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A COMPARATIVE STUDY ON CARDIOVASCULAR PARAMETERS AND LIPIDS IN METABOLIC SYNDROME WITH AND WITHOUT DIABETES MELLITUS

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Abstract:Metabolic syndrome (MS) and diabetes mellitus (DM) are risk factors for cardiovascular disease. But influence of MS in presence of DM on cardiovascular risk factors is less described. This study evaluated the combined effect of MS and DM on blood pressure (BP) heart rate (HR) and lipids. In 39 subjects with MS alone (group A) and 38 subjects with MS and DM (group B), plasma total cholesterol, triglycerides, low density and high density lipoprotein - cholesterol , fasting blood sugar, BP and HR were noted . The mean HR, diastolic blood pressure (DBP) of group B was higher compared to group A ($p = 0.0345$; 0.027 respectively). Mean total cholesterol, triglycerides and low density lipoproteins of group B was higher compared to group A ($p = 0.0155$, 0.033, 0.0055 respectively) In conclusion, MS in presence of DM causes raise in DBP, low-density lipoprotein and triglycerides

Keywords:Metabolic syndrome, diabetes mellitus, lipids, diastolic blood pressure

I. INTRODUCTION

Toward the end of the 20th century, the clustering of risk factors for cardiovascular disease was first described, most notably the simultaneous presence of obesity, type 2 diabetes, hyperlipidaemia, and hypertension [1-3]. The term "metabolic syndrome" has now taken hold in the medical literature.

World-wide, the prevalence of metabolic syndrome ranges from 10% to 50% [4]. Prospective studies have established that metabolic syndrome is associated with a doubling of the risk of cardiovascular disease [5]. Importantly, this risk was also extended to people with metabolic syndrome who did not have diabetes [6]. However, the combined effect of diabetes mellitus and metabolic syndrome on cardiovascular risk factors is less explored. Thus we aimed to compare the effect of metabolic syndrome in subjects with diabetes mellitus and without diabetes mellitus on cardiovascular parameters and lipids.

II. MATERIALS AND METHODS

This was a cross sectional study done in subjects with metabolic syndrome alone and subjects with metabolic syndrome and diabetes mellitus. This study was undertaken after the approval by the institutional ethical committee overseeing human studies in accordance with the Ethical Standards laid down in the Declaration of Helsinki and obtaining consent from study participants.

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39 consecutive subjects with metabolic syndrome and 38 subjects with metabolic syndrome and diabetes in whom recent lab report on lipid profile and fasting blood sugar was available were enrolled into the study.

The parameters measured were: Waist hip ratio, body mass index, resting heart rate, blood pressure, fasting blood glucose and plasma lipids.

Patients with metabolic syndrome were identified using IDF-2005 definition [7] with adoption of the Asian criteria for central obesity (central obesity defined as waist circumference greater than or equal to 90 cm for men and greater or equal to 80 cm for women as per Asian –Indian population; plus any two of the following factors:

• Raised triglyceride level: more than 150 mg per dl (1.7 m mol per L) or specific treatment for this lipid abnormality.

• Reduced HDL cholesterol: less than 40 mg per dl (0.9 mmol per L) for males and less than 50 mg per dl (1.1 mmol per L) in females, or specific treatment for this lipid abnormality.

• Raised blood pressure: systolic greater than or equal to 130 mmHg or diastolic greater than or equal to 85 mmHg or treatment of previously diagnosed hypertension.

• Raised blood glucose level greater than or equal to 100 mg per dl (5.6 mmol per L), or previously diagnosed type 2 diabetes).

Data was analysed employing unpaired student t test. When data was not uniformly distributed non-parametric method namely Mann-Whitney test was used. The p value less than 0.05 were taken as significant.

TABLE1. COMPARISON OF BASELINE CHARACTERISTICS INCLUDING CARDIOVASCULAR PARAMETERS IN METABOLIC SYNDROME WITH AND WITHOUT DIABETES MELLITUS (VALUES ARE MEAN ± SD)

Group A = with metabolic syndrome alone; Group B = with metabolic syndrome and diabetes

Variables	**Group A (n = 39)**	**Group B (n =38)**	**t/ u value**	**P value**
Age (years)	65.75 ± 14.56	61.15 ± 11.51	510.50	0.042
Body mass index ((kg/m2)	25.84 ± 3.78	24.44 ± 3.92	1.56	0.12
Waist hip ratio	0.97 ± 0.07	0.97 ± 0.08	0.29	0.77
Systolic blood pressure (mmHg)	138.70 ± 18.57	145.10 ± 23.39	608	0.31
Diastolic blood pressure (mmHg)	80.32 ± 7.60	84.97 ± 9.98	495	0.027
Heart rate (beats/min)	79.40 ± 7.77	85.59 ± 12.91	503	0.0345

TABLE2. COMPARISON OF FASTING BLOOD SUGAR AND LIPID PROFILE IN METABOLIC SYNDROME WITH AND WITHOUT DIABETES MELLITUS (VALUES ARE MEAN ± SD)

Variables	**Group A (n =37)**	**Group B (n =38)**	**t/ u value**	**P value**
Fasting blood sugar (mg %)	91.48 ± 12.63	165.63 ± 59.69	41.00	0.0001
Total cholesterol (mg %)	195.83 ± 49.42	218. 38.87	474	0.0155
Triglycerides (mg %)	127.72 ± 52.58	150.57 ± 69.36	501.50	0.033
High density lipoprotein (mg %)	44.64 ± 12.56	46.94 ± 11.45	0.82	0.41
Low density lipoprotein (mg %)	121.02 ± 35.32	148.53 ±39.70	440.50	0.0055

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III. RESULTS

Data is presented as mean ± SD. Comparison of data on baseline characteristics including cardiovascular parameters of subjects with metabolic syndrome alone (group A) and subjects with metabolic syndrome and diabetes mellitus (group B) is presented in table 1. Data on lipids and fasting blood sugar in these two groups are presented in table 2.

The mean heart rate, diastolic blood pressure and age of group B was significantly higher compared to group A ($p = 0.0345$ and $p = 0.027$, $p = 0.042$ respectively, table 1). Mean body mass index, waist hip ratio and systolic blood pressure of group B did not differ significantly compared to group A.

Mean fasting blood sugar, total cholesterol, triglycerides and low density lipoproteins of group B was significantly higher compared to group A ($p < 0.0001$, $p = 0.0155$; $p = 0.033$; $p = 0.0055$ respectively, table 2). Mean high density lipoprotein of group B was not significantly different compared to group A (table 2).

IV. DISCUSSION

The metabolic syndrome is characterized by a group of risk factors including, abdominal obesity, dyslipidaemia, elevated blood pressure, and impaired glucose tolerance [1]. The original World Health Organization definition emphasized insulin resistance [8]. But the more recent definition from the National Cholesterol Education Program Adult Treatment Panel III (ATPIII) had treated the individual components equally [9] while the International Diabetes Federation (IDF) takes central obesity as a pre-requisite [7]. In this study we compared the influence of metabolic syndrome as defined by IDF criteria in presence and absence of diabetes on cardiovascular parameters and lipids.

The presence of hypertension constitutes one criterion for metabolic syndrome but not a prerequisite by ADF definition. In the present study diastolic blood pressure was significantly higher in subjects with metabolic syndrome and diabetes compared to metabolic syndrome alone (table 1). Peripheral resistance is a major factor influencing diastolic blood pressure. Peripheral resistance in turn is influenced by narrowing of blood vessels. Thus it could be said that presence of diabetes mellitus increases diastolic blood pressure probably by increasing peripheral resistance.

In the present study, total cholesterol, triglycerides, low density lipoprotein cholesterol was significantly higher in combined metabolic syndrome and diabetes mellitus group compared to metabolic syndrome alone group (table 2). Type 2 diabetics have four fold increases in chances of having cardiovascular disease compared to subjects without diabetes mellitus [10]. Hyperlipidaemia is associated with atherosclerosis. Atherosclerosis is one of the major risk factors for cardiovascular disease. Thus, hyperlipidaemia, hyperglycaemia coupled with raised diastolic blood pressure may contribute to the observed four-fold increase in cardiovascular disease in subjects with diabetes mellitus.

V.CONCLUSION

Metabolic syndrome in presence of diabetes mellitus causes raise in diastolic blood pressure, increase in low-density lipoprotein and triglycerides.

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