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Prevalence of Metabolic Syndrome, Association of Factors: An Epidemiological Study among College Students.

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ABSTRACT

The metabolic syndrome is a group of closely related abnormalities namely obesity, dyslipidaemia, hyperglycaemia, and hypertension which increase the risk for cardiovascular disease and type 2 diabetes. The prevalence rates varied with definition criteria and study groups which prompted us to undertake this study. The objectives were to find out the prevalence of metabolic syndrome, diabetes mellitus and correlation between variables. Seventy six college students not found to be obviously obese were selected on a single day. All went through the study and no one was excluded. In the clinical laboratory we measured waist and hip circumference, weight and height, Fasting Blood Sugar, Triglycerides, High Density Lipoprotein, Systolic Blood Pressure and Diastolic Blood Pressure. All students were having no calorie intake for eight hours. The body mass index (BMI) was calculated. The prevalence of metabolic syndrome was 5.2 %. If two instead of three variables were taken into account, the prevalence rate rose to 22.3 % . One out of the seventy six was found to be a frank diabetic. There is a definite correlation between variables of the metabolic syndrome which coincided with the findings of earlier studies. A routine work up for college students regarding metabolic syndrome and programmes to control it in a regular manner is suggested.
Key words: metabolic syndrome, college students, diabetes mellitus

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INTRODUCTION

The metabolic syndrome is a constellation of interrelated abnormalities (namely obesity, dyslipidaemia, hyperglycaemia, and hypertension) that increases the risk for cardiovascular disease and type 2 diabetes [1]. This is a common metabolic disorder which increases in prevalence as the majority of people become more and more obese. The disorder is defined in various ways. Diagnostic criteria for the metabolic syndrome have been established by the World Health Organisation (WHO) in 1998, by the National Cholesterol Education Program's Adult Treatment Panel III (NCEP: ATP III), in 2001, and more recently by the International Diabetes Federation (IDF), in 2005. The metabolic syndrome was introduced as a diagnostic category to identify the individuals that satisfy arbitrary chosen criteria to initiate lifestyle changes, and drug treatment when needed, with the goal of decreasing risk of cardiovascular disease and type 2 diabetes mellitus. In the developing countries, the prevalence of the metabolic syndrome varies from 13% in China to 30% in Iran. In another survey, 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%.This followed mild changes when the definition criteria varied. In college students 10 to 14 % have been reported. In this varied scenario, we wished to study the incidence of metabolic syndrome among college students in a rural south Indian area.

Aims and objectives

Aim of the research is to study and analyze the metabolic syndrome among the college students in Kumbakonam Town of South India.

- To analyze the prevalence of metabolic syndrome among college students.
- To evaluate the number of students with either one or two factors of metabolic syndrome among college students.
- To determine whether there is any correlation or association among selected syndrome variables.
- To summarize the facts and findings of the study in a conceptual framework towards the metabolic syndrome.

MATERIAL AND METHODS

Before we move on to the actual methods, the various definitions of metabolic syndrome is detailed.

WHO:

Impaired fasting glycaemia or impaired glucose tolerance or insulin resistance (hyperinsulinaemic, euglycaemic clamp-glucose uptake in lowest 25%) Plus any two of the following [2]:

- Obesity: BMI > 30 or waist-to-hip ratio > 0.9 (male) or > 0.85 (female)
- Dyslipidaemia: triglycerides ≥ 1.7 mmol/L or HDL cholesterol < 0.9 (male) or < 1.0 (female) mmol/L
- Hypertension: blood pressure > 140/90 mm Hg
- Microalbuminuria: albumin excretion > 20 μg/min

NATIONAL CHOLESTEROL EDUCATION PROGRAM'S ADULT TREATMENT PANEL III (NCEP: ATP III), 2001

Any 3 of the following [3]

- Central obesity: waist circumference > 102 cm (male), > 88 cm (female)
- Hypertriglyceridaemia: triglycerides ≥ 1.7 mmol/L
- Low HDL cholesterol: < 1.0 mmol/L (male), < 1.3 mmol/L (female)
- Hypertension: blood pressure ≥ 135/85 mm Hg or medication
- Fasting plasma glucose ≥ 6.1 mmol/L

INTERNATIONAL DIABETES FEDERATION, 2005

Central obesity (defined as waist circumference ≥ 94 cm for Europoid men and ≥ 80 cm for Europoid women) [4]

Plus any two of the following:

- Raised triglycerides > 1.7 mmol/L, or specific treatement for this lipid abnormality
- Reduced HDL cholesterol: < 1.03 mmol/L in males, and 1.29 mmol/L in females, or specific treatment for this lipid abnormality
- Raised blood pressure: systolic blood pressure ≥ 130mmHg or diastolic blood pressure ≥ 85 mmHg
- Raised fasting plasma glucose ≥ 5.6 mmol/L, or previously diagnosed diabetes mellitus

As many as 76 students on a single day from a single college were selected for the study. This was done with the confidence level of 90%, margin of error of 8 and a student population of 950. In the clinical laboratory we measured waist and hip circumference, weight and height, Fasting Blood Sugar, Triglycerides, High Density Lipoprotein, Systolic Blood Pressure and Diastolic Blood Pressure. All students were having no calorie intake for eight hours. The body mass index (BMI) was calculated. The data (information) was transformed into selected variables and entered into SPSS/PC version 15.0 for the application of statistical techniques to find out interrelationships and association. The Chi Square test and Correlation techniques were performed suitably to bring out the interrelationships between variables related to metabolic syndrome. The present study is focused on the student's clinical diagnosis towards the metabolic syndrome. The findings limit our study to the Pearson Correlation technique which was employed at the 0.01 and 0.05 (99% and 95%) level of 2-tailed significance.

RESULTS

In our sample study of clinical diagnosis 76 male students were selected. Of the individuals surveyed, age was between 17 and 23years and their height varied from 1.48 meter to 1.81 meter. Their weight was between 40 and 78k.g; waist circumference ranged from 61.00c.m to 96.00c.m, waist circumference varied from 76.00c.m to 104.00c.m, Body Mass Index from 16.22 to 29.72 and waist to hip ratio from 0.75 to 0.97. Among the students Fasting Blood Sugar was recorded 62.00 and 253.00mg% (It was changed to m.moles - eg mg/18 is for glucose), Triglycerides was 76.00 to 275.00, High Density Lipoprotein was found from 40.00 to 58.00 and Systolic Blood Pressure data to be from 92.00 to 150.00 mmHg. The Diastolic Blood Pressure data varied from 70.00 to 100 mmHg.

Out of seventy six students, three had metabolic syndrome. One student had frank diabetes mellitus. The prevalence is 5.2 %**.** (NCEP: ATP III), 2001 - CRITERIA) If the definition can be construed as two instead of three variables, seventeen students had the abnormality. This amounts to 22.3% The correlation matrix showed that there is a strong positive association with weight and height (0.520), waist and weight (0.758), hip and height (0.318), hip and weight (0.811) hip and waist (0.919), body mass index and age (0.249) body mass index and weight (0.856), body mass index and waist (0.795), body mass index and hip (0.756),waist to hip ratio and weight (0.448), waist to hip ratio and waist (0.817), waist to hip ratio and hip (0.524) and waist to hip ratio and body mass index (0.601) (see figures 1,2,3)

As age and weight increase, the incidence of metabolic syndrome and diabetes mellitus also increase. The occurrence of metabolic syndrome is positively associated with Body Mass Index, Waist to Hip Ratio, Triglycerides, Fasting Blood Sugar, Diastolic Blood Pressure and Systolic Blood Pressure. The incidence of metabolic syndrome and diabetes mellitus are negatively correlated with selected variables like High Density Lipoprotein.
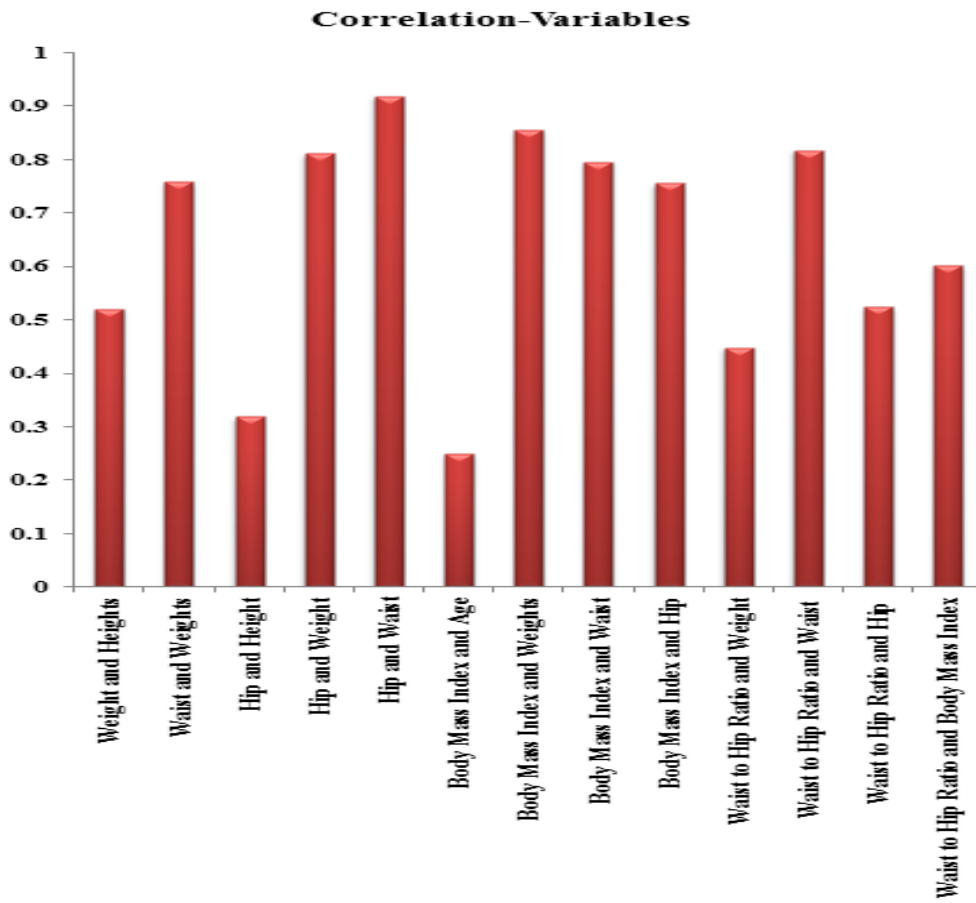
Figure 1 showing correlation variables

Correlation-Variables

Figure 2 showing correlation variables

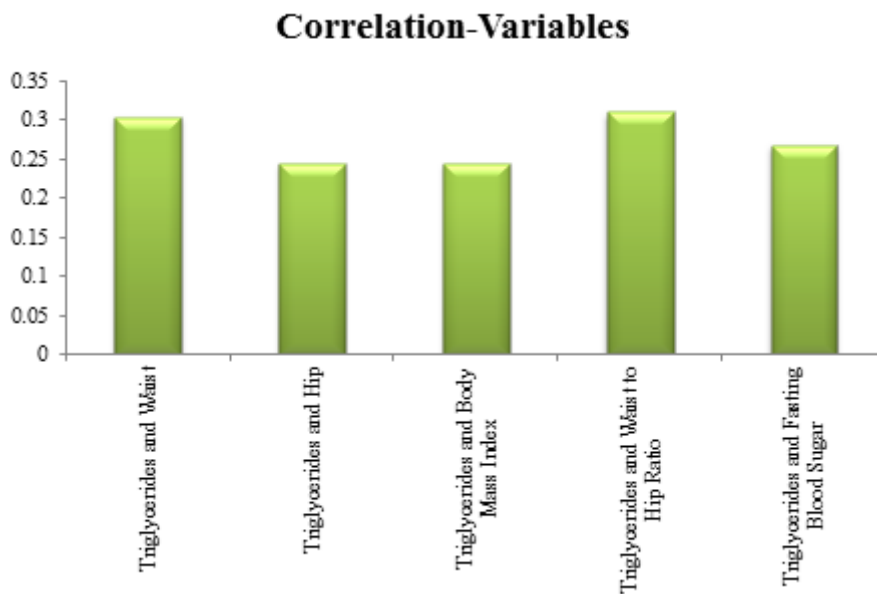## Correlation-Variables

Figure 3 showing correlation variables

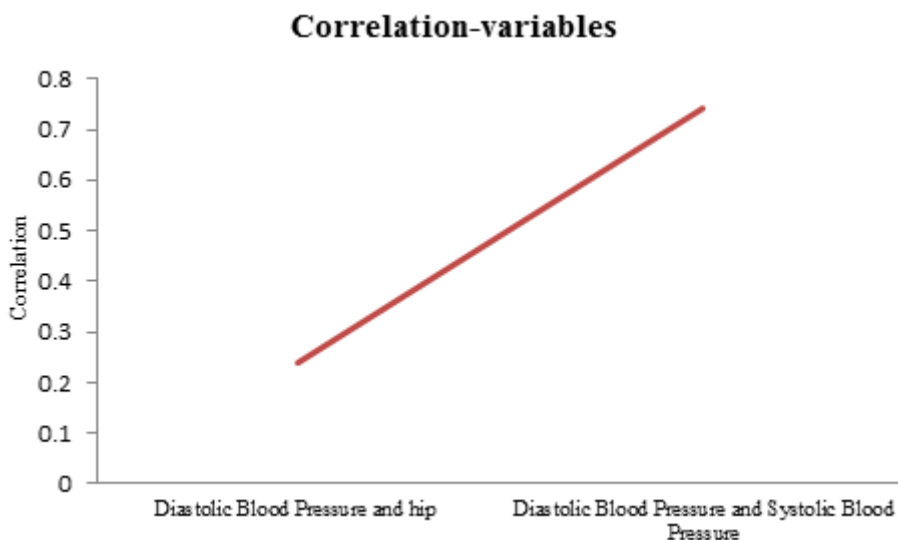## Correlation-variables

DISCUSSION

In a large cross-sectional survey on urban Asian Indians, the Chennai Urban Rural Epidemiology Study, the prevalence of the metabolic syndrome was found to be 23%, 18% and 26% using the WHO, ATP III and IDF definitions respectively [5]. In our study, it was only 5.2%. The major limitation of the study is the number of samples. As we did the study on a single day with college students, the sample size is low.

Recent studies by Anand et al [6], reported the prevalence of MS in 1,276 randomly adults of four ethnic groups in Canada, which showed that the Chinese had the lowest prevalence of metabolic syndrome (MS) (11%), followed by European Whites (22%) and south Asians (25.9%), with the highest in Native Indian Canadians (41.6%) . In our study the prevalence is much lower and this can also be attributed to a semi urban and not an urban population with exclusive college students only. The DECODE study [7] reported that the presence of MS increased all-cause and CAD mortality by 1.2–2.8 times. The correlation analysis clearly shows that increasing height and weight increased the incidence of metabolic syndrome. There is also a positive correlation between triglycerides and waist to hip ratio. There is a negative correlation to HDL levels. This clearly demonstrates that prevalence of all the risk factors for an atherosclerotic disease and their correlation with metabolic syndrome are similar to earlier studies. Yet in our study the true incidence of metabolic syndrome may be less as this a study among college students. There are definite relationships between the measured variables. Waist to hip ration was affected in maximum number of college students in our study.

Among students, Avinash M Topè et al [8] in their study showed the prevalence rates for MetS (metabolic syndrome) criteria varied depending on the definition used. According to the NCEP ATP definition, 31.4% of the sample population had at least 1 criterion for MetS, while 20.7% had 2 criteria. When IDF definition was applied, 21.3% sample population had 1 criterion and 17.5% had at least two criteria. Prevalence was highest for low levels of high-density lipoprotein cholesterol (37.3%) and elevated fasting glucose (22.1%). This conclusion coincided with our results.

Cha EunSeok et al [9] in their study of obese college students, 20 % students have identifiable risk factors. This was the study done with obese patients which is different from our findings. This study was done with a sample size of 74 students only which is less than ours.

Terri L. Keown et al [10]. in their study, found the prevalence to be 10%., this increased to 14.3% when two variables were considered. The three variable criteria was less but two variable criteria were more in our study.

CONCLUSION

To conclude, in a random study of college students in a semi urban town of south India, the prevalence of metabolic syndrome is 5.2 %. If two instead of three variables were taken into account, the prevalence rate rose to 22.3 % .There is a definite correlation between variables of the metabolic syndrome which coincided with the findings of earlier studies. A bigger sample size study is suggested to confirm the above findings. A routine work up awareness camps for college students regarding metabolic syndrome and programmes to control it in a regular manner is suggested.

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