THE PREVALENCE OF METABOLIC SYNDROME IN NEWLY DIAGNOSED TYPE II DIABETES MELLITUS
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ABSTRACT: Metabolic syndrome is a combination of factors that multiply person’s risk for diabetes, heart disease, and stroke. In the present study which included 100 newly diagnosed patients of diabetes mellitus of less than 6 months in duration selected from out-patient department, GGH, KAKINADA, EGdt, INDIA, out of which 46 were males and 54 females. Based on the following methods we studied and compared with other studies with significant results. a. Current NCEP ATP III criteria: b. International Diabetes Federation Criteria. c. WHO Criteria 1999. Among 100 newly detected type 2 DM patients, the mean age of presentation with new onset diabetes in males is 42.02 Yrs ±8.14 and in females it is 44.96 Yrs ±8.57. Prevalence of MetS was found in 69.56% of males and 88.88% of females. Prevalence of MetS was 66.67%, 71.85%, 82.92%, 85% in the age groups of 20-29, 30-39, 40-49, 50-59 yrs of age group respectively, and all 4 cases above 60 yrs had MetS.

KEYWORDS: Mets; Metabolic syndrome, BMI, HC; Hip circumference, NCEP ATPIII, WHO criteria, IDFC, NHANESIII.

INTRODUCTION: The metabolic syndrome¹ (MetS) is a constellation of metabolic abnormalities that confer increased risk of cardiovascular disease (CVD) and diabetes mellitus (DM).

As per Third National Health and Nutrition Examination Survey (NHANES III) data, those meeting the criteria for metabolic syndrome had an intermediate level of risk, and those with diabetes and metabolic syndrome had the highest level of risk. The metabolic syndrome prevalence is even higher in diabetes mellitus patients and insulin resistance is believed to be the underlying cause for both type 2 diabetes mellitus and the metabolic syndrome.¹ Wasir JS, Misra A, Vikram NK, Pandey RM, Gupta R.; Comparison of definitions of the metabolic syndrome in adult Asian Indians. J Assoc Physicians India2008; 56: 158-64.56: 158-64.²

The main objective of this study is to explore the prevalence of metabolic syndrome in newly diagnosed type 2 DM using the National Cholesterol Education Program (NCEP) Adult Treatment Panel (ATP) III guidelines, International Diabetes Federation Criteria (IDF) and Modified WHO criteria (1999) for metabolic syndrome and compare the study among these criteria and with other studies. Joshi S R. Metabolic Syndrome- Emerging clusters of the Indian phenotype. J Assoc. Physicians India 2003; 51: 445-446.³

PEOPLE AND METHODS:
Source of Data: Patients aged >20 years with type 2 diabetes mellitus attending the out-patient department of Government General Hospital, Kakinada, East Godavari District, Andhra Pradesh.
Methods of Collection of Data: Informed and written consent was obtained from all the participants after explaining the procedure. The study protocol was approved by the Institute’s Ethics Committee. Initial evaluation included a detailed history and clinical examination to exclude any systemic disease.

INCLUSION CRITERIA: Type 2 diabetes mellitus detected < 6 months both sexes age 20 years and above.

EXCLUSION CRITERIA: The following patients were excluded from the study,
- Gestational diabetes mellitus.
- Type 1 diabetes mellitus.
- Type 2 diabetes mellitus >6 months.
- Age below 20 years.

MODE OF COLLECTION:
- Simple random method.
- Sample size 100 patients.
- Duration of study October 2012 to September 2014 (2 years).

LIST OF INVESTIGATIONS:
- Lipid Profile.
- FBS (Fasting Blood Sugar) and 2 Hr post prandial plasma glucose.
- HbA1C.
- Renal Function Tests.
- USG abdomen.

ANTHROPOMETRIC ASSESSMENT:
- Standing body height (to the nearest 0.5 cm) was measured with a commercial stadiometer.
- The waist circumference (WC):
- Hip circumference (HC)
- Body mass index (BMI) (kg/m2): BMI is calculated by dividing weight (in kilograms) by the square of height (in meters), as a measure of total adiposity.
- Systolic and diastolic blood pressure (SBP & DBP).

Blood samples (3 ml) were drawn after 8-12 h overnight fasting for the measurement of lipid profile and fasting plasma glucose levels.

Patients were evaluated basing on the following criteria:
- a. Current NCEP ATP III criteria:
- b. International Diabetes Federation Criteria.
- c. WHO Criteria 1999.
PLUS any two of the following four components;

- Triglycerides >150 mg/dL (1.7 mmol/L) or treatment for elevated triglycerides
- HDL cholesterol <40 mg/dL (1.03 mmol/L) in men or <50 mg/dL (1.29 mmol/L) in women, or treatment for low HDL
- Systolic blood pressure >130, diastolic blood pressure >85, or treatment for hypertension
- Fasting plasma glucose >100 mg/dL (5.6 mmol/L)

Observations and Results newly detected diabetes mellitus;

| Sex    | No. of Cases |
|--------|--------------|
| Male   | 46           |
| Female | 54           |

| Age     | Male | Female | Total |
|---------|------|--------|-------|
| 20-29   | 2    | 1      | 3     |
| 30-39   | 18   | 14     | 32    |
| 40-49   | 18   | 23     | 41    |
| 50-59   | 7    | 13     | 20    |
| ≥ 60 yrs| 1    | 3      | 4     |

In the Study, 41 patients were in the age group of 40-49 yrs, 32 patients in 30-39 yrs, 20 patients in 50-59 yrs and 4 patients with age more than 60 years and 3 patients are in the age group of 20–29. The Mean age in Males is 42.02 Yrs ± 8.14 S.D and the mean age of Females is 44.96 Yrs ± 8.57 S.D.

Prevalence of MS in 100 cases in different criteria:

| Criteria          | Total | Male | Female |
|-------------------|-------|------|--------|
| Modified NCEP ATP III | 69   | 25   | 44     |
| IDF               | 60    | 23   | 37     |
| WHO 1999          | 71    | 29   | 42     |

NCEP ATP III Criteria: Expert Panel on Detection, Evaluation, the Third Report of the National Cholesterol Education Program (NCEP); JAMA. 2001; 285(19): 2486.4

The number of patients with metabolic syndrome as per NCEP ATP III in the study is 69 out of 100 cases with a predicting rate of 87.34%
Results of Statistical analysis of Parameters in NCEP ATP III Criteria are as follows.

| Parameter                        | With metabolic Syndrome | Without Metabolic Syndrome | 95% Confidence Interval | Two - tailed P value | Statistical Significance |
|----------------------------------|-------------------------|---------------------------|-------------------------|---------------------|--------------------------|
| Mean Waist Circumference         | 92.35 ± 7.60 (S.D)      | 87.89 ± 5.37 (S.D)       | 2.17 to 8.12            | 0.0013              | very statistically significant |
| Mean FPG                         | 120.51 ± 16.62 (S.D)    | 119.23 ± 10.38 (S.D)     | -4.86 to 7.42           | 0.6802              | not statistically significant |
| Mean SBP                         | 134.82 ± 15.39 (S.D)    | 119.89 ± 9.58 (S.D)      | 8.55 to 19.85           | 0.0001              | extremely statistically significant |
| Mean DBP                         | 85.14 ± 12.42 (S.D)     | 77.20 ± 9.59 (S.D)       | 2.10 to 11.73           | 0.0062              | very statistically significant |
| Mean HDL                         | 41.52 ± 6.97 (S.D)      | 47.06 ± 5.22 (S.D)       | -8.21 to -2.86          | 0.0001              | extremely statistically significant |
| Mean TGs                         | 163.48 ± 15.18 (S.D)    | 146.57 ± 9.72 (S.D)      | 10.90 to 23.79          | 0.0001              | extremely statistically significant |
| Mean Waist Hip Ratio             | 0.8892 ± 0.0487 (S.D)   | 0.8691 ± 0.0346 (S.D)    | 0.0041 to 0.0451        | 0.0203              | statistically significant |
| Mean BMI                         | 28.140 ± 2.585 (S.D)    | 24.706 ± 2.662 (S.D)     | 2.234 to 4.594          | 0.0001              | extremely statistically significant |

IDF criteria.

| Parameter                        | With metabolic Syndrome | Without Metabolic Syndrome | 95% Confidence Interval | Two - tailed P value | Statistical Significance |
|----------------------------------|-------------------------|---------------------------|-------------------------|---------------------|--------------------------|
| Mean Waist Circumference         | 93.67 ± 6.94 (S.D)      | 87.58 ± 6.46 (S.D)       | 3.39 to 8.79            | 0.0001              | extremely statistically significant |
| Mean FPG                         | 120.23 ± 16.35 (S.D)    | 119.72 ± 11.73 (S.D)     | -5.33 to 6.34           | 0.8634              | not statistically significant |
| Mean SBP                         | 133.86 ± 15.77 (S.D)    | 123.86 ± 13.55 (S.D)     | 1.00 to 16.21           | 0.0276              | statistically significant |
| Mean DBP                         | 84.11 ± 1.63 (S.D)      | 79.49 ± 1.72 (S.D)       | -0.14 to 9.38           | 0.0571              | not quite statistically significant |
The number of patients with metabolic syndrome as per IDF Criteria in the study is 60 out of 100 cases with a predicting rate of 75.94%.

**Prevalence of Metabolic Syndrome Gender wise:**

| Sex      | Total Number of Cases | Total No. of cases with Metabolic Syndrome | Prevalence |
|----------|-----------------------|-------------------------------------------|------------|
| Male     | 46                    | 32                                        | 69.56%     |
| Female   | 54                    | 48                                        | 88.88%     |

**Comparison with Previous studies:**

| Criteria        | Ethiraj et al. | Carole et al. | Present study |
|-----------------|----------------|---------------|---------------|
| Modified WHO    | 64.36%         | 38%           | 71%           |
| NCEP ATP III    |                |               |               |
| IDF             | 61.60%         | 54%           | 60%           |

a. NCEP ATP III showed a prevalence of metabolic syndrome 69 patients out of 80 patients with metabolic syndrome,

b. IDF criteria is 60 patients out of 80 cases.

c. Modified WHO criteria, 71 out of 80 cases in the study with a sensitivity rate of 87.5 percent.

Mean BMI of cases with and without metabolic syndrome:

| Criteria       | $\text{BMI}_{\text{DM with MetS}}$ | $\text{BMI}_{\text{DM without MetS}}$ | P Value* |
|----------------|-----------------------------------|--------------------------------------|----------|
| NCEP ATP III   | $28.140 \pm 2.585$ (S.D)          | $24.706 \pm 2.662$ (S.D)             | 0.0001   |
Overview of Parameters and their sensitivity in the study: IDF Criteria.

**DISCUSSION:** Metabolic syndrome multiplies risk for diabetes, heart disease, and stroke. Dan L. Longo, Anthony S. Fauci, Harrison’s Principles of Internal Medicine, 18th Edition, Metabolic Syndrome, Vol –II, Chapter.(5)

In the present study which included 100 newly diagnosed patients of diabetes mellitus of less than 6 months in duration, 46 were males and 54 females.

In the study group, majority (41 cases out of 100) were in the age group of 40 to 49 yrs, followed by the 32 cases in the age group of 30-39 yrs. In the age group of 50 to 59 yrs there were 20 cases with only 4 cases above 60 yrs of age and just 3 cases below 30 yrs of age. This difference in the age group could be attributed to the inclusion criteria of this study where only newly diagnosed cases of less than 6 months were included, for longer duration than 6 months. In this present study, newly detected type 2 DM patients included were 20 years and above. The age at diagnosis of type 2 diabetes mellitus has been decreasing with time. R. Bethene Ervin, Prevalence of Metabolic Syndrome Among Adults 20 Years of Age and Over, National Health Statistics Reports Number 13, May5, 2009.(6) This finding likely represents a combination of changing diagnostic criteria, improved physician recognition of diabetes, and increased public awareness.

**SUMMARY AND CONCLUSION:**

- Among 100 newly detected type 2 DM patients, the mean age of presentation with new onset diabetes in males is 42.02 Yrs ± 8.14 and in females it is 44.96 Yrs ±8.57.
- Prevalence of Mets was found in 69.56% of males and 88.88% of females.
- Prevalence of MetS was 66.67%, 71.85%, 82.92%, 85% in the age groups of 20 - 29, 30 - 39, 40 - 49, 50 - 59 yrs of age group respectively, and all 4 cases above 60 yrs had MetS. R. Bethene Ervin, Prevalence of Metabolic Syndrome Among Adults 20 Years of Age and Over, National Health Statistics Reports Number 13, May5, 2009.(6)
- Modified WHO 1999 criteria predicted the maximum prevalence of MetS with 71 cases followed by the NCEP ATP III criteria and IDF criteria with 69 cases and 60 cases respectively.
- In NCEP ATP III and IDF criteria, serum triglycerides level in both male and female cases was noted to be the strongest single predictor effectively indicating presence of MetS, followed by arterial hypertension.
- In Modified WHO criteria, waist hip ratio was the single best predictor of MetS in cases with type II DM.
- There is a decreasing trend in the age at presentation with new onset type II DM in both male and female population. V. Mohan, S. Sandeep, R. Deepa, Epidemiology of type 2 diabetes: Indian scenario, Indian J Med Res 125, March 2007, pp 217-230(7)
There is considerable prevalence of metabolic syndrome in people with newly diagnosed type II diabetes mellitus and measures should be taken to screen and identify at risk population to prevent overt cardiovascular diseases and stroke.

There is female preponderance compared to males with respect to the prevalence of Met S.

Central abdominal obesity indicated by waist to hip ratio has got high predictability in identifying metabolic syndrome as well as raised levels of triglycerides and arterial hypertension.

Lifestyle modification: Prevention or reduction of obesity, particularly abdominal obesity, should be the main therapeutic goal in patients with metabolic syndrome as well as proper control of hypertension and dyslipidemia with or without pharmacological intervention. Grundy SM, Cleeman JI, Daniels SR; Diagnosis and management of the metabolic syndrome: an American Heart Association/National Heart, Lung, and Blood Institute Scientific Statement, Circulation. 2005; 112(17): 2735. (8)

REFERENCES:
1. Deepa R, Shanthirani CS, Premalatha G, Sastry NG, Mohan V. Prevalence of insulin resistance syndrome in a selected South Indian population and the Chennai urban population study 7 (CUSP-7). Indian J Med Res 2002; 115: 118-27.
2. Wasir JS, Misra A, Vikram NK, Pandey RM, Gupta R.; Comparison of definitions of the metabolic syndrome in adult Asian Indians. J Assoc. Physicians India2008; 56:158-64.56: 158-64.
3. Joshi S R. Metabolic Syndrome- Emerging clusters of the Indian phenotype. J Assoc. Physicians India 2003; 51: 445-446.
4. Expert Panel on Detection, Evaluation, and Treatment of High Blood Cholesterol in Adults, Executive Summary of the Third Report of the National Cholesterol Education Program (NCEP); JAMA. 2001; 285(19): 2486.
5. Dan L. Longo, Anthony S. Fauci, Harrison`s Principles of Internal Medicine, 18th Edition, Metabolic Syndrome, Vol –II, Chapter.
6. R. Bethene Ervin, Prevalence of Metabolic Syndrome among Adults 20 Years of Age and Over, National Health Statistics Reports Number 13, May 5, 2009.
7. V. Mohan, S. Sandeep, R. Deepa, Epidemiology of type 2 diabetes: Indian scenario, Indian J Med Res 125, March 2007, pp 217-230.
8. Grundy SM, Cleeman JI, Daniels SR; Diagnosis and management of the metabolic syndrome: an American Heart Association/National Heart, Lung, and Blood Institute Scientific Statement, Circulation. 2005; 112(17): 2735.
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