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Original Research Article

LH/FSH , BMI and Clinical Profile in Polycystic Ovarian Disease: A Correlative Study

Abstract

Background and Objectives:

Polycystic ovarian disease (PCOD) is probably the most prevalent endocrinological disorders affecting females and is the most common cause of menstrual disturbance during the reproductive age. It is characterized by polycystic ovaries on ultrasound with clinical and biochemical signs and symptoms of hyperandrogenism. Therefore, this study was designed to determine relationship among LH/FSH ratio, BMI and the clinical profile of females suffering from PCOD.

Materials and Methods:

Blood samples from 50 study subjects were taken after getting informed consent for hormone profile (FSH and LH) by ELISA. Body Mass index (BMI) and Ultra-sonogram related findings of polycystic ovarian disease patients were recorded. Statistical analysis was done by using SPSS-20.

Results:

LH/FSH values were significantly higher among infertile and fertile females (P=0.05). BMI was also significantly co-related statistically in female patients with and without hirsuitism (P=0.005). BMI (P=0.00) and LH/FSH (P=0.004) were also found to be associated significantly with obesity in patients with PCOD.

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Conclusion:

Significant statistical correlations among LH/FSH, BMI and other clinical parameters depict that by controlling the BMI, the hormonal imbalance can be controlled which may ultimately reduce the unwanted clinical signs and symptoms (Infertility, obesity, hiruistism, acne etc) of PCOD patients.

Key words:

Polycystic Ovarian Disease, FSH, LH, BMI, Polycystic Ovaries, Obesity, Hirsutism, Oligomenorrhea, Amenorrhea.

Introduction

Polycystic Ovarian Disease (PCOD) is probably the most prevalent endocrinological disorders affecting females and it is the most common cause of menstrual disturbance during the reproductive age. It is characterized by presence of polycystic ovaries on ultrasound together with the clinical & biochemical signs of hyperandrogenism [1].

PCOD was first described by Stein and Leventhal in 1935 in women with of PCOD is multifactorial and complex. The disease has genetic basis affected by environmental factors [2] [3].

Obesity is an important risk factor for PCOD. Literature review shows that 30-70% of PCOD females are obese, though disease is also seen in females of normal weight but with less frequency. The presence of obesity markedly modifies the clinical and biochemical expression of disease and makes the management of the syndrome very difficult [4].

World Health Organization (WHO) and National Institute of Health (NIH) criteria defined obesity; underweight as body mass index (BMI) < 18.5, normal weight as BMI between 18.5-

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24.9, overweight as BMI between 25-29.9 and obesity as a BMI of 30 or greater. Obesity is further divided into class 1 (BMI 30-34.9), class ll (BMI 35-39.9) and class lll (BMI > 40) [5]

When defined by the presence of oligomenorrhea and hyperandrogenism, 75% of women with PCOS have an LH level that is above the normal range for women in the early follicular phase and 94% have an increased LH to FSH ratio [6].

However, further studies have demonstrated an inverse relationship between LH and body weight that is continuous across a wide spectrum of body weights in PCOS patients, supporting the model of an intrinsic neuroendocrine abnormality in all oligomenorrheic PCOS patients that is modified by obesity [7] [8].

Moreover, manifestations of PCOS may include menstrual irregularities, obesity, insulin resistance and elevated serum LH levels [9].

The characteristic increase in LH relative to FSH release, have long been appreciated in PCOS . Because of the pulsatile nature of their release, a single test fails to detect an increased LH/FSH ratio. This, as well as its lack of specificity, has led to the recommendation that LH/FSH ratios not be included in the diagnostic criteria for PCOD [10] [11].

Approximately half of PCOS women are obese or overweight and obesity has important role in the development of the Hyperandrogenic state [12] [13]. Even those with normal BMI, PCOS sufferers tend to have android body type with waist to hip ratio greater than 0.8 [14].

The study is designed to demonstrate a correlation/ association among LH/FSH ratio, BMI, and the clinical profile of females suffering from PCOS.

Materials and Methods

Subjects: It was a comparative study, carried out in the Department of Pathology, Allama Iqbal Medical College Lahore after approval of Ethical Review Committee. The sample was taken in

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Infertility clinic of Obstetrics and Gynaecology Department of Jinnah Hospital, Lahore. Purposive sampling technique was used and a total of 50 subjects were recruited for this study after an informed consent. The study included all diagnosed cases of females of reproductive age, married or unmarried presenting with clinical features of PCOD confirmed on Ultrasound. Patients with hyperandrogenism and anovulation other than PCOD like Cushing syndrome, un-treated hypo or hyperthyroidism, ovarian tumors and adrenal hyperplasia/tumors.

At the time of sample collection, relevant details of each participant such as age, sex, and clinical features of disease were noted. The detail about their ultrasonic findings and BMI was also noted. Samples were processed for fertility hormone profile by sandwich ELISA technique.

Statistical analysis: The data was entered and analyzed using IBM SPSS 20.0. Mean± SD was used for quantitative variables. Qualitative variables were expressed as frequencies, percentages and graphs. For normally distributed data one way ANOVA and for not normally distributed data Kruskal-Walis test was applied. Post Hoc Turkey test was applied to observe which group means differ in various groups. A p-value of ≤ 0.05 was considered as statistically significant.

Results:

When BMI, FSH and LH were compared b/w fertile and infertile femles, the value of FSH was statistically different between two groups (P = 0.05) as shown in Table 1.

When BMI, FSH and LH were compared b/w menstrually disturbed and undisturbed females, there was no significant difference b/w two groups as shown in Table 2.

When BMI, FSH and LH were compared b/w females with hirsuitism and without hirsuitism, the value of BMI was statistically significant b/w two groups (P = 0.005) as shown in Table 3.

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When BMI, FSH and LH were compared b/w females with oligomenorrhea and without oligomenorrhea, there was no significant difference b/w two groups as shown in Table 4.

When BMI, FSH and LH were compared b/w females with amenorrhea and without amenorrhea, there was no statistically significant difference b/w two groups as shown in Table 5.

When BMI, FSH and LH were compared b/w females with menopause and without menopause, there was no statistically significant difference b/w two groups as shown in Table 6.

When BMI, FSH and LH were compared b/w females with acne and without acne, there was no statistically significant difference b/w two groups as shown in Table 7.

When BMI, FSH and LH were compared b/w females with and without obesity, the values of BMI and FSH were statistically significantly different between two groups (p=0.00 and p=0.04) as shown in Table 8.

When BMI, FSH and LH were compared b/w patients with and without regular menstrual periods, there was no statistically significant difference b/w two groups as shown in Table 9.

Discussion

In the current study, FSH, LH and BMI were compared among different groups of PCOD categorized on the basis of fertility, menstrual disturbance, hirsuitism, oligomenorrhea, amenorrhea, menopause, acne, obesity and regular menstrual periods.

The current study is partially in agreement with the studies of Olooto et al. (2012) [15] who find statistical significant difference in FSH (P=0.00) and LH (P=0.00) but not in BMI (P=0.554) b/w fertile and infertile females..In our study only FSH is statistically significant between infertile and fertile females (P=0.05).

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When FSH, LH and BMI were compared between females with and without menstrual disturbance, there was no statistically significant difference between two groups. The current study is in accordance with the studies of Abdulrazak et al. (2007) [16].

BMI is significantly different between females with and without hirsuitism (P=0.005) that is not in agreement with the studies of Farid-ur-rehman et al. (2010) [17] (P>0.05). FSH and LH values are statistically insignificant between these groups that is also not in accordance with the studies of Shazia Rasool et al. (2011) [18] (P<0.05).

FSH, LH and BMI were compared between females with and without oligomenorrhea, no statistically significant difference is found that is partially in accordance with the studies of Singer et al.(2009) [19] whose studies FSH and LH were significantly higher in patients with oligomenorrhea (P<0.001) but no significant difference in BMI that is similar to current study.

The current study is partially in agreement with the study of Shazia Rasool et al. (2011) [18]. FSH and LH were significantly different between females with and without amenorrhea that is not similar to the current study. BMI was not significantly different between these groups that is similar to the current study.

According to Ewenighi Chinwe et al. (2014) [20] BMI, FSH and LH were statistically significant (0.000) between these groups with and without menopause that is not in accordance with current study.

The current study is in agreement with the study of Sayera Begum et al. (2012) [21] who also found no difference in LH, FSH and BMI (P>0.05).

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BMI (P=0.00) and FSH (P=0.04) are statistically significant between females with and without obesity but no difference is found in LH that is partially in agreement with the study of Abdulrazak et al. (2007) [16] who could not found any statistically significant difference in FSH, LH and BMI.

According to Abdulrazak et al. (2007) [16] there was no statistically significant difference in LH, FSH and BMI in females with and without regular menstrual periods that is in accordance with the current study.

Conclusions

FSH values are statistically significant b/w infertile and fertile females. BMI is statistically significant b/w females with and without hirsuitism. BMI and FSH are statistically significant b/w females with and without obesity. Significant statistical correlations among LH/FSH, BMI and other clinical parameters depict that by controlling the BMI, the hormonal imbalance can be controlled which may ultimately reduce the unwanted clinical signs and symptoms (Infertility, obesity, hiruistism, acne etc) of PCOD patients.

References

1. Ovesen PG, Moller N, et al. Polycystic ovary Syndrome. Clinical presentation and treatment Ugesker Laeger 1998; 160(3):260-4.

2. Stein IF, Leventhal ML. Amenorrhea associated with bilateral polycystic ovaries. American J Obstet Gynecol 1935; 29: 181-191.

3. Asuncion Clavo, R.M, San Millan, J L, Sancho, J Avila S and Escobar Morreale, H F. A prospective study of the prevalence of the polycystic ovary syndrome in unselected

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Caucasian women from Spain. Journal of Clinical Endocrinology and Metabolism; 2000; 85: 2434-2438.

4. Venkatesan, A M, Dunaif, A and Corbould, A. Insulin resistance in Polycystic Ovarian Syndrome: Progress and Paradoxes: Recent Progress in Hormone Research, 2001; 56: 295-308.
5. World Health Organization, Obesity; Preventing and Managing the Global Epidemic, Report of the WHO Consultation on Obesity. Geneva: World Health Organization; 3-5 June 1997.
6. National Institute of Health. Clinical guidelines on the identification, evaluation and treatment of overweight and obesity in adults: the evidence based report. Bethesda, MD: National Institute of Health, US Department of Health and Human Services; 1998.
7. Taylor AE, McCourt B, Martin KA, Anderson EJ, Adams JM, Schoenfeld D, Hall. Determinants of abnormal gonadotropin secretion in clinically defined women with polycystic ovary syndrome. J Clin Endocrinol Metab 1997; 82:2248–2256.
8. Arroyo A, Laughlin GA, Morales AJ, Yen SS. Inappropriate gonadotropin secretion in polycystic ovary syndrome: influence of adiposity. J Clin Endocrinol Metab 1997; 82:3728–3733.
9. Rotterdam ESHRE/ASRM-Sponsored PCOS Consensus Workshop Group Revised 2003 consensus on diagnostic criteria and long term health risks related to polycystic ovary syndrome. Fertil Steril 2004;81: 19-25.
10. Dunaif A, Givens JR, Hasltine F and Merriam GR. The polycystic ovary syndrome. 1992, Blackwell Scientific, Cambridge, MA Dunaif A. Insulin Resistance and the Polycystic

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Ovary Syndrome: Mechanism and Implications for Pathogenesis. Endocrine Reviews 1997; 18 (6): 774-800.

11. Dunaif A. Insulin Resistance and the Polycystic Ovary Syndrome: Mechanism and Implications for Pathogenesis. Endocrine Reviews 1997; 18 (6): 774.
12. Pasquali R, Vicennate V. Influence of weight and distribution of adipose tissue in functional hyperandrogenism. Contracept Fertil Sex 1998; 26(5):372-5
13. Yen SS. The polycystic ovary syndrome. Clin.Endocrinol 1980; 12:177 183.
14. Hull L, Dunaif A. Menstrual disorders in insulin resistant states. Diabetes Spectr 1997;10: 185- 190.
15. Olooto, Eniola W, Adeleye, Olufemi A, Amballi, Adetola A, Mosuro, Oladipupo A. Pattern of Reproductive Hormones (Follicle Stimulating Hormone, Luteinizing Hormone, Estradiol, Progesterone, and Prolactin) Levels in Infertile Women in Sagamu South Western Nigeria. Der Pharmacia Lettre 2012; 4 (2):549-553.
16. Alnakash AH, Al-Tae'e NK. Polycystic ovarian syndrome: the correlation between the LH/FSH ratio and disease manifestations. Middle East Fertility Society Journal Vol. 12, No. 1, 2007.
17. Rehman F, Sohail I, Hayat Z, Niazi N A. Etiology of hirsutism. Is there a correlation between menstrual regularity, body mass index and severity of hirsutism with the cause? Journal of Pakistan Association of Dermatologists 2010; 20: 4-9.
18. Rasool S, Dar LR, Hameed A. Prevalence of polycystic ovaries among patients with hirsutism and menstrual abnormalities. Journal of Pakistan Association of Dermatologists 2011; 21 (3): 174-178.

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19. Singer K, Rosenthal A, Kasa-Vubu J. Elevated Testosterone and Hypergonadotropism in Active Adolescents of Normal Weight with Oligomenorrhea Journal of Pediatric and Adolescent Gynecology 2009;22(5): 323-327.

20. Chinwe E, Uchechukwu D, Babatunde A, et al. Enzymatic Activities of Glucose 6Phosphate Dehydrogenase and Some Liver Enzymes among Quarry Workers in Umuoghara. Ebonyi State- Nigeria International Journal of Health Sciences and Research 2014; 4(9): 2249-9571.

21. Begum S, Hossain MZ, Rahman F, Banu LA. Polycystic ovarian syndrome in women with acne. Journal of Pakistan Association of Dermatologists 2012; 22: 24-29.

Table 1: Comparison of BMI, FSH, LH b/w fertile and infertile females

		N	Mean ± SD	P- value
BMI	Infertility	25	27.52 ± 5.39	0.55
	Fertility	25	26.48 ± 6.70	
FSH	Infertility	25	8.49 ± 3.98	0.05
	Fertility	25	6.60 ± 2.63	
LH	Infertility	25	10.40 ± 7.98	0.09
	Fertility	25	14.24 ± 7.80	

Table 2: Comparison of BMI, FSH, LH b/w menstrually disturbed and undisturbed females

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	History of menstrual disturbance	N	Mean ± SD	P- value
BMI	No disturbance	1	23.9 ± 6.09	0.609
	Disturbance	49	27.06 ± 6.09	
FSH	No disturbance	1	10.50 ± 3.48	0.397
	Disturbance	49	7.48 ± 3.48	
LH	No disturbance	1	21.4 ± 8.02	0.259
	Disturbance	49	12.13 ± 8.02	

Table 3: Comparison of BMI, FSH, LH b/w females with hirsuitism and without hirsuitism

	Hirsuitism	N	Mean ± SD	P- value
BMI	No hirsuitism	19	23.98 ± 4.60	0.005
	Hirsuitism	31	28.85 ± 6.13	
FSH	No hirsuitism	19	6.93 ± 3.30	0.331
	Hirsuitism	31	7.92 ± 3.58	
LH	No hirsuitism	19	9.78 ± 7.79	0.081
	Hirsuitism	31	13.87± 7.43	

	Oligomenorrhea	N	Mean ± SD	P- value

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BMI	No	20	27.58 ± 6.29	0.586
	Oligomenorrhea	30	26.62 ± 5.95	
FSH	No	20	8.18 ± 3.10	0.298
	Oligomenorrhea	30	7.12 ± 3.69	
LH	No	20	13.77 ± 8.42	0.302
	Oligomenorrhea	30	11.35 ± 7.78	

Table 4: Comparison of BMI, FSH, LH and Oligomenorrhea

Table 5: Comparison of BMI, FSH, LH and amenorrhea

	Amenorrhea	N	Mean ± SD	P- value
BMI	NO	47	26.9 ± 5.99	0.810
	Amenorrhea	3	27.8 ± 8.31	
FSH	NO	47	7.70 ± 3.51	0.200
	Amenorrhea	3	5.03 ± 1.33	
LH	No	47	12.45 ± 8.16	0.643
	Amenorrhea	3	10.20 ± 6.97	

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233 **Table 6: Comparison of BMI, FSH, LH and menopause**

	Menopause	N	Mean ± SD	P value
BMI	No	49	26.98 ± 6.10	0.870
	Yes	1	28.00 ± 6.10	
FSH	No	49	7.58 ± 3.50	0.617
	Yes	1	5.80 ± 3.50	
LH	No	49	12.41± 8.10	0.559
	Yes	1	7.60 ± 8.10	

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235 **Table 7: Comparison of BMI, FSH, LH b/w patients of Acne and without acne**

	Acne	N	Mean ± SD	P- value
BMI	No	20	27.34 ± 6.63	

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	Acne	30	26.78 ± 5.73	0.75
FSH	No	20	8.50 ± 4.09	0.112
	Acne	30	6.90 ± 2.90	
LH	No	20	11.05 ± 7.92	0.368
	Acne	30	13.16 ± 8.15	

Table 8: Comparison of BMI, FSH, LH b/w patients with obesity and without obesity

	Obesity	N	Mean ± SD	P- value
BMI	No	15	20.6 ± 3.85	0.00
	Obesity	35	29.7 ± 4.63	
FSH	No	15	6.06 ± 2.96	0.04
	Obesity	35	8.18 ± 3.52	
LH	NO	15	11.82 ± 7.88	0.77
	Obesity	35	12.53 ± 8.22	

Table 9: Comparison of BMI, FSH, LH b/w patients with regular menstrual periods and without regular menstrual periods

	Regular menstrual period	N	Mean ± SD	

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				P- value
BMI	No	49	26.9 ± 6.10	0.870
	Yes	1	28.00 ± 6.10	
FSH	No	49	7.58 ± 3.50	0.617
	Yes	1	5.80 ± 3.50	
LH	No	49	12.41 ± 8.10	0.559
	Yes	1	7.600 ± 8.10	

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