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Study of Lipid Profile in Metabolic Syndrome Patients

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

Background: Metabolic syndrome is a group of metabolic abnormalities in which the chance of developing cardiovascular disease, diabetes mellitus, chronic kidney disease are high.
Aim: It aims at studying the lipid abnormalities in metabolic syndrome patients.
Methods: Total of 100 metabolic syndrome patients were selected for study over a period of 1year. These patients were selected based on the criteria for metabolic syndrome as established by National Cholesterol Education Program (NCEP) adult Treatment Panel III (ATP III). Demographic data were taken and biochemical parameters were estimated by standard guideline.
Results: Total cholesterol is significantly higher in very high risk (272.1 ± 8.591) compared to high risk (241.2 ± 3.901) and moderate risk (231.5 ± 4.498). TGL is significantly higher in very high risk (263.9 ± 13.70) compared to high risk (202.1 ± 6.531) and moderate risk (183.7 ± 7.650). HDL is almost same in very high risk (43.09 ± 1.533), high risk (40.44 ± 0.996) and moderate risk (42.53 ± 1.088). LDL is significantly higher in very high risk (177.9 ± 4.255) and high risk (169.4 ± 3.190) compared to moderate risk (155.7 ± 3.098). VLDL is significantly higher in very high risk (52.78 ± 2.739) compared to high risk (40.43 ± 1.306) and moderate risk (36.73 ± 1.530). CHO: HDL is significantly higher in very high risk (6.648 ± 0.366) compared to moderate risk (5.560 ± 0.207). High risk (6.060 ± 0.156) is not significantly different from very high risk and moderate risk. Thus,

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TC, TGL, LDL, VLDL, and CHO: HDL is significant as p value < 0.05 while HDL did not have any significance as p value > 0.05.
Conclusion: In this study, high prevalence of dyslipidaemia is seen. So, timely diagnosis and treatment will help in detecting dyslipidaemia patients in future.

Keywords: Dyslipidaemia; lipid profile; NCEP; metabolic syndrome.

1. INTRODUCTION

The term metabolic syndrome (MS) also known as "syndrome X", "insulin resistance syndrome" was only coined in the 1950s and commonly used in the late 1970s. It is a group of risk factors that adversely affect the health. The chance of developing diabetes mellitus, cardiovascular disease, non-alcoholic fatty liver disease, non-alcoholic steatohepatitis, cirrhosis, cerebrovascular disease and chronic kidney disease are high in these particular groups of people. The prevalence of metabolic syndrome is approximated as 17%-25% in general population [1,2] and 59% to 61% in people with diabetes mellitus [1,3]. Researchers have shown a higher incidence of the metabolic syndrome in men [4,5] than in women, while in some other studies, it shows the reverse of it [6]. Studies have found out the age dependence of metabolic syndrome; it increases with increase in age [4,7].

According to National Cholesterol Education Program (NCEP) Adult Treatment Panel III (ATP III), JAMA 2001, it introduced clinical criteria in which the metabolic syndrome is identified by the presence of three or more of the five abnormalities [8]: Abdominal obesity (waist circumference >35 inches in women, >40 inches in men), Triglycerides ≥150 mg/dl, High-density lipoprotein cholesterol (<50 mg/dl in women or <40 mg/dl in men), Blood pressure ≥130/≥85 mmHg, Fasting blood glucose ≥ 110mg/dl. In 2005, the International Diabetes Federation (IDF) proposed a definition which represents the modifications of ATP III and WHO guidelines showing visceral obesity as the main factor of the syndrome [9].

Metabolic risk factors contributing are abdominal obesity, dyslipidemia, hypertension, elevated plasma glucose, pro-thrombotic state and pro-inflammatory state [10-13]. Dyslipidaemia characterized by increase TGL and decrease HDL leads to cardiovascular complications. It is seen in 20-80% of NAFLD patients [14] and the leading cause of deaths. Several studies were done, Matteoni et al found mortality rate of 36% among 132 patients and was due to cardiac complications [15]. The present study aims to evaluate the lipid profile in metabolic syndrome patients.

2. MATERIALS AND METHODS

This study was conducted in the Department of Biochemistry, Sree Balaji Medical College and Hospital, Chromepet, Chennai during the period of December 2016 – December 2017 among 100 patients with metabolic syndrome attaining outpatient and inpatient services of the Department of General Medicine. These patients were selected based on the criteria for metabolic syndrome as established by National Cholesterol Education Program (NCEP) Adult Treatment Panel III (ATP III).

Inclusion criteria:

- Patients between age group of 20-50 years who are willing to participate.
- 100 patients with metabolic syndrome
- Both genders equally (50- F, 50- M)

Exclusion criteria:

Chronic hepatitis, Cirrhosis, Steroid use, Pregnancy, Malignancy.

General history, medical and family history were also noted. In these patients general demographic data like history, age, gender, waist circumference and blood pressure were recorded. The laboratory investigations done: blood sugar (fasting and post prandial), total cholesterol, triglyceride, HDL, LDL, VLDL. All the Biochemical Investigations were done using BS390 fully automated analyser.

3. RESULTS

The average age of the patients was 41.36 with standard deviation 7.170. The minimum and maximum age was 25 and 55 years respectively.

Table 1. Frequency distribution of age

Age (Years)	Frequency	Percent
25 - 30	9	9.0%
31 - 35	10	10.0%
36 - 40	25	25.0%
41 - 45	18	18.0%
46 - 50	35	35.0%
51 - 55	3	3.0%

Table 2. Distribution of sex

Sex	Frequency	Percent
Male	50	50.0%
Female	50	50.0%

Out of 100 patients taken for the study, exact 50.0% of the cases were male and 50.0% of the cases were female.

3.1 ROC Analysis

On performing receiver operative characteristics analysis with the above set criteria we noticed the patients getting demarked into 3 risk categories: Moderate Risk, High Risk and Very High Risk.

The frequency of distribution was 30 moderate risk cases, 36 high risk cases and 34 very high risk cases.

Table 3. Distribution of risk groups

Groups	Frequency	Percent
Very High Risk	34	34.0%
High Risk	36	36.0%
Moderate Risk	30	30.0%
Total	100	100.0%

3.2 Comparison of Waist Circumference between Groups

Here the p-value <0.05; the difference in waist circumference between groups is significant. The Table 4 reveals that waist circumference is significantly higher in very high risk (100.6 ± 1.591) and significantly lower in moderate risk (83.96 ± 0.153) compared to high risk (96.12 ± 1.841).

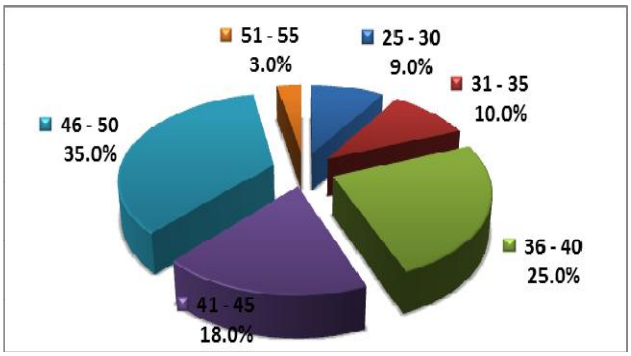

Fig. 1. Distribution of age

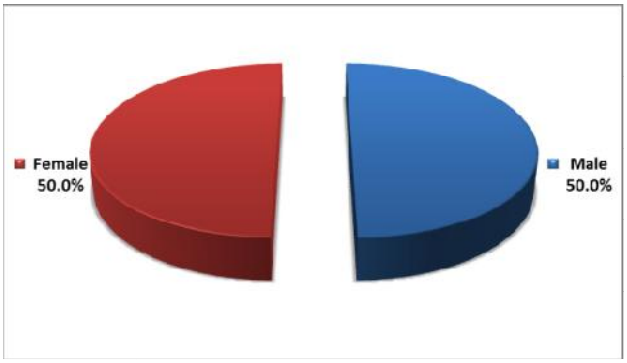

Fig. 2. Distribution of sex

3.3 Comparison of Systolic BP between Groups

Here the p-value <0.05; the difference in systolic blood pressure between groups is significant. The Table 5 reveals that systolic blood pressure is significantly higher in very high risk (147.2 ± 1.241) compared to high risk (140.4 ± 0.851) and moderate risk (141.5 ± 1.178).

3.4 Comparison of Diastolic BP between Groups

Here the p-value >0.05; the difference in diastolic blood pressure between groups is not significant different. The Table 6 reveals that diastolic blood pressure is almost same in very high risk (88.94 ± 0.682), high risk (89.28 ± 0.529) and moderate risk (88.33 ± 0.552).

3.5 Comparison of FBS between Groups

Here the p-value <0.05; the difference in FBS between groups is significant. The Table 7 reveals that FBS is significantly higher in very high risk (141.6 ± 5.159) compared to high risk (123.2 ± 2.658) and moderate risk (123.6 ± 3.764).

3.6 Comparison of PPBS between Groups

Here the p-value >0.05; the difference in PPBS between groups is not significant. The Table 8 reveals that PPBS is almost same in very high risk (196.9 ± 9.137), high risk (197.8 ± 9.163) and moderate risk (178.0 ± 10.20).

3.7 Comparison of Total Cholesterol between Groups

Here the p-value <0.05; the difference in total cholesterol between groups is significant. The Table 9 reveals that total cholesterol is significantly higher in very high risk (272.1 ± 8.591) compared to high risk (241.2 ± 3.901) and moderate risk (231.5 ± 4.498).

3.8 Comparison of TGL between Groups

Here the p-value <0.05; the difference in TGL between groups is significant. The Table 10 reveals that TGL is significantly higher in very high risk (263.9 ± 13.70) compared to high risk (202.1 ± 6.531) and moderate risk (183.7 ± 7.650).

Table 4. Comparison of Waist Circumference between Groups

Group	Mean	SE	Range	p – value
Very High Risk	100.6	1.591	83.5 - 117.2	0.000
High Risk	96.12	1.841	85.0 - 112.5	
Moderate Risk	83.96	0.153	82.0 - 85.0	

Table 5. Comparison of Systolic BP between Groups

Group	Mean	SE	Range	p - value
Very High Risk	147.2	1.241	130 - 162	0.000
High Risk	140.4	0.851	130 - 150	
Moderate Risk	141.5	1.178	130 - 150	

Table 6. Comparison of Diastolic BP between Groups

Group	Mean	SE	Range	p – value
Very High Risk	88.94	0.682	80 - 100	0.535
High Risk	89.28	0.529	84 - 96	
Moderate Risk	88.33	0.552	84 - 100	

Table 7. Comparison of FBS between Groups

Group	Mean	SE	Range	p - value
Very High Risk	141.6	5.159	100 - 244	0.001
High Risk	123.2	2.658	100 - 180	
Moderate Risk	123.6	3.764	100 - 200	

3.9 Comparison of HDL between Groups

Here the p-value >0.05; the difference in HDL between groups is not significant. The Table 11 reveals that HDL is almost same in very high risk (43.09 ± 1.533), high risk (40.44 ± 0.996) and moderate risk (42.53 ± 1.088).

3.10 Comparison of LDL between Groups

Here the p-value <0.05; the difference in LDL between groups is significant. The Table 12 reveals that LDL is significantly higher in very high risk (177.9 ± 4.255) and high risk (169.4 ± 3.190) compared to moderate risk (155.7 ± 3.098).

3.11 Comparison of VLDL between Groups

Here the p-value is less than the significance level 0.05; the difference in VLDL between groups is significant. That is, there is a significant difference in VLDL between groups. The Table 13 reveals that VLDL is significantly higher in very high risk (52.78 ± 2.739) compared to high risk (40.43 ± 1.306) and moderate risk (36.73 ± 1.530).

3.12 Comparison of CHO: HDL between Groups

Here the p-value < 0.05; the difference in CHO: HDL between groups is significant. The Table 14 reveals that CHO: HDL is significantly higher in very high risk (6.648 ± 0.366) compared to moderate risk (5.560 ± 0.207). High risk (6.060 ± 0.156) is not significantly different from very high risk and moderate risk.

Table 8. Comparison of PPBS between groups

Group	Mean	SE	Range	p – value
Very High Risk	196.9	9.137	130 - 309	0.272
High Risk	197.8	9.163	103 - 308	
Moderate Risk	178.0	10.20	103 - 304	

Table 9. Comparison of Total Cholesterol between Groups

Group	Mean	SE	Range	p – value
Very High Risk	272.1	8.591	200 - 420	0.000
High Risk	241.2	3.901	201 - 300	
Moderate Risk	231.5	4.498	200 - 300	

Table 10. Comparison of TGL between Groups

Group	Mean	SE	Range	p – value
Very High Risk	263.9	13.70	152 - 500	0.000
High Risk	202.1	6.531	158 - 333	
Moderate Risk	183.7	7.650	152 - 332	

Table 11. Comparison of HDL between Groups

Group	Mean	SE	Range	p – value
Very High Risk	43.09	1.533	30 - 60	0.267
High Risk	40.44	0.996	30 - 52	
Moderate Risk	42.53	1.088	30 - 52	

Table 12. Comparison of LDL between Groups

Group	Mean	SE	Range	p – value
Very High Risk	177.9	4.255	120 - 220	0.000
High Risk	169.4	3.190	134 - 200	
Moderate Risk	155.7	3.098	132 - 200	

Table 13. Comparison of VLDL between Groups

Group	Mean	SE	Range	p – value
Very High Risk	52.78	2.739	30.4 - 100	0.000
High Risk	40.43	1.306	31.6 - 66.6	
Moderate Risk	36.73	1.530	30.4 - 66.4	

Table 14. Comparison of CHO: HDL between Groups

Group	Mean	SE	Range	p – value
Very High Risk	6.648	0.366	3.38 - 13.12	0.017
High Risk	6.060	0.156	4.54 - 8.57	
Moderate Risk	5.560	0.207	4.16 - 9.00	

4. DISCUSSION

The metabolic syndrome has become one of the more prevalent diseases in Asian countries. In our study with 100 patients diagnosed with metabolic syndrome, WC is significantly higher in very high risk (100.6 ± 1.591) and significantly lower in moderate risk (83.96 ± 0.153) compared to high risk (96.12 ± 1.841). The total cholesterol is significantly higher in very high risk (272.1 ± 8.591) compared to high risk (241.2 ± 3.901) and moderate risk (231.5 ± 4.498). TGL is also significantly higher in very high risk (263.9 ± 13.70) compared to high risk (202.1 ± 6.531) and moderate risk (183.7 ± 7.650). HDL between groups is not significant. It is almost same in very high risk (43.09 ± 1.533), high risk (40.44 ± 0.996) and moderate risk (42.53 ± 1.088). On the other hand, LDL is significantly higher in very high risk group (177.9 ± 4.255) and high risk (169.4 ± 3.190) compared to moderate risk (155.7 ± 3.098). VLDL is significantly higher in very high risk (52.78 ± 2.739) compared to high risk (40.43 ± 1.306) and moderate risk (36.73 ± 1.530). CHO: HDL is significantly higher in very high risk (6.648 ± 0.366) compared to moderate risk (5.560 ± 0.207). High risk (6.060 ± 0.156) is not significantly different from very high risk and moderate risk.

Thus, TC, TGL, LDL, VLDL and CHO: HDL is significant while HDL did not have any significance. A study done by Dhumal Uttareshvar Mahaling et al. [16] to detect and do a comparison of serum lipid abnormalities in patients with different grades of non-alcoholic fatty liver diagnosed by ultrasonography. A total of 70 NAFLD cases (30 males and 40 females) taken and their lipid profile compared. It was found that, out of 70 cases, grade I NAFLD as 47.15%, grade II of 42.85% and grade III of 10%. Serum TG, TC, LDL and VLDL levels were raised and low serum HDL levels were seen in 62.85%.

An original article by Abhijit Sen et al. [17] in 2013, conducted a cross sectional study to assess the BMI and lipid profile of NAFLD patients. A total of 385 NAFLD subjects included where the demographic and lipid profile as total cholesterol, triglycerides, HDL, LDL, VLDL recorded. TC and TG were found to be higher in grade III and similarly for HDL and VLDL. But LDL was similar in all grades of NAFLD patients.

A similar study by Khem Raj Bhusal et al. [18] was conducted on studying the lipid abnormalities in different grades by ultrasound. A total of 100 NAFLD patients (67 males and 37 females) were included in the study where mild NAFLD was found in 83%, moderate in 17% n severe none. Similarly, TC, TG, LDL were raised and HDL decreased. It was concluded that prevalence of dyslipidemia was high in NAFLD patients. So, early detection with ultrasonography is useful in these patients.

Bashu Dev Pardhe et al. [19] shows the bidirectional and mutual linkage of high density lipoprotein when compared to controls, which was significantly less as compared to the controls. Likewise another study was carried out by Agarwal et al. and Uttareshvar et al who reported that there was an increase in TC, TGL, LDL-C, VLDL-C but decrease in HDL-C levels indicating the possible atherogenic dyslipidaemia [20,21].

The uptake of fatty acids in the liver causes accumulation of fat especially triglyceride, liver toxicity and the inflammatory cytokines, tumour necrosis factor causes non-alcoholic fatty liver disease and also fatty liver with mild to moderate elevation of liver enzymes [22].

5. CONCLUSION

The study showed patients with dyslipidaemia. There is positive correlation of obesity, waist circumference, systolic blood pressure, fasting plasma glucose, total cholesterol, triglyceride, LDL, VLDL and negative correlation with HDL-C. Dyslipidaemia is a common condition associated with non-alcoholic fatty liver disease. So, early detection, frequent checking, identifying and treating dyslipidaemia is important to prevent any cardiovascular and cerebrovascular disease.

CONSENT

The study explained to the participants and before taking the blood sample, informed consent were taken from them.

ETHICAL APPROVAL

As per university standard guideline ethical approval has been collected and preserved by the authors.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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