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A STUDY OF METABOLIC SYNDROME IN OBESE PATIENTS IN A TEACHING HOSPITAL IN KERALA

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ABSTRACT: Metabolic syndrome is a major health problem worldwide, increasing the risk of cardiovascular diseases and diabetes. It is characterized by central obesity, dyslipidemia, hyperglycemia and hypertension and is currently a major global public health challenge because it involves a serious risk of cardiovascular disease and type 2 diabetes. The present study was conducted to find out the prevalence of metabolic syndrome in obese people and to compare that with non-obese people. The study was conducted on patients at Travancore Medical College, Kollam during the period July to December 2012. The total participants comprised of seventy subjects (men and women) who were 30 to 65 years old at the time of examination. Self-answered questionnaires were used for collecting participants' information including medical history, use of antidiabetic, antihypertensive or lipid lowering medications, smoking status and alcohol consumption habits. All participants underwent routine physical examinations that included measurement of waist circumference and resting blood pressure. 41 subjects were obese and 29 were non obese. The study showed that the systolic blood pressure was significantly higher in obese people compared to non-obese. Diastolic blood pressure also showed higher values in obese people but statistically it was insignificant. It was seen that the mean FBS is higher in obese compared to non- obese, and there was a higher proportion of people with hyperglycemia among the obese. Results show that LDL Cholesterol was significantly higher in obese people compared to non- obese. Among the study group of 70 patients, 43 had metabolic syndrome. Prevalence of metabolic syndrome in obese people was 85 % whereas in non-obese it was only 28 %. This shows that there is a significantly increased prevalence of metabolic syndrome among obese people. From the above findings it has been concluded that there is an increased risk of Hypertension, Diabetes and dyslipidemia among obese compared to non-obese.

KEYWORDS: Metabolic Syndrome, Obesity, Risk Factors.

INTRODUCTION: People are predisposed to various diseases based on their way of living and occupational habits. They are preventable, and can be lowered with changes in diet, lifestyle, and environment. Lifestyle diseases characterize those diseases whose occurrence is primarily based on daily habits of people. The main factors contributing to lifestyle diseases include bad food habits including consumption of diets rich in highly saturated fats, sugars and salt, typified by fast foods, lack of regular physical activity, tobacco use.

Factors such as stress, exposure to environmental toxins, lack of exercise, poor nutrition excessive intake of alcohol etc. might play a confounding role and are the priority areas for further research.¹⁻³ This lifestyle results in higher levels of risk factors such as hypertension, diabetes, dyslipidemia, and obesity that act independently and synergistically.⁴ They can include atherosclerosis, hypertension, heart disease, type 2 diabetes, obesity, metabolic syndrome,

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depression, stroke, asthma, some kinds of cancer etc.⁵ According to the report, jointly prepared by the World Health Organization and the World Economic Forum,⁶ 60% of all deaths worldwide in 2005 (35 million) resulted from non- communicable diseases and accounted for 44% of premature deaths.

The report also points to the fact that countries like Brazil, China, Russia and India currently lose more than 20 million productive life-years annually to chronic diseases and the number is expected to grow by 65% by 2030. The income loss to Indians because of these diseases, which was \$8.7 billion in 2005, is projected to rise to \$54 billion in 2015. According to a survey conducted by the Associated Chamber of Commerce and Industry (ASSOCHAM),⁷ 68% of working women in the age bracket of 21-52 years were found to be afflicted with lifestyle ailments such as obesity, depression, chronic backache, diabetes and hypertension, heart diseases, asthma etc.

In many countries, peoples' diet changed substantially in the second half of the twentieth century with crease in consumption of meat, dairy products, vegetable oils, fruit juice, and alcoholic beverages, and decrease in consumption of starchy staple foods such as bread, potatoes, rice, and maize flour. Other aspects of lifestyle also changed, notably, large reductions in physical activity and prevalence of obesity. Physical inactivity as indicated by a sedentary lifestyle is associated with the occurrence of obesity and metabolic syndrome.

Regular physical activity would help curb the growing menace of obesity and co morbidities of metabolic syndrome.⁸ Metabolic syndrome is a major health problem worldwide, increasing the risk of cardiovascular diseases and diabetes. It is characterized by central obesity, dyslipidemia, hyperglycemia and hypertension and is currently a major global public health challenge because it involves a serious risk of cardiovascular disease and type 2 diabetes.^{9, 10} Asians have an unusual high tendency to develop type 2 diabetes mellitus and coronary heart disease.

Important determinants of both these non- communicable diseases are insulin resistance and clustering of other proatherogenic factors.^{11, 12} Obesity is considered to be the link between insulin resistance and metabolic abnormalities like diabetes, hypertension and dyslipidemia, all of which are risk factors for coronary artery disease.¹³ In the recent INTERHEART study, abdominal obesity assessed by waist-to-hip ratio showed a strong association with myocardial infarction.¹⁴ Obesity is also considered to be a major risk factor for hypertension.¹⁵

There is a significant correlation between obesity indices and systolic and diastolic blood pressure. The present study was conducted to find out the prevalence of metabolic syndrome in obese people and to compare that with non-obese.

AIM:

1. To find out the prevalence of metabolic syndrome in obese people in general population and to compare this with the prevalence in non-obese people.
2. To assess whether there is any increased risk of cardiovascular diseases among the obese, compared to non-obese.

MATERIALS AND METHODS: The study was conducted on patients who attended various outpatient departments at Travancore Medical College, Kollam during the period July to December 2012. Only those patients who satisfied the inclusion criteria and showed willingness to participate in study were included. The total participant's population comprised subjects (men and women) who were 30 to 65 years old at the time of examination. Self-answered questionnaires were used for collecting

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participants' information including age, occupation, medical history, use of antidiabetic, antihypertensive or lipid lowering medications, smoking status and alcohol consumption habits.

All participants underwent routine physical examinations that included measurement of waist circumference and resting blood pressure. Waist circumference was measured midway between the inferior margin of last rib and the iliac crest at the end of expiration with a heavy duty inelastic plastic fiber measuring tape to the nearest 0.5cm while the subject stood balanced on both feet. Systolic and diastolic blood pressure was measured using sphygmomanometer after the subjects had been in a rested seating position.

Central obesity was measured by waist circumference. The cut points were greater than or equal to 40 inches for men and greater than or equal to 35 inches for women. Fasting plasma glucose was measured by the hexokinase method, Total cholesterol by cholesterol oxidase method, HDL cholesterol by direct non-immunological homogenous enzymatic colorimetric method, LDL cholesterol by direct enzymatic colorimetric assay, Triglycerides by Lip/GK colorimetric assay. All these estimations were carried on Roche Cobas Integra 400 plus fully automated clinical chemistry analyzer. Results were recorded as per proforma, interpreted and analysed.

RESULT: The present study was conducted at Travancore Medical College, Kollam. Seventy patients in the age group of 30 to 65 years who attended medical OP were included in the study after informed consent. Those with thyroid or renal diseases, or those who were on steroid therapy were excluded since it may cause secondary dyslipidemia, hypertension or diabetes mellitus. Smokers, alcoholics and postmenopausal women were also excluded. The modifiable risk factors included in the study were increased blood sugar, Hypertension and Dyslipidemias (Increased total Cholesterol, increased LDL, decreased HDL and increased Triglycerides). The results obtained were summarized and statistically analysed were done.

HYPERTENSION IN OBESE AND NONOBESE PEOPLE:

Systolic BP	Obese	Non-obese	Total
<130mmHg	10	16	26
>130mmHg	31	13	44
Total	41	29	70

TABLE 1: SYSTOLIC BLOOD PRESSURE

Diastolic BP	Obese	Non-obese	Total
<85mmHg	14	15	29
>85mmHg	27	14	41
Total	41	29	70

TABLE 2: DIASTOLIC BLOOD PRESSURE

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Fasting blood sugar	Obese	Non-obese	Total
<100mg/dl	14	14	28
≥100mg/dl	27	15	42
Total	41	29	70

TABLE 3: BLOOD GLUCOSE IN THE STUDY GROUPS

Total Cholesterol (TC)	Obese	Non-obese	Total
<200mg/dl	13	19	32
>200mg/dl	28	10	38
Total	41	29	70

TABLE 4: TOTAL CHOLESTEROL IN THE STUDY GROUPS

LDL-CHOLESTEROL	Obese	Non-obese	Total
>130mg/dl	10	16	26
<130mg/dl	31	13	44
Total	41	29	70

TABLE 5: LDL-CHOLESTEROL IN THE STUDY GROUPS

HDL-CHOLESTEROL	Obese	Non-obese	Total
Low	20	15	35
Normal or high	21	14	35
Total	41	29	70

TABLE 6: HDL-CHOLESTEROL IN THE STUDY GROUPS

*HDL values were considered low if the values are <40mg/dl in men and <50mg/dl in women.

Triglyceride (TG)	Obese	Non-obese	Total
<150mg/dl	34	22	56
>150mg/dl	7	7	14
Total	41	29	70

TABLE 7: TRIGLYCERIDE (TG) IN THE STUDY GROUPS

Metabolic syndrome	Obese	Non-obese	Total
Present	35	8	43
Absent	6	21	27
Total	41	29	70

TABLE 8

From Table-8 it was seen that among the study group of 70 patients, 43(20 males and 23 females) had metabolic syndrome.

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DISCUSSION: In the present study, 70 subjects were included. They were grouped into obese and non-obese based on their Body Mass Index (BMI). BMI above 30 was taken as obese and BMI <25 was as normal weight subjects. BMI between 25 and 30 was taken as overweight. 41 subjects were obese and 29 were non-obese.

Blood pressure was measured using sphygmomanometer from right arm with the subject in supine position. A chi-square test was conducted to find out the relationship between hypertension in obese and non-obese people. For Systolic BP, χ^2 (1, N=70) = 6.894, P=0.009. For diastolic BP, χ^2 (1, N=70) = 2.163, P=0.141. The study showed that the systolic blood pressure was significantly higher in obese people compared to non-obese (Table-1). Diastolic blood pressure also showed higher values in obese people (Table-2), but statistically it was insignificant. (p value less than 0.05 was taken as significant).

These findings correlate well with the findings of Beverly et al.¹ Many studies have shown that Systolic Blood pressure (SBP) is more important than diastolic blood pressure (DBP) with respect to obesity associated health risk, and also possibly more responsive than DBP to changes in modifiable risk factors such as exercise, diet, and weight loss. There is a linear association between WC and systolic blood pressure (SBP), although these relations may vary by age, gender and race. The high systolic blood pressure in obese people may be attributed to the hemodynamic overload, increase in the activity of sympathetic nervous system, as a result of hyperinsulinemia and autonomic dysfunction.

Fasting blood glucose was estimated in all subjects. It was seen that the mean FBS is higher in obese compared to non-obese, and there was a higher proportion of people with hyperglycemia among the obese (Table-3). But this difference was found to be statistically insignificant. (A chi-square test showed χ^2 (1, N=70) = 1.413, P=0.235). Similar findings observed in Aviva et al.² and Michael Criqui.³ Type 2 DM showed a strong increase in prevalence with increasing overweight class among both younger and older subjects. Accompanying the increase in obesity there will be increase in insulin resistance which includes pre diabetes and diabetes.

Total Cholesterol was estimated in all subjects. A chi-square test was conducted to find out the relationship between total cholesterol in obese and non-obese people. χ^2 (1, N=70) = 7.824, P=0.005. The study showed that the total Cholesterol was significantly higher in obese people compared to non-obese (Table-4). These findings correlated well with the findings of Philip et al.⁴. In this study, Cholesterol levels in conjunction with hypertension increase with the rising trend in overweight and obesity while amplifying the burden of cardiovascular disease.

LDL Cholesterol was estimated in all subjects. A chi-square test (χ^2 (1, N=70) = 6.894, P=0.009) was conducted to find out the relationship between LDL-Cholesterol in obese and non-obese people. Results show that LDL Cholesterol was significantly higher in obese people compared to non-obese (Table-5). HDL Cholesterol was estimated in all subjects (Table-6).

A chi-square test χ^2 (2, N=70) = 1.695, P=0.429 was conducted to find out the relationship between HDL Cholesterol in obese and non-obese. The result shows that it is insignificant because p value is greater than 0.05. These findings correlate well with the studies of Grundy SM and Barnett JP.⁵ One of the most common consequences of obesity is dyslipidemia that is, elevations of LDL cholesterol and low concentrations of HDL cholesterol.

Triglyceride was estimated in all subjects and the results are summarized in table 7. A chi-square test showed χ^2 (1, N=70) = 0.530, P=0.467. These findings correlated well with the findings of

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Lemieux et al⁶. Hypertriglyceridemia was directly associated with elevated waist circumference and this hypertriglyceridemic waist was a high risk clinical phenotype associated with atherogenesis. Among the study group of 70 patients, 43(20 males and 23 females) had metabolic syndrome as summarized in table 8. The prevalence of metabolic syndrome was found to be significantly higher in obese people than non-obese and there is a direct association between obesity and metabolic syndrome.

Chi-square test χ^2 (1, N=70) =23.933, P=0.000 also showed that the result was significant because p value is less than 0.05. Similar findings were observed in the studies of Cornier et al (7) and Ginsberg.⁸ (The worldwide increase in the prevalence of obesity in the recent decades is a likely cause of the rising incidence of insulin resistance and the Metabolic Syndrome as well as CVD and Type 2 Diabetes mellitus. Although not all overweight or obese individuals are metabolically unhealthy, the majority are insulin resistant. The combination of obesity, physical inactivity, and consumption of an atherogenic diet is believed to lead to insulin resistance and thus to metabolic syndrome.

CONCLUSION: By analyzing the results of the study conducted among 70 patients in the age group of 30 to 65 years who attended medical OPD at Travancore Medical College, Kollam, it was found that

1. The modifiable risk factors like systolic blood pressure, serum total cholesterol and LDL cholesterol were significantly higher in obese than in non-obese people
2. The mean blood level of glucose and triglycerides were higher in obese than in non-obese people but the prevalence of hyperglycemia or hypertriglyceridemia did not show significant difference between the two groups
3. Prevalence of metabolic syndrome in obese people was 85 % whereas in non-obese it was only 28 %. This shows that there is a significantly increased prevalence of metabolic syndrome among obese people.

From the above findings it has been concluded that there is an increased risk of cardiovascular diseases among obese compared to non-obese people.

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