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THE CLINICAL AND LABORATORY CHARACTERISTICS OF METABOLIC SYNDROME AND HEALTHY GROUP

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ABSTRACT

Background: Understanding the clinical and laboratory characteristics of both metabolic syndrome and healthy individuals allows for the identification of key differences and helps clinicians in diagnosing and managing metabolic syndrome more effectively. By recognizing these features, healthcare professionals can implement targeted interventions to mitigate the risk factors associated with metabolic syndrome and improve the overall health outcomes of affected individuals. **Objective:** To assess the Clinical and laboratory characteristics of metabolic syndrome and healthy group. **Method:** This Cross-sectional study was carried out at Out patient department of Medicine, BSMMU, Shahbagh, Dhaka from March 2020 – July 2021. By non-probability sampling technique 36 diagnosed metabolic syndrome patients, 36 normal healthy subjects will be enrolled in the study. The purpose and procedure of the study was explained in detail and informed written consent was be taken from all the study subjects. **Results:** During the study, 41 identified as Metabolic Syndrome (M=16, F=25), and 30 identified as healthy individuals (M=11, F=19). Gender has no significant effect on these two groups (p= 0.697). The mean ± SD of age of Metabolic syndrome and healthy individuals were 47.88± 9.69 and 43.43 ±12.68 years respectively. Weight, waist circumference, SBP, and BMI were significantly higher in the Metabolic syndrome group (p< 0.05). The mean of Fasting plasma glucose was significantly higher in the metabolic syndrome group than in healthy individuals (p=0.000). The mean of fasting TG was significantly higher in the metabolic syndrome group than in the healthy group (p=0.000). The mean HDL-C level was statistically not significant between the groups (p=0.197). **Conclusion:** Based on our study we can say that, Weight, waist circumference, SBP, and BMI were significantly higher in the Metabolic syndrome group. Plus mean of Fasting plasma glucose, mean of fasting TG and mean HDL-C level was significantly higher in the metabolic syndrome group than in the healthy group.

KEYWORDS: Clinical characteristics, metabolic syndrome, fasting glucose.

INTRODUCTION

Metabolic syndrome is a cluster of metabolic abnormalities that collectively increase the risk of cardiovascular disease and type 2 diabetes. It is characterized by a combination of several interrelated clinical and laboratory features, including central obesity, insulin resistance, dyslipidemia, and hypertension. Understanding the clinical and laboratory characteristics of metabolic syndrome is essential for its early identification, accurate diagnosis, and effective management.

One of the key clinical features of metabolic syndrome is central obesity, which refers to excessive accumulation of visceral fat in the abdominal region. This is typically assessed by measuring waist circumference. Increased waist circumference is associated with an elevated risk of metabolic syndrome and its associated complications, as it reflects the deposition of fat in and around vital organs, leading to metabolic disturbances.[1-3]

Insulin resistance is another hallmark of metabolic syndrome and is characterized by impaired glucose uptake and utilization in target tissues, predominantly skeletal muscle, liver, and adipose tissue. Insulin resistance can be assessed through various methods, including fasting insulin levels, homeostatic model assessment for insulin resistance (HOMA-IR), and

glucose tolerance tests. Elevated insulin levels or insulin resistance indicate an impaired ability of cells to respond to insulin, which can lead to glucose intolerance and the development of type 2 diabetes.

Dyslipidemia, a common feature of metabolic syndrome, involves abnormal lipid profiles, including elevated triglycerides, reduced high-density lipoprotein (HDL) cholesterol, and increased small, dense low-density lipoprotein (LDL) particles. These lipid abnormalities contribute to the development of atherosclerosis and cardiovascular disease. Lipid panel tests can assess these lipid parameters and aid in the diagnosis and monitoring of dyslipidemia in individuals with metabolic syndrome.[4-7]

Hypertension, or high blood pressure, is frequently associated with metabolic syndrome. It is defined as persistent elevation of systolic and/or diastolic blood pressure above normal ranges. Hypertension is a major risk factor for cardiovascular disease and its complications. Regular blood pressure measurements using a sphygmomanometer can help diagnose and manage hypertension in individuals with metabolic syndrome.

In contrast to the clinical features, laboratory characteristics of metabolic syndrome include the measurement of specific biomarkers. These may include fasting glucose levels, glycated hemoglobin (HbA1c), lipid profile components (triglycerides, HDL cholesterol, LDL cholesterol), and inflammatory markers such as C-reactive protein (CRP). These laboratory tests provide valuable information about the underlying metabolic derangements associated with metabolic syndrome and aid in risk assessment and treatment monitoring.[8-11]

Comparatively, a healthy group refers to individuals without metabolic syndrome or its associated risk factors. They typically exhibit normal body weight, glucose metabolism, lipid profiles, blood pressure, and inflammatory markers within the normal ranges.

Objective

To assess the Clinical and laboratory characteristics of metabolic syndrome and healthy group.

METHODOLOGY

This Cross-sectional study was carried out at Out patient department of Medicine, BSMMU, Shahbagh, Dhaka from March 2020 – July 2021. By non-probability sampling technique 36 diagnosed metabolic syndrome patients, 36 normal healthy subjects will be enrolled in the study. The purpose and procedure of the study was explained in detail and informed written consent was be taken from all the study subjects.

Collected data was checked and edited (to remove the outliers) and then processed with the help of a software statistical package for social science (SPSS) and analyzed. Statistical analyses was done by using SPSS 25.0. Quantitative data will be expressed as mean (±SD) or median (inter-quartile range) as appropriate. The crosstabs and descriptive procedures were used to produce frequencies of categorical variables. Comparisons between metabolic syndrome and healthy individuals were performed by unpaired t-test. Subjects were divided into four groups according to the number of components of the MetS (0, 1, 2, and 3 or more components). Comparisons between groups classified by quartiles of serum GGT and the number of components of the MetS were performed using one-way ANOVA analysis. Spearman correlation coefficient between serum GGT and other parameters was performed. To assess which components of the Metabolic Syndrome contribute to the change in serum GGT, we performed linear regression using serum GGT as the dependent variable and all the different components of the Metabolic Syndrome as the covariates. Serum GGT level has non-normal distribution, thus we used a logarithmic transformation. The level of significance used for all of the above analyses was two-tailed, $p < 0.05$. The SPSS statistical package was used to perform all statistical evaluations (SSPS Inc., Chicago, IL, USA).

RESULTS

Table-1 showed demographic characteristic of the study group where Among 71 participants, 41 identified as Metabolic Syndrome (M=16, F=25), and 30 identified as healthy individuals (M=11, F=19). Gender has no significant effect on these two groups (p= 0.697). The mean ± SD of age of Metabolic syndrome and healthy individuals were 47.88± 9.69 and 43.43 ±12.68 years respectively. There was no significant difference in age, between the Metabolic syndrome & healthy group (p =0.098).

Table 1: Demographic characteristic of the study group.

Variables	Metabolic Syndrome (n = 41) (Mean± SD)	Healthy group (n = 30) (Mean± SD)	p- value
Age of the study subjects (years)	47.88± 9.69	43.43 ±12.68	0.098
Gender distribution	**Metabolic Syndrome**	**Healthy group**	P value
Male	16	11	0.697
Female	25	19	

In table-2 Clinical and anthropometric characteristics of the study subjects were compared between metabolic syndrome and healthy group. Weight, waist circumference, SBP, and BMI were significantly higher in the Metabolic syndrome group ($p< 0.05$).

Table 2: Clinical and anthropometric characteristics of metabolic syndrome and healthy group (n=71)

Variables	Metabolic Syndrome (n=41) (Mean± SD)	Healthy group (n=30) (Mean±SD)	p- value
Height (meter)	1.6068 ±.05685	1.6057 ±.05244	0.930
Weight (Kg)	67.1463 ±5.82049	63.2000 ±6.97483	**0.012**
WC (cm)	83.1463 ±5.31771	78.1000± 5.18186	**0.000**
SBP (mmHg)	124.63± 8.971	117.33 ±7.849	**0.001**
DBP (mmHg)	78.41± 7.701	75.33 ±7.303	0.093
BMI ($kg/m^{2)}$	25.9947 ±1.70248	24.4923± 2.27234	**0.002**

Unpaired student's t-test was done.

BMI-body mass index, SBP- systolic blood pressure, DBP- diastolic blood pressure, WC-waist circumference.

Table-3 showed a comparison of laboratory variables between the metabolic syndrome group and the healthy group. The mean of Fasting plasma glucose was significantly higher in the metabolic syndrome group than in healthy individuals (p=0.000). The mean of fasting TG was significantly higher in the metabolic syndrome group than in the healthy group (p=0.000). The mean HDL-C level was statistically not significant between the groups (p=0.197).

Table 3: Laboratory variables of metabolic syndrome and healthy group (n=71)

Variables	Metabolic Syndrome (n=41) (Mean± SD)	Healthy group (n=30) (Mean±SD)	p- value
Fasting plasma glucose (mmol/L)	11.29± 3.89	5.7800± .79	**0.000**
LDL cholesterol (mg/dl)	101.48 ±32.53	112.39 ±37.45	0.195
HDL cholesterol (mg/dl)	41.61 ±8.76	44.40 ±9.15	0.197
Triglyceride (mg/dl)	296.22 ±155.55	154.77 ±85.33	**0.000**
Total cholesterol (mg/dl)	196.46 ±40.85	188.53 ±49.16	0.461
S. creatinine (mg/dl)	0 .8361± .22	0 .8103 ±.27	0.656
ALT (U/L)	34.20 ±21.46	27.70 ±13.36	0.148

Unpaired student's t-test was done.

HDL-C- high-density lipoprotein cholesterol, LDL- C-low-density lipoprotein cholesterol, TG – Triglycerides, ALT-alanine aminotransferase.

Table-4 showed Level of serum GGT in study group. Mann-Whitney U test showed there is a significant difference in GGT level between metabolic syndrome and the healthy group (p=0.000).

Table 4: Level of Serum GGT in metabolic syndrome and healthy group (n=71)

Variable	Metabolic Syndrome (n=41)	Healthy group (n=30)	p-value
GGT (U/L) Median ±SD	45.56 ± 34.81	23.47 ±12.07	**0.000**

Mann-Whitney U test was done.
GGT- Gamma Glutamyl Transferase (U/L)

DISCUSSION

Metabolic syndrome is a state of chronic low‑grade inflammation caused by systemic oxidant stress induced by obesity and insulin resistance. A rise in inflammatory markers has been seen in MetS. Serum GGT concentrations were significantly higher in subjects with metabolic syndrome compared to those without it. In subclinical inflammation, GGT could be elevated because of its role in glutathione homeostasis and oxidant stress.[10-11]

Research on the Chinese population has also found a positive association. GGT is the principal enzyme that influences the extracellular hydrolysis of glutathione (GSH). Elevated levels of GGT result in increased production of reactive oxygen species (ROS), aggravating oxidative stress, and leading to peroxidation

of lipids by highly reactive free radicals. The adverse effects of increased GGT ultimately leading to tissue injury and increased risk of MetS and its consequences.[12]

In our study, 71 subjects were recruited comprising 41 cases of metabolic syndrome and 30 cases of a healthy individual. The mean ± SD age in the MetS group was 47.88±9.69 years and 43.43 ±12.68 years in the healthy group. A similar study revealed that the mean ± SD age was 47.8±9.9 years and 49.0 ±9.6 in controls respectively.13 Out of the cases, 27 (38.03%) were males and 36(61.97%) females which was supported by other study. 14 The gender distribution showed 62% females and 38% males in the study group.

Clinical and anthropometric characteristics were compared between metabolic syndrome and healthy group in this study revealed, weight, waist circumference, SBP, and BMI were significantly higher in the MetS group ($p< 0.05$). FPG, TG, and GGT were also significantly higher in the MetS group ($p<0.01$) which was also supported by a recent study. 15 However, Age and gender distribution had no statistical significance between the groups ($p>0.05$).

CONCLUSION

Based on our study we can say that, Weight, waist circumference, SBP, and BMI were significantly higher in the Metabolic syndrome group. Plus mean of Fasting plasma glucose, mean of fasting TG and mean HDL-C level was significantly higher in the metabolic syndrome group than in the healthy group.

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