Original Research Article

Cross sectional study on Prevalence of metabolic syndrome among medical students: Time to intervene for future

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Abstract

Background : Metabolic syndrome is a new emerging public health pandemic which is a cluster of several risk factors, often resulting from unhealthy life style practices. While several studies have been done regarding metabolic syndrome but , only few have been done in children and young adults in India **Material and methods**:This cross-sectional study was conducted at Government Medical College (GMC), Thrissur in MBBS students studying at Government Medical College, in 146 participants. Metabolic syndrome was considered when 3 or more criteria was positive.and analyzed for various variables.**Results** :Prevalence of metabolic syndrome among medical students of south India was 2.1% according to the NCEP ATP- III (2005 revision) criteria. It was twice higher in males than females. In those with abnormal values of waist circumference and HDL- cholesterol, more were females, while in those with abnormal values of fasting plasma glucose, triglyceride and blood pressure, there were more of males. There was a high prevalence of unhealthy lifestyle practices like excessive consumption of hotel foods(83%) and junk food (53.5%), lack of physical exercise (58.2%), decreased sleep (36.3%) and increased use of mobile phones (92.5%). The most common abnormality noted was decreased HDL- cholesterol (18.5%), followed by high systolic blood pressure (11.6%), increased waist circumference (10.3%), triglyceride (6.8%), diastolic BP (6.2%) and fasting plasma glucose (6.2%). Mean BMI was higher in those with metabolic syndrome. BMI also showed a positive relation with the individual components of metabolic syndrome.**Conclusion** :Thus, targeted intervention at this right age group with lifestyle modification can help in reducing the risk for metabolic syndrome and its complications

Key words : Metabolic syndrome , BMI , Medical Graduates, Lifestyle modification

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Introduction

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Ischemic heart disease is already the leading cause of mortality in India[1]. and the magnitude of impact of this disease is expected to grow over the next two decades[2]. It is projected that ischemic heart disease will result in two and one-half million Indian deaths by 2020[3]. Acute coronary syndrome (ACS), including both ST-elevation myocardial infarction (STEMI) and non-ST elevation STEMI (NSTE-STEMI), is an important manifestation of ischemic heart disease.

Acute coronary syndrome is a set of signs and symptoms related to the heart. STEMI is compatible with a diagnosis of acute myocardialinfarction, but it is not characteristic of the diagnosis.Metabolic syndrome

is anew emerging public health pandemic which is a cluster of several risk factors, often resulting from unhealthy lifestyle practices.Also known as cardio-metabolic syndrome, syndrome X and insulin resistance syndrome. Although an exact cause for metabolic syndrome is not known, it's often attributed to central obesity and insulin resistance[1]. A quarter of adults in South Asia are estimated to have metabolic syndrome[2]. People diagnosed with the same have an increased chance of developing some cardiovascular diseases (by two fold) and type 2 diabetes mellitus (by fivefold),within the next 20 years of their lives[3]. Further, they also have a 2- to 4-fold increased risk of stroke, 3- to 4-fold increased risk of myocardial infarction, and nearly 2-fold risk of dying from such an event when compared to those without the syndrome [4], regardless of presence of any preexistent cardiovascular disease[5]. Metabolic syndrome is simply a conglomeration of risk factors. Stratification to Low Risk and High risk. In fact, lifestyle diseases are some of easily preventable diseases if proper awareness can be made in society. Assessment of metabolic syndrome and its components early in life can help analyses the specific risk factors involved to allow proper targeted intervention.Risk stratification among young adults of the society, who are tomorrow's working populationis an investment into the future of our nation's growth and progress. Only very few studies have been conducted especially among the medical students of India, in particular South India, most of which were cross- sectional studies. This study is also a cross- sectional one, assessing the population based on a selected set of known risk factors through physical examination, questionnaire filling and blood tests. What sets this study apart from others' is that a greater number of known and likely risk factors have been analyzed.

Material and methods

This cross- sectional study was conducted at Government Medical College (GMC), Thrissur between 23rd June, 2018- 23rd August, 2018 in MBBS students studying at Government Medical College, Thrissur, who are more than 18 years of age and have given informed written consent.146 participants were included in the study .

Operational Definition of Metabolic syndrome was defined as per National Cholesterol Education Program (NCEP) Adult Treatment Panel –III (2005 revision) criteria[14] for Asian population, as proposed by American Heart Association and National Heart, Lung & Blood Institute, was used to define metabolic syndrome. This guideline makes a diagnosis of metabolic syndrome if any three out of the below said five criteria are satisfied. They are

1.Waist circumference: > 90 cm (males), > 80 cm (females)

2.Fasting blood glucose: ≥ 100 mg/dl or on drugs

3.Fasting triglycerides: ≥ 150 mg/dl or on drugs

4.Fasting HDL cholesterol: < 40 mg/dl (males), < 50 mg/dl (females) or on drugs

5.Blood pressure: Systolic > 130 mm Hg or Diastolic > 85 mm Hg or on drugs .

Anthropometric measurements like height, weight, and waist circumference were measured by standard methods. Body Mass Index (BMI) was calculated as Weight (kg)/ height (m^2) and the participants were categorized as underweight (<18.49), normal (18.5-24.99), overweight (25- 29.99) and obese (≥30).A pretested semi- structured questionnaire was used as the data collection tool. The details were collected using a standardized proforma of multiple variables. The biochemical profile measured included fasting plasma glucose, serum triglyceride, high density lipoprotein (HDL) - cholesterol and total cholesterol .

Data obtained from the questionnaire were coded systematically and analyzed using IBM SPSS statistical software version 20. Descriptive statistics were summarized,and association was tested using Chi square test. Independent sample t test was used to compare means for two independent variables. Pearson's correlation coefficient was used to assess the correlation between biochemical profile and anthropometric parameters. The results were expressed as text, tables and diagrams. Statistical significance was places at $p < 0.05$.

Results

This study was conducted in 146 medical students with the mean age of the sample was 20.64± 0.82 years.. There were 77 (52.7%) females compared to 69 (47.2%) males. A great proportion of them were hostelers (86.3%). Based on religion, there were 72 (49.3%) Hindus, 48 (32.9%) Muslims, 25 (17.1%) Christians and 1 (0.7%) of mixed religion. Out of the total participants, 8 (5.5%) reported regular use of some form of systemic medication. Two (1.4%) of them were known cases of hypothyroidism. Only 11 out of 146 had some consumption of Alcohol or smoking .

As many of metabolic syndrome has familial background we analyzed the association of hypertension, type 2 diabetes mellitus, hyperlipidemia, obesity and cardiovascular disease in either of the

parents, were given by 39 (26.7%), 47 (32.2%), 25 (17.1%), 11 (7.5%) and 12 (8.2%) participants, respectively. Three (2.1%) reported history of hypertension in their sibling, while one (0.7%) each reported type 2 diabetes mellitus, hyperlipidemia, and obesity. Thirty- nine (26.7%) participants also reported incidence of death of either first- or second-degree relatives due to cardiovascular or cerebrovascular diseases.

Table 1:Dietary trends among participants (n= 146)

Type	Everyday	Weekly	Monthly	Never
Fish	1 (0.7%)	110 (75.3%)	19 (13%)	16 (11%)
Hotel foods	60 (41.1%)	61 (41.8%)	21 (14.4%)	4 (2.7%)
Sweet foods	34 (23.3%)	84 (57.5%)	26 (17.8%)	2 (1.4%)
Junk foods	9 (6.2%)	69 (47.3%)	62 (42.5%)	6 (4.1%)
Soft drinks	4 (2.7%)	36 (24.7%)	73 (50%)	33 (22.6%)

Table 2: Prevalence of components of metabolic syndrome

Sl. No.	Criteria	Number of participants (%)		
		Males	Females	Total
1	Increased waist circumference	5 (33.3)	10 (66.6)	15 (10.3)
2	Increased fasting plasma glucose(≥100 mg/dl)	6 (66.7)	3 (33.3)	9 (6.2)
3	Increased triglyceride (≥150mg/dl)	9 (90)	1 (10)	10 (6.8)
4	Increased systolic BP (≥130mm Hg)	15 (88.2)	2 (11.8)	17 (11.6)
5	Increased diastolic BP (≥85mm Hg)	6 (66.7)	3 (33.3)	9 (6.20)
6	Decreased HDL- cholesterol	10 (37)	17 (63)	27 (18.5)

Table 3 : Prevalence of metabolic syndrome in the sample

Number of components present	Number of participants (%)		
	Males	Females	Total
None	34 (41)	49 (59)	83 (56.8)
1	24 (51.1)	23 (48.9)	47 (32.2)
2	9 (69.2)	4 (30.80	13 (8.9)
3	1 (50)	1 (50)	2 (1.4)
4	1 (100)	0	1 (0.7)

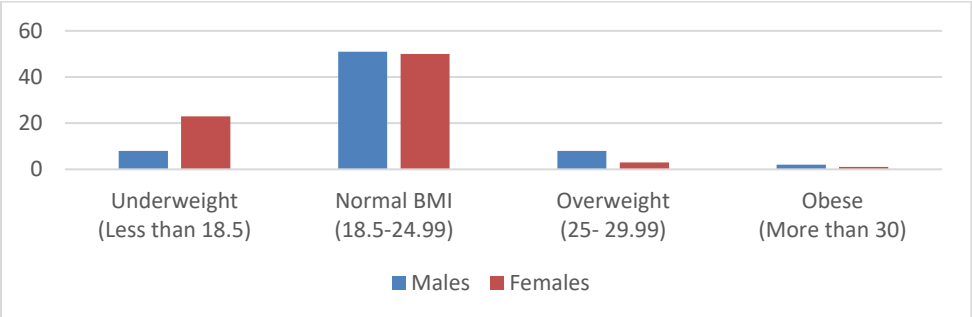

Fig 1:Gender distribution of BMI classes

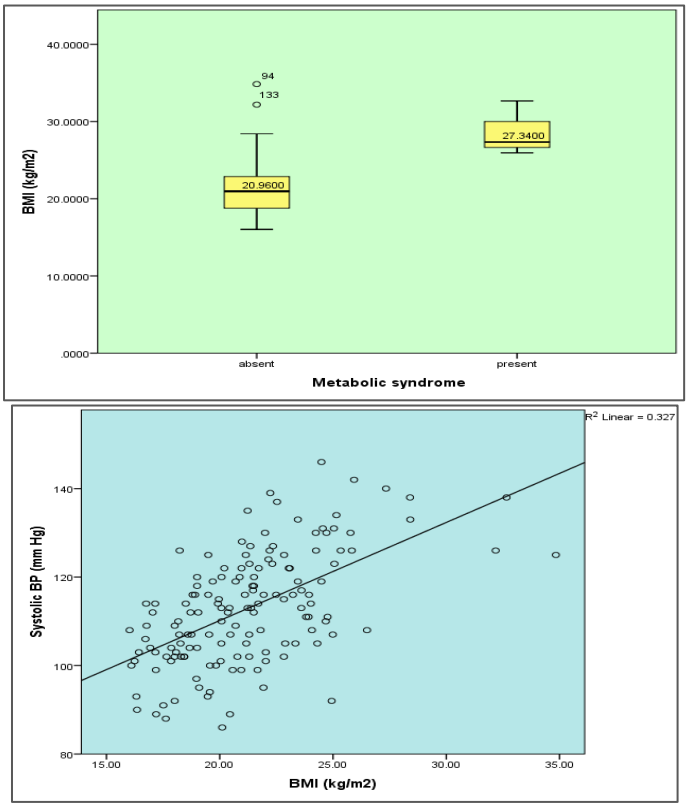

Fig 2: Correlation between Systolic blood pressure and BMI and BMI and metabolic syndrome

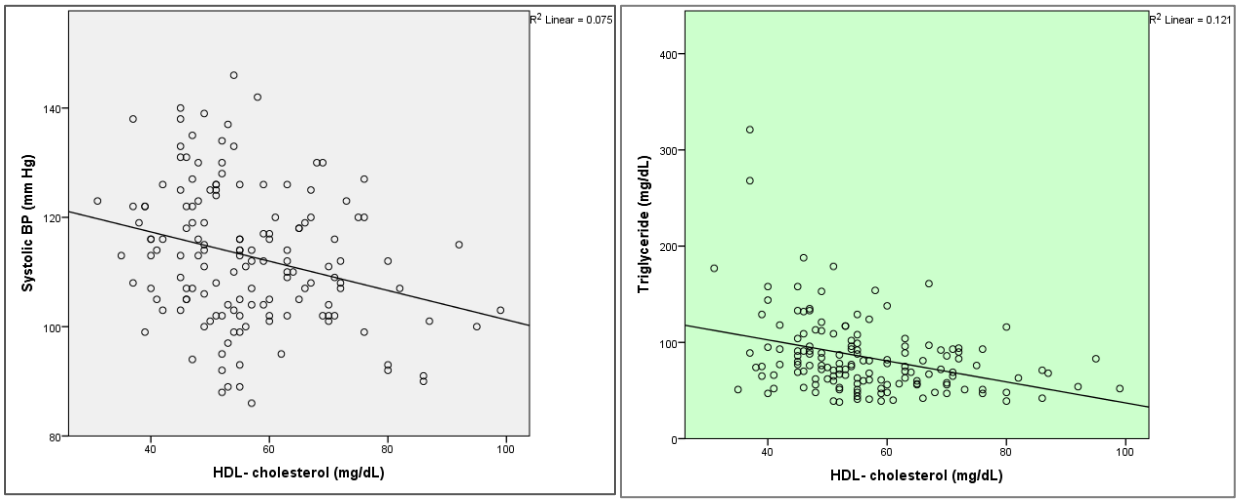

Fig 3:Correlation between systolic blood pressure, HDL- cholesteroland triglyceride

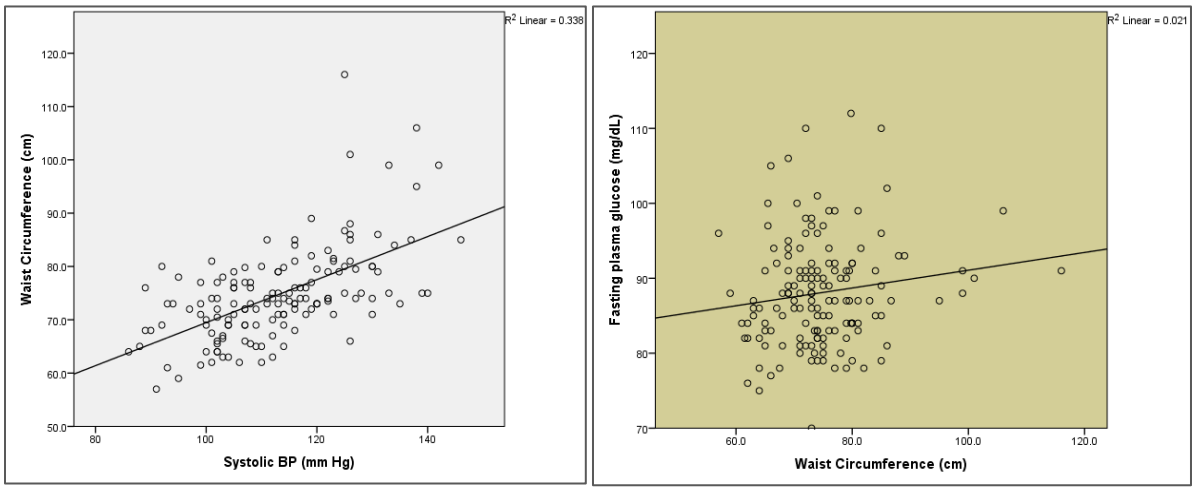

Fig 4: Correlation between waist circumference and systolic blood pressure and fasting plasma glucose

The lifestyle has an influence in all metabolic syndrome,The participants were mostly non-vegetarians (96.6%). Twenty- four (16.4%) and seventy (47.9%) participants reported daily intake of fruits and vegetables, respectively. Most of them (38.4%) usually took 2 cups of either tea or coffee daily, while others took one cup (30.1%), more than 2 cups (16.4%) or none (15.1%). There was significant evidence of students adhering to hotel foods 41.1% and 47.5% students had the habit of consuming junk foods at least on weekly basis. (Table 1) .A greater proportion of females had abnormal values of waist circumference and HDL- cholesterol, while a greater proportion of males had abnormal values of fasting plasma glucose, triglyceride, systolic and diastolic blood pressure. Higher proportion of females were found to have normal values of all the components. Fourteen (9.5%) participants had elevated total cholesterol, of which 11 (78.6%) were males and 3 (21.4%) were females. Compared to females, the mean values of fasting plasma glucose, waist circumference, triglyceride, systolic and diastolic blood pressure was found to be higher and that of HDL- cholesterol lower in males. Of these, the most significant were triglyceride (mean value in males 98.22± 50.3 and females 72.34± 23.2) and systolic blood pressure (mean value in males 120.51±9.8 and females 106.51±10.8). Decreased HDL- cholesterol (18.5%) was found to be the most common metabolic syndrome component in the sample studied (Table 4).

It was also the most common component in females. The second most common abnormality was elevated systolic blood pressure (11.6%), which was also the most common abnormality in males. The least common components in the sample were increased fasting plasma glucose and elevated diastolic blood pressure (6.2% each). The least common in males was increased waist circumference and in females increased triglyceride. None of the components of metabolic syndrome were present in 83 (56.8%) participants, of which 34 (41%) were males and 49 (59%) were females (table 5). Forty- seven (32.2%) had at least one component, equally in both genders. At leastwo components were present in 13 (8.9%) participants, of which majority were males 9 (69.2%). Of the 3 (2.1%) participants who had at least 3 components (that is, metabolic syndrome), 2 (66.6%) were males and only 1 (33.3%) was female. Thus, metabolic syndrome was found to have a prevalence of 2.1% (3 participants) in the study population. One of the participants even had 4 components. While all of them had elevated triglyceride and elevated systolic BP, only two of them had decreased HDL- cholesterol and increased waist circumference (Table 3).Normal BMI was present in 101 (69.2%) participants, while 31 (21.2%) were underweight, 11 (7.5%) overweight and 3 (2.1%) obese. More of females were under weight (29.2%), while more of males were overweight (11.6%) and obese (2.9%) (figure 1). Seven (63.6%) of all the overweight participants reported regular use of some vehicle to move about campus stressing to sedentary lifestyle. Overweight participants constituted 41.2% of those with high systolic BP('r' is close to +1, positive correlation, In those with normal systolic BP, 92 (71.3%) had normal BMI and 31 (24%) were underweight (χ^2 = 35.093, p<0.05, df= 3). While 5 (50%) of those with increased triglyceride had normal BMI, 3 (30%) were overweight and 1(10%) was obese.

The average BMI in those with metabolic syndrome (27.34 kg/ m^2) was found to be considerably higher compared to those without the same (Figure 2). The HDL- cholesterol values were relatively lower in those with high triglyceride and systolic blood pressure values(negative correlation)(Figure3).

Positive correlations were also found between waist circumference and systolic blood pressure (Figure 6), and fasting plasma glucose (Figure 4).

Discussion

According to a recent study by International Diabetes Federation (IDF), there are around 425 million people with diabetes in the world, of which three- fourth are working persons (327 million)[7].A survey done in Kerala had found that in adults more than 18 years , at least one in three had hypertension and one in five had diabetes[8].Yet another study by WHO shows that 65% of the world's population lives in countries where more people die of overweight and obesity, than underweight [9]. Several studies have found that a high proportion of medical students in India are vulnerable to metabolic syndrome and cardiovascular diseases due to the coexistence of several risk factors[10,11].Of the different several diagnostic criteria for metabolic syndrome, The earliest criteria was put forward by World Health Organization (WHO) in 1998, and multiple revisions have occurred[14]. The ATP- III (2005 Revision) panel which is simple to use and does not require any specific criteria to be met, is the most widely used guideline and has been used in this study.

The prevalence of metabolic syndrome in the studied population was 2.1%, which is quite in the lower range compared to findings of other studies. Ford et al had found a prevalence of 6.7% among adults aged 18- 30 years in the United States. This clearly shows the great variation in prevalence of metabolic syndrome with difference in the sample population and study setting. The prevalence in males was found to be twice higher than that in females, which was like the data reported by de Freitas et alin Brazil and Barbieri et al. The most common component of metabolic syndrome prevalent in the study population was decreased HDL-cholesterol, followed by high blood pressure. This was in line with the findings of a similar study among Columbian college students.The most common component in males was high BP and that in females was decreased HDL- cholesterol. Hence, screening for metabolic syndrome can be done in either gender by routinely monitoring the values of these two components.The least common components were increased fasting plasma glucose and high diastolic BP. A lower incidence of higher fasting plasma glucose might have resulted from prolonged hours of fasting by some participants prior to their blood test. However, in those with metabolic syndrome, the most common components were increased triglyceride and high systolic blood pressure. This shows that a higher significance should be placed on high systolic BP as a risk factor for metabolic syndrome. Nearly 10% of participants were either overweight or obese, of which most were males. Close to one- fifth were under underweight, constituting mostly females. About 83% took hotel foods everyday or weekly, which is very unhealthy since most of the foods served are either fast foods or deep fried. Those who ate very rarely from hotels were not found to be obese. Junk food was consumed regularly by almost half of the total sample. There were many factors pointing out the lineage to a significant genetic component, while it also shows the prevalence of these metabolic disorders in the general community [14]. The study population also had a more sedentary lifestyle, with more than half reporting lack of regular physical exercise, more than 90% using mobile phones and other electronic gadgets for more than 2 hours a day and 50% regularly using some forms of vehicle at campus.There was also a significant prevalence of smoking and alcohol consumption among the population, despite knowing the ill- effects of these addictions. Sleeping for 6 hours or lesser was reported among one-third of the participants, causes for which could be stress or increased mobile phone usage. A positive correlation was found between BMI and systolic blood pressure, and with waist circumference. As expected, a positive correlation was also found between waist circumference and systolic BP. Thus, simple monitoring of waist circumference by individuals can greatly help in preventing hypertension and metabolic syndrome. Regular calculation of one's BMI can also help to assess the risk for metabolic syndrome, since a great number of participants with abnormal values of biochemical profile had metabolic syndrome. A negative correlation was found between triglyceride and HDL- cholesterol values. All these findings show that the components of metabolic syndrome are greatly linked to one another in some way and all are cross linked.Although a causal relationship of these selected risk factors with metabolic syndrome cannot be proved through this cross- sectional study, it can greatly help in identifying important risk factors existent among medical students of South India.

Conclusion

BMI can be used as a simple tool in screening individuals for metabolic syndrome. Serum HDL-

cholesterol values can be used to stratify the community into high- risk and low- risk groups, which may be followed with proper spread of awareness and lifestyle modifications. Despite the presence of a strong genetic component,it's the modifiable risk factorsthat could help in reducing morbidity and mortality in the future due to diseases stemming out from metabolic syndrome. Hence, there arise the need for better surveillance of this population with routine physical examination and lab investigations, along with adoption of a healthier lifestyle, in terms of diet and exercise.

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