# Metabolic Syndrome among Adult Individuals -A Preliminary Cross Sectional Study in Kurnool District

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**Abstract:** The adaptation of adverse lifestyle in urban and semi urban population leads to increase in prevalence of abdominal obesity, which is the basic cause for metabolic syndrome (Met S) in adults. The critical risk factors of this syndrome include type 2 diabetes mellitus (DM), cardiovascular diseases (CVD) and cancer. According to World health report of 2002, CVD will be the largest cause of morbidity and mortality in India. The early identification of risk factors can help reduce comorbidities of this syndrome. Hence in the present study, we have under taken a preliminary cross sectional study to estimate prevalence of metabolic syndrome among adult individuals of Kurnool district, Andhra Pradesh, India. We have selected 125 male (65) and female (60) subjects aged between 20-50 years old in respect to exclusion criteria. The subjects were analyzed for metabolic syndrome using modified NECP ATP III criteria. Overall prevalence of metabolic syndrome was 29.6% where males between 31-40 years old (16.8%) were more affected than females41-50 years old (12.8%). Atherogenic lipid profile trait was highly prevalent among males and females. Most common risk factors include high triglyceride (44.8%) followed by low HDL-c (43.2%), increased waist circumference (40.8%), blood pressure (40.0%) and fasting blood glucose (29.6%). Nearly 28.8% (n=36) had at least one abnormal parameter of NECP ATP III criteria. The magnitude of metabolic syndrome was high among females than in males. Atherogenic risk factors were high among this population. Further large scale population based studies are required to carry out this district.

**Keywords:** Atherogenic risk factors, diabetes mellitus, Kurnool, obesity, metabolic syndrome.

## Introduction

Metabolic syndrome is a preventable and treatable cause for morbidity and mortality among adult individuals. The cluster (group of risk factors) of this syndrome include abdominal adiposity, dyslipidemia, insulin resistance (IR), altered glucose tolerance, type 2 diabetes mellitus (DM), hypertension (HTN), cardiovascular diseases (CVD), pro-inflammation and polycystic ovarian syndrome (PCOS) of females. These risk factors may oscillate with ethnic population, region and country. The factors will be influenced by adverse lifestyle, nutritional and socioeconomic status of an individual. Therefore research in metabolic syndrome provides a substratum to explore the pathophysiology and treatment modalities of associated cluster risk factors with the entity of metabolic syndrome.

The basic risk factor for the development of metabolic syndrome is abdominal obesity. The increased intra-abdominal adiposity in abdominal obesity will conduct the pathological transition of associated risk factors. The prevalence of abdominal obesity is increasing constantly in urban and rural population of developing countries like India. Correspondingly the associated comorbidities like

type-2 diabetes mellitus (DM), cardiovascular disease (CVD), renal and liver diseases are also increasing. This scenario deserves better appraisal on prevalence of metabolic syndrome.

In this study, we have undertaken a preliminary study, designed with an objective to assess the prevalence of metabolic syndrome among apparently healthy adults aged between 30-50 years old, using ATP-III criteria [Table.1]. Any 3 of the 5 risk factors defines metabolic syndrome in an individual.

**Table.1:** Modified NECP ATPIII criteria for metabolic syndrome screening [1].

| Risk Factor | Cut Off Value |
| --- | --- |
| Waist circumference (WC) | −males >90 cm<br>−females >80cm |
| Blood pressure (BP) | ≥ 130/≥ 85 mmHg |
| Triglycerides (TGL) | ≥ 150 mg/dL |
| HDL-cholesterol (HDL-C) | −males < 40 mg/dL<br>−females < 50 mg/dL |
| Triglycerides (TGL) | ≥ 150 mg/dL |
| Fasting glucose (FBS) | ≥ 100 mg/dL |

## Materials and Methods

The study was undertaken among subjects attending the Santhiram Medical College and

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General Hospital (SRMC & GH) Nandyal. Total 150 subjects aged between 20-50 years old were selected randomly, from the individuals come for routine biochemical evaluation and medical check-up and taken into the current study. Subjects who are severely ill and on drug therapy were not included in this study.

**Anthropometric and vital Evaluation:**
Waist circumference (WC):
- Is measured at the level of umbilicus.
- Systolic / diastolic blood pressure:
- Was defined as mean of the second and third reading of the consecutive blood pressure measurements.

**Biochemical evolution:**
Blood samples were obtained under 12 hours fasting condition and the following biochemical tests were performed on chem. V7 analyzer using standard laboratory methods.

- Fasting blood sugar (FBS).
- Triglycerides (TGL).
- High density lipoprotein (HDL-C).

**Statistical Analyses:**
The data was tabulated and analyzed biostatistically by using Microsoft offices excel with windows operating system. Simple proportions method was applied.

### Results

From the study, overall prevalence of metabolic syndrome as per modified NECP ATP-III criteria was 29.6% (n=37). It was significantly higher among males 16.8% (n=21) when compared to females 12.8% (n=16), where the prevalence is equal among males 5.6 %( n=7) and females 5.6 %( n=7) [in the age group of 41-50 years old] [Graph1].

**Graph.1**: Prevalence of metabolic syndrome by age and gender
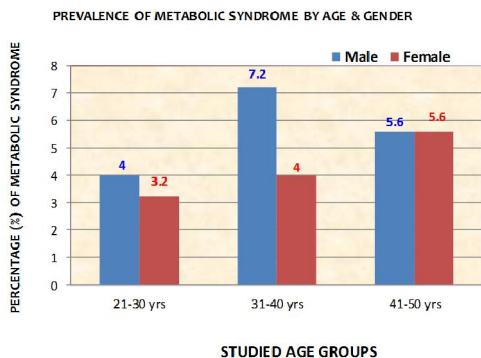


Hypertriglyceridemia was the commonest component, being seen in 44.8 % (n=56) of the total subject group followed by low levels of HDL-

cholesterol 43.2% (n=54) and hypertension 50% (n=40.0). Among the subjects, 29.6% (n=37) and 40.8 %( n=51) had impaired fasting plasma glucose and high waist circumference (WC) respectively. A significant relationship was obtained between Waist circumference (WC) vs. fasting blood glucose (r=0.4239; p=0.015), Triglycerides (r=0.9342; p=0.001) and High density lipoprotein (r=0.4020; p=0.0267). Increased triglyceride accompanied by elevated fasting blood glucose was found in 22% in total subjects, whereas with hypertension it was seen in 39% subjects. All the parameters of modified NECP ATP III criteria were elevated in 6 (4.8%) of the total cases, whereas more than 3 metabolic syndrome risk factors present in 19 (15.2%) of subjects. Table 2 shows Age and sex distribution of the study subjects and Table 3 shows the biochemical and anthropometric indices of subjects studied.

**Table.2:** Age and sex distribution of the study subjects

| Age Group In Years | Gender | | Total Number (%) |
|---|---|---|---|
| | Male Number (%) | Female Number (%) | |
| 21-30 | 20(16) | 17(13.6) | 37(29.60) |
| 31-40 | 27(21.6) | 28(22.4) | 55(44.00) |
| 41-50 | 18(14.4) | 15(12.0) | 33(26.40) |

**Table.3:** Clinical biochemistry, blood pressure and anthropometric parameters by sex

| Parameter | | Male N=66 | Female N=60 | Total N=125 |
|---|---|---|---|---|
| Waist circumference (WC) | | 91.41±10.34 | 89.34±11.56 | 90.30±12.59 |
| Blood pressure | Systolic | 126.25±7.18 | 122.90±4.53 | 124.59±6.24 |
| | Diastolic | 83.90±5.10 | 81.93±3.74 | 82.91±4.58 |
| Triglycerides (TGL) | | 163.64±13.10 | 120.74±29.63 | 142.19±85.41 |
| High density lipoprotein (HDL) | | 47.76±7.68 | 48.61±9.44 | 48.16±8.62 |
| Fasting blood sugar (FBS) | | 124.38±60.41 | 111.61±27.25 | 118±47.30 |

### Discussion

Obesity is an epidemic, strongly associated with rising prevalence of metabolic syndrome. In Framingham cohort study it was showed that the key risk factor for new onset of diabetic in both men and women is metabolic syndrome, predicted approximately 25% of all new onset of cardiovascular disease [2]. Applying the criteria of metabolic syndrome serves as a simple and inexpensive tool for identifying patients at high risk for diabetes mellitus and cardiovascular disease particularly those who do not fall into traditional risk categories.

In this study the prevalence of metabolic syndrome was found to be 29.6% and more common

in men than women (16.8% Vs.12.8%), which is in concordance with Chow *et al.,*[3] (26.9% vs. 18.4%). The differences may be attributed to the difference in study areas, and the different definitions of metabolic syndrome used. Similar studies at various places were shown in Table 4.

**Table.4:** Prevalence of metabolic syndrome at various places

| Author (Year) And Criteria | Place | % Of Metabolic Syndrome (Men Vs. Women) |
|---|---|---|
| Mishra *et al.,* [4] (2001) Won criteria | Urban Slum population of Delhi | 30 % |
| Ramchandran *et al.,* [5] (2003) modified ATP III | Urban area of Chennai | 41.1 % (36.4 % vs. 46.5 %) |
| Gupta *et al.,* [6] (2004) modified ATP III | Urban north Indian population | 24.9% (18.4 % Vs. 30.9 %) |
| Ozsahind *et al.,* [7] (2004) modified ATP III | Adana- southern province of Turkey | 33.4 % (39.1 % vs. 23.7 %) |
| Sarkar *et al.,* [8] (2006) NCEP ATP III | Sub-Himalayan tribal populations (Bhutia and Toto) | 30-50 % (Bhutia) 4-9 % (Toto) |
| Fakhrazadeh *et al.,* [9] (2006) ATP III criteria | Tehran women | 27.5 % (20.3 % vs. 35.9 %) |
| Chow *et al.,* [3] (2008) NCEP-ATPIII | Rural Andhra Pradesh | 26.9 % (men 18.4 %-women |
| Lavanya *et al.,* [10] (2012)Adult Treatment Panel III | Hyderabad urban slums | 23.6 % (17.1 % vs. 29.4 %) |
| Selva Raj *et al.,* [11] (2012) modified NECP ATP III | Rural women of Tamilnadu | 30.7 % women |
| Prasad *et al.,* [12] (2012) Unified definition syndrome | Urban estern India | 35.5 % (24.9 % vs. 42.3 %) |
| Present study (2013) Modified ATP III | Urban adults of Kurnool district | 29.6 % (16.8 % Vs.12.8 %) |

The current study identified the common risk factor in male was decreased HDL cholesterol levels followed by hypertension, increased triglycerides estimates. Where as in females it was increased triglycerides, decreased HDL cholesterol, increased waist circumference. In male and female, the atherogenic risk factors such as decreased HDL-c, increased triglycerides are found to be the primary abnormal risk factor respectively. Similar findings were obtained by Sawant *et al.,*[13] who found 65% male subjects had low HDL-cholesterol levels. It represents the classical Indian triad of low HDL, elevated triglyceride and elevated LDL cholesterol; the most common finding in most other Indian studies. A strong predictor for occurrence or reoccurrence of myocardial infarct (MI), stroke which are associated with premature coronary artery disorders (CAD). This may be due to imbalanced diet and modernized lifestyle, especially increased dietary consumption of carbohydrates, saturated fat, cholesterol, chronic smoking, alcoholism and low intake of dietary fiber and antioxidants.

Based on NECP ATP III criteria the most commonly observed components of metabolic syndrome among total subjects of this study was high triglyceride (44.8%) followed by low HDL-c (43.2%), increased waist circumference (40.8%), blood pressure (40.0%) and fasting blood glucose (29.6%) [Table. 4].

**Table.4**: Proportion of adults with metabolic syndrome parameters [In respect to Table.3: threshold levels].

| Parameter | Gender | | Total (125) Number (%) |
|---|---|---|---|
| | Male (65) Number (%) | Female (60) Number (%) | |
| Waist circumference males >90;females>80 cm | 24 (19.2) | 27 (21.6) | 51 (40.8) |
| FBS ≥100 | 23 (18.4) | 14 (11.2) | 37 (29.6) |
| HDL males <40; females<50 | 28 (22.4) | 26 (20.8) | 54 (43.2) |
| Triglycerides (TGL) | 26 (20.8) | 30 (24.0) | 56 (44.8) |
| Blood pressure (BP) | 27 (21.6) | 23 (18.4) | 50 (40.0) |

The present study found that out of the 125 studied subjects, nearly 28.8% (n=36) had at least one abnormal parameter of NECP ATP III criteria followed by 20% (n=25), 9.6% (12), 15.2% (n=19), 4.8% (n=6) of subjects had two, three, four and five abnormal parameters respectively and 21.6% of subjects were found to be normal. It indicates that the 20% of the total subjects with at least two abnormal parameters were on their way to develop metabolic syndrome, which is an important long term risk factor for the development of type-2 DM and CVD.

The Indian subcontinent is undergoing epidemiological transition as non-communicable diseases, which are become leading cause of morbidity and mortality. The key risk factor for metabolic syndrome is abdominal adiposity, which drives the progression of multiple cardio metabolic risk factors independently of body mass index. Increased physical activity, modest weight loss about 6 kg, consumption of unsaturated fatty acids, reduced intake of simple sugars can help to prevent some adverse effects of biologically active substance and inflammatory markers by thereby metabolic syndrome and its comorbidities like type-2 DM and CVD. However patients with higher risk are necessary to turn drug therapies to control risk factors.

## Conclusion

In conclusion, the metabolic syndrome was highly prevalent among males than females. The age group 41-50 years old was more susceptible, suggesting that individuals with > 40 years of age were at increased risk of developing CVD and type-

2 DM. It was also found that increased triglycerides and low HDL cholesterol levels are the major driving forces in the development of metabolic syndrome in the studied population.

There is an urgent need to explore diet and physical activity and their role in prevalence of metabolic syndrome among the urban population Kurnool district.

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