Original Research Article

A lipid profile study in polycystic ovary syndrome women

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ABSTRACT

Background: Dyslipidemia in PCOS has multifactorial causation and insulin resistance plays a pivotal role by stimulation of lipolysis and altered lipases which are characterized by higher triglyceride and lower high-density lipoprotein cholesterol.[1]
Methods: This observational cross-sectional study was conducted in the obstetrics and gynaecology department of SPS hospital Ludhiana Punjab and included 60 women with PCOS and 30 non PCOS women of age group 18-40 who meet the inclusion criteria.
Results: PCOS women with BMI <18.5 (underweight) their mean cholesterol, HDL, LDL, VLDL and triglycerides were 158.00, 48.00, 74.00, 35.60, 178.00 respectively. PCOS women with BMI ranging from >18.5-24.99 (normal) the mean±SD for cholesterol, HDL, LDL, VLDL and triglycerides were 169.50 ± 21.83, 44.86±2.66, 85.80±20.33, 38.84±3.57, 194.18±17.86 respectively. PCOS Subjects with BMI25-29.99 (overweight) Mean±SD for total cholesterol was 197.04±18.16, HDL=40.48±3.19, LDL=112.37±18.10, VLDL=44.20±2.89 and for triglycerides was 221.00±14.45.
Conclusions: An early treatment for obesity should be a priority to prevent cardiometabolic complications in future in women with Polycystic ovaries syndrome.

Keywords: Polycystic ovaries syndrome, Lipid profile, BMI, HDL, LDL, VLDL, Cholesterol, Triglyceride

INTRODUCTION

Dyslipidemia in PCOS has multifactorial causation and insulin resistance plays a pivotal role by stimulation of lipolysis and altered lipases which are characterized by higher triglyceride and lower high-density lipoprotein cholesterol and thus Insulin resistance and hyperandrogenism are major contributors to increased cardiovascular risk of women with PCOS.[1,2] Abnormal glucose and lipid metabolism, hypertension, obesity, insulin resistance and other features are suggestive of systemic inflammatory response. Early diagnosis and appropriate intervention to accompanying obesity is critical for metabolic and cardiovascular outcomes.[3] So, this study is taken to establish lipid profile in PCOS patients.

Objectives

Objective of current study was to study hormonal and lipid profile in polycystic ovary syndrome (PCOS) women.

METHODS

Study design, location and duration

Current study was a cross sectional study conducted at Satguru Pratap Singh Hospitals, Ludhiana from September 2018 to February 2020. The study was conducted on 60 women with PCOS (Rotterdam criteria 2003) and 30 non PCOS women, attended out-patient

department of obstetrics and gynecology, SPS Hospitals, Ludhiana.

Inclusion criteria

All female participants of age group 18-40 years who meet the Rotterdam criteria, 2003 like oligomenorrhea/anovulation, clinical and/or biochemical signs of hyperandrogenism and polycystic ovaries were included.

Exclusion criteria

Any participants with diabetes mellitus type-1 and type-2, stage 2 hypertension, congenital adrenal hyperplasia, hyperprolactinemia, hypothyroidism and Cushing syndrome were excluded from the study.

Sample size and sample technique

The following formula (Daniel 1999) was used to calculate sample size:

$$n = Z2P(1 - P)/d2$$

where n=sample size, Z=Z statistic for a level of confidence of 95% which is conventional (Z=1.96), P=expected prevalence of PCOS is 4% (in proportion is 0.04), d=precision (in proportion is 0.05). Therefore, the sample size for one year is 59; so, 60 cases to round off the figure were taken.

Procedure

This observational cross-sectional study was conducted in the obstetrics and gynaecology department of SPS Hospital Ludhiana Punjab and included 60 women with PCOS and 30 non PCOS women of age group 18-40 who meet the inclusion criteria. Informed written consent was obtained from all the participants and institutional ethics review committee approval was obtained before commencing the study. A detailed history of woman including chief complaints, history of presenting illness, demographic entity, menstrual history, obstetric, past medical and surgical history, personal history were documented. General physical examination was done, specially looking for features of hirsutism, acne, acanthosis nigricans. Anthropometric measurements were taken. BMI, pulse, blood pressure, respiratory rate, temperature was recorded. Blood pressure (BP) was measured after a 10 minutes rest period using digital automatic blood pressure monitor in sitting position placing the patient's right or left arm at the level of mid sternum (the approximation of right atrial level). Systemic examination included, cardiovascular, respiratory and per abdomen examination. Pelvic examination included per speculum, bimanual examination and per rectal examination wherever required has been done.

Ultrasound examination

Ultrasound machine E Saote was used to perform USG of lower abdomen in 2-Dimensions in all participants. Transvaginal sonography where ever was required had been done. Complete ultrasonography of lower abdomen was done to look uterus, bilateral fallopian tubes, and bilateral ovaries for any pathology. Ovarian measurements size, volume, no of follicles in both ovaries had been recorded. Venous fasting sample (10 ml) was taken after an overnight fasting for 12 hours and was sent for routine investigation, hormonal assay and lipid profile on 2nd day of onset of menstruation.

Routine investigations

Routine investigations performed were complete blood count urine routine/microscopy and random blood sugar.

Hormonal assay

Hormonal assays were performed for thyroid stimulating hormone, serum prolactin, follicular stimulating hormone, luteinizing hormone, LH/FSH ratio and serum testosterone.

Lipid profile

Lipid profile test were performed for total cholesterol, serum triglyceride, HDL cholesterol, LDL cholesterol and VLDL cholesterol. Very low-density lipoprotein (VLDL) cholesterol will be calculated according to formula:

$$LDL\ Cholesterol = Cholesterol - (HDL\ cholesterol + 0.46\ x\ triglyceride)$$

Statistical analysis

Statistical analysis was performed using the statistical package for the social sciences trial version 18.0 software (SPSS) and MS excel 2007 spread sheet. Pearson's co relation correlation co-efficient was calculated to see co relation between anthropometric parameters and lipid profile in PCOS female patients. For all statistical analysis p value, 0.05 had been considered statistically significant.

RESULTS

Participants

This observational cross-sectional study was conducted in the obstetrics and gynaecology department of SPS hospital Ludhiana Punjab and included 60 women with PCOS and 30 non PCOS women of age group 18-40 who meet the inclusion criteria.

Hormonal assay

The mean value of LH: FSH ratio was 3.23+0.18 in group A and 1.06+0.21 in group B. Majority (93%) of the subjects had value >3:1 and 4 subjects (7%) had ratio value <3:1 in group A whereas in group B all women had ratio value <3:1 which was statistically significant. Serum prolactin value <26 ng/ml was seen in all subjects in group A and 97% subjects in group B. The Mean serum prolactin level was 15.22+10.17 and 15.53+3.44 in respective groups. Serum testosterone value >75 ng/dl was seen in all subjects in group A and <75 ng/ml in all subjects in group B. The mean serum testosterone level 87.60 +4.98 and 8.40+6.24 respectively.

Table 1: Mean and difference (cases and controls).

Parameters	Group A		Group B		T value	P value	Difference	
	Mean	SD	Mean	SD			Mean	SD
Total Cholesterol	192.93	29.42	176.83	22.93	2.623	0.010	16.10	6.14
HDL Cholesterol	41.15	4.51	40.69	4.40	0.460	0.646	0.46	1.00
LDL Cholesterol	107.62	27.30	97.38	22.18	1.781	0.078	10.24	5.75
VLDL	44.10	6.58	38.77	4.63	3.966	0.000	5.33	1.34
Total Triglycerides	220.48	32.91	193.83	23.16	3.966	0.000	26.65	6.72

Table 2: Comparison between BMI and lipid profile mean and differences (group A).

Parameters	Body mass index								F	P value
	<18.5		>18.5-24.99		25-29.99		>30			
	Mean	SD	Mean	SD	Mean	SD	Mean	SD		
Total Cholesterol	158.00	29.42	169.50	21.83	197.04	18.16	225.50	20.11	23.649	0.000
HDL Cholesterol	48.00	4.51	44.86	2.66	40.48	3.19	35.93	2.56	30.307	0.000
LDL Cholesterol	74.40	18.57	85.80	20.33	112.37	18.10	136.49	18.20	21.962	0.000
VLDL	35.60	6.58	38.84	3.57	44.20	2.89	52.80	5.29	39.898	0.000
Total Triglycerides	178.00	32.91	194.18	17.86	221.00	14.45	264.00	26.43	39.898	0.000

Table 3: Comparison between BMI and lipid profile mean and differences (group B).

Parameters	Body mass index						F	P value
	>18.5-24.99		25-29.99		>30			
	Mean	SD	Mean	SD	Mean	SD		
Total Cholesterol	163.54	14.26	178.55	23.70	202.50	13.50	9.458	0.001
HDL Cholesterol	43.08	2.99	41.06	3.24	34.83	3.71	13.528	0.000
LDL Cholesterol	84.38	13.84	98.27	21.58	123.90	13.32	11.055	0.000
VLDL	36.08	2.61	39.22	4.75	43.77	3.71	8.848	0.001
Total Triglycerides	180.38	13.05	196.09	23.73	218.83	18.54	8.848	0.001

Lipid profile

Calculated Mean±SD value for total cholesterol was 192.93±29.42 and 176.83±22.93 for group A and group B respectively. 55% subjects in group A and 90% in group B had serum normal total cholesterol value (<200 mg/dl), 37% subjects in group A and 10% subjects in group B had normal value of range 200-239 mg/dl and 8% women in group A had high serum cholesterol value (>239 mg/dl) (Table 1). The Mean±SD value of HDL was 41.15±4.51 and 40.69±4.40 in group A and group B respectively. In group A, 35% subjects and in group B 30% subjects had low serum HDL value (<40 mg/dl) while 65% subjects in group A and 70% subjects in group B had normal value ranging from 40-60 mg/dl (Table 1). 42% subjects in group A and 57% in group B had serum optimal LDL value (<100 mg/dl). Above optimal were present in 38% and 33% subjects in group A and B respectively. Borderline high LDL was observed in 17% subjects of group A and 10% of group B with a value ranging from 130-159 mg/dl. Also, 3% women in group A had high LDL (>189 mg/dl). Mean±SD value of LDL was 107.62±27.30 in group A whereas for group B value accounted as 97.38±22.18 (Table 1, Figure 1). The Mean±SD values of VLDL for group A and group B was 44.10±6.5 and 38.77±4.63 respectively. 20% subjects in group A and 40% in group B had serum low VLDL value (<12 mg/dl). On the other hand, 80% subjects in group A and 60% subjects in group B had normal value ranging from 12-38 mg/dl (Table 1, Figure 1). The Mean±SD value of triglyceride was 220.48±32.91 and 193.83±23.1 in respective groups. Among group A, majority (68%) subjects had high TG level followed by normal levels (32%) whereas in group B, 73% had normal serum TG value (<150 mg/dl) and High TG value was present in 27% subjects (Table 1, Figure 1). In both the groups A (n=60 PCOS patients) and B (n= 30 non PCOS controls) subjects respectively were sub divided on the basis of BMI; <18.5 (underweight), >18.5-24.99 (normal), 25-29.99 (over weight), >30 (obese) and the mean values of

cholesterol, HDL, LDL, VLDL and triglyceride were calculated and compared. In both the groups p values were statistically significant. PCOS women with BMI <18.5 (underweight) their mean cholesterol, HDL, LDL, VLDL and triglycerides were 158.00, 48.00, 74.00, 35.60, 178.00 respectively (Table 2).

Table 4: Serum total cholesterol (comparison with previous studies).

Study	Year	Place	Subjects		Mean Tc (cases)	Mean Tc (controls)
			Cases	Controls		
Pirwany et al.[4]	2001	Glasgow UK	52	14	193.35 (181-201)	181.74 (170-197)
Valkenburg et al.[5]	2007	Nether lands	557	295	196 (170-226)	178 (162-209)
Berneis et al.[6]	2007	Italy	30	24	158±23	159±28
Macut et al.[7]	2008	Serbia	75	51	170.14±38.66	174.01±30.93
Rocha et al.[8]	2011	Brazil	142	31	180.88±30.31	165.34±15.49
Ambiger et al.[10]	2016		60	60	210.05±36.96	152.43±25.78
Donthu et al.[3]	2017	India	86	-	164.69±34.06	-
Present study	2020	India	60	30	192.93±29.42	176±22.93

Table 5: Serum HDL (comparison with previous studies).

Study	Year	Place	Subjects		Mean HDL (cases)	Mean HDL (controls)
			Cases	Controls		
Pirwany et al.[4]	2001	Glasgow UK	52	14	46.01 (43.3-49.1)	50.65 (43.69-58.0)
Valkenburg et al.[5]	2007	Nether lands	557	295	45 (36-56)	56 (46-66)
Berneis et al.[6]	2007	Italy	30	24	47±11	56±14
Macut et al.[7]	2008	Serbia	75	51	46.40±11.60	58.00±11.60
Rocha et al.[8]	2011	Brazil	142	31	47.74±17.56	58.32±7.91
Saghafi-Asl et al.[11]	2013	Iran	23	40	41.78±7.54	47.25±8.38
Ambiger et al.[10]	2016	India	60	60	33.71±6.74	53.84±5.18
Donthu et al.[3]	2017	India	86	-	44.83±14.62	-
Present study	2020	India	60	30	41.15±4.51	40.69±4.40

Table 6: Serum LDL (comparison with previous studies).

| Study	Year	Place	Subjects		Mean LDL (cases)	Mean LDL (controls)
			Cases	Controls		
Pirwany et al.[4]	2001	Glasgow UK	52	14	123.7 (116.0-131.4)	116.0 (104.4-131.4)
Valkenburg et al.[5]	2007	Nether lands	557	295	125 (102-152)	106 (90-128)
Berneis et al.[6]	2007	Italy	30	24	94±32	91±33
Macut et al.[7]	2008	Serbia	75	51	100.54±38.66	100.54±23.20
Rocha et al.[8]	2011	Brazil	142	31	111.0±25.36	101.54±22.49
Ambiger et al.[10]	2016		60	60	135.85±38.60	73.59±27.45
Donthu et al.[3]	2017	India	86	-	96.97±27.18	-
Present study	2020	India	60	30	107.62±27.30	97.38±22.18

Table 7: Serum triglycerides (comparison with previous studies).

Study	Year	Place	Subjects		Mean Tg (cases)	Mean Tg (controls)
			Cases	Controls		
Pirwany et al.[4]	2001	Glasgow UK	52	14	115.15 (106.29-132.86)	79.72 (70.86-97.43)
Valkenburg et al.[5]	2007	Nether lands	557	295	95 (71-139)	82 (61-110)
Berneis et al.[6]	2007	Italy	30	24	85±29	61±27
Macut et al.[7]	2008	Serbia	75	51	88.57±53.14	70.86±35.43
Rocha et al.[8]	2011	Brazil	142	31	118.97±66.03	117.32±35.81
Ambiger et al.[10]	2016		60	60	202.44±30.15	124.97±13.87
Donthu et al.[3]	2017	India	86	-	123.39±56.10	-
Present study	2020	India	60	30	220.48±32.91	193.83±23.16

Table 8: Serum VLDL (comparison with previous studies).

Study	Year	Place	Subjects		Mean VLDL (cases)	Mean VLDL (controls)
			Cases	Controls		
Pirwany et al.[4]	2001	Glasgow UK	52	14	19.33 (15.46-23.20)	11.60 (7.73-19.33)
Donthu et al.[3]	2017	India	86	-	30.01±18.359	-
Present study	2020	India	60	30	44.10±6.58	38.77±4.63

PCOS women with BMI ranging from >18.5-24.99 (normal) the mean±SD for cholesterol, HDL, LDL, VLDL and triglycerides were 169.50±21.83, 44.86±2.66, 85.80±20.33, 38.84±3.57, 194.18±17.86 respectively (Table 2). PCOS Subjects with BMI25-29.99 (overweight) Mean±SD for total cholesterol was 197.04±18.16, HDL=40.48±3.19, LDL=112.37±18.10, VLDL=44.20± 2.89 and for triglycerides was 221.00±14.45 (Table 2). Whereas, PCOS Subjects with BMI >30 (obese) the cholesterol, HDL, LDL, VLDL and triglycerides had their mean±SD as 225.50±20.11, 35.93±2.56, 136.49±18.20, 52.80±5.29, 264.00±26.43 respectively (Table 2). Similar observations were done for Non PCOS subjects with BMI ranging from >18.5-24.99 had mean±SD for cholesterol as 163.54±14.26, HDL as 43.08±2.99, LDL 84.38±13.84, VLDL 36.08±2.61 and triglycerides as 180.38±13.05 (Table 3). Non PCOS women with BMI range 25-29.99 differed with mean±SD values for cholesterol, HDL, LDL, VLDL and triglycerides as 178.55±23.70, 41.06±3.24, 98.27±21.58, 39.22±4.75, 196.09±23.73 respectively (Table 3). Non PCOS whose BMI was >30 the mean±SD for cholesterol was 202.50±13.50, HDL=34.83±3.71, LDL=123.90±13.32, VLDL=43.77±3.71 and for triglycerides was 218.83±18.54 (Table 3).
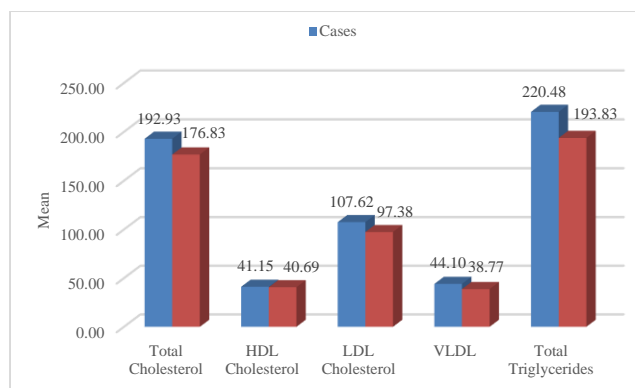
Figure 1: Lipid profile (mean and differences).

DISCUSSION

Lipid profile

Lipid profile included total serum cholesterol, high density lipoproteins, low density lipoproteins, very low-density lipoproteins and serum triglycerides. The serum cholesterol value obtained in present study was 192.93 and 176 for cases and controls respectively, which is comparable to Pirwany et al and Valkenburg et al whereas

higher as compared to studies by Berneis et al, Macut et al , Rocha et al and Donthu et al and lower than Ambiger et al as (Table 4).[3-9] As far as the serum value of HDL was concerned, value in present study is 41.15 and 40.69 for cases and controls respectively, which is comparable with Saghafi-Asl et al, higher than Ambiger and lesser than other studies as shown in (Table 5).[10,11] In present study mean LDL value is 107.6 for cases and 97.38 for controls which is comparable to Macut et al where observed values for cases and controls were near same and Rocha et al, higher as compare to Berneis et al and Donthu et al and lesser to other studies as shown in (Table 6).[3,6-8] The value of serum triglyceride in present study is 220.4 and 193.8 for cases and controls, which is comparable to Ambiger and much higher as compared to other studies done by Pirwany et al, Valkenburg et al, Berneis et al, Macut et al, Rocha et al, Donthu et al as shown in (Table 7).[3,4-8] As far as serum VLDL is concerned present study have higher values as compared to study done by Pirwany et al and near comparable with Donthu et al as depicted in (Table 8).[3,4]

Limitations

Limitations of current study were; this study didn't take into consideration, the phenotypic types of PCOS and Ferriman Gallwey score in examination and this study didn't obtain a daily calorie intake calculation for subjects.

CONCLUSION

An early treatment for obesity should be a priority to prevent cardiometabolic complications in future in women with polycystic ovaries.

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REFERENCES

1. Lath R, Shendye R, Jibhkate A. Insulin resistance and lipid profile in polycystic ovary syndrome. Asian J Biomed Pharm Sci. 2015;5(48):30-5.

2. Cristian-Ioan I, Nicolae C, Dan M. Lipid parameters in patients with polycystic ovary syndrome. Appl Med Inform. 2012;31(4):27-32.
3. Kiranmayee D, Kavya K, Himabindu Y, Sriharibabu M, Madhuri GLJ, Venu S. Correlations between anthropometry and lipid profile in women with PCOS. J Hum Reprod Sci. 2017;10(3):167-72.
4. Pirwany IR, Fleming R, Greer IA, Packard CJ, Sattar N. Lipids and lipoprotein subfractions in women with PCOS: relationship to metabolic and endocrine parameters. Clin Endocrinol Oxf. 2001;54(4):447-53.
5. Valkenburg O, Steegers-Theunissen RPM, Smedts HPM, Dallinga-Thie GM, Fauser BCJM, Westerveld EH, et al. A More atherogenic serum lipoprotein profile is present in women with polycystic ovary syndrome: A case-control study. J Clin Endocrinol Metabol. 2007;93(2):470-6.
6. Berneis K, Rizzo M, Lazzaroni V, Fruzzetti F, Carmina E. Atherogenic lipoprotein phenotype and low-density lipoproteins size and subclasses in women with polycystic ovary syndrome. J Clin Endocrinol Metabol. 2007;92(1):186-9.
7. Macut D, Panidis D, Glick B, Spanos N, Petakov M, Beki J, et al. Lipid and lipoprotein profile in women with polycystic ovary syndrome. Can J Physiol Pharm. 2008;86(4):199-204.
8. Rocha MP, Marcondes JAM, Barcellos CRG, Hayashida SAY, Curi DDG, da Fonseca ÂM, et al. Dyslipidemia in women with polycystic ovary syndrome: incidence, pattern and predictors. Gynecol Endocrinol. 2011;27(10):814-9.
9. Sudha A. Study of insulin resistance and lipid profile in polycystic ovarian syndrome. Int J Sci Res Publ. 2016;6(2):2250-3153.
10. Saghafi-Asl M, Pirouzpanah S, Ebrahimi-Mameghani M, Asghari-Jafarabadi M, Aliashrafi S, et al. Lipid profile in relation to anthropometric indices and insulin resistance in overweight women with polycystic ovary syndrome. Health Promot Perspect. 2013;3(2):206-16.