Study of Cardiovascular Profile among Metabolic Syndrome Patients - A Hospital based Study

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ABSTRACT

Introduction: The metabolic syndrome is a cluster of anthropological and biochemical abnormalities that predispose an individual to cardiovascular disease. One of the metabolic risk factors likewise appear individually to be atherogenic. Indeed, 3 of the metabolic risk factors- elevated apoB-containing lipoproteins, low HDL-C levels, and hypertension are major risk factors. Hence, the present study aims to study blood pressure and lipid profile among metabolic syndrome patients.

Material and Methods: The present cross sectional study was conducted among 100 patients, 50 cases of Metabolic syndrome and 50 controls. Patients satisfying the inclusion criteria underwent relevant investigations which included fasting blood sugars and fasting lipid profile. Statistical analysis was carried using Chi-square test with p value ≤ 0.05 as significant value.

Results: 35 cases (70%) had hypertension and majority of them had hypertension duration between 1 to 10 yrs. 74% cases had SBP between 120 to 160mmHg whereas 82% control group had SBP between 90 to 120mmHg. 50% cases had total cholesterol >200mg/dl, all controls had total cholesterol <200mg/dl. 82% cases had TGL >150mg/dl, 96% controls had TGL<150mg/dl. Significant difference (p < 0.001) was noted with respect to lipid profile parameters - total cholesterol, triglycerides, LDL, VLDL among cases and control groups.

Conclusion: Significant difference (p<0.001) was noted with respect to SBP, DBP and lipid profile parameters – total cholesterol, triglycerides, LDL, VLDL,HDL among cases and control groups. The detection, prevention, and treatment of the underlying risk factors of the metabolic syndrome and adopting healthy life style should become an important method for reducing cardiovascular disease burden among the general population.

Keywords: Cardiovascular Disease, Dyslipidemia, Metabolic Syndrome

INTRODUCTION

The metabolic syndrome is a cluster of anthropological and biochemical abnormalities that predispose an individual to coronary artery disease. It is considered a prominent cardiovascular risk factor due to its high predictive ability for the development of cardiovascular diseases (CVDs).[1]

It is reported that cardiovascular risk is directly proportional to the number of components of metabolic syndrome involved.[2] The components include abdominal obesity, hypertension, hyperglycemia, dyslipidemia, and insulin resistance.[3]

The metabolic risk factors consist of those factors that seemingly have a direct effect on atherosclerotic disease. Among these, atherogenic dyslipidemia consists of an aggregation of lipoprotein abnormalities including elevated serum triglyceride and apoB, increased small LDL particles, and a reduced level of HDL-C. Among triglyceride-rich lipoproteins, remnant lipoproteins almost certainly are the most atherogenic. The atherogenic potential of lipoprotein remnants and small LDL could be confounded in part by their common association with an increased total number of apoB-containing lipoproteins in circulation; this increased number is reflected by an elevation of serum total apoB.[4] Finally, the lipoprotein field widely holds that low levels of HDL are independently atherogenic; multiple mechanisms are implicated to explain this relationship.[5]

Other metabolic risk factors likewise appear individually to be atherogenic. Among these are hypertension, elevated plasma glucose, a prothrombotic state, and a proinflammatory state. Indeed, 3 of the metabolic risk factors- elevated apoB-containing lipoproteins, low HDL-C levels, and hypertension are major risk factors.[6] Hence, the present study aims to study blood pressure and lipid profile among metabolic syndrome patients.

MATERIAL AND METHODS

The present cross sectional case control study was conducted in Bangalore Medical College And Research Institute (BMCRI) among 100 patients attending OPD and admitted in the department of medicine of hospital in Bangalore. 50 cases of Metabolic syndrome and 50 age and sex matched controls were enrolled into the study. Adult patients who fulfilled the criteria of metabolic syndrome IDF [International Diabetes Federation] guidelines shown as below, were enrolled.

- Waist circumference ≥90 cm in men or ≥80 cm in women[south Asians].
- Two or more of the followings;
  - Triglycerides ≥150 mg/dL or treatment for hypertriglyceridemia.
  - HDL-C < 40 mg/dL in men or <50 mg/mL in women or treatment for low HDL-C.
  - Blood pressure ≥130/85 mmHg or treatment for hypertension.
  - Fasting glucose ≥100 mg/dL or treatment for hyperglycemia.

Patients with chronic liver disease and renal disease, chronic inflammatory condition such as lupus or rheumatoid arthritis, ulcerative colitis or Crohn's disease, acute and chronic infectious disease, steroid abuse, acute stroke, acute myocardial infarction

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and pregnant patients were excluded from the study. Informed consent was taken. A pre-structured proforma was used to collect the baseline data.

Patients satisfying the inclusion criteria underwent relevant investigations which included fasting blood sugars and fasting lipid profile. Measurement was at the end of normal expiration. Blood samples for lipid profile were taken after 12 hours overnight fast. Blood pressure was recorded in right upper limb with patient in sitting posture.

STATISTICAL ANALYSIS

Statistical analysis was carried with the help of Microsoft office 2007 using Chi-square test with p value ≤ 0.05 as significant value.

RESULTS

35 cases (70%) had hypertension and majority of them had hypertension duration between 1 to 10 yrs. All controls were non hypertensive (table 1; figure 1 and 2).

74% cases had SBP between 120 to 160mmHg whereas 82% control group had SBP between 90 to 120mmHg. This was stastically significant (p<0.001). Majority of controls(98%) had DBP <90mmHg (table 2, figure 3 and 4).

50% cases had total cholesterol >200mg/dl, all controls had total cholesterol <200mg/dl (table 3, figure 5).

82% cases had TGL >150mg/dl, 96% controls had TGL<150mg/dl. In this study all controls had LDL <150mg/dl. In this study all controls had VLDL <40mg/dl (table 3).

Significant difference (p < 0.001) was noted with respect to lipid profile parameters - total cholesterol, triglycerides, LDL, VLDL among cases and control groups.

Among male cases, 60.87% subjects had low HDL (<40 mg/dl), whereas only 9.1% in control group had low HDL. There was a statistically significant difference among the two groups (p <0.01)

Hypertension	Cases (n=50)		Controls (n=50)	
	No.	%	No.	%
Yes	35	70.0	0	0.0
<1 year	5	14.28	-	-
1 to 5 years	15	42.85	-	-
5 to 10 years	12	34.28	-	-
>10 years	3	8.59	-	-
No	15	30.0	50	100.0

Table-1: Prevalence of Hypertension in Cases and Controls with duration

Blood pressure	Cases (n=50)		Controls (n=50)	
	No	%	No	%
SBP mmHg				
90-119	7	14.0	42	82.0
120-139	23	46.0	8	16.0
140-159	14	28.0	-	-
>160	6	12.0	1	2.0
DBP mmHg				
60-79	8	16.0	43	86.0
80-89	22	44.0	6	12.0
90-99	10	20.0	-	-
>100	10	20.0	1	2.0

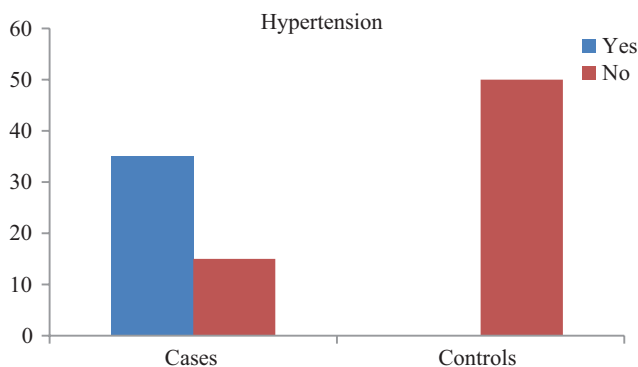**Table-2:** Shows Blood pressure level in cases and controls

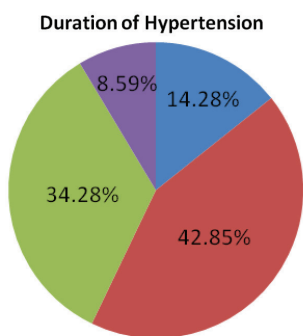**Figure-1:** Shows prevalence of Hypertension in Cases and Controls

Figure-2: Pie chart showing duration of Hypertension in Cases and Controls
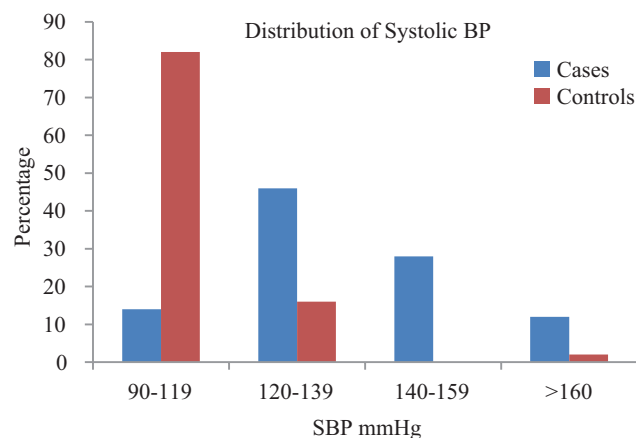

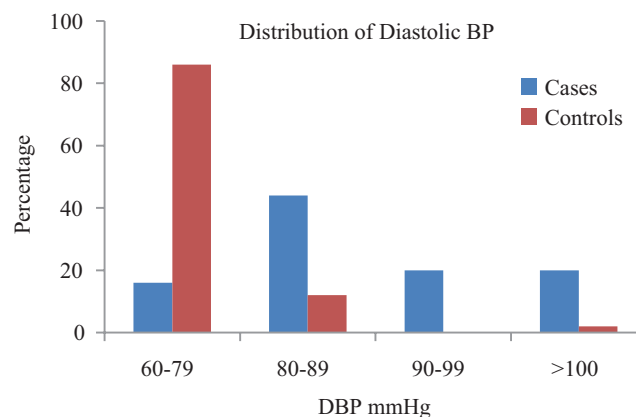**Figure-3:** Showing distribution of systolic BP among cases and controls

Figure-4: Showing distribution of diastolic BP among cases and controls

(table 4).

Among female cases, 85.19% of the subjects had low HDL (<50 mg/dl) whereas only 32.14% of subjects in control group had low HDL. There was a statistically significant difference among the two groups (p < 0.01) (table 5).

DISCUSSION

Emerging epidemic of metabolic syndrome is a major public health concerns globally.[7] The metabolic syndrome is a cluster of cardio-vascular risk factors, which includes abdominal obesity, hypertension, hyperglycemia, dyslipidemia, and insulin resistance.[3]

According to the WHO, a person with diabetes has the metabolic syndrome if he or she fulfills 2 or more of the following criteria: hypertension (systolic pressure >160 mm Hg and diastolic pressure >90 mm Hg, or receiving blood pressure lowering therapy), dyslipidemia (triglycerides >150 mg/dL and high density lipoprotein [HDL] cholesterol <35 mg/dL in men or <40 mg/dL in women), obesity (BMI>30 and WHR>0.9 in men or >0.85 in women), and microalbuminuria (24 h urinary albumin excretion rate >30 mg).[8,9]

In the present study, 70% of the cases had hypertension. Similar results were found in study carried out by Florez K et al[10] (70%) and Bo S et al[11] (66%).

In present study, 50% cases had total cholesterol >200mg/dl, all controls had total cholesterol <200mg/dl. 82% of cases had high triglyceride levels. Similar results were seen in study done by Vidyasagar S et al[12] in which 81% of metabolic syndrome cases had high triglyceride levels and hs-CRP was significantly elevated in this group.

In present study 74% cases had low HDL compared to cases, similar results were seen in study done by Ramachandran A et al[13] (65%) in 475 cases.

Galassi A et al[14] conducted a meta-analysis of literature to evaluate association between the metabolic syndrome and risk of cardiovascular disease and suggested that the metabolic syndrome is an important risk factor for cardiovascular disease incidence and mortality, as well as all-cause mortality. Janghorbani M et al[15] estimated the prevalence and risk factors of metabolic syndrome in people with type 2 diabetes mellitus and reported age-adjusted prevalence rate of metabolic syndrome was associated with female gender, duration of diabetes, fasting blood glucose, systolic and diastolic blood pressure, body mass index (BMI), smoking, proteinuria, insulin-treatment, triglyceride, cholesterol, HDL cholesterol, hypertension, and dyslipidemia. Dekker JM et al[16] reported that the metabolic syndrome, is associated with an approximate 2-fold increased risk of incident cardiovascular morbidity and mortality in a European population.

Metabolic syndrome is a constellation of clinical findings that identify individuals at higher than normal risk of developing diabetes mellitus or cardiovascular disease. The common elements of syndrome are abdominal obesity, hypertriglyceridaemia, low HDL-cholesterol, hypertension and abnormal glucose regulation. Metabolic syndrome can be used to assess risk for cardiovascular disorder and individuals at high risk require multimodal interventions, including lifestyle interventions and targeted medications as appropriate.[17] Lifestyle changes are an effective first-line management;
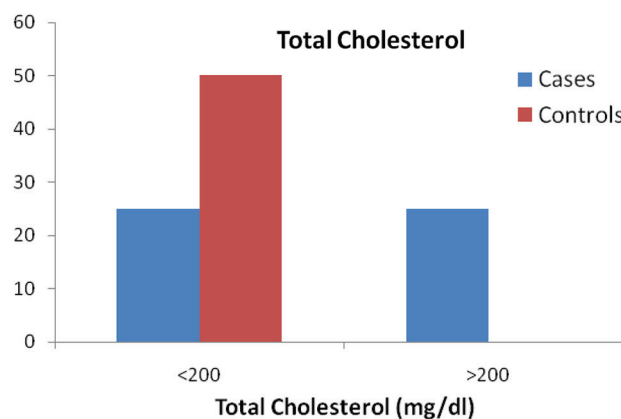

Figure-5: Shows distribution of total cholesterol among cases and controls

Lipid profile	Cases (n=50)		Controls (n=50)		P value
	No	%	No	%	
Total cholesterol mg/dl					
150 to 200	25	50.0	50	100.0	<0.0001
>200	25	50.0	0	0	
Triglycerides mg/dl					
<150	9	18.0	48	96.0	<0.0001
>150	41	82.0	2	4.0	
LDL mg/dl					
<150	41	82.0	50	100.0	<0.0001
>150	9	18.0	0	0	
VLDL mg/dl					
<40	18	36.0	50	100.0	<0.0001
>40	32	64.0	0	0	

Table-3: Shows Lipid profile comparsion between cases and controls

HDL(mg/dl)– Males	Cases (n=23)		Controls (n=22)	
	No.	%	No.	%
>/=40	9	39.13	20	90.9
30-39	8	34.78	2	9.1
<29	6	26.09	0	0

Table-4: Shows HDL levels in males among cases and controls

HDL(mg/dl)– Females	Cases (n=27)		Controls (n=28)	
	No.	%	No	%
>/=50	4	14.81	19	67.86
40-49	10	37.04	8	28.57
30-39	9	33.33	1	3.57
<29	4	14.82	0	0

Table-5: Shows HDL levels in females among cases and controls

pharmacological interventions for hypertension, diabetes and dyslipidaemia are in accordance with established guidelines.[18,19]

CONCLUSION

The prevalence of metabolic syndrome varies around the world. It reflects the age and ethnicity of the populations involved in the study and the diagnostic criteria applied. Greater industrialization is associated with rising rates of obesity, diabetes, hypertension which is anticipated to increase prevalence of the metabolic syndrome dramatically, especially

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as the age of the population increases.

Significant difference (p<0.001) was noted with respect to SBP, DBP and lipid profile parameters – total cholesterol, triglycerides, LDL, VLDL,HDL among cases and control groups. The detection, prevention, and treatment of the underlying risk factors of the metabolic syndrome and adopting healthy life style should become an important method for reducing cardiovascular disease burden among the general population.

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