

## Effect of Socio-demographic, Clinical and Hormonal Factors on Polycystic Ovarian Syndrome (PCOS) among the Infertile Women: A Hospital-based Study in Rajshahi, Bangladesh

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### **ABSTRACT**

*Polycystic ovarian syndrome (PCOS) is a common medical problem that causes infertility to women. The objectives of the present study were to investigate the effect of socio-demographic, clinical and hormonal factors on PCOS among infertile women in Rajshahi, Bangladesh. The present cross-section study was carried out in the Motherland Infertility Centre and Hospital in Rajshahi, Bangladesh. The data was collected from 324 infertile women by using systematic sampling. The results revealed that about half (48.1%) of infertile women were young adults (aged 21-25 years). More than 64% infertile women came from urban areas. A remarkable number of infertile women (14.8%) passed their conjugal life more than 10 years. Among infertile women, 56.1% completed their secondary and higher education and 79% women were housewife. This study demonstrated that most of the infertile women (65.4%) were over nourished. More than 78% and 25.9% women experienced irregular and painful menstrual cycle and 61.7% women had oligomenorrhoea. Most of the women (95%) did not have hirsutism, and most of the respondents (96.3%) did not have occurrence abortion. Among infertile women, 25.3% and 48.1% had raised (>10 mlU/ml) serum FSH and raised (>10 mlU/ml) serum LH respectively, which was not 1:1 ratio. 30.2% infertile women had raised (>498 mlU/ml) serum prolactin and the mean value was 708.17 mlU/ml which was greater than 700 mlU/ml. More than 34% respondents had high (>3.6 mlU/ml) serum TSH and their mean value was 6.24 mlU/ml. Therefore, this study suggests that obesity, menstrual disturbances and hormonal level are most important risk factors for PCOS patients among infertile women in Rajshahi, Bangladesh.*

**Keywords:** Polycystic ovary syndrome; infertility; Obesity; menstrual disturbances; LH/FSH ratio

## INTRODUCTION

The polycystic ovary syndrome (PCOS) is one of the most common diseases that involve approximately 7% of women in reproductive age (Dunaif, 2011). The PCOS has also been known by the name of Hyperandrogenic anovulation (HA) and Stein-Leventhal syndrome (Ehrmann, 2005; Kollmann *et al.*, 2014). Infertility may describe a woman who is unable to conceive as well as being unable to carry a pregnancy to full term. The World Health Organization (WHO) estimates that 60 to 80 million couples suffer from infertility globally (WHO, 2004). The polycystic ovary syndrome is a hormonal disorder among women and the main cause of infertility due to ovulatory dysfunction (Delitala *et al.*, 2017). Ovulation problems can be associated with polycystic ovaries, thyroid problems and premature ovarian failure (National Health Service, 2017). It has been reported that up to 10% of women of reproductive age and up to 90% of women with irregular menstrual cycles are affected by polycystic ovaries (Homburg, 2008).

The clinical symptoms of PCOS also include obesity, oligo/anovulatory cycles, dysmenorrhea, hirsutism, exacerbated by poor dietary choices and physical inactivity (Diamanti-Kandarakis, 2006; De Leo, 2016). The responsible factors for the increasing occurrence of PCOS are linked to genetic, environment, dietary habits, behavior and other undefined factors (Ehrmann, 2005). The menstrual cycle abnormality ranges from amenorrhoea, oligomenorrhoea to menorrhagia. Ultrasound findings revealed that the menstrual cycle abnormalities are found in around 66 per cent of women (Cahill, 2010). The incidence of obesity has an important impact in patients with PCOS (Kumar and Malhotra, 2008). Excessive hair growth (hirsutism) is another important character and visible mark of PCOS, and the hair growths usually are seen on the face, upper lip, chin and lower abdomen. (Archer and Chang, 2004).

The PCOS disease is frequently diagnosed by the laboratory investigations. Most women have about equal ratio (1:1) of luteinizing hormone (LH) and follicle stimulating hormone (FSH) during the early part of their cycle. The increasing of LH over FSH level is able to disrupt ovulation (Sterling, 2011). The measurement of serum prolactin is a baseline assessment of study on PCOS disease. Prolactin levels are usually normal in women with PCOS; however, a moderate elevation level (greater than 700 mIU/ml) is common finding in women with PCOS (Balen *et al.*, 1995; Sterling, 2011). PCOS patients usually have normal thyroid stimulating hormone (TSH) levels (0.3-3.6 uIU/ml). The TSH is also used to check PCOS-related problems, such as an underactive or overactive thyroid, which often cause irregular or lack of periods and anovulation (Sterling, 2011).

Socio-demographic characteristics, clinical manifestations and hormonal investigations of PCOS patients among infertile women have been reported by several scientists (Gill *et al.*, 2012; Ishak *et al.*, 2012; Hussein and Alalaf, 2013). However, PCOS and related conditions and problems among infertile women in Rajshahi, Bangladesh remain unknown. Keeping this background in mind the present study was carried out to evaluate the socio-demographic status, clinical features and hormonal level findings of PCOS patients among infertile women in this area.

## **MATERIALS AND METHODS**

### **Study population**

It was a cross-section study carried out from September 2016 to May 2017 at Motherland Infertility Centre and Hospital (MICH) in Rajshahi, Bangladesh. Data was collected by systematic consecutive sampling technique among infertile PCOS patients. During the investigation period, every day around 50-60 patients visited this hospital and among them about 3 patients had PCOS.

### **Sample size determination**

An appropriate mathematical formula was used for calculating sample size for this study, where 95% confidence interval and 80% power of study were considered. All necessary information were taken from one of the Bangladeshi studies (Nahar *et al.* 2014). The formula provided that 300 sample was adequate for our present study. Initially, we considered 350 women for collecting their information related to PCOS, but 26 women did not agree to provide their information, consequently 324 samples were considered in this study.

### **Study protocol**

Trained study personal interviewed participants using standardized questionnaires containing all the variables of interest. Socio-demographic characteristics and clinical manifestations were evaluated. These were woman's age, marriage history educational status, occupation, family income, Body Mass Index (BMI), menstrual cycle, menstrual cycle patents, dysmenorrhoea, hirsutism, type of infertility and history of abortion etc. The findings of hormonal status like serum Follicle Stimulating Hormone (FSH), serum Luteinizing Hormone (LH), serum prolactin level and Thyroid Stimulating Hormone (TSH) were collected after their laboratory investigation.

### **Ethics approval and consent to participate**

We obtained permission from MICH authority for getting data from PCOS patients, and MICH got approval from Rajshahi Civil Surgeon office and Rajshahi City Corporation,

Bangladesh for providing support to researcher. Before interview, we obtained written consent from all the respondents.

### Statistical analysis

Collected data were processed and analyzed using computer based softwares (SPSS 16 and GraphPad InStat 3). Unpaired t-test was used in this study to find the significance difference between two groups.

## RESULTS

In the present study, it was found that a total of 324 women had PCOS where most women had been suffering from primary infertility (93.2%), while few women had been suffering from secondary infertility (6.8%). Table 1 shows the socio-demographic characteristics of the women included in this study. The average age of the study participants was 24.36 years. About half (48.1%) of the women were in age group of 21-25 years, followed by age group 26-30 years (27.2%), 15-20 years (17.3%) and 31-35 years (7.4%). The maximum number of women 208 (64.2%) came from urban areas for treatment, whereas 35.8% women from rural areas.

**Table1 1:** Distribution of the study population according to women socio-demographic characteristics (n = 324)

	Variables	n	Percentages (%)	
Age (Years)	15-20	56	17.3	
	21-25	156	48.1	
	26-30	88	27.2	
	31-35	24	7.4	
Residence	Urban	208	64.2	
	Rural	116	35.8	
Duration of married life (Years)	1-5	174	53.7	
	6-10	102	31.5	
	11-15	34	10.5	
	16-20	12	3.7	
	> 20	2	0.6	
Educational Status	Illiterate	44	13.6	
	Primary	98	30.2	
	Secondary	144	44.4	
	Higher secondary	38	11.7	
Occupation	Housewife	256	79	
	Service	68	21	
Family income group (BDT/Month)	< 20000	Poor	118	36.4
	21000-40000	Middle	158	48.8
	> 40000	Higher	48	14.8

BDT= Bangladesh Taka

The results showed that 53.7% women got married before 5 years of the present survey followed by 31.5% in 6-10 years, 10.5% in 11-15 years, 3.7% in 16-20 years and finally 0.6% in more than 20 years. It was noted that 13.6%, 30.2%, 44.4% and 11.7% women were illiterate, primary, secondary and higher secondary level of education, respectively. About 79% infertile women were housewife and 21% in service. Considering the economic condition, about 48.8% women were came from middle income group whereas 39.4% and 14.8% from lower and higher income groups, respectively.

The manifestations of medical related factors of study women were examined (Table 2). The highest prevalence of PCOS (65.4%) was observed among overweight and obsess infertile women, while the prevalence among normal weight women was 34.6%. It was noted that more than 78% infertile women experienced irregular menstruation. We also noted that 61.7% women were suffered from oligomenorrhoea, while 9.3% and 7.4% had menorrhagia and amenorrhoea respectively. A remarkable number (25.9%) of women suffered painful cramps (dysmenorrhoea) during their menstruation period. We observed that only 5% respondents had hirsutism, and most of the women (96.3%) did not have any history of abortion (Table 2).

**Table 2:** Clinical manifestations of PCOS patients among infertile women (n = 324)

Variables		n	Percentages (%)	
Type of infertility	Primary	302	93.2	
	Secondary	22	6.8	
BMI (Kg/m <sup>2</sup> )	< 25	Normal	112	34.6
	25-30	over-weight	132	40.7
	> 30	Obese	80	24.7
Menstrual cycle	Regular	70	21.6	
	Irregular	254	78.4	
Menstrual cycle patterns	Regular	70	21.6	
	Amenorrhoea	24	7.4	
	Oligomenorrhoea	200	61.7	
	Menorrhagia	24	9.3	
Dysmenorrhoea	Present	84	25.9	
	Absent	240	74.1	
Hirsutism	Present	16	5	
	Absent	308	95	
History of Abortion	Present	12	3.7	
	Absent	312	96.3	

The majority of our respondents had normal FSH (74.7%) with an average of 6.65 mIU/ml and raised FSH in 25.3% patients (average 12.52 mIU/ml). We noted that about half of women (51.9%) had normal serum LH and rest of 48.1% had raised serum LH. The average of normal and raised LH was 6.55 and 16.39 mIU/ml respectively. In our study, serum

prolactin was normal in large number of women (69.8%) with an average of 339.82 mIU/ml and raised prolactin in 30.2% women (average 708.17 mIU/ml). A good number (65.8%) of the women was normal serum TSH, and notable percentage (34.2%) was raised TSH. The average serum TSH was 2.19 and 6.24 mIU/ml respectively.

**Table 3:** Distribution of the study population according to hormonal level findings (n = 324)

	Parameter	N	%	Mean	t-value	p-value
Serum FSH	Normal (1-10 mIU/ml)	242	74.7	6.65	2.061	< 0.001
	Raised (> 10 mIU/ml)	82	25.3	12.52		
Serum LH	Normal (1-10 mIU/ml)	168	51.9	6.55	9.146	< 0.001
	Raised (> 10 mIU/ml)	156	48.1	16.39		
Serum prolactin	Normal (87-498 mIU/ml)	226	69.8	339.82	2.813	< 0.001
	Raised (> 498 mIU/ml)	98	30.2	708.17		
Serum TSH	Normal (0.3-3.6 mIU/ml)	212	65.8	2.19	25.617	< 0.001
	Raised (> 3.6 mIU/ml)	110	34.2	6.24		

## DISCUSSION

The present study was intended to explore the related causes of PCOS patients. Estimates of PCOS prevalence have been shown to vary across regions within a country. This study revealed that many socio-demographic variables of women's were statistically significant namely age, occupation, address, educational status, occupation and family income. It was reported that the mean age was 23.55 years, while 72.7% were within the age of 20-29 years for PCOS patients (Nahar *et al.*, 2014). In the present study among 324 women, the average age of the study participants was 24.36 years and 75.3% were within the age of 21-30 years which is quite young age. More than 64% PCOS women came from urban area, and duration of married life was 1-5 years in 53.7% of cases. A recent study was also revealed that duration of married life was 56% for 1-5 years age group (Anwary *et al.*, 2013). In this study, we found that 56.1% patients completed secondary and higher education, and most of the subjects (79%) were housewife. Almost same results were found in Hussein and Alalaf (2013) study, they reported that most of the infertile women (84%) in Turkey were housewife and a remarkable number of women (27.4%) was higher educated. The family income of 48.8% participant was middle class ranging from 21000 to 40000 BDT. Similar finding was observed in a study conducted in Malaysia, and researchers found that 47.9% infertile Malaysian women were living in middle income family (Ishak *et al.*, 2012).

In the present study, 324 women with PCOS attend in Motherland infertility center and hospital during the study time period. Among them about 302 (93.2%) had primary fertility, and 22 (6.8%) had secondary fertility. A recent study showed that the primary infertility was found in 72% cases and secondary infertility was found in 28% cases (Khanam and Parvin, 2014). In another study 90% was suffered primary subfertility and 10% was secondary subfertility, nearer to present study (van Hooff *et al.*, 2000). It was noted from the present study that 40.7% and 24.7% (total 65.4%) women were over-weight and obese respectively. In comparison, studies performed in Dutch found that 11.3% of women with PCOS were over- weight and 32.7% were obese (Elting *et al.*, 2001).

The common appearance of the women having PCOS was menstrual problems (Cahill, 2010). In the present study 78.4% women had irregular menstrual cycle, and 61.7% women had oligomenorrhoea. This study has similarity to a previous study in which irregular menstrual cycle was found in 80% subjects (Anwary *et al.*, 2009). A recent study was revealed that oligomenorrhoea was prevalent in 56.3% women with PCOS, nearer to the present study (Nahar *et al.*, 2014). Although in a study in Malaysia and Brazil, oligomenorrhoea was found in 94.9% and 80% women (Ishak, *et al.*, 2012; Barbosa *et al.*, 2016). Hirsutism was present only in 5% cases in the present study, although around 50% hirsutism among PCOS patients had also been reported in other studies (Anwary *et al.*, 2009; Nahar *et al.*, 2014). It has been reported that one of the risk factors of PCOS is spontaneous abortion (Wang *et al.*, 2001). In our study history of abortion was found in 3.7% women. The prevalence of abortion among PCOS patients was higher (10-12%) in other reports compared with our study (Anwary *et al.*, 2009, 2013)

A set of blood investigations was done including serum FSH, LH, prolactin and TSH to evaluate the hormonal profile. On the basis of hormonal profile, normal and raised levels of those hormones are significantly associated ( $p < 0.001$ ) among the PCOS women. PCOS is caused by an inequality in the hormone levels in brain and ovaries (Ahmed *et al.*, 1992). PCOS usually happens when levels of LH is high over FSH, which then causes the ovaries to make extra amounts of testosterone resulting interrupt ovulation (Sterling, 2011). In this study, serum FSH and LH were raised in 25.3% and 48.1% women, respectively, and the ratio of LH and FSH was 1:1.31, which was high. Raised level of serum prolactin was also found in 30.2% of women which was greater than 700 mIU/ml. It was reported that hyperprolactinemia may be associated with a variety of menstrual cycle disturbances particularly in polycystic ovarian syndrome, and major cause of subfertility (Avner and Mathew, 2002; Nizam *et al.*, 2008). Our observation showed 34.2% raised level of serum

TSH (>6 mIU/ml) among women. Raised levels of TSH showed significant association between subclinical hypothyroidism and infertility (Yasmin *et al.*, 2008). This study has several possible limitations. Since this is a cross-sectional study, it is difficult to establish a causal relationship between the investigated factors and PCOS. Moreover, the study did not consider any genetic association of PCOS. This study was done only at Rajshahi district of Bangladesh. This may not represent the whole PCOS patients in Bangladesh.

## CONCLUSION

It may be concluded from the present study that the prevalence of PCOS among young women (21-30 years) was 75.3%, and most of them were in primary infertility. Increased BMI (Overweight and obese), irregular menstruation and oligomenorrhoea are the common characteristics of PCOS patients among infertile women. Furthermore, our study showed the effect of hormonal changes such as LH/FSH ratio, high level of serum prolactin and TSH in occurrence of PCOS. The health authorities of Bangladesh can consider our findings to reduce the number of infertile women in Bangladesh specifically in Rajshahi district. However, more research is required for PCOS among infertile women in order to understand the causal pathways.

## REFERENCES

- Anwary SA, Alfazzaman M, Begum N. 2009. A clinical study on PCOS patients in a tertiary hospital. *Medicine Today* 22: 34–37.
- Anwary SA, Chowdhury S, Fatima P, Alfazzaman M, Begum N, Banu J. 2013. A study on subfertile women suffering from polycystic ovarian syndrome with hyperprolactinaemia and hypothyroidism as associated factors. *J Bangladesh Coll Phys Surg* 31(3): 140-143.
- Archer JS, and Chang RJ. 2004. Hirsutism and acne in polycystic ovary syndrome. *Best Pract Res Clin Obstet Gynaecol* 18:737-54.
- Avner H, and Mathew PC. 2002. Endocrine Disorders in Novak's Gynecology. In: Jonathan BS, editor. 13th ed. Lippincott Williams and Wilkins, Philadelphia. p. 899.
- Balen AH, Conway GS, Kaltsas G, Techatrasak K, Manning PJ, West C, Jacobs HS. 1995. Polycystic ovary syndrome: The spectrum of the disorder in 1741 patients. *Hum Reprod* 10: 2107-2111.
- Barbosa G, de Sá LBPC, Rocha DRTW, Arbex AK. 2016. Polycystic ovary syndrome (PCOS) and fertility. *Open Journal of Endocrine and Metabolic Diseases* 6: 58-65.



- Cahill D. 2010. Polycystic ovary syndrome (PCOS): diagnosis and treatment. Available from <http://www.netdoctor.co.uk/conditions/sexual-health/a11644/polycystic-ovary-syndrome-pcos/>
- De Leo V, Musacchio MC, Cappelli V, Massaro MG, Morgante G, Petraglia F. 2016. Genetic, hormonal and metabolic aspects of PCOS: an update. *Reprod Biol Endocrinol* 14 (1): 38.
- Delitala AP, Capobianco G, Delitala G, Cherchi PL, Dessole S. 2017. Polycystic ovary syndrome, adipose tissue and metabolic syndrome. *Arch Gynecol Obstet* 296(3): 405–419.
- Diamanti-Kandarakis E, Kandarakis H, Legro RS. 2006. The role of genes and environment in the etiology of PCOS. *Endocrine* 30 (1): 19–26.
- Dunaif A. 2011. Polycystic ovary syndrome in 2011: genes, aging and sleep apnea in polycystic ovary syndrome. *Nat Rev Endocrinol* 8(2): 72–74.
- Ehrmann, DA. 2005. Polycystic ovary syndrome. *N Engl J Med* 352: 1233-1236.
- Elting MW, Korsen TJM, Bezemer PD, Schoemaker J. 2001. Prevalence of diabetes mellitus, hypertension and cardiac complaints in a follow up study of a Dutch PCOS population. *Hum Reprod* 16, 556- 560
- Gadir AA, Khatim MS, Mowafi RS, Alnaser HMI, Muharib NS, Shaw RW. 1992. Implications of ultrasonically diagnosed polycystic ovaries. I. Correlations with basal hormonal profiles, *Hum Reprod* 7(4): 453–457.
- Gill H, Tiwari P, Dabadghao P. 2012. Prevalence of polycystic ovary syndrome in young women from North India: A Community-based study. *Indian J Endocrinol Metab* 16(Suppl 2): S389–S392.
- Homburg R. 2008. Polycystic ovary syndrome. *Best Pract Res Clin Obstet Gynaecol* 22(2): 261-274.
- Hussein B, Alalaf S. 2013. Prevalence and characteristics of polycystic ovarian syndrome in a sample of infertile Kurdish women attending IVF infertility center in maternity teaching hospital of Erbil City. *Open Journal of Obstetrics and Gynecology* 3: 577-585.
- Ishak A, Kadir AA, Hussain NHN, Ismail SB. 2012. Prevalence and Characteristics of Metabolic Syndrome among Polycystic Ovarian Syndrome Patients in Malaysia. *Int J Collab Res Intern Med Public Health* 4(8): 1577-1588.
- Khanam K, and Parvin M. 2014. An observational study on 100 patients with polycystic ovarian syndrome (PCOS). *J Enam Med Coll* 4: 156-160.

- Kollmann M, Martins WP, Raine-Fenning N. 2014. Terms and thresholds for the ultrasound evaluation of the ovaries in women with hyperandrogenic anovulation. *Hum Reprod Update* 20 (3): 463–4.
- Kumar P, and Malhotra N. 2008. *Jeffcoatee's Principles of Gynecology*. 7<sup>th</sup> ed., Jaypee Brothers Medical Publishers (P) Ltd., New Delhi, India.
- Nahar K, Yasmin H, Pramanik L. 2014. Study of polycystic ovaries (PCO) in Mymensingh Medical College Hospital, Bangladesh. *J Bangladesh Coll Phys Surg* 32(3): 142-148.
- National Health Service. 2017. Causes of infertility. Available from <https://www.nhs.uk/conditions/infertility/causes/>
- Nizam K, Memon N, Devrajani BR. 2008. Outcome of treatment with Insuride in hyperprolactinemic infertile women. *J Liaquat Uni Med Health Sci* 7(2): 120-123.
- Sterling E. 2011. Hormone levels and PCOS. Available from <http://www.obgyn.net/polycystic-ovary-syndrome-pcos/hormone-levels-and-pcos>
- van Hooff MH, Voorhorst FJ, Kaptein MB, Hirasing RA, Koppelaar C, Schoemaker J. 2000. Polycystic ovaries in adolescents and the relationship with menstrual cycle patterns, luteinizing hormone, androgens and insulin. *Fertil Steril* 74 (1): 49-58.
- Wang JX, Davies MJ, Norman RJ. 2001. Polycystic ovarian syndrome and the risk of spontaneous abortion following assisted reproductive technology treatment. *Hum Reprod*, 16: 2606-2609.
- World Health Organization, 2004. Infecundity, infertility, and childlessness in developing countries. DHS Comparative Reports No 9. Calverton, Maryland, USA: ORC Macro and the World Health Organization.
- Yasmin F, Ava NN, Jahan K. 2008. Association between subclinical hypothyroidism and infertility. *Bangladesh J Urol*; 11: 47-53.