Metabolic Syndrome: The Prevalence of Mounting Public Health Problem in Ghaziabad, India

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Metabolic syndrome (MetS) is a name for a group of risk factors that occur together and increases the risk for coronary artery disease, stroke, and type 2 diabetes. The MetS is a clustering of components that reflect over nutrition, sedentary lifestyles and resultant excess adiposity. Metabolic Syndrome is posing a major public health challenge to the health systems in developed and developing countries. The 405 study subjects aged between 25-65 yrs from general population in Ghaziabad, India, were taken, who attended the hospital for general checkup. Complete fasting lipid profile, Blood glucose, and Hs-CRP, Lp(a) and GGT, blood urea and Serum Creatinine of subjects were evaluated. On application of ATP 3rd criteria on the screened subject patients, they are classified. Our study found that the number of subjects having MetS was 173 (42.71% of total). In the subgroup of metabolic syndrome with diabetes, the total number of subjects was 105(25.92%) in which age wise distribution was 26 (6.41%) in 25-45 yrs and 79 (19.50%) in 45-65 yrs. In the second subgroup of metabolic syndrome without diabetes total number of subjects was 68 (16.79%) in which age wise distribution was 16 (3.95%) in 25-45 yrs and 52 (12.83%) in 45-65 yrs. The study proposes the inclusion of biochemical parameter Hs-CRP, Lp (a) and GGT in the criteria for defining cases of metabolic syndrome, so that more metabolic syndrome cases can be picked up at earliest. This issue is especially pertinent for the Indian patient population in whom cardiovascular disease is becoming increasingly common in both sexes and in age group of 25-65 yrs. There should be emphasis on detection of metabolic syndrome and intensification of targeted preventive strategies.

Keywords: Metabolic Syndrome (MetS), High-Sensitivity C-reactive Protein (Hs-CRP), Lipoprotein(a), Gamma Glutamyltransferase (GGT), Cardiovascular Disease(CVD).

1. INTRODUCTION

Metabolic syndrome (MetS) has generated a great deal of interest of Indian researchers in recent years. Metabolic syndrome and diabetes mellitus have reached global pandemic proportions with India being designated 'diabetes capital' of the world. Metabolic syndrome is a name for a group of risk factors that occur together and increase the risk for coronary artery disease, stroke, and type-II diabetes [1,2,3]. The MetS is a clustering of components that reflect over nutrition, sedentary lifestyles, and resultant excess adiposity. The MetS includes the clustering of abdominal obesity, insulin resistance, dyslipidaemia, and elevated blood pressure and is associated with other co-morbidities including the prothrombotic state, proinflammatory state, nonalcoholic fatty liver disease, and reproductive disorders. Because the MetS is a cluster of different

conditions, and not a single disease, the development of multiple concurrent definitions has resulted [4]. Metabolic Syndrome is defined according to national cholesterol education program & Adult treatment panel 3rd (NCEP ATP 3rd) criteria for diagnosis of metabolic syndrome as the presence of three or more of the following risk factor, (1) Abdominal obesity (Waist circumference >40 inch in men, >35 inch in women), (2) Elevated Triglycerides levels of ($\geq$150 mg/dl), (3) High density lipoprotein (HDL) cholesterol (Levels of $\geq$40 mg/dl for men and $\geq$50 mg/dl for women), (4) Hypertension (>130/85 mmHg) or anti hypertensive medication use and (5) Impaired fasting glucose level ($\geq$110 mg/dl) [5]. Epidemiological studies over the last three decades have shown fivefold increase in the prevalence of diabetes in India, while prevalence rates of >30% have been reported recently for metabolic syndrome [6] and by the year 2020, is projected to have the highest number of individuals suffering from atherothrombotic, cardiovascular disease (CVD) [7]. The underlying pathophysiology is as yet unclear, but has been closely linked to insulin resistance and obesity [8]. It may be considered as a pre-condition of two major clinical entities that are constantly on the rise: Atherosclerotic cardiovascular diseases and Diabetes mellitus, which are major contributors to morbidity and mortality all over the world [9]. The occurrence of the metabolic syndrome in various ethnic groups – including Caucasians, Africans, Latin Americans, Asian Indians, Chinese, Aboriginal Australians, Polynesians and Micronesians – has been confirmed in several epidemiological studies [10]. In developing countries, the lifestyle changes resulting from industrialization and rural-urban migration involve decreased levels of physical activity and the increased intake of energy [10]. In these developing countries, the prevalence of the metabolic syndrome varies from 13.3% in China to 30% in Iran. In a survey in Singapore, the prevalence of the syndrome varied between the three major ethnic groups – from the Chinese at 15% and Malays at 19%, to the Indians at 20% all these studies have used either WHO or ATP III criteria for defining the metabolic syndrome [11].

2. METHODOLOGY

2.1. ATP 3rd Criteria for Metabolic Syndrome

The presence of three or more of the following risk factor, (1) Abdominal obesity (2) Elevated Triglycerides (3) High density lipoprotein (HDL) cholesterol (4) Hypertension or anti hypertensive medication use and (5) Impaired fasting glucose is termed as Metabolic Syndrome.

- Three or more than three positive of the above five factors = Metabolic Syndrome
- Less than three positive of the above five factors = No Metabolic Syndrome

2.2. Study Subject

The 405 patients aged between 25-65 yrs from general population in Ghaziabad, India, were taken, who attended the hospital for general checkup, as study subjects for this study. In these 405 subjects age-wise distribution is 108 (26.66% of total) in 25-45 yrs age group and 297 (73.33 % of total) in 46-65 yrs age group. All subjects after various tests divided into three groups as:

(i) Control group: Only those subjects were selected for inclusion in the control group that does not fulfill adult treatment panel 3rd criteria for Metabolic Syndrome.

(ii) Metabolic syndrome with Diabetes group: Only those subjects were selected for inclusion in this group that fulfills adult treatment panel 3rd criteria for Metabolic Syndrome and they should have Diabetes. This group is further mentioned as 'Diabetic group'.

(iii) Metabolic Syndrome with No Diabetes group: Only those subjects were selected for inclusion in this group that fulfills adult treatment panel 3rd criteria for Metabolic Syndrome but they should not have Diabetes. This group is further mentioned as 'Non-Diabetic group'.

Fasting blood samples has also be taken from all the subjects for the estimation of Hs-C Reactive protein, Lipoprotein (a), and Gamma-Glutamyltransferase and fasting blood glucose, lipid profile, blood urea and serum Creatinine. All parameters have estimated by the reagent Randox International Laboratory Ltd. and run the samples on fully auto chemistry analyzer Olympus AU480 in the laboratory. We applied internal and external quality control measures in the laboratory.

2.3. Statistical Analysis

The statistical analysis was carried out using ANOVA (One-way) by SPSS (Ver.19) Inc., Chicago, Illinois, USA.

3. RESULTS AND DISCUSSION

The prevalence of metabolic syndrome in our study of general population of city Ghaziabad, India is based upon 405 subjects. In these subjects 232 were found in control group, 105 were found in Diabetic group and rest 68 were found in Non- Diabetic group as shown in Figure 1.

In the diabetic group, the number of subjects was 105 (25.92% of total) with age-wise distribution as 26 (6.41% of total) in 25-45 yrs age group and 79 (19.50% of total) in 45-65 yrs age group. In the non-diabetic group, the number of subjects was 68 (16.79% of total) with age-wise distribution as 16 (3.95% of total) in 25-45 yrs age group and 52 (12.83% of total) in 45-65 yrs age group. In control group the number of subjects was 232 (57.29% of total) with age-wise distribution as 66 (16.30% of total) in 25-45 yrs age group and 166 (40.99% of total) in 45-65 yrs age group as shown in Figure 1.
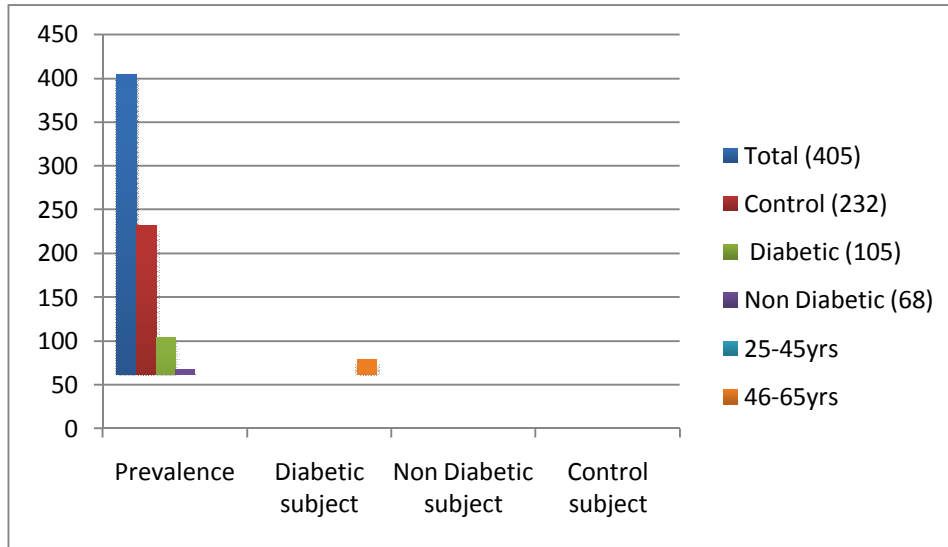
Fig. 1: Total prevalence and age wise distribution (control, diabetic, non diabetic groups) out of 405 studied subjects.

Overall prevalence of control, Diabetic & Non Diabetic groups including their biochemical parameters is presented in Figure 2(a), 2(b) and 2(c) respectively.
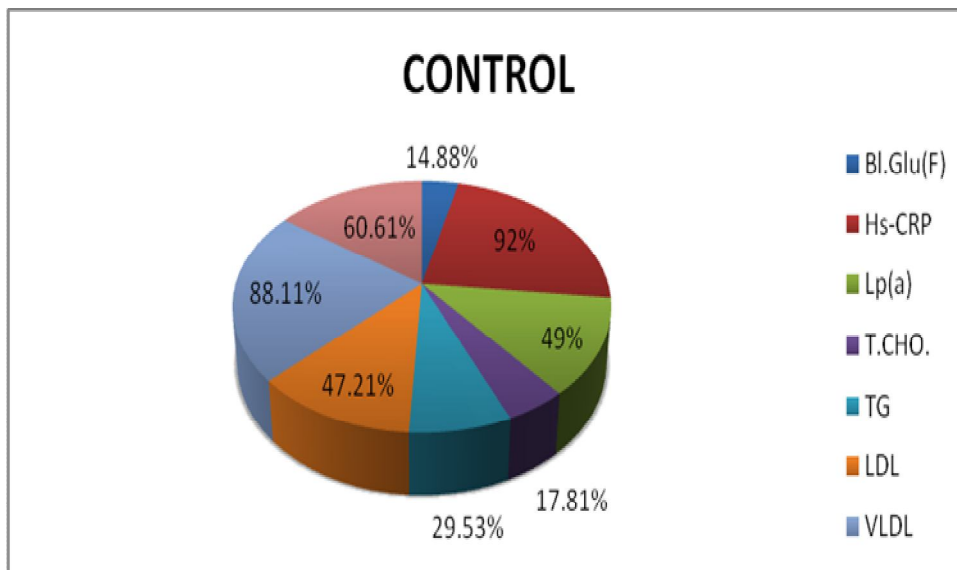

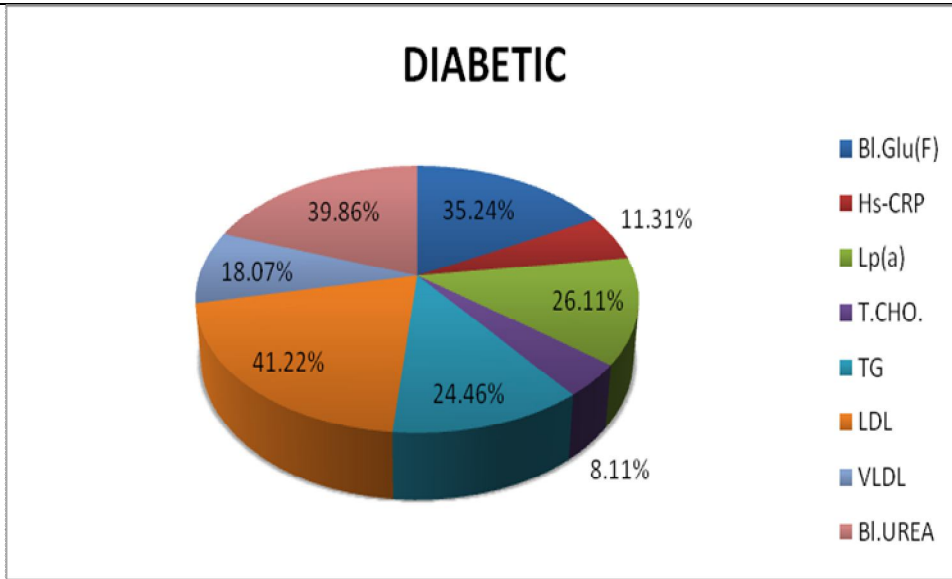**Fig. 2(a):** Percentage (%) of biochemical parameters in control group.

Fig. 2(b): Percentage (%) of biochemical parameters in diadetic group.
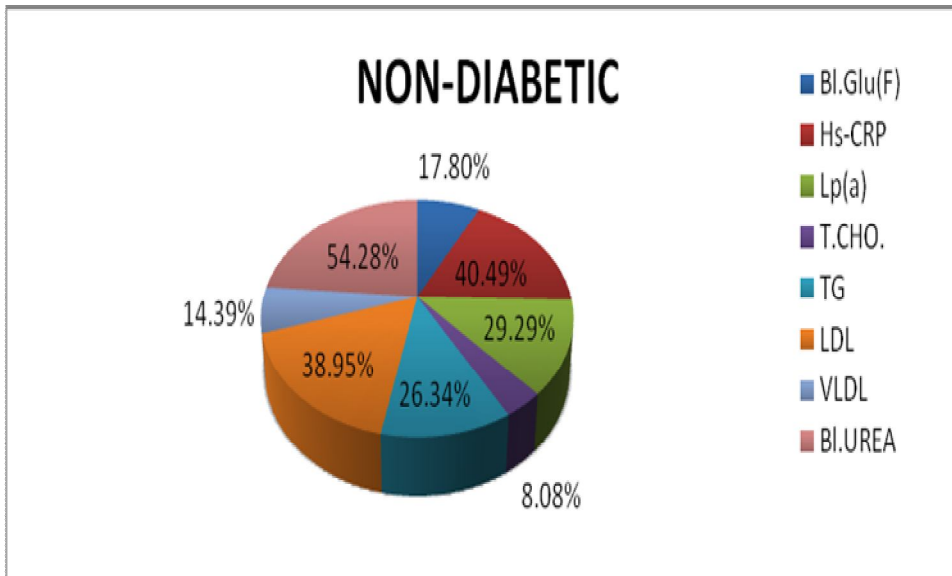

Fig. 2(c): Percentage (%) of biochemical parameters in non-diabetic group.

GGT level is raised in 100% in both age group of female subjects and 89-96% in both age group of male subjects. Lp (a) level is raised in 100% of the cases of metabolic syndrome in this study. Hs-CRP level is raised in 84% subjects of non-diabetic group and in 53% subjects of diabetic group as shown in Table 1.

Table 1: Biochemical parameters in control, diabetic and non diabetic group.

S. No.	Biochemical Parameter	Control Group (232)	Diabetic Group (105)	Non Diabetic group (68)
1.	Blood Sugar (Fasting)	5.60%	99.04%	0.0%
2.	Hs-CRP	0.0%	52.38%	83.82%
3.	Lp(a)	2.50%	100%	100%
4.	GGT	1.27% (Male)	89.23% (Male)	96.97% (Male)
		40% (Female)	100% (Female)	100% (Female)
5.	T.CHO.	55.17%	59.04%	55.88%
6.	TG	17.60%	66.66%	83.82%
7.	LDL	9.40%	13.33%	13.23%
8.	HDL-C	12.10% (Male)	18.46% (Male)	12.12% (Male)
		6.67% (Female)	17.50% (Female)	28.57% (Female)
9.	VLDL	62.50%	48.57%	38.23%
10.	Blood Urea	24.13%	16.19%	11.76%
11.	Creatinine	39.49% (Male)	36.92% (Male)	33.33% (Male)
		22.67% (Female)	25.00% (Female)	14.29% (Female)

Inferring from the various Socio-Cultural parameters collected during the course of this study, obesity does not seem to be a very significant factor for metabolic syndrome in the study population. According to our study HDL-C is not a very significant factor for metabolic syndrome in diabetic patient in the age group of 25-45 yrs. Patients of Indian origin often fit into the model of metabolically obese, normal weight individuals and are, therefore, at high risk for development of both MetS and subsequent Cardio vascular disease [12]. The fact that MetS can develop in "apparently non obese Indians" with near normal waist circumference was in line with some of the previous studies in Indian population [13]. Similar trends have been observed in previous studies in Indian patients, pointing towards the fact that Indians tend to develop MetS at different criteria when compared to their western counter parts [13,14,15].

4. CONCLUSION

The study proposes the inclusion of biochemical parameter Hs-CRP, Lp (a) and GGT in the criteria for defining cases of metabolic syndrome in Indians. So that more metabolic syndrome can be picked up at earliest. This issue is especially pertinent for the Indian patient population in whom cardiovascular disease is becoming increasingly common in both sexes and in age group of 25-65 yrs. There should be continued health care emphasis on detection of metabolic syndrome and intensification of targeted preventive strategies. We strongly recommend that large prospective studies are needed to establish link between the biochemical parameter of Hs-CRP, Lp(a) and GGT with metabolic.

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