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Association of Metabolic Syndrome with Coronary artery disease in Telangana Rural Population – Retrospective Study

Chakrapani Vuppala [1], **Thota Abhinav** (Corresponding Author) [2], **Hita Vuppala** [3]

1) Assistant Professor Department of General Medicine TRR institute of Medical Sciences Panjagutta, Hyderabad-502319, Telangana

2) Assistant Professor Department of General Medicine TRR institute of Medical Sciences Inole (V), Patancheru (M) Hyderabad - 502319, Telangana

3) PG Student Department of Radio-agnostics, Malla Reddy Medical College Hyderabad-500015, Telangana

Abstract

Background: Metabolic syndrome (Mets) is characterized by insulin resistance and a clustering of cardio-vascular risk factors that include HTN, obesity elevated TG, and low levels of HDL cholesterol.

Method: 40 metabolic syndrome patients having positive angiography of CAD was compared with 40 Non-Mets volunteers (controlled). Blood investigation i.e; lipid profile, Insulin levels, IL-6, TNF-α, Hs-CRP, HOME-IR, Quicki and a angiological findings showing single vessel disease, double vessel disease and triple vessels diseases were analyzed. BMI, HTN, DM were also noted.

Results: All Bio-Chemical parameters were significant in Mets patients 19 (± 3.1) single vessel, 23 (± 12.6) double vessel disease, 28 (± 4.1) triple vessel disease observed in Mets patient with significant 2.75 (± 2.2) BMI, 6 (15%) DM, 32 (80%) HTN was also observed in Mets patients.

Conclusion: These overt variations in Mets patients will be quite helpful to the cardiologists and physicians to predict the risk factors of coronary artery diseases and treat such patients efficiently to prevent morbidity and mortality.

Keywords: CAD, CHODPAP, HOMA-IR, Mets, QUICKI (Quantitative Insulin check Index), Telangana

Introduction

Metabolic syndrome (Mets) is characterized by insulin resistance and a clustering of cardio-vascular risk factors that includes Hypertension (HTN), obesity, hyper triglyceridemia, the presence of small, dense low-density lipoprotein, HDL cholesterol and hyper-coagulability (1). Metabolic syndrome has also contributed greatly to the world wide epidemic of type-II DM. The final product of this syndrome is atherogenic dyslipidemia, elevated blood pressure, elevated plasma glucose, prothrombotic state and pro-inflammatory state (2)(3). Atherogenic dyslipidemia comprises elevation of TG, LDL, and low levels of HDL. Elevated plasma glucose falls in the range of either pre-diabetic or diabetes. A prothrombotic stage signifies anomalies in pro-coagulant factors (ie increase in fibrinogen and factor VII) anti-fibrinogenic factors (i.e. increase in plasminogen and endothelial dysfunction. A pro-inflammatory state is characterized by elevation of circulating cytokines and acute phase reactants (Eg. C-reactive protein) (4)(5).

The major risk factors are obesity and insulin resistance. Insulin resistance can be secondary to obesity hence attempt is made to evaluate the anthropological and Biochemical studies in metabolic syndrome and non-metabolic syndrome populations.

Observation and Results

Table-1: Comparison Biochemical study in both MS (Metabolic syndrome) and Non Ms group – TG 1799 (± 40.5) in MS group, 167.5 (± 1.70) in Non-MS group t test was 1.93 and p<0.001 HDL – 35.08 (± 6.64) in MS group, 40.03 (± 0.49) in Non MS group t test value was 4.95 and p<0.001. VLDL – 36.9 (± 8.2) in MS group, 32.7 (± 0.32) in Non-MS Group t test 3.2 p<0.001, LDL – 105.03 (± 9.2) in MS group, 99.5 (± 1.30) in Non-MS group
t test 3.76 p<0.001

Table-2: 6 (15%) DM in MS group, 3 (7.5%) in Non MS group, HTN

Table-3: Comparison of Anthropometric bio-chemical and inflammatory markers – Insulin 52.4 (± 3.8) in MS group 17.9 (± 2.2) in Non-MS Group t test 47.2 p<0.001.

IL-6 – 35.6 (± 0.8) in MS group 12.10 (± 0.5) in Non-MS Group t test 40

p<0.001

TNF-α - 12.1 (± 0.8) in MS 7.30 (± 0.1) in Non-MS Group t test 37.6

p<0.001

HsCRP – 14.4 (± 0.9) in MS group, 3.2 (± 0.2) in Non-MS Group t test 38.7

And p<0.001

HOMA-IR – 17.8 (± 0.60) in MS group, 5.5 (± 0.40) in Non MS group t test

Was 53.3 and p<0.001

Material and Methods

40 (forty) adult patients aged between 26 to 60 years regularly visiting to medicine department of TRR Medical College Hospital, Hyderabad were studied.

Inclusive Criteria: Patients having anginal chest pain with positive angiography were selected for study.

Exclusion Criteria: Patients of chronic kidney diseases, hepatic dysfunction, endocrinal disorders, rheumatological diseases and immuno-compromised patients having anginal pain were excluded from this study.

Method: Same number of (40) healthy volunteers (controlled) working in hospital including both teaching and non teaching staff were also studied for comparison. Blood investigations were done for all of them. Fasting Blood samples were collected after 12 hour of fasting. Triglycerides (TG)and High density lipoprotein (HDL) were measured by Cholesterol oxidize phenol 4 - aminoantipyrine (CHOD PAP)and Lipase Glycerol Kinase (LIP / GK) enzymatic clearance method respectively whereas LDL and VLDL were calculated by Friedewald formula. Tumor necrosis factor-α (TNF-α), Interlukin-6 (IL-6) and high sensitivity c-reactive protein (hsCRP) were measured by enzyme linked immunosorbent assay method with kits manufactures by Gen-probe Diaclone, France and Bio-check CA, USA.

Insulin estimation was done by micro particle enzyme immune

Assay with commercial kits supplied by Abbott laboratory. Insulin resistance and sensitivity was calculated by using homeostatic model analysis insulin resistance (HOMAIR)

The NCEP (National Cholesterol Education Program) ATP III panel defined Metabolic Syndrome as the presence of three or more of the following risk determinants :

1) Central obesity (Waist circumference Male > 90 cm, female>80 cm)
2) Raised triglyceride (> 150 mg/ml or on treatment).
3) Reduced HDL cholesterol (< 40 mg/dl in men or < 50 mg/dl in women)
4) Raise Blood pressure (systolic ≥130 mm Hg or diastolic ≥ 85 mm Hg
5) Raised fasting plasma glucose (fasting plasma glucose ≥100 mg/dl or on treatment)

The duration of study was Jan-2017 to December-2019

Statistical analysis: various parameters of MS and Non-MS were compared with z test and significant values are recorded. The statistical data was calculated in SPSS software. Ratio of Male and females were 2:1

Quicki – 0.27 (± 0.16) in Ms Group, 0.30 (± 0.20) in Non-MS Group, t test -0.74 and p<0.004.

Single vessel disease – 19 (± 3.1) in MS group, 12 (± 2.1) in Non-Ms Group t test 11.8 and p<0.001

Double vessel disease – 23 (± 12.5) in MS group, 14 (± 9.8) in Non-Ms Group t test was 3.56 and p<0.003

Triple vessel disease – 28 (± 4.1) in MS group, 19 (± 5.21) in Non-Ms Group t test 8.5 and p<0.000

BMI – 28.5 (± 2.2) in MS group, 26.4 (± 3.1) in Non-Ms group t test 3.49 and p<0.004.

Discussion

Present study of association of Metabolic syndrome with coronary artery disease (DA) in Telangana Rural population – TG 179.9 (± 4.05) in Mets, 167 (± 1.70) in Non-MS Group t test 1.93 and p value p<0.0001 HDL – 35.08 (± 6.64) in MS, 40.3 (± 3.49) in Non-MS Group t test 4.95 p<0.0001 VLDL – 36.9 (± 8.2) in MS, 32.7 (± 0.32) in Non-MS Group, t test 3.2 p<0.001, LDL – 105.03 (± 9.2) in MS, 99.5 (± 1.30) in Non-MS group t test 3.76 9<0.001, (Table-1) DM 6 (15%) in MS, 3 (7.5%) in Non-MS, HTN 32 (80%)
in MS, 5 (12.5%) in non-MS group (Table-2)

Insulin – 52.4 (±3.8) in MS, 17.9 (±2.2) in non-MS group t test 47.2 p<0.0001,

IL-6 – 35.6 (± 0.8) in MS 12.10 (± 0.5) t test 40 p<0.001

TNF-α - 12.1 (± 0.8) in MS, 7.30 (± 0.1) in non-Ms group t test 37.6 p<0.001, HsCRP – 14.4 (± 0.9) in MS, 3.2 (± 0.2) t test 38.7 p<0.001, HOMA IR – 17.8 (± 0.60) in MS, 5.5 (± 0.40) in non-MS t test 53.3 p<0.000,

Quicki – 0.27 (±0.16) in MS, 0.30 (± 0.20) in Non-MS t test -0.74 p<0.004,

Single vessel disease – 19 (± 3.1) in MS, 12 (± 2.1) in Non-MS t test 11.8

p<0.001,

Double vessel disease – 23 (± 12.6) in MS, 14 (±9.8) in Non-MS t test 3.56

p<0.003

Triple vessel disease – 28 (± 4.1) in MS, 19 (± 5.2) in Non-MS t test 8.5

p<0.001

BMI – 28.5 (± 2.2) in MS, 26.4 (± 3.1) in Non-MS t test 3.49 p<0.004

(Table-3) These findings are more or less in agreement with previous studies (6)(7)(8).

It is an established fact that insulin resistance is the dominant cause of the syndrome. Hence it prefers to term as “Insulin Resistance Syndrome”. According to Insulin Resistance Hypothesis, even obesity elicits the metabolic risk factors through insulin resistance. Moreover the term pre-diabetes encompasses impaired fasting glucose, and impaired glucose tolerance is meant to identify the elevated risk for type-II DM (9).

ATP III(Third Adult Treatment Panel) indeed defines diabetes itself as a high risk condition for CAD. It is also reported that Metabolic syndrome as defined by ATP-III accounts for the increased risk for congenital heart disease (10).

Unfortunately most of the physicians who treat the patients with type-II DM fail to recognize the necessity to substantially lower the cholesterol and blood pressure levels and to prescribe aspirin prophylaxis to avoid cardio-vascular risks factors in patients with type-II DM, who have features of the metabolic syndrome. Metabolic syndrome (Mets) carries increased long term risk for atherosclerosis, cardio-vascular diseases and DM-II as well. It is important to note that though the Mets is not a reliable tool to assess the risk of CVD / CAD, but can be a good predictor to start drug therapies for prevention. But once a person is found to be confirmed as Mets, life style and proper diet should be introduced apart from drug therapy.

Summary and Conclusion

As Mets consists of clustering of risk factors of metabolic origin that together associated with Atherosclerotic CVD’s and diabetes. Life style, diet, drug therapies will dampen the syndrome. But this study demands further genetic, hormonal, angiological, nutritional and patho-physiological studies as the exact mechanism of insulin resistance and elevation of cholesterol is still not clear.

Limitation of study – As our place of study was in remote area; hence we were unable to use latest techniques for our study

Table-1

Comparative of Biochemical analysis in MS and Non-MS Groups

Parameters	MS group	Non MS	t test	p value
TG	179.9 (± 1.5)	167.5 (± 1.70)	1.93	P<0.0001
HDL	35.08 (± 6.64)	40.3 (± 13.9)	-4.95	P<0.0001
VLDL	36.9 (± 8.2)	32.70 (± 0.32)	3.2	P<0.001
LDL	105.08 (± 9.2)	99.5 (± 1.30)	3.76	P< 0.001

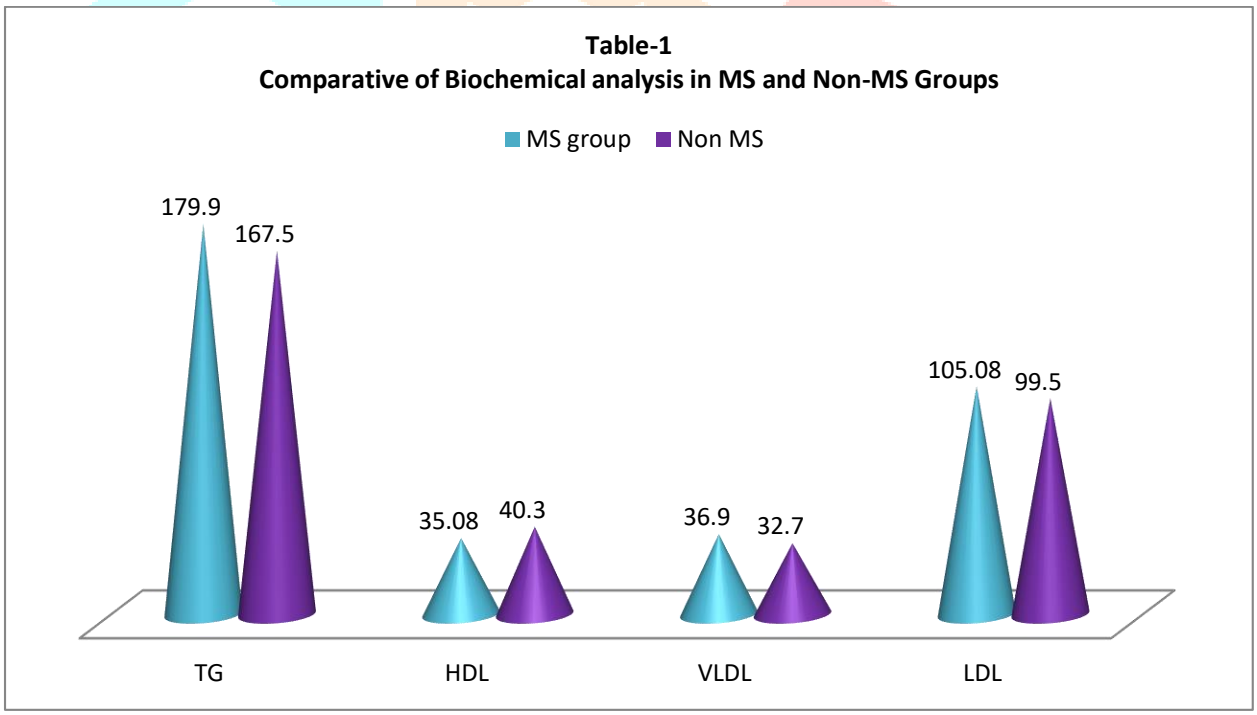


Table – 2

	MS group		Non Ms Group	
Particular	No	%	No	%
DM	6	15 %	3	7.5 %
HTN	32	80 %	5	12.5 %

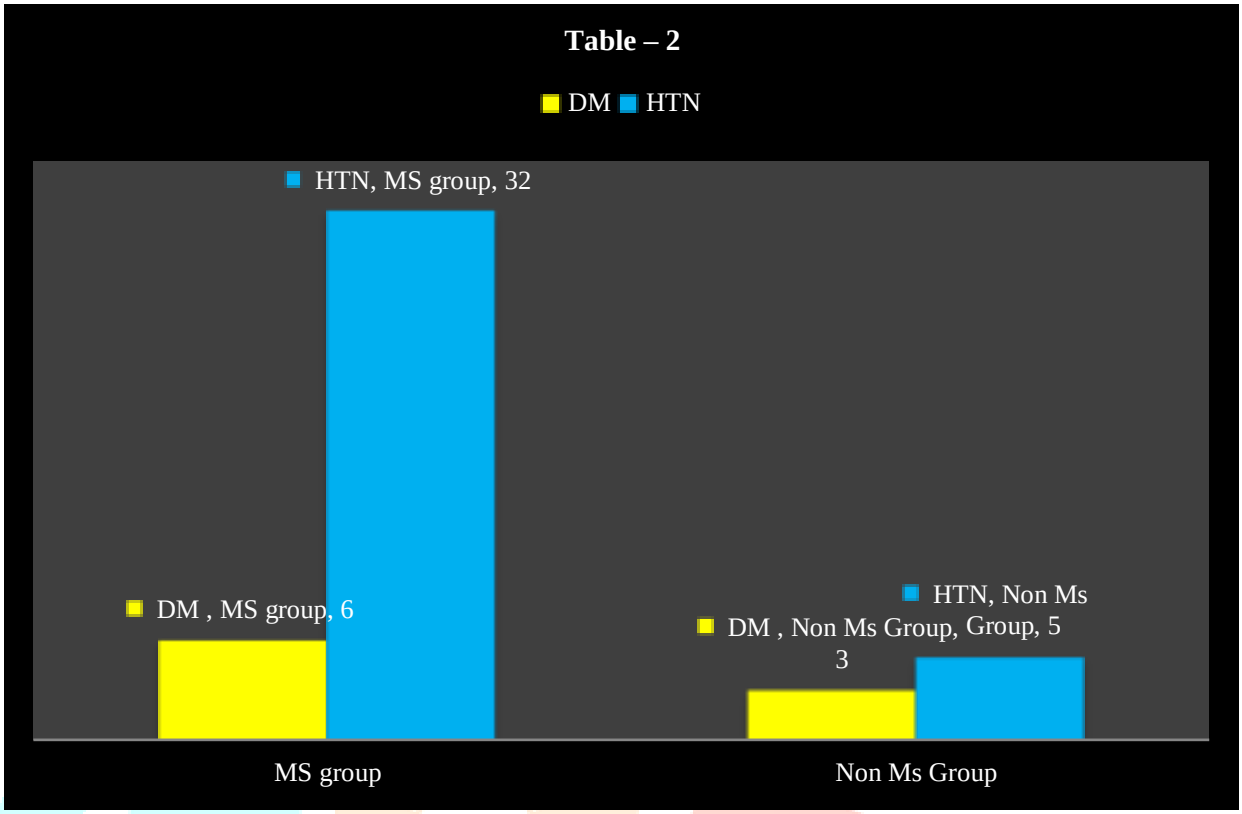


Table – 3

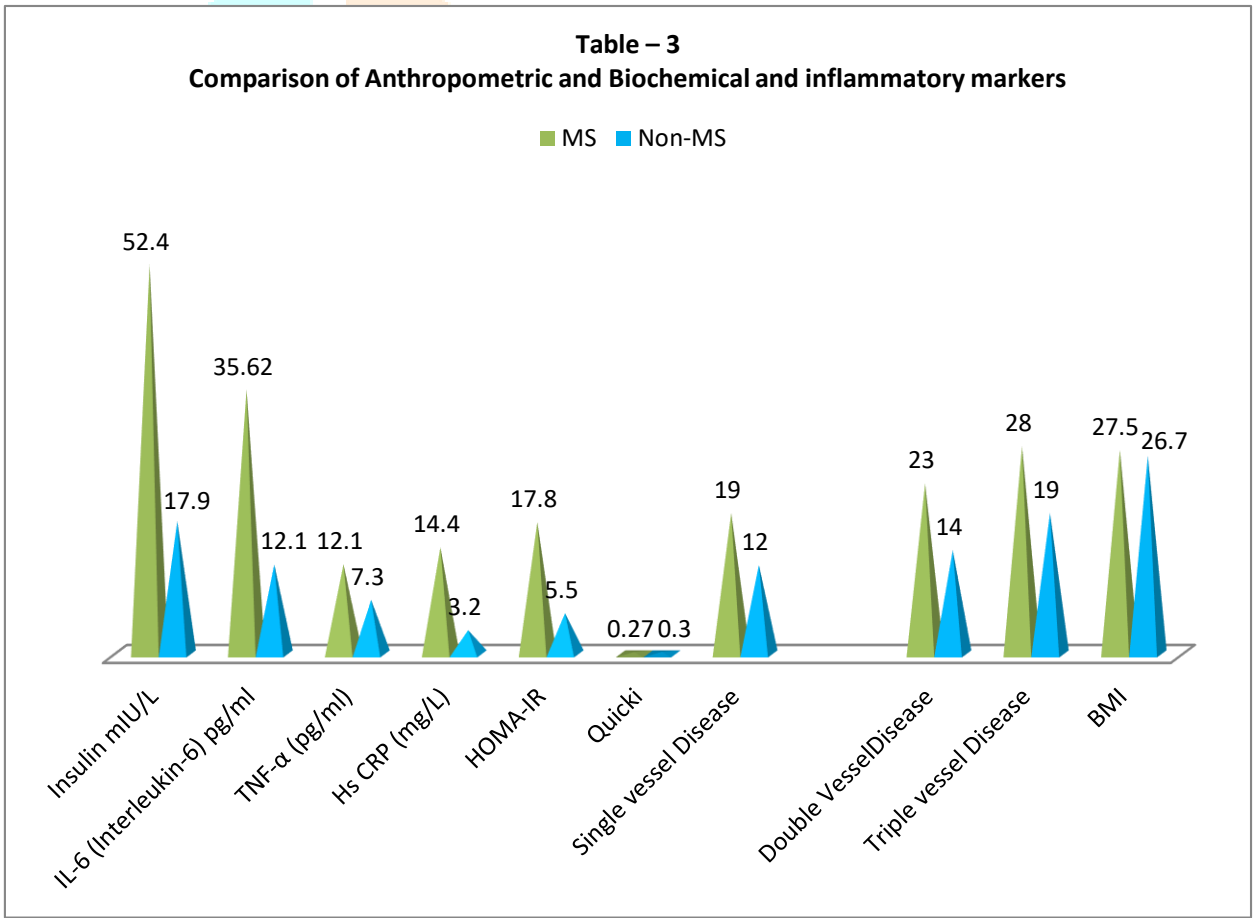
Comparison of Anthropometric and Biochemical and inflammatory markers

Parameters	MS (40)	Non-MS	t test	p value
Insulin mIU/L	52.4 (± 3.8)	17.9 (± 2.2)	47.2	P<0.001
IL-6 (Interleukin-6) pg/ml	35.62 (± 0.8)	12.10 (± 0.5)	40	P<0.000
TNF-α (pg/ml)	12.1 (± 0.8)	7.30 (± 0.1)	9.6	P<0.001
Hs CRP (mg/L)	14.4 (± 0.9)	3.2 (± 0.2)	38.7	P<0.001
HOMA-IR	17.8 (± 0.60)	5.5 (± 0.60)	53.3	P<0.000
Quicki (Quantitative Insulin check Index)	0.27 (± 0.16)	0.30 (± 0.20)	-074	P<0.004

Single vessel Disease	19 (± 3.5)	12 (± 2.1)	11.8	P<0.001
Double Vessel Disease	23 (± 12.6)	14 (± 9.8)	3.56	P<0.003
Triple vessel Disease	28 (± 4.1)	19 (± 5.2)	8.5	P<0.000
BMI	27.5 (± 2.2)	26.7 (± 3.1)	3.49	P<0.004

Quicki = Quantitative Insulin check Index
hsCRP = highly sensitive C-reactive protein HOMA = Homeostatic Model Analysis TNFα = Tumour Necrosis Factor alpha BMI = Body Mass Index

Table – 3
Comparison of Anthropometric and Biochemical and inflammatory markers



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