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Increased TG/HDL Ratio, A Surrogate Marker of Insulin Resistance In PCOS Women

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Abstract:
Background: *Insulin resistance (IR) is an important clinical and biochemical determinant, not only for diabetes but also of many other clinical states including polycystic ovarian syndrome. TG/HDL ratio has been a simple and reliable marker of insulin resistance. Hence TG/HDL ratio was analyzed to assess the degree of insulin resistance in women with Poly Cystic Ovarian Syndrome.*
Methods: *Total of 60 patients diagnosed as PCOS by Rotterdam criteria (mean age 23.8±4.18) and 35 healthy subjects (mean age 24.06±4.01) were enrolled for this study. Anthropometric measurements, glucose levels, insulin levels and lipid profile were measured in all these subjects. TG/HDL ratio, Homeostasis model of assessment of IR (HOMA-IR) and Quantitative Insulin check index (QUICKI) were then calculated.*
Results: *PCOS women had a higher BMI with increased Total Cholesterol, TGL, LDL, VLDL, HOMA-IR value and a lower HDL and QUICKI check index when compared to the control group which was statistically significant ($p<0.001$). There was no significant difference in Plasma glucose level among the groups. Women with PCOS showed a significantly higher TGL/HDL ratio and significant positive correlation with HOMA-IR ($r=0.4$, $p<0.001$) and negative correlation with QUICKI check index ($r=-0.41$, $p<0.001$).*
Conclusion: *TG/HDL ratio is strongly associated with insulin resistance in PCOS women .So it could be a less expensive, reliable marker for assessment of insulin resistance in PCOS women.*
Keywords: *Insulin Resistance, Triglycerides, High density Lipoprotein, Polycystic Ovarian Syndrome*

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I. Introduction

Polycystic Ovarian Syndrome the most common endocrinopathy affecting female fertility[(1)]. Worldwide it affects 8-20% of women in the reproductive age [(2)].In India the prevalence of PCOS is relatively high which is estimated to be 22.5% [(3)]. It is characterized by clinical or biochemical hyperandrogenism, chronic ovulatory dysfunction, and polycystic ovaries on ultrasound [(4)]. The exact cause of PCOS is not known. Insulin resistance and its subsequent secondary hyperinsulinemia play an important role in the pathogenesis of the reproductive abnormalities [(5)]. Dyslipidemia associated with insulin resistance is common in PCOS and characterized by higher TGL and LDL-C and lower HDL-C independent of BMI[(6,7)]. Insulin resistance increases the risk of developing diabetes and cardiovascular complications [(8)]. Hence assessing insulin resistance might be useful in investigating the epidemiology, pathophysiologic mechanisms and clinical course in patients with Polycystic Ovarian Syndrome [(9)]. To date several methods for estimating insulin resistance have been developed. The hyperinsulinemic-euglycemic clamp technique which is the gold standard for measuring insulin sensitivity is too expensive, time-consuming, and labor-intensive to be of practical use in an office setting [(10)]. The routinely used models for insulin resistance namely HOMA-IR and quantitative insulin sensitivity check index (QUICKI) were expensive. TG/HDL ratio has been proposed as a simple marker of insulin resistance [(12)] which is simple and cost effective reliable marker .It has also been shown to be an independent risk factor for coronary heart disease (CHD) [(13)]. So we analyzed TG/HDL ratio and its correlation with HOMA –IR and QUICKI in PCOS women

II. Materials And Methods

The present study was done in department of Biochemistry in collaboration in with Department of Obstetrics and Gynecology from January to August 2017 at Rajah Muthiah Medical College & Hospital,

Annamalai University. The study was approved by Institutional ethical committee. An informed written consent was obtained from Subjects and controls who participated in this study.

Inclusion Criteria: 60 subjects of age group 18-30 years who were diagnosed as PCOS according to Rotterdam criteria and 35 age matched healthy females were chosen as controls.

Exclusion Criteria: Subjects with the history of diabetes, hypertension, systemic inflammatory conditions, clinical evidence of acute infections, renal and hepatic diseases and Oral contraceptive pill usage were all excluded from the study.

Complete physical examination was recorded including anthropometric measurements (Height and weight, BMI, Blood pressure, waist circumference, Hip circumference and Waist hip ratio). Fasting Plasma Glucose, Lipid profile and serum insulin were all measured. Plasma glucose, Serum total cholesterol, triglycerides and HDL were measured using standard kits in auto analyzer. LDL was calculated using Friedewald formula. Insulin was measured by ELISA method. Insulin resistance was calculated using Homeostasis Model Assessment insulin resistance index: HOMA-IR = [fasting plasma glucose (mg/dl) × fasting insulin (IU/ml)]/405 and the quantitative insulin sensitivity check index (QUICKI). QUICKI = 1/[log fasting insulin (μU/ml) + log fasting glucose (mg/dl)]

Statistical Analysis*:* Statistical Analysis was carried out using SPSS 20. Values were expressed in mean ± standard deviation. Statistical difference between the control and PCOS groups were carried out using unpaired student "t" test and p value of < 0.05 was considered to be statistically significant. Pearson's correlation analysis was performed to assess the relationship between TG/HDL ratio and HOMA-IR, QUICKI check index.

III. Results

Table I depicts the clinical and biochemical characteristics of control and PCOS group. Table II shows the correlation statistics between TG/HDL ratio and insulin resistant indices namely HOMA-IR and QUICKI check index. There were no significant differences in age, blood pressure and fasting plasma glucose between the patients with PCOS and the control group. In PCOS group the BMI, waist-to-hip ratio were higher than the control group ($p<0.001$). Fasting insulin, Total cholesterol, TGL, LDL and VLDL levels were all significantly higher in women with PCOS than control group ($p<0.001$) and HDL was significantly lower in women with PCOS ($p<0.001$). A significant increase of HOMA-IR values and TG/HDL ratio and a lower QUICKI check index value was observed in PCOS women ($p<0.001$). TG/HDL ratio was significantly positively correlated with HOMA- IR ($r=0.4, p<0.001$) and negatively with QUICKI ($r= -0.41$, $p<0.001$).

Table I: The Clinical and Biochemical Parameters in PCOS Patients and Control Women

PARAMETERS	GROUP I (CONTROLS) (N=35)	GROUP II (PCOS) (N=60)	P VALUE
AGE	24.06±4.01	23.8±4.18	NS
SYSTOLIC BLOOD PRESSURE (mmHg)	119.3±3.76	118.5±4.2	NS
DIASTOLIC BLOOD PRESSURE (mmHg)	78.3±2.8	77.9±2.56	NS
BMI (kg / m^2)	23.2±1.5	26.21±3.08	P<0.001
WHR	0.82 ± 0.03	0.85 ± 0.02	P<0.001
FASTING PLASMA GLUCOSE (mg/dl)	85.97±4.28	85.45±3.94	NS
FASTING INSULIN (μU/ML)	8.2±1.17	17.97±3.13	P<0.001
HOMA-IR	1.75±0.32	3.8±0.72	P<0.001
QUICKI	0.35±0.01	0.31±0.09	P<0.001
TOTAL CHOLESTEROL (mg/dl)	150.86±13.5	193.52±31.3	P<0.001
TGL (mg/dl)	103.57±13.5	145.75±30.2	P<0.001
HDL (mg/dl)	44.54±3.59	40.3±4.8	P<0.001
LDL (mg/dl)	85.6±12.77	124.06±30.1	P<0.001
VLDL (mg/dl)	20.71±3.80	29.15±6.05	P<0.001
TGL/HDL RATIO	2.35±0.52	3.7±1.03	P<0.001

Values are expressed as Mean±S.D.

Table 2: Correlation of TG/HDL ratio with HOMA-IR AND QUICKI IN PCOS WOMEN

Variables	Pcos subjects r value	Coefficient of Determination r^2	P value
HOMA-IR	0.4	0.16	p<0.001
QUICKI	-0.41	0.17	p<0.001

Fig.1: Correlation between TG/HDL ratio and HOMA-IR in PCOS women.

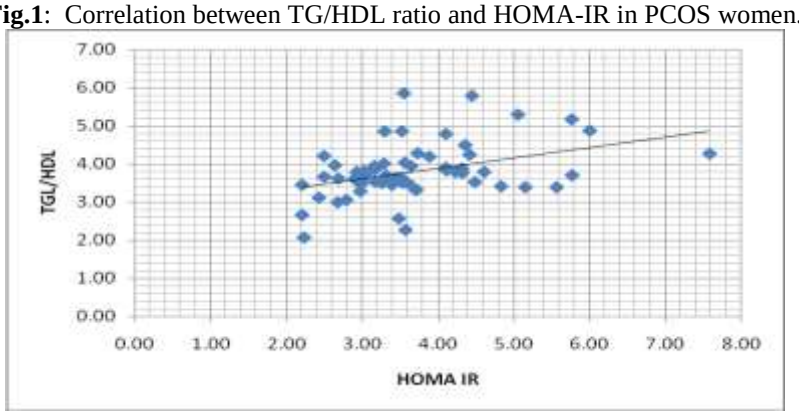
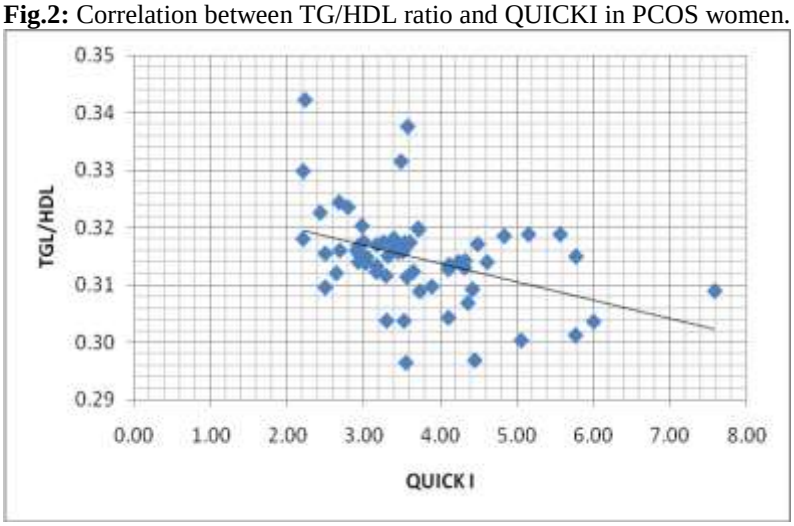


Fig.2: Correlation between TG/HDL ratio and QUICKI in PCOS women.



IV. Discussion

The present study investigated TG/HDL ratio as a marker of insulin resistance in PCOS women. The diagnosis of PCOS was done by Rotterdam criteria. In our study Insulin concentration and insulin resistance were significantly increased in PCOS patients when compared with healthy controls. Raised HOMA-IR and a lower QUICKI value were also observed. A cut off value of >2.6 for HOMA-IR and <0.33 for QUICKI was used to determine insulin resistance in this study. Altered lipid metabolism is one of the major characteristics of PCOS women. Many studies have reported increased prevalence of dyslipidemia in both obese and non-obese PCOS patients [(14)]. In our study, we found higher levels of BMI, Waist Hip Ratio, Total cholesterol, TGL, LDL, VLDL and lower level of HDL in PCOS women compared to controls and were statistically significant ($p<0.001$). IR seems to contribute to dyslipidemia partly through lipolysis stimulation and altered expression of lipoprotein lipase and hepatic lipase respectively [(13)]. The TGL to HDL ratio has been used as a predictor of insulin resistance [(16, 17)]. A TG/HDL ratio of ≥ 3 has been shown to be closely correlated with insulin resistance [(17)]. In our study the TG/HDL ratio was significantly higher in PCOS women than controls ($p<0.001$). TG/HDL-C ratio correlated positively with HOMA-IR and negatively with QUICKI check index. Similar results were also obtained by Roa barrios et al [(18)]. However further confirmatory studies are warranted involving large population to establish itself a marker for insulin resistance in PCOS women.

V. Conclusion

TG/HDL ratio is strongly associated with insulin resistance in PCOS women and could serve as a simple and reliable marker for insulin resistance.

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