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STUDIES ON LIPID PROFILE LEVELS IN FEMALE PATIENTS AMONG METABOLIC SYNDROME POPULATION

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Abstract

The present study enables us to know the prevalence of metabolic syndrome among female population and to correlate with lipid profile parameters. It was a non-interventional, observational study in which 100 metabolic syndromes among female patients, the essential lipid profiles who fulfilled the inclusion criteria were included and all were subjected to a uniform questionnaire, medical examination and investigations. Comparison of the mean values of the five variables in the 'Control' and 'Syndrome' groups by employing unpaired't' test showed that the differences between the groups were significant for all the variables. The mean values of variables were generally higher in the syndrome population than in the control group. But in respect of HDL there was a decrease in the levels of the syndrome group as compared to the control group. The magnitude of increase in means between the control and syndrome groups were observed to be highest for TGL (102.66%) followed by BMI (45.97%), LDL (29.30%) and Total Cholesterol (26.22%) whereas there was a decrease of - 8.46% for HDL cholesterol.

Key Words: Metabolic Syndrome, BMI, LDL, TGL, HDL, Total Cholesterol, Female Patients.

Introduction

The metabolic syndrome is a group of consistent abnormalities that increase the risk for cardiovascular disease and type 2 diabetes. This is a common metabolic disorder which increases in prevalence as the population becomes further obese. It affects a great number of people and prevalence increasing with age. Metabolic syndrome is also known as CS syndrome – X, Insulin Resistance syndrome and Reaven's syndrome. The disorder is defined in various ways. Diagnostic criteria for the metabolic syndrome have been established by the World Health Organisation (WHO) in 1998, by the National Cholesterol Education Program's Adult Treatment Panel III (NCEP: ATP III), in 2001, and recently by the International Diabetes Federation (IDF), in 2005. The metabolic syndrome was introduced as a diagnostic category to identify the individuals that satisfy subjective chosen criteria to initiate lifestyle changes, and drug treatment when needed, with the goal of decreasing risk of cardiovascular disease and type 2 diabetes mellitus.

Symptoms of Metabolic syndrome includes Fasting Hyperglycemia – Diabetes Mellitus Type II, Impaired Fasting Glucose, Impaired Glucose tolerance or Insulin Resistance, High Blood Pressure, Central obesity, overweight with fat deposits around the waist, Decreased HDL - Cholesterol and Elevated Triglycerides. Other associated diseases and signs are elevated uric acid, fatty liver (especially in concurrent obesity) progressing to non-alcoholic liver diseases, polycystic ovarian diseases (PCOD), Haemochromatosis (Iron overload), and Acanthosis Nigricans (skin condition featuring dark parches).

About 47 million adults in United States (25 percent) have metabolic syndrome. Metabolic syndrome is common in African American women than men of same regions. Mexican Americans have the highest rate of Metabolic syndrome (31.09 percent) followed by Caucasians (23.8 percent) and African Americans (21.6 percent). According to American Heart Association updated figures for 2008, the age adjusted prevalence of metabolic syndrome for adults is 23.7 percent. The prevalence is 42 percent for age greater than 70 years, 43.5 percent for 60 – 69 years and 6.7 percent for 20 – 29 years category (Ervin, 2009; Meigs *et al* ., 2003) .

As such, it may be very appropriate to carryout region wise studies among local populations for enhancing the clinical relevance and direct applicability of the results and fine tuning our procedures of diagnosis and management of the risk. The present study was therefore taken up in a local population of 100 women with features of Metabolic syndrome and 40 normal women without the syndrome as control group, both hailing from Thanjavur district of Tamilnadu. Lee *et al.* (2008) carried out a comparative cross sectional study of metabolic syndrome definitions in four populations of the Asia – Pacific region namely Australia, Japan, Korea and Samoa. It was seen that prevalence of metabolic syndrome was the lowest among Japanese and the highest among Samoans. Age adjusted prevalences for the four definitions ranged from 16% to 42% in Australia, 3% to 11% in Japan, 7% to 29 percent in Korea and 17 to 60 percent in Samoa.

Eilat Adar *et al.* (2008) studied the relationship of 'Diet' to several characteristics of metabolic syndrome and insulin resistance that carry increased risk of diabetes and heart disease. Their results showed that "Polyunsaturated fatty Acid" intake was associated with lower incidence of Metabolic syndrome in women but not in men and higher intake of simple carbohydrates intake was associated with increased levels of Metabolic syndrome in men but not so in women.

Methodology

The study was conducted in Thanjavur Medical College Hospital which included 100 females with metabolic syndrome according to 3/5 criteria of National Cholesterol Education Programme (NCEP) the syndrome group and control group of 40 normal women without Metabolic syndrome. Only female patients in the age group 30 to 75 years were used.

All the people in the study group were enquired to as per the following questionnaire; Name, age, gender, occupation, religion, complaints, past history suggestive of DM/BA/TB, PIH or GDM, H.O alcohol intake , menstrual history, family history of obesity, HT, stroke and CV diseases. Also the treatment history of anti-hypertensive drug. Height, Weight, Body Mass Index, Measurement, Waist circumference, systolic and diastolic blood pressure was measured as described elsewhere (Stern *et al*., 1992).

We excluded patients with liver diseases, renal diseases, alcoholism, drug in take (Anticoagulants), males (Prostatic GGT) on the other hand included the patients with obesity, hypertension, dyslipidemia (over 150 g/dl TAG blood), fasting blood sugar (more than 106 mg/dl) and HDL less than 50mg/dl.

The patients were identified as having metabolic syndrome according to the five different criteria (Elevated waist circumference ≥35 inches, Elevated Triglycerides ≥150 mg/ dl, Decreased HDL-C ≤ 50 mg/dl, Elevated Blood pressure ≥ 130/85 mm of Hg, Elevated fasting Glucose ≥ 100mg/dl).

The levels of BMI, LDL Cholesterol, HDL-Cholesterol, Serum Cholesterol and Serum Triglycerides were carried out by the method described by Tietz (1976).

Statistical Analyses

Unpaired 't' test on the equality of group mean values, Coefficient of variation (CV%), Pearson's simple correlation, multiple regression, Chi-square analyses, Co-efficient of mean square contingency group wise using Statistical analysis was carried out using the SPSS software, version 16.0.

Results and Discussion

The present investigation involved the study of biochemical and other variables among in two populations namely the control population and the metabolic syndrome population which consist exclusively of women, the control population of size forty and the metabolic syndrome population of size 100 from Thanjavur district of Tamilnadu. Data collected on BMI, LDL, HDL, TGL and Total cholesterol variables in Control population (N=40) were subjected to statistical analysis as per standard procedures and the results are presented here.

Comparison of the mean values of the five variables in the 'Control' and 'Syndrome' groups employing unpaired't' test (Tables 2 and 3) showed that the differences between the groups were significant for all the variables. The mean values of variables were generally higher in the syndrome population than that in the control group. But in respect of HDL there was a decrease in the levels in the syndrome group as compared to the control group. The magnitude of increase in means between the control and syndrome groups were the highest for TGL (102.66%) followed by BMI (45.97%), LDL (29.30%) and Total Cholesterol (26.22%) whereas there was a decrease of - 8.46% for HDL.

The metabolic syndrome populations were studied to include 14 Muslims, 9 Christians and 77 Hindus (Table 3). In view of the very small sample size of Muslims and Christians, only mean values for selected risk factors were computed. Comparison of means indicated that the levels of risk factors such as LDL, TGL, Total Cholesterol and BMI were relatively higher and that of HDL-C level lower in the syndrome group of Muslim women when compared to Hindus and Christians.

The syndrome and control groups significantly differed in respect of mean and variability between lipid profiles and other variables. The mean values of variables were higher in metabolic syndrome population than that in the control group except in respect of HDL-C. The magnitude of change in mean values between the control and syndrome groups were the highest for the cardiovascular risk factors TGL (102.66 percent), BMI (45.87 percent) and LDL (29.30 percent). It was -8.48 percent

for HDL-C indicating a significant reduction in HDL-C levels in the syndrome group as compared to the control group. There was also highly significant increase (44.68 percent) in the levels of total cholesterol level (P=0.001) in the syndrome group.

In the Control group, all the individuals recorded values well within/below clinically normal levels for all characters except for a few marginally-above normal values in 3 cases of LDL (134-135.2 mg/dl). On the other hand, in the Syndrome group a large proportion of individuals recorded values much higher than clinically normal levels in respect of TGL, Total Cholesterol, LDL and BMI as evident form wider range coupled with higher maximum values and lowered or unchanged Coefficient Variation % compared to the corresponding control values.

The Metabolic syndrome population studied happened to include 14 Muslims, 9 Christians and 77 Hindus. No definite conclusions on lipid profiles and related aspects can be drawn regarding differences in the magnitude between religious groups in view of the very small sample size of Muslims and Christians. However, comparisons of the data on simple means indicated that the levels of risk factors such as LDL, TGL, Total Cholesterol and BMI were relatively higher and mean HDL-C level lower in the syndrome group of Muslims than that among Hindus and Christians. Studies involving large populations of the different religious groups and including socio economic, lifestyle aspects etc., as additional parameters in the study may be required for drawing definite conclusions regarding inter-religious differences on lipid profiles and related risk factors.

Metabolic syndrome can be considered a coronary artery disease equivalent (Akosah *et al*.,2006). Multiple pathop hysiological mechanisms play a role in the increased risk of cardiovascular events in the metabolic syndrome. These mechanism include hypertension, dyslipidemia etc. Atherogenic dyslipidemia is an integral component of the metabolic syndrome and is a major contributor to the cardiovascular risks. In these patients an abnormal lipid profile is a more significant risk factor than either hypertension (or) diabetes mellitus alone. The typical lipid abnormalities defined in patients with metabolic syndrome consists of a triad, as observed in the present study.

In the syndrome population the mean value of TGL was 199.97 mg/dl, whereas in control group it was only 98.67 mg/dl, a significant increase of 102.66 percent. HDL – C, showed a highly significant negative correlation at (P<0.001) level in the control group (n=40) as well as the syndrome groups. The mean HDL – C level was 43.40 mg/dl in the control group as against 39.74 in the syndrome population, a significant reduction of - 8.46 percent. While the correlation between LDL and TGL was positive, both showed significant negative association with HDL-C.

Thus the syndrome population studied showed all the three typical lipid abnormalities defined in relationship with the metabolic syndrome. LDL, a direct risk factor for coronary vascular disease is independently associated with cardiovascular disease was reported by E1 Friede Ruttman *et al*. (2005), in their prospective cohort. LDL is a direct risk factor for coronary vascular disease, positively associated with incidental fatal events of chronic form of coronary artery diseases, congestive cardiac failure and stroke (https://en.wikipedia.org/wiki/Metabolic_syndrome).

The small dense LDL particles are more atherogenic because they are more susceptible to oxidation (Dennis L. Kasper *et al*., 2005). The formation of early lesions of atherosclerosis most often arise from focal increase in content of lipoprotein within regions of intima of arteries because they bind to constituents of extracellular matrix increasing the residing time of lipid rich particles with arterial wall. Lipoproteins which accumulate in the extracellular space of intima of arteries associate with proteoglycan of arterial extra cellular matrix and become susceptible to oxidative modification.

In the syndrome population the mean value of TGL was 199.97 mg/dl whereas in control group it was only 98.67 mg/dl, a significant increase of 102.66 percent. More than 75 percent showed highly elevated TGL levels of 185 mg/dl, much above clinically normal levels.

Insulin normally suppresses the production of VLDL particles from Liver. This effect is due to increase in free-fatty acid availability following Insulin inhibition of lipolysis in adipose tissue, and a direct hepatic effect of Insulin, inhibiting the production of VLDL particles. The intra hepatic defect appears to be the major contributory mechanisms underlying the increase in serum triglycerides in insulin resistance condition.

HDL – C, showed a highly significant negative correlation at (P<0.01) level in the control group (n=40) as well as the syndrome groups. The mean HDL – C level was 43.40 mg/dl in the control group as against 39.74 in the syndrome populations, a significant reduction of - 8.46 per cent. While the correlation between LDL and TGL was positive, both showed significant negative association with HDL-C. HDL levels are reduced in Insulin resistance patients with high serum

triglycerides. Under hypertriglyceridemic conditions there is excessive exchange of cholesterol esters and triglycerides between HDL and expanded pool of triglyceride rich lipoproteins medicated by the cholesterol ester transfer protein (CETP). HDL becomes enriched with triglycerides and acts as a good substrate for hepatic lipase which removes HDL at an accelerated rate, lowering serum levels of HDL-C. In my study, there was a significant decrease in HDL-C levels in the syndrome group compared to the control.

In the present study the females with features of metabolic syndrome showed mean total cholesterol of 215.05 mgs/dl against 170.37 among the control females. Of the syndrome group 33 percent showed serum cholesterol levels between 200-219 mg/dl and 25 percent had 180-199 mg/dl, three percent had levels greater than 260 mg/dl. The mean body mass index (BMI) in my study was 32.20 in the syndrome group compared to 22.06 in control ($P<0.01$). Though, 50 percent of the females showed high BMI values between 29-31.4, two percent showed very high values of BMI (41.50). BMI had a significant positive correlation ($P=0.05$).

In obesity particularly visceral, adipocytes secrete number of biological marker products like Tumor Necrosis factor – alpha, free fatty acids, adiponectin, leptin and interleukin-6 that modulate insulin secretion, insulin action, body weight and contribute to insulin resistance. These biological substances secreted by adipocytes increase the amount of inflammation which can cause build up of plaques in vessel walls. Eventually pieces of clots can break up and block blood vessels leading to myocardial infarction. Persons with Metabolic syndrome have a threefold greater risk of coronary heart disease and four fold risk of cardiovascular mortality. The growth in prevalence of metabolic syndrome parallels the dramatic rise in prevalence of obesity (Reaven, 1988).

Metabolic syndrome is a very wide topic with lot of prospects for future study and research into the various aspects of risk factors, interventions, and treatment modalities. Studies involving appropriately large population size of the different religious groups and also including socio economic, lifestyle aspects etc., as additional parameters in the study may prove very useful for drawing definite conclusions regarding inter-religious group differences on Lipid profiles and related risk factors.

Conclusion

The present study illustrates the levels of BMI, LDL, HDL, TGL and Total Cholesterol profile in syndrome group of our study population. Analyses illustrates that in comparison with control group, the syndrome group had significant deviation in biochemical parameters. The experimental result is demonstrated to be a prediction for upcoming cram as well as explore into various risk factors on the metabolic syndrome groups.

References

1. Akosah, K.O., McHugh, V.L., Mathiason, M.A., Kulkarni, A., and Barnhart, S.I. (2006) Metabolic syndrome and coronary heart disease equivalent conditions in predicting cardiovascular events in young to middle-aged adults. *J Cardiometab Syndr. Summer*; **1(3)**:173-7.
2. Dennis L. Kasper , Eugene Braunwald, Stephen Hauser ,, Dan Longo, Larry Jameson, J. and Anthony S. Fauci (2005) Harrison's Principles of Internal Medicine, 16th Edition. Ed. By Harrison, T. R., Pub. By McGraw-Hill Medical Publishing Division, pp.2607.
3. Eilat Adar,S., Xu,J., Goldbourt,U., Zephier, E., Howard,B.V., Reshick,H.E. (2008) Sex may modify the effects of macronutrient intake on metabolic syndrome and insulin resistance in American Indians: the strong heart study. *J. Am. Diet Assoc*., **108(5)**: 794-802.
4. El Freide Ruttmann, brant, L.J., Conchin,H., Diem,G., Rapp,K. and Ulmer,H. (2005) GGT as a risk factor for cardiovascular mortality: epidermiological investigation in a cohort of 163944 Austrian adults, *Circulation*, **112**:2130-2137.
5. Ervin, R.B. (2009) Prevalence of metabolic syndrome among adults 20 years of age and over, by sex, age, race and ethnicity, and body mass index: United States, 2003–2006. *Natl Health Stat Report*; **13**: 1–7.
6. Lee,C.M., Huxley,R.R., Woodward,M., Zimmet,P., Shaw,J., Cho,N.H.,Kim,H.R. Viali,S., Tominaga,M., Vistigen,D., Borch Johnson,K. and Calagiuri,S. (2008) Comparisons of metabolic syndrome definitions in four populations of the Asia-Pacific region, *Metab. Syndr. Relat. Disord*., **6(1)**: 37-46.
7. Meigs, J.B., Wilson, P.W. and Nathan, D.M. (2003) Prevalence and characteristics of the metabolic syndrome in the San Antonio Heart and Framingham Offspring Studies. *Diabetes*, **52**: 2160–2167
8. Raaven,G.M. (1988) Banting lecture: Role of Insulin resistance in human disease,*Diabetes*, **37**:1595-1607.

9. Stern, M.P., Gonzales, C., Mitchell, B.D., Villapando, E., Haffner, S.M.and Hazuda, H.P. (1992) Ge netic and environmental determinants of type II diabetes in Mexico City and San Antonio. *Diabetes*, **41**:484–492.
10. Tietz, N.W. (1976) Fundamentals of clinical Chemistry, 2nd ed., W.B.Saunders, Philadelphia, PA, p. 622.
11. https://en.wikipedia.org/wiki/Metabolic_syndrome.

Table - 1. Mean values of variables studied in the Control and Syndrome populations

Variables	Mean values*		Difference	% Increase/ Decrease Overcontrol	S.E. D	' T' Values	'P' levels
	Control Group (N=40)	Syndrome Group (N=100)					
BMI	22.06	32.20	10.14	45.97	0.50	20.36	<.001
LDL	107.39	138.87	31.47	29.30	4.55	6.91	<.001
HDL	43.40	39.74	-3.67	-8.46	0.87	-4.22	<.001
TGL	98.67	199.97	101.30	102.66	4.29	23.60	<.001
TCL	170.37	215.05	44.68	26.22	4.22	10.57	<.001

Table -2. Variability for characters in the Control and Syndrome populations

Characters	Control Group (N=40)					Syndrome Group (N=100)				
	Range		Mean	S.D	C.V.% Mini.	Range		Mean	S.D	C.V.%
	Mini.	Max.				Mini.	Max.			
BMI	19.2	24.8	22.06	1.73	7.83	25.5	43.6	32.20	2.95	9.16
LDL	76.0	138.6	107.39	18.44	17.17	78.0	225.0	138.87	26.30	18.90
HDL	33.0	56.0	43.40	5.62	12.95	28.3	49.0	39.74	4.20	10.57
TGL	65.0	128.0	98.67	15.43	15.64	140.0	337.0	199.97	25.30	12.65
TCL	135.0	200.0	170.37	16.98	9.97	166.0	308.0	215.05	24.44	11.36

Table- 3. Mean values of variables among Religious Groups Studied in the Control and Syndrome populations

Religious Group	Mean Values		
Variables	Hindus N=77	Muslims N=14	Christians N=9
BMI	31.95	33.69	32.04
LDL	137.80	152.82	125.60
HDL-C	39.86	32.26	40.48
TGL	198.21	217.00	187.44
TCL	215.25	228.70	196.40