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Research Article

Clinical profile in metabolic syndrome

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ABSTRACT

Background: The metabolic syndrome is a condition characterized by a constellation of metabolic disorders including: abdominal obesity, insulin resistance/glucose intolerance, atherogenic dyslipidemia [elevated Triglyceride (TG), and lower High Density Lipoprotein (HDL-c)], raised blood pressure, proinflammatory and prothrombotic state. It was referred to as the "X syndrome" by Kylin in the 1920's and described as a phenomenon of the clustering of obesity, hypertension, and gout.[1] Aims and objects: To correlate different clinical and biochemical parameters in metabolic syndrome among the staff of Hospital in Imphal.
Methods: A total of 239 staffs were selected randomly from the Hospital, Imphal, Manipur. Sample size was calculated based on the prevalence of metabolic syndrome of 33.2%[4] with 95% precision, coming to a sample size of 237.
Results: Metabolic syndrome was found in 49 out of 239 staffs and its prevalence was 21% which increased with age. There was a strong association between metabolic syndrome and obesity. There is lower prevalence rate of metabolic syndrome among the staff compared to other studies. This may have resulted from a number of factors including younger age, physical activities and ethnic origin.
Conclusions: Measuring MetS components is necessary for the early detection of this abnormal condition and early intervention.

Keywords: Metabolic Syndrome (MetS), Waist circumference (WC), Obesity

INTRODUCTION

The term "Metabolic syndrome" dates back to at least the late 1950s, but came into common usage in the 1970s to describe various associations of risk factors with diabetes that had been noted as early as the 1920s.[2]

The definition of metabolic syndrome depends on which group of experts is doing the defining. Based on the guidelines from the 2001 National Cholesterol Education Program Adult Treatment Panel (ATP III), any three of the following traits in the same individual meet the criteria for the metabolic syndrome.[3]

1. Abdominal Obesity (AO): a waist circumference over 102 cm (40 inches) in men and over 85 cm (35 inches) in women.
2. Serum triglycerides 150 mg/dl or above.
3. HDL cholesterol - 40 mg/dl or lower in men and 50 mg/dl or lower in women.
4. Blood pressure of 130/85 mmHg or more.
5. Fasting Blood Glucose (FBG) of 110 mg/dl or above.

Aims and objectives

To correlate different clinical and biochemical parameters in metabolic syndrome among the hospital staff in Imphal, Manipur.

METHODS

A total of 239 staffs were selected randomly from the Hospital, Imphal, Manipur. Sample size was calculated based on the prevalence of metabolic syndrome of 33.2%[4] with 95% precision, coming to a sample size of 237.

Exclusion criteria

1. Any staff suffering from acute MI, renal failure, liver disease, critical illness, carcinoma and any infection is excluded from the study.

2. Any staff with a history of endocrine disorder and/or previous treatment with hormones or steroids were excluded.

Procedure

1. Detailed history of clinical information including the patients' age, sex, weight, occupation, religion, smoking, alcohol consumption, intercurrent illness. Detailed examination was conducted as per protocol of clinical examination and general and physical examination. Records of examination were maintained.

2. Sitting blood pressure was measured in both arms with an appropriate mercury sphygmomanometer using the phase I and phase V Korotkoff sounds after at least 10 minutes of resting.

3. Anthropometric measurements: Body weight, height, BMI, waist circumference were determined using standard procedure

4. Blood sugar and serum lipid profile were estimated.

RESULTS

Age distribution

In the present study, a total of 239 staffs were selected. Their age ranged from 27 to 62 years with mean age of 39.67±7.87 years. The maximum number was in the age group 31 to 40 years.

The mean age of staff with MetS was 44.69±8.18 years and that without MetS was 38.37±7.27 years. Hence, staff with MetS were found older than those without MetS (p = 0.000) as shown in Figure 1 & Table 1.

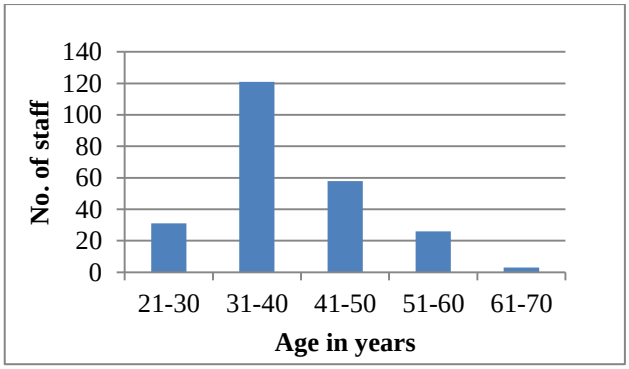

Figure 1: Age distribution.

Table 1: Showing Mean±SD of age.

	With MetS	Without MetS	p value
	Mean±SD	Mean±SD	
Age	44.69±8.18	38.37±7.27	0.000

Height

The height of the studied ranged from 148 cm to 170 cm and mean height was 152.09±2.47.

Weight

Among the study population, weight ranged from 45 to 95 Kg and the mean weight was 57.37±6.85 Kg. The weight was found heaviest in the age group of 51 to 60 years and weight of most of the nurses i.e. 25 (16.56%) nurses with MetS was in between 51 to 60 kg. The mean weight among MetS was 61.37±7.77 kg and those without MetS was 56.34±6.21 kg. Hence, the weight of the nurses with MetS (p = 0.000) was more than those without MetS (Table 2 & 3).

Table 2: Distribution of weight with and without MetS.

Weight (kg)	With MetS	Without MetS	Total
41-50	2 (6.06%)	31 (93.94%)	33
51-60	25 (16.56%)	126 (83.44%)	151
61-70	20 (41.67%)	28 (58.33%)	48
71-80	1 (20.00%)	4 (80.00%)	5
81-90	0 (0%)	1 (100%)	1
91-100	1 (100%)	0 (0%)	1

Table 3: Showing Mean±SD of weight.

	With MetS	Without MetS	p value
	Mean±SD	Mean±SD	
Weight (kg)	61.37±7.77	56.34±6.21	0.000

Body Mass Index (BMI)

BMI in the study population ranged from 19.74 to 61.66 kg/m^2 (mean of 24.79±2.78 kg/m^2). Most staff with MetS

are obese (Table 4). The mean BMI among MetS was 24.36±2.45 kg/m^2 and those without MetS was 26.45±3.36 kg/m^2. Hence, the BMI of the staff with MetS (p = 0.000) was more than those without MetS (Table 4 & 5).

Table 4: Distribution of BMI.

BMI (kg/m^2)	With MetS	Without MetS	Total
<23 (normal)	6 (10%)	54 (90%)	60 (25.10%)
23-24.99 (over weight)	10 (10.99%)	81 (89.01%)	91 (38.08%)
25-32.49 (obese)	32 (37.65%)	53 (62.35%)	85 (35.56%)
≥32.50 (obese)	1 (33.33%)	2 (66.67%)	3 (1.26%)
Total	49	190	239

Table 5: Showing Mean±SD of BMI.

	With MetS	Without MetS	p value
	Mean±SD	Mean±SD	
BMI	26.45±3.36	24.36±2.45	0.000

Waist Circumference (WC)

WC ranges from 60 to 130 cm and the mean WC was found to be 88.12±12.93 cm. 194 subjects out of 239 had WC ≥80 cm and maximum number was found in the age group 31 to 40 years. Mean WC among MetS and without MetS nurses were 95.18±9.58 and 86.3±13.07 cm respectively. So, staff with MetS (p=0.000) are having higher WC as compared to without MetS (Table 6 & 7).

Table 6: Waist circumference in relation to age.

Age group	n (≥80 cm)	n (<80)	Total
21-30	22(70.97%)	9 (29.03%)	31 (12.97%)
31-40	96 (79.34%)	25 (20.66%)	121 (50.63%)
41-50	52 (89.66%)	6 (10.34%)	58 (24.27%)
51-60	22 (84.62%)	4 (15.38%)	26 (10.88%)
61-70	2 (66.67%)	1 (33.33%)	3 (1.26%)
Total	194	45	239

Table 7: Showing Mean±SD of WC.

	With MetS	Without MetS	p value
	Mean±SD	Mean±SD	
WC	95.18±9.58	86.3±13.07	0.000

Blood pressure

The Systolic Blood Pressure (SBP) of all the staff ranged from 90 to 230 mmHg with a mean SBP of 120.60±13.10 mmHg. Among the staff with MetS the mean SBP was 131.71±20.22 mmHg and 117.74±8.50 mmHg among without MetS. Thus, subjects with MetS (p=0.000) had higher SBP than those without MetS (Table 12).

The Diastolic Blood Pressure (DBP) of the entire studied group ranged from 60 to 130 mmHg and mean DBP was 78.46±9.14 mmHg. Thus, subjects with MetS had higher DBP than those without MetS (p=0.000) as shown in Table 8.

Table 8: Showing Mean±SD of blood pressure.

	With MetS	Without MetS	p value
	Mean±SD	Mean±SD	
SBP	131.71±20.22	117.74±8.50	0.000
DBP	86.94±11.03	76.28±7.13	0.000

Fasting Blood Glucose (FBG)

The FBG ranged from 43 to 196 mg/dl and mean FBG was 86.28±21.17 mg/dl. Mean FBG among MetS and without MetS were 100.29±29.58 and 82.67±16.68 mg/dl. Most subjects with MetS had higher FBG as compared to those with without MetS (p=0.000) as shown in Table 9.

Table 9: Showing Mean±SD of blood pressure.

	With MetS	Without MetS	p value
	Mean±SD	Mean±SD	
FBG (mg/dl)	100.29±29.58	82.67±16.68	0.000

Triglyceride (TG)

The value of TG ranged from 62.52 to 450 mg/dl and mean TG level was 141.72±53.44 mg/dl. Mean TG level in MetS and without MetS were 177.03±48.36 and 132.61±50.95 respectively .and high TG (≥150) are much higher in Mets than those without MetS (p=0.000) as shown in Table 10.

Table 10: Showing Mean±SD of TG.

	With MetS	Without MetS	p value
	Mean±SD	Mean±SD	
TG (mg/dl)	177.03±48.36	132.61±50.95	0.000

High Density Lipoprotein-cholesterol (HDL-c)

The values of HDL-c ranged from 30 to 85 mg/dl, mean HDL-c level was 51.76±11.57 mg/dl. The Mean±SD HDL-c were 48.52±13.84 mg/dl and 52.6 ± 11.03 mg/dl respectively in MetS and without MetS (Table 11).

Table 11: Showing Mean±SD of HDL-c.

	With MetS	Without MetS	p value
	Mean±SD	Mean±SD	
HDL-c (mg/dl)	48.52±13.84	52.6±11.03	0.000

Metabolic syndrome components

Among the study sample, 194 staff had increased waist circumference, 54 staff had high BP, 46 staff had high FBG, 101 staff had high TG and 63 staff had low HDL-c and among the five components, WC (81%) was the most prevalent component, followed by hypertriglyceridemia (42%), low HDL-c (26%), high BP (23%) and high FBG (19%).

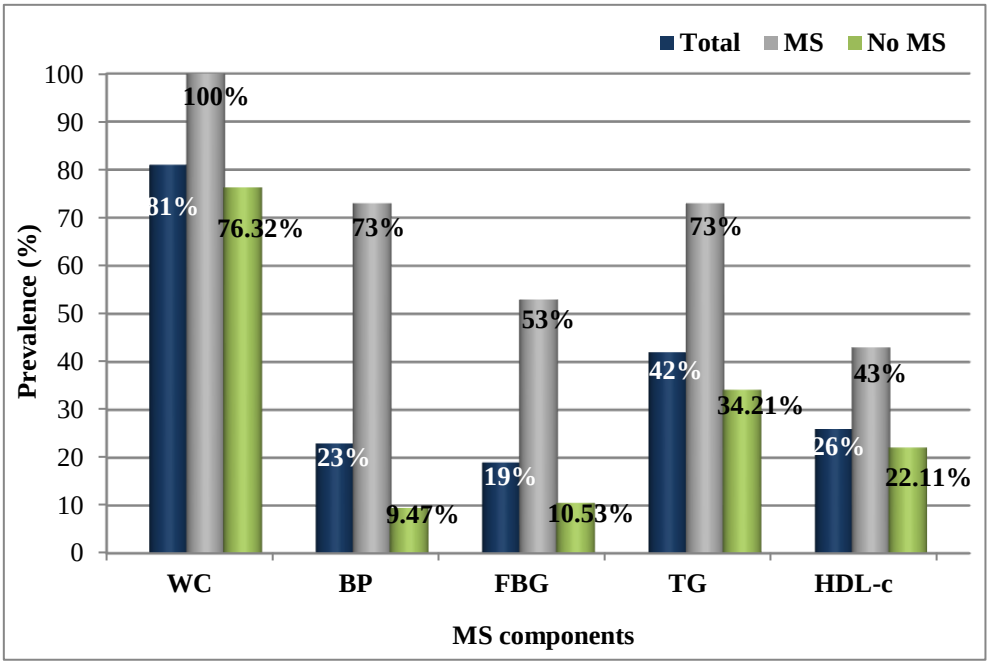

Figure 2: Prevalence of individual components.

Table 12: Showing components of MetS.

MetS components	Total (n=239)	MetS (n=49)	Without MetS (n=190)	p value
WC (>80 cm)	194 (81 %)	49 (100%)	145 (76.32%)	0.003
High blood pressure (≥130/85 mmHg)	54 (23%)	36 (73%)	18 (9.47%)	0.000
High FBG (>100 mg/dl)	46 (19%)	26 (53%)	20 (10.53%)	0.000
High Triglyceride (>150 mg/dl)	101 (42%)	36 (73%)	65 (34.21%)	0.000
Low HDL (<50 mg/dl)	63 (26%)	21 (43%)	42 (22.11%)	0.001
Total	239	49	190	

Table 13: Frequency and percentage of metabolic syndrome.

Metabolic syndrome		
	Frequency	**%**
MetS	49	21
Non MetS	190	79
Total	239	100

The total study consists of 239 subjects. The overall prevalence of metabolic syndrome was 21% (49 subjects) as shown in Figure 3.

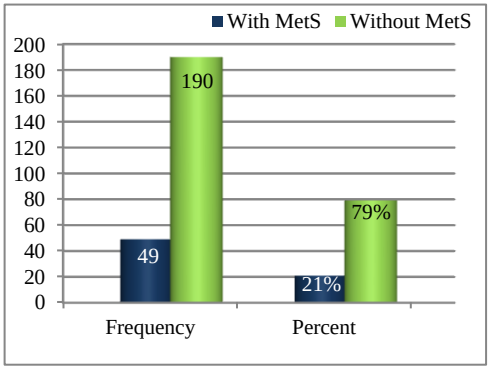

Figure 3: Frequency and percentage of metabolic syndrome.

DISCUSSION

Metabolic syndrome is a complex web of metabolic factors that are associated with a 2-fold risk of CVD and a 5-fold risk of diabetes. Individuals with metabolic syndrome have a 30%-40% probability of developing diabetes and/or CVD within 20 years, depending on the number of components present.[5]

Asian Indians are a high risk population with respect to diabetes and CVD, and the numbers are consistently on the rise.[6] The prevalence of MetS in Asian Indians varies according to the region, the extent of urbanization, lifestyle patterns, and socioeconomic/cultural factors. Recent data show that about one third of the urban population in India's major cities have MetS.[7]

Prevalence of metabolic syndrome

Out of 239 studied metabolic syndrome was seen in 49 with a prevalence of 21% and this result coincide with the finding of Gustavo et al.,[8] in which the overall prevalence of MetS was also 21.6%. These figures are lower than those reported from the study population of Kinmen, an island off the coast of South China.[9] Their findings are also lower than those reported from US study populations.[10] These large variations in the prevalence of the Metabolic Syndrome could be partly accounted for by differences in study populations, lifestyles and socio-economic status.

Age, BMI and waist circumference in relation to metabolic syndrome

Among the study group highest prevalence of MetS was found in 61 to 70 years .The prevalence of MetS increased with age (p = 0.000) from 2 (6%) in those aged 21 to 30 years to 2 (67%) in the age group 61 to 70 years. Since aging is associated with increased risk of insulin resistance, the hormonal alteration and increase in visceral adipose tissue.[11] This result coincide with the finding of Hildrum et al.,[12] in which the prevalence increased from 11% among participants aged 20 through 29 years to 47.2% in the 80 to 89 years group in men and from 9.2% to 64.4% for women in corresponding age groups.

The development of obesity, or more specifically an increase in abdominal fat, is thought to be the primary event in the progression of MetS. A tendency to gain fat in the abdominal area, as opposed to the hip, buttock, and limb areas, is linked to a rise in fatty acids in the blood, which is thought to lead to insulin resistance, high blood pressure, abdominal blood lipids, and eventually diabetes. Asian Indians tend to develop central obesity rather than generalised obesity.[13] Hence, Most with MetS are obese and the BMI of the Staff with MetS was more than that of without MetS (p=0.000). In the study by Park et al.[14] a steep rise in the prevalence of MetS was observed in overweight men and women.

Mean WC among MetS and without MetS were 95.18±9.58 cm and 86.3±13.07 cm respectively. MetS and abdominal obesity occur in a very high proportion of Turkish adult. Kozan et al.[15] reported a relatively lower frequency of MetS and abdominal obesity among health worker which may have resulted from a number of factors including younger age, higher level of physical activity due to working conditions and awareness about healthy lifestyle habits.

FBG, HDL-c in relation to metabolic syndrome

FBG among MetS and without MetS were 100.29±29.58 and 82.67±16.68 mg/dl. Most subjects with MetS had higher FBG as compared to those without MetS (p=0.000). Enas et al.[16] in Coronary Artery disease in Indians (CADI) study report the prevalence of diabetes to be 3 to 6 times higher among South Asians than Europeans Americans and other Asians. In India it is estimated that 32 million people suffer from diabetes, and the number is projected to increase to 69.8 million by 2025.

The mean HDL-c were 48.52 mg/dl and 52.6 mg/dl respectively in MetS and without MetS. Most of the nurses with MetS had low HDL-c as compared to those without MetS (p=0.015).

Increased prevalence of low HDL-c has been reported earlier by Enas et al. who found that only 4% of the Asian Indian men and 5% Asian Indian women had optimal HDL-c levels. Low HDL-c levels are a strong predictor of occurrence and reoccurrence of myocardial infract and stroke and are associated with premature death.

CONCLUSION

Clinical diabetes and CAD are preceded by a constellation of risk factors that are also the components of MetS. Among the studied population, the prevalence of MetS among 239 studied was 49 (21%). The mean age was 44.69±8.18 years and the prevalence of MetS increased with age. A steep rise in the prevalence of MetS is observed in obese (BMI≥25). Mean WC among MetS was 95.18 cm, Mean FBG among MetS was 100.29 mg/dl, the mean HDL-c was 48.52 mg/dl. Several issues related to MetS are unresolved and need further study. Measuring MetS components is necessary for the early detection of this abnormal condition and early intervention.

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