

**A CROSS-SECTIONAL STUDY OF THE PREVALENCE OF METABOLIC SYNDROME IN
NEWLY DIAGNOSED TYPE 2 DIABETICS**

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ABSTRACT

BACKGROUND:The study was conducted with an aim to estimate the prevalence of metabolic syndrome in newly diagnosed type 2 diabetics. **MATERIALS AND METHODS:**A cross-sectional study was carried out to estimate the prevalence of metabolic syndrome in patients who have been newly diagnosed with type 2 diabetes in the past 3 months. 100 patients participated in our study from who relevant history was collected and clinical investigations were done. Metabolic syndrome was identified using the National Cholesterol Education Programme : ATP III criteria (NCEP:ATP III).

RESULTS:Among the 100 study participants, 82 (82%) fulfilled the criteria for metabolic syndrome with a 95% confidence interval of 0.776 – 1.136. 34 (79.07%) were males and 48 (84.21%) were females. 17(17%) participants met all the 5 components, 36 (36%) participants met 4 components and 29 (29%) participants met 3 components. In our study, 49 participants had low HDL, 69 participants had high waist circumference(central obesity), 55 participants had hypertriglyceridemia and 75 participants had elevated blood pressures. **CONCLUSION:**There is higher prevalence of metabolic syndrome in females with increased blood pressures, central obesity and dylipidemia.

Keywords: Type 2 diabetes, metabolic syndrome, central obesity

1.INTRODUCTION

Diabetes mellitus is the commonest metabolic abnormality in the world with type 2 diabetes being the commonest form of diabetes. It constitutes 90% of the diabetic population in any country. The so called 'Asian Indian Phenotype' refers to certain unique clinical and biochemical abnormalities in Indians, which include increased insulin resistance, greater abdominal adiposity, lower adiponectin and sensitive c - reactive protein levels(Mohan et al., 2007). According to the sixth edition of International Diabetes Federation, there were 382 million diabetes patients by the year 2013 worldwide and the number of people with diabetes will increase by 55% by 2035. Type 2 diabetes accounts for 85 to 95% of all diabetes(International Diabetes Federation, 2013). Reaven postulated that insulin resistance and compensatory hyperinsulinemia was the reason which predisposed the individuals to hypertension, hyperlipidemia and diabetes(Reaven, 1988). A study done by Prasad et al shows

that even in the poorest states of India metabolic syndrome is a significant public health problem(Prasad et al., 2012). In Framingham cohort they have found that metabolic syndrome was highly predictive of new onset diabetes mellitus(Grundy et al., 2004). Metabolic syndrome predicts diabetes mellitus independently of other risk factors. In predicting the NCEP definition is better than modified 1999 WHO definition(Qiao et al., 2007). The risk of

developing diabetes in metabolic syndrome is increased three to five fold(Eckel, 1997).

2.MATERIALS AND METHODS:

A cross-sectional study was carried out to assess the prevalence of metabolic syndrome in newly diagnosed type 2 diabetics in a rural South-Indian population. A total of 100 newly diagnosed type 2 diabetics were enrolled in our study. Patient relevant data was collected from the inpatient and outpatient department of Medicine, RMMCH. The National Cholesterol Education Program Adult Treatment Panel III (NCEP ATP III) (2001) criteria was used which requires at least three of the following:

- Central obesity: waist circumference ≥ 102 cm (male), ≥ 88 cm (female)
- Hypertriglyceridemia: TGL ≥ 150 mg/dl or specific medication
- Low HDL cholesterol: HDL-C < 40 mg/dl (male), < 50 mg/dl (female) or specific medication
- Blood pressure ≥ 130 mm Hg systolic or diastolic ≥ 85 mm Hg or specific medication
- Fasting plasma glucose ≥ 100 mg/dl or specific medication or previously diagnosed type 2 diabetes

According to modified NCEP ATP III criteria, the waist circumference cut-off should be specific for different ethnicities. For

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the Asian population, it should be 90 cm in men and 80cm in women(Moy and Bulgiba, 2010).

Inclusion Criteria:

- All patients who have been diagnosed as having type 2 diabetes mellitus within the last 3 months using ADA criteria
- Age of the patient: > 25 years
- Sex: both males and females.

EXCLUSION CRITERIA:

- Patients on steroids
- Type 1 diabetics
- Patients on antipsychotic medications
- Known cases of active hypothyroidism
- Known cases of Cushing’s syndrome were excluded from the study.

3.RESULTS:

AGE DISTRIBUTION:

TABLE 1: AGE DISTRIBUTION AMONG THE PARTICIPANTS (n=100)

Age	No. Of Participants
20-30	1
30-40	20
40-50	53
50-60	26
Total	100

Maximum number of subjects belonged to the age group of 40-50 years (53%).

GENDER DISTRIBUTION:

TABLE 2: GENDER DISTRIBUTION AMONG THE PARTICIPANTS(n=100)

	Male	Female
Number	43	57
percentage	43	57

Among the total participants, 43(43%) were males and (57) 57% were females.

WAIST CIRCUMFERENCE DISTRIBUTION:

TABLE 3: WAIST CIRCUMFERENCE FREQUENCY DISTRIBUTION.

Waist Circumference	Male	Female	Total
High Waist	26	43	69
High Waist (%)	37.68	62.32	100
Normal Waist	17	14	31
Normal Waist (%)	54.84	45.16	100
Total	43	57	100

Among all the participants, 69 (69%) participants had high waist circumference which is ≥ 90 cm in males and ≥ 80 cm in females. Out of these, 37.68% were males and 62.32 were females with statistically significant p value.

TABLE 8: BASELINE CHARACTERISTICS OF ALL THE PARTICIPANTS:

	AGE	BMI	WC	SBP	DBP	FBS	Total Chol	LDL	HDL	TGS
Mean	44.44	26.2933	88.52	122.70	87.70	189.40	199.28	123.27	45.82	205.14
Median	45.00	25.4400	90.00	130.00	90.00	194.50	190.00	119.00	46.00	162.00
Std. Deviation	7.469	3.90640	9.058	16.988	8.022	45.013	22.155	30.376	7.915	110.382
Range	32	18.13	37	70	40	180	92	116	30	463
Minimum	26	17.48	69	100	70	108	168	86	32	122
Maximum	58	35.61	106	170	110	288	260	202	62	585

SERUM TRIGLYCERIDES DISTRIBUTION: TABLE 4: SERUM TRIGLYCERIDE DISTRIBUTION

Triglycerides Level	Number Of Participants	% Of Participants	Males	Females	Total
Normal	45	45	17	28	45
BorderLineHigh	34	34	16	18	34
High	18	18	9	9	18
VeryHigh	3	3	1	2	3
Total	100	100			

In our study, 55 (55%) participants had an abnormal level of serum triglycerides with female predominance(52.7%). Out of these, 34% were Borderline high levels (150-199mg/dl), 18% had high levels (200-499 mg/dl) and 3% participants had very high triglycerides (≥ 500 mg/dl).

SERUM HDL (HIGH DENSITY LIPOPROTEINS) DISTRIBUTION:

TABLE 5: PARTICIPANTS HAVING LOW HIGH DENSITY LIPOPROTEINS (n=100)

Low HDL	Male	Female	Number of participants
No	23	28	51
Yes	20	29	49
Total	43	57	100

49% participants have Low HDL out of which 29(59.18%) were predominantly females and 51% did not have Low HDL.

PREVALENCE OF HYPERTENSION:

TABLE 6: PARTICIPANTS HAVING HIGH BLOOD PRESSURE (n=100)

Hypertension	Males	Females	Total
Absent	9(36%)	16(64%)	25
Present	34(45.33%)	41(54.66%)	75
Total	43(43%)	57(57%)	100

Among the 100 total participants, 75 (75%) participants had high blood pressure out of which 41(54.66%) are females and 34(45.33%) are males.

PREVALENCE OF ELEVATED BLOOD SUGARS:

TABLE 7: PARTICIPANTS HAVING ELEVATED BLOODSUGARS (n=100)

Fasting Blood Sugar	Male %	Female %	Total
Impaired (100-125mg/dl)	2(22.22%)	7(77.78%)	9
High (126-250mg/dl)	34(44.15%)	43(55.84%)	77
Very High (>250mg/dl)	7(50%)	7(50%)	14
Total	43(43%)	57(57%)	100

Among the total participants there was a female predominance with 77(77%) having High Fasting Blood Sugars and 14(14%) having very High Fasting Blood Sugars.

PREVALENCE OF METABOLIC SYNDROME:

TABLE 9: PREVALENCE AND AGE DISTRIBUTION OF METABOLIC SYNDROME

Age Group	Metabolic Syndrome Components			Total
	3.00	4.00	5.00	
20-30	0	0	0	0
30-40	7	4	2	13
40-50	14	22	10	46
50-60	8	10	5	23
Total				82

Among the 100 study participants, 82 (82%) fulfilled the criteria for metabolic syndrome 95% Confidence Interval of 0.776 – 1.136.

GENDER DISTRIBUTION AMONG THE PARTICIPANTS WITH METABOLIC SYNDROME:

TABLE 10: GENDER DISTRIBUTION OF PARTICIPANTS WITH METABOLIC SYNDROME

Criteria	Male (n= 43)	Female (n=57)	Total (n=100)
A TP III	34 (79.07%)	48 (84.21%)	82 (82 %)

34 (79.07%) were males and 48 (84.21%) were females. The P value was >0.05 was not statistically significant.

NUMBER OF INDIVIDUAL COMPONENTS MET FOR METABOLIC SYNDROME:

TABLE 11: NUMBER OF INDIVIDUAL COMPONENTS MET FOR METABOLIC SYNDROME

Gender	HDL Low		Central Obesity		Hypertri glyceridemia		Blood Pressure High		Fasting Glucose High	
	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
Male	23	20	17	26	17	26	9	34	43	43
Female	28	29	14	43	28	29	16	41	57	57
Total	51	49	31	69	45	55	25	75	100	100

49 participants had low HDL, 69 participants had high waist circumference(central obesity), 55 participants had hypertriglyceridemia and 75 participants had elevated blood pressures. All components had a female predominance.

NUMBER OF COMPONENTS MET FOR CRITERIA OF METABOLIC SYNDROME:

TABLE 12: NUMBER OF COMPONENTS MET FOR CRITERIA OF METABOLIC SYNDROME

No. Of Criteria Met	Frequency	Percent	Cumulative Percent
1.00	4	4.0	4.0
2.00	14	14.0	18.0
3.00	29	29.0	47.0
4.00	36	36.0	83.0
5.00	17	17.0	100.0
Total	100	100.0	

17(17%) participants met all the 5 components, 36 (36%) participants met 4 components and 29 (29%) participants met 3 components.

ASSOCIATION OF RISK WITH INDIVIDUAL COMPONENTS AGE, BMI, WC, SBP, DBP, FBS, TC, LDL, HDL AND TGS IN GETTING METABOLIC SYNDROME BY ODDS RATIO

TABLE 13: ASSOCIATION OF RISK WITH INDIVIDUAL COMPONENTS LIKE AGE, BODY MASS INDEX(BMI), WAIST CIRCUMFERENCE(WC), SYSTOLIC BLOOD PRESSURE(SBP), DIASTOLIC BLOOD PRESSURE(DBP), FASTING BLOOD SUGARS(FBS), TOTAL CHOLESTEROL(TC), LOW DENSITY LIPOPROTEIN(LDL), HIGH DENSITY LIPOPROTEINS(HDL), TRIGLYCERIDES (TGS) IN GETTING METABOLIC SYNDROME BY ODDS RATIO.

S.No	Components	Odds ratio	p value
1	AGE	0.942 (0.815 - 1.089)	0.42
2	BMI	1.786 (1.021 - 3.124)	0.042
3	WC	1.007 (0.863 - 1.175)	0.925
4	SBP	1.068 (0.966 - 1.182)	0.2
5	DBP	1.066 (0.879 - 1.293)	0.513
6	FBS	1.047 (1.007 - 1.088)	0.02
7	TC	1.178 (0.989 - 1.403)	0.067
8	LDL	1.044 (0.95 - 1.147)	0.371
9	HDL	0.802 (0.636 - 1.011)	0.062
10	TGS	1.057 (0.948 - 1.179)	0.316

With 1 Kg/m² increase in BMI there is 78 % risk of getting metabolic syndrome, with 1 mg/dl increase in FBS, there is 4% risk of getting metabolic syndrome. The other components are not significant as their p value <0.05. TC and HDL show significance value close to 0.05. If there is increase in the participant's data, they may become significant.

4.DISCUSSION:

In our study comprising of 100 participants who were newly diagnosed or diagnosed as having type 2 diabetes in the past three months, overall gender distribution revealed 43% males and 57% females. A similar study done by Deepa et al (2007) comprising of 26001 participants had the same female

predominance⁹. In the present study, we observed that the maximum number of participants belonged to the age group 40-50 years (53%). A similar study done by Nahar et al involving 200 participants also showed majority of the participants between 40-50 years(Nahar et al., 2011). Among the 100 study participants, 82 (82%) fulfilled the criteria for metabolic syndrome with a 95% confidence interval of 0.776 – 1.136. 34 (79.07%) were males and 48 (84.21%) were females. The P value was >0.05 was not statistically significant. A similar study done by Nahar et al in Sylhet showed that the prevalence of metabolic syndrome in newly diagnosed type 2 diabetes mellitus was 81% according to the modified NCEP ATP III criteria(Nahar et al., 2011). 49 participants had low HDL, 69 participants had high waist circumference(central obesity), 55 participants had hypertriglyceridemia and 75 participants had elevated blood pressures. All components had a female predominance. 17(17%) participants met all the 5 components, 36 (36%) participants met 4 components and 29 (29%) participants met 3 components. A study done by Ogbera in Lagos involving 963 general population, 5.8% met 4 components, 4.1% met 3 components and 53.2% met 2 components of the NCEP ATP III criteria(Ogbera,2010). In Assessment of risk with individual components using adjusted odds ratio showed that With 1 Kg/m² increase in BMI there is 78 % risk of getting metabolic syndrome, with 1 mg/dl increase in FBS, there is 4% risk of getting metabolic syndrome. The other components are not significant as their p value <0.05. TC and HDL show significance value close to 0.05. If there is increase in participants data, they may become significant.

5.CONCLUSION:

The metabolic syndrome is a common metabolic disorder that results from the increasing prevalence of obesity. The complication of metabolic syndrome are broad causing increased cardiovascular disease, increased stroke and thromboembolic disease, obstructive sleep apnea, non-alcoholic fatty liver disease and preeclampsia to name a few. These increased risks demand therapeutic attention for those at high risk. For both pre-diabetes, diabetes and metabolic syndrome, the desirable approach is lifestyle intervention, especially weight reduction and physical activity.

LIMITATIONS:

- The participants of the study do not accurately represent the rural population and hence the findings cannot be extrapolated to the entire population.
- Measuring the waist circumference does not reliably distinguish increase in subcutaneous adipose tissue from those in visceral fat. This distinction requires CT or MRI.

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