identified by ultrasound sonography (ICD. 2022). The underlying mechanisms for the development of PCOS and complications associated with it appear to be influenced by several factors. Elevated level of serum testosterone including higher hirsutism is found among the patients suffering from PCOS and the results postulated a higher prevalence of this complication in Assamese community as compared to Bihari Community. The higher level of serum testosterone contributes to reduced activities of follicle-stimulating hormone (FSH) and disrupts the function of ovaries. Hyperandrogenism also causes hirsutism, elevated serum insulin etc. Several studies reported that environmental factors, food habits and lifestyle were influential in the development of PCOS and associated complications (Deswal *et al.*, 2020).

As seen in other studies, symptoms of hyperandrogenism, serum insulin resistance, and recent weight gain were commonly noted in the present study participants with PCOS. Weight gain and body fat are strongly associated with PCOS, and obesity is well known to worsen the severity of this disorder (Yildiz *et al.*, 2012, Barber *et al.*, 2019). PCOS is an obesity related condition, as such weight gain and obesity contribute towards development of PCOS (Barber *et al.*, 2019). In women who are predisposed to PCOS, the metabolic and hormonal issues that are present such as insulin resistance and hyperandrogenism, can lead to weight gain and eventually obesity (Rosenberg *et al.*, 2019). A study reported that the high percentages of women with PCOS (50-90%) are insulin resistant and weight gain and obesity along with PCOS also promote worsening insulin resistance (Venkatesan *et al.*, 2001; Barber *et al.*, 2006). With every unit increase in BMI, the risk of getting PCOS increases by 9% (Teede *et al.*, 2013). It was noted that girls with high BMI in childhood had an increased risk of oligomenorrhea and

diagnosis of PCOS in young adulthood (age 24) (Rosenberg *et al.*, 2019). In a study done among South Indian adolescents with PCOS, weight gain was the most common symptom reported in menstrual disorders which can be called as oligomenorrhea (Balaji *et al.*, 2015). A systematic review and meta-analysis done in 2016 reported lowest rates of hirsutism in Asian women (Bozdag *et al.*, 2016). The present study showed that PCOS participants had hirsutism. Women with PCOS, develop hirsutism gradually which intensifies with weight gain and menstrual irregularity like oligomenorrhea was frequently associated with the rapid onset of hirsutism (Mehreen *et al.*, 2021). Serum insulin is found to be an independent predictor of PCOS and several other studies also reported that Indian women with PCOS have higher fasting serum insulin levels (Mehreen *et al.*, 2021) and thus greater insulin resistance when compared with white women with PCOS (Kauffman *et al.*, 2002; Wijeyaratne *et al.*, 2011). As many as 30% to 40% of women with PCOS have insulin resistance - a condition that leads to high glucose level and the potential for pre-diabetes and type 2 diabetes (Sirmans *et al.*, 2013). PCOS is often associated with profound insulin resistance as well as with defects in insulin secretion. These abnormalities, together with obesity, explain the substantially increased prevalence of glucose intolerance in PCOS. LH and FSH are the hormones that encourage ovulation. Hyperinsulinemia probably adds to the increase of ovulation and irregular menstrual cycle (Radha *et al.*, 2016). In the present study, the clinical manifestations of PCOS like hirsutism, serum testosterone, oligomenorrhea with weight gain, serum insulin levels and LH/FSH are found to be in higher proportion among the Assamese community in comparison with the Bihari community. And this is mainly due to the difference in their lifestyle activities. Most of the Bihari women with low income group are hard working with healthy food habits. They mostly prefer food like chapattis and vegetables which is highly rich in fibers, proteins and vitamins. While the staple food of Assamese is rice which is highly rich in carbohydrates and fats. Most of the Assamese women in their high income group in the cities use labor saving technologies for their simple stuffs which in turn lead them to obesity and PCOS related syndrome. The present study found the involvement in vigorous work activity was significantly higher among the Bihari women as compared to Assamese caste women. Through the present study based on the studied reports and analysis, PCOS cases is found to be higher among Assamese women group (62.00%) than among Bihari women group (40.00%). Differences in dietary intake and physical activity play a significant role in the prevalence of PCOS. Therefore, lifestyle modification measures, such as diet control and exercise helps to improve the clinical manifestations of PCOS. Currently, PCOS has no definite cure, but the associated co-morbidities can be addressed to improve the quality of life and minimize the long term

complications associated with PCOS (Jabeen *et al.*, 2022). The strength of the present study focused on two particular communities of urban areas in estimating the prevalence through clinic-based studies. Further research is necessary to determine the relative contributions of lifestyle modifications in PCOS and helps to improve this lifestyle disease in the near future.

### **Conclusion**

The prevalence of PCOS increases with age that needs a multidisciplinary approach to prevent and diagnose the disorder at a very early age. The increased risk of developing type II diabetes is of immense public health concern in India. A long term personalized management program is required for effectively treating individuals with PCOS which can help in regulating the symptoms like menstrual irregularities, various dermatological issues like hirsutism, acne, improving fertility, lowering the burden of obesity, diabetes and various other metabolic complications.

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