

A study on prevalence of metabolic syndrome in adult population of Ranchi

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Abstract:

Introduction: The Metabolic Syndrome (syndrome X, insulin resistance syndrome) consists of a constellation of metabolic abnormalities that confer increased risk of cardiovascular disease and diabetes mellitus. Coronary artery disease is the leading cause of morbidity and mortality worldwide with the heaviest toll in the developing countries.

Material and Method: The study was done in 170 subjects. The study subjects were selected randomly from patients, who were visiting the OPDs and indoors of various departments in Rajendra Institute of Medical Sciences, Ranchi

Results: It was observed that the total prevalence of metabolic syndrome is 20.6 %

Conclusion: The data obtained after the study shows that one out of every five adults in Ranchi is at an increased risk of developing diabetes and/or cardiovascular disease. Women are equally prone as men. Results show a shift toward a sedentary lifestyles, alcoholism and smoking.

Key Words: Metabolic Syndrome, Coronary artery disease, Diabetes Mellitus and syndrome X.

I. Introduction

The Metabolic Syndrome (syndrome X, insulin resistance syndrome) consists of a constellation of metabolic abnormalities that confer increased risk of cardiovascular disease and diabetes mellitus¹. The metabolic syndrome is a cluster of risk factors like impaired glucose tolerance, abdominal obesity, dyslipidemia and hypertension.

Coronary artery disease is the leading cause of morbidity and mortality worldwide with the heaviest toll in the developing countries². Recent studies show that, overall the diabetics have a two fold increase in risk of coronary heart disease³. Angiographic data on Indian patients with suspected coronary artery disease had revealed that triple vessel disease was much higher in diabetics as compared to non-diabetics to be followed by double vessel disease while single vessel disease was more common in non-diabetics⁴. In a recent publication from Ahmadabad there has been substantial rise in prevalence of coronary artery disease from 5.8% to 20-30% amongst diabetics over the period of time⁵.

According to statistical fact sheet given by American Heart Association (2010 update, National Health and Nutritional Examination Survey – 2003-06), the prevalence among males age 20-39 years was 20.3%, age 40-59 years was 40.8% and age >60 years was 51.5%, among females age 20-39 years was 15.6%, age 40-59 years was 37.2% and age > 60 years was 54.4%. A study conducted by Cameron AJ, Shaw JE, Zimmet PZ et al (2004) shows that among US people (age 30-79 years) the prevalence was 29% among males and 32.8% among females, in English population (age 40-65 years) the prevalence 44.8% among males and 30.9% among females, in Iranian population (age >20 years) the prevalence was 24% among males and 42% among females, in Chennai population (age >20 years) the prevalence was 36.4% among males and 46.5% females. Reddy et al conducted a multicentric study in subjects 20-69 years of age belonging to industrial employees and their families show Bangalore- 38.8%, Trivandrum- 37.9%, Hyderabad- 33%, and Lucknow- 29% (bulletin of WHO June- 2004). Gupta et al estimated the prevalence in Bhatiya community in Rajasthan; it was 36.2% among males and 47.8% among females (journal Indian Heart-2004)⁶. The above data indicates that the metabolic syndrome is a global problem. The situation in India is alarming too.

The concept of metabolic syndrome dates back to 1920, when Kylin⁷, a Swedish physician first described a constellation of metabolic disorder. In 1988, Reaven named these constellations of abnormalities as syndrome X and proposed insulin resistance as the underlying factor but he did not include obesity⁸. Further in 1998 WHO proposed its criteria on metabolic syndrome. The world has finally started accepting metabolic syndrome as a new disease entity.

Since scientists, doctors, researchers from all over the world are working seriously to find a sharply defined picture of metabolic syndrome, a large number of definitions have come into existence as, 1.WHO definition(1999) 2.European group for the study of insulin resistance(EGIR-1999) 3.The national cholesterol

education programme-3rd adult treatment panel(NCEP ATPIII-2001) 4.American association of clinical endocrinology (AACE) Position statement(2002) 5.International diabetes federation definition(IDF-2004) 6.Platinum standard definition(IDF-2004).

The fundamental mechanism that leads to the metabolic syndrome still remains unknown. Many researchers have tried to put forward possible hypothesis and explanations for the mechanism that links the different component of the metabolic syndrome. Insulin resistance, leptin resistance, obesity/visceral adiposity, beta-cell dysfunction, endothelial dysfunction, sympathetic overactivity, reduced serotonergic responsivity, endocannabinoid system overactivity. Thrifty genotype and candidate genes are some of the etiological factors that have been proposed to cause metabolic syndrome. Besides these, there are multiple risk factors which are associated like advancing age, gender and sex hormone imbalance, race and ethnicity, socioeconomic status, family history of chronic disease, genetic factors, food habits and addictions, physical activity, psychological and personality factors, obstructive sleep apnea syndrome, BMI (body mass index) and waist circumference etc. In last few decades world has changed rapidly. A fast pace of life, affluence, lack of time has greatly affected the urban population leading to major changes in life style and food habits. There has been a dietary transition from a high fibre complex carbohydrate diet to a low fibre refined carbohydrate diet. Above all an increasingly sedentary lifestyle combined with professional stress has lead to emergence of large number of risk factors for various diseases. Metabolic syndrome is very important disease related to these sudden changes in life style and food habits.

Knowing the importance of metabolic syndrome several studies being carried out worldwide. Recent studies show prevalence in USA is about 25% Of the adult population (survey JAMA-287, 3rd National Health and Nutritional Examination Survey or NHANES-III).In India Mishra A et al on north Indian population (Delhi), Gupta R et al on Punjabi Bhatia community (Jaipur) and Deepa R et al on urban population of Chennai did extensive study. The results of the above studies are alarming. There is a great need of a similar study in Ranchi, capital city of newly formed state Jharkhand. Ranchi of late very fastly being influenced by westernization in life style and diet, and thus it was selected for the present study. The outcomes of the present study will hopefully help in evaluating current situation, so that effective preventive and treatment strategies could be deployed.

II. Materials And Methodology

The study was done in 170 subjects. The study subjects were selected randomly from patients, who were visiting the OPDs and indoors of various departments like department of Medicine, Surgery, Obstetrics and Gynaecology, ENT, Eye .Medical students, Para-medical staffs and local population of Ranchi were also taken as a study subjects.

Inclusion criteria

1. Age 18-60 years both the sexes
2. Should be fasting for at least 10 hours and should readily agree to participate in the study with an informed consent.

Exclusion criteria

1. Non-cooperative patients
2. Patients suffering from serious illness which might affect biochemical parameters like chronic liver disease, renal disease, AIDS, chronic psychiatric illness.

III. Results

Statistical Analysis: The data was analyzed by using SPSS 20 software. The data is presented in percentages, rates and ratios. Chi square test was used to find the association between attributes.

Table – I: Age Distribution

Distribution of study population according to age		
Age group	Number of subjects	Percentage
18-30 years	50	29.4
31-40 years	66	38.8
41-50 years	35	20.6
51-60 years	19	11.2
Total	170	100.0

Table – I shows majority, 66 (38.8%) subjects belong to 31-40 years age group. 50 (29.4%) subjects belong to 21-30 years, 35 (20.6%) subjects belong to 41-50 years and 19 (11.2%) subjects belong to 51-60 years age group.

Table – II: Sex distribution

Distribution of study population according to sex		
Sex	Number of subjects	Percentage
Male	96	56.5
Female	74	43.5
Total	170	100.0

The above table shows that 96 (56.5%) subjects are male and 74 (43.5%) subjects are female.

Table – III: Family history of different disease

Distribution of study population according to family history of different disease		
	Number of subjects	Percentage
No family history (N)	111	65.3
Hypertension (H)	11	6.5
Hypertension & Diabetes (HD)	10	5.9
Hypertension, Diabetes & Obesity (HDO)	3	1.8
Hypertension & Obesity	7	4.2
Diabetes (D)	18	10.6
Obesity (O)	2	1.2
Obesity & Diabetes (OD)	8	4.5
Total	170	100.0

The above data shows that majority of study population that is 111 (63.5%) didn't report history of any family diseases.

18 (10.6%) subjects had a family history of Diabetes (D), 11 (6.5%) subjects had a family history of Hypertension (H), 10 (5.9%) subjects had a family history of Hypertension and Diabetes (HD), 7 (4.2%) subjects had a family history of Hypertension and Obesity (HO), 8 (4.5%) subjects had a family history of Obesity and Diabetes (OD), 3 (1.8%) subjects had a family history of Hypertension, Diabetes and Obesity (HDO) and 2 (1.2%) subjects had a family history of Obesity (O).

Table – IV: Addiction

Distribution of study population according to Addiction		
Addiction	Number of subjects	Percentage
Smoking	16	9.4
Smoking & Alcoholism	02	1.2
Smoking, tobacco and alcoholism	09	5.3
Chewing Tobacco	33	19.4
Chewing Tobacco and Alcoholism	01	0.6
Tobacco and Smoking	08	4.7
No addiction	101	59.4
Total	170	100.0

The above data shows 101 (59.4%) subjects didn't had any addiction. 33 (19.4%) subjects were addicted to Chewing tobacco, 16 (9.4%) subjects were addicted to Smoking, 9 (5.3%) subjects were addicted to Chewing tobacco, Smoking and Alcoholism, 8 (4.7%) subjects were addicted to Chewing tobacco and Smoking, 2 (1.2%) subjects were addicted to Smoking and Alcoholism and 1 (0.6%) subjects were addicted to Chewing tobacco and Alcoholism.

Table – V: Life style

Distribution of study population according to Life style		
Life styles	Number of subjects	percentage
Active	32	18.8
Moderately active	94	55.3
Sedentary	44	25.9
Total	170	100.0

The above data shows, 94 (55.3%) subjects had Moderately active life style, 44 (25.9%) subjects had Sedentary life style and 32 (18.8%) had Active life style.

Table – VI: Prevalence (%) of Hypertension in study population

Prevalence (%) of Hypertension in study population									
	Hypertension			Normal			Total		
	M	F	T	M	F	T	M	F	T
Number of subjects	28	17	45	68	57	125	96	74	170
% within corresponding Hypertension	62.2%	37.8%	100.0%	54.4%	45.6%	100.0%	56.5%	43.5%	100.0%
% within sex	29.2%	23.0%	26.5%	70.8%	77.0%	73.5%	100.0%	100.0%	100.0%
% of Total	16.5%	10.0%	26.5%	40.0%	33.5%	73.5%	56.5%	43.5%	100.0%

M= Male, F= Female, T= Total, $\chi^2 = 0.37$, $p = 0.54$

In the present study Blood pressure > 130/85 mmHg was taken as Hypertension. 45 (26.5%) subjects were Hypertensive. Among Hypertensive 28 (16.5%) were males and 17 (10.0%) were females.

Table – VII: Prevalence (%) of Overweight and Obesity in study population

Prevalence (%) of Overweight and Obesity in study population												
	Normal			Overweight			Obese			Total		
	M	F	T	M	F	T	M	F	T	M	F	T
Number of subjects	59	47	106	28	20	48	9	7	16	96	74	170
% within sex	61.4 %	63.5 %	62.2 %	29.1 %	27.0 %	28.2 %	9.3 %	9.4 %	9.4 %	-	-	-
% within corresponding BMI group	55.7 %	44.3 %	100.0 %	58.3 %	41.7 %	100.0 %	56.3 %	43.7 %	100.0 %	56.5 %	43.5 %	100.0 %
% of Total	34.7 %	27.6%	62.3 %	16.5%	11.8 %	28.3 %	5.3 %	4.1 %	9.4 %	56.5 %	43.5%	100.0 %

Normal = BMI < 25, Overweight = BMI 25-29, Obese = BMI ≥ 30, $\chi^2 = 1.7$, $p = 0.41$

The above data shows that 106 (62.3%) subjects were Normal. 16 (9.4%) subjects were Obese and 48 (28.3%) subjects were Overweight. Among females the prevalence of Obesity was 9.4% and Overweight was 27.0%. Among males prevalence of Obesity was 9.3% and Overweight was 29.1%.

Table – VIII: Prevalence (%) of Impaired Glucose Tolerance in study population

Prevalence (%) of Impaired Glucose Tolerance in study population									
	Normal Fasting Plasma Glucose(<110 mg/dl)			Impaired Glucose Tolerance(≥110 mg/dl)			Total		
	M	F	T	M	F	T	M	F	T
Number of subjects	72	57	129	24	17	41	96	74	170
% within FPG	55.8%	44.2%	100.0%	58.5%	41.5%	100.0%	56.5%	43.5%	100.0%
% within sex	75.0%	77.0%	75.9%	25.0%	23.0%	24.1%	100.0%	100.0%	100.0%
% of Total	42.3%	33.5%	75.9%	14.1%	10.0%	24.1%	56.5%	43.5%	100.0%

FPG – Fasting Plasma Glucose, $\chi^2 = 0.43$, $p = 0.51$

The above data shows that most of the study population had normal Fasting Plasma Glucose. 41 (24.1%) subjects had Impaired Glucose Tolerance. The prevalence of Impaired Glucose Tolerance among male is 25.0% and among female is 23.0%.

Table – IX: Prevalence (%) of Hypercholesterolemia in study population

Prevalence (%) of Hypercholesterolemia in study population									
	Total Cholesterol <250 mg/dl			Total Cholesterol ≥250 mg/dl			Total		
	M	F	T	M	F	T	M	F	T
Number of subjects	79	70	149	17	04	21	96	74	170
% within TC	53.1%	46.9%	100.0%	80.9%	19.1%	100.0%	56.5%	43.5%	100.0%
% within sex	82.3%	94.6%	87.6%	17.7%	5.4%	12.4%	100.0%	100.0%	100.0%
% Of Total	46.5%	41.2%	87.6%	10.0%	2.4%	12.4%	56.5%	43.5%	100.0%

TC = Total Cholesterol, $\chi^2 = 1.39$, $p = 0.24$

The above data shows that the prevalence of total Cholesterol level ≥ 250 mg/dl is 12.4%. 7 (10.0% of total) males and 4(2.4% of total) females had total cholesterol level ≥ 250 mg/dl. 79 (46.5% of total) males and 70 (41.2% of total) had total cholesterol level less than 250 mg/dl.

Table – X: Prevalence (%) of Metabolic Syndrome among both Sexes in the study population

Prevalence (%) of Metabolic Syndrome among both Sexes in the study population									
	Female			Male			Total		
	Metabolic syndrome			Metabolic syndrome			Metabolic syndrome		
	N	Y	T	N	Y	T	N	Y	T
Number of subjects	57	17	74	78	18	96	135	35	170
% within sex	77.0%	23.0%	100.0%	81.2%	18.8%	100.0%	79.4%	20.6%	100.0%
Corresponding % within cases or non-cases of metabolic syndrome	42.2%	48.6%	-	57.8%	51.4%	-	100.0%	100.0%	100.0%
% of Total	33.5%	10.0%	-	45.9%	10.6%	-	79.4%	20.6%	100.0%

N= Normal subject, Y= Diagnosed as cases of metabolic syndrome, $\chi^2 = 0.08$, p = 0.77

The above data shows the prevalence of metabolic syndrome. The total prevalence of metabolic syndrome is 20.6% that is 35 out of 170 study subjects were diagnosed as the cases of metabolic syndrome. Prevalence among females was 23.0% and among male was 18.8%.

IV. Discussion

Metabolic syndrome is widely prevalent and multi-factorial disorder. It is basically, a constellation of dyslipidemia (hypertriglyceridemia), low level of high density lipoproteins, elevated blood pressure, impaired glucose tolerance and central obesity.

A total of 170 subjects participated in the present study. This included 96(56.5%) males and 74(43.5%) females. The study age group was 18-60 years. Majority of subjects ,66(33.8%) belonged to 31-40 years age group. 50 (29.4%) subjects belonged to 21-30 years, 35(20.6%) subjects belonged to 41-50 years and 19(11.2%) belonged to 51-60 years age group.

The prevalence of obesity in the study population is 9.4 %(16/170). Prevalence of overweight is 28.3 %(48/170). Among females prevalence of obesity is 9.4% and prevalence of overweight is 27%. Prevalence of obesity among male is 9.3% and overweight is 29.1%. The prevalence of obesity found in Ranchi is lower than that in Jaipur and Chennai. Ramachandran et al (2003) calculated the obesity prevalence 31% in Chennai. He used the waist-circumference that is appropriate to Indian population. In Jaipur, Gupta et al (2003) used the standard ATP III definition of obesity and found the prevalence of obesity was 33%. The data obtained from the present study shows that the prevalence of obesity in Ranchi is lower than the other cities. This lower prevalence of obesity did not co-relate well with the prevalence of other risk factors which showed a higher prevalence. This is in agreement with the findings of Anoop Mishra et al (2002), which suggested that the existing definition of obesity was not appropriate for Asian or Indian in particular, who have a different phenotype compared to western countries. He suggested a new cut-off value to define obesity as BMI ≥ 23 . This was similar to the new recommendations of the International Diabetes Federation to define obesity for Asian as BMI ≥ 25 . otherwise the findings are well understood, as the prevalence of the overweight group (BMI 25-29) IS 28.3%, which is similar to the obese group of Ramachandran et al and Gupta et al.

Hypertension was defined as blood pressure more than 130/85mm of Hg for present study.45 (26.5%) subjects had blood pressure higher than 130/85 mm of Hg. Prevalence of hypertension among males 29.2% and among females is 23%. This is lower than the prevalence of hypertension in Jaipur (Gupta et al) where it was 55%. In Chennai, Ramachandran et al (2003) found that prevalence to be 39%. This was obvious as the study population in Jaipur (Punjabi Bhatiya community) and the Chennai urban community had different lifestyle and dietary habits.

In the present study the prevalence of Impaired Glucose Tolerance is 24.1%. The prevalence among males are 25% and among females are 23%. Impaired fasting glucose value ≥ 110 mg/dl was taken as a cut off value. Reports from Chennai (Ramachandran et al) show prevalence is 5% and report from Jaipur (Gupta et al) showed prevalence of 25% which was closer to the prevalence of Ranchi. Both of them used the same ATP III definition.

The prevalence of hypercholesterolemia (total cholesterol ≥ 250 mg/dl) is 12.4 %(21/170). Prevalence among men is 17.7 %(17/96) and prevalence among women is 5.4 %(4/74). Rajeev Gupta, Mukesh Sarna et al in their studies on north Indian Bhatiya community used cut off levels to define hypercholesterolemia as ≥ 200 mg/dl. They found the prevalence among men is 33.2% and among women is 28.9%. This fact is understood by the use of low cut off levels.

After the analysis of data, the results showed that 35 out of a total 170 study subjects were diagnosed as cases of metabolic syndrome based on the NCEP ATP III diagnostic criteria. It is concluded that the prevalence (%) of metabolic syndrome in Ranchi is 20.6 %. The results obtained by Ramachandran et al from Chennai (2003) showed that prevalence of metabolic syndrome in Chennai was 41%. For diagnosis he used a waist circumference that is appropriate for Indians. Gupta et al (2003) reported that the prevalence of metabolic syndrome was 13% in Jaipur. He used the standard ATP III definition of obesity which was similar to that used in the present study. He studied the age group 20 and above. Another study from Chennai by Deepa et al (2002) reported a prevalence of 11.2%. She used the European Group for the Study of Insulin Resistance (EGIR) criteria. Ranjita Mishra et al (2008) showed that the age adjusted prevalence of metabolic syndrome among Asian Indian immigrants in the US was 26.9% by the original NCEP ATP III criteria and 38.2% by the IDF criteria. Reports from the other countries have shown different rates of prevalence. According to Ford ES et al (2002), in the United States, the prevalence of metabolic syndrome increased from 24.1% in NHANES III to 27% in NHANES 1999-2000.

V. Conclusion

The data obtained after the study shows that one out of every five adults in Ranchi is at an increased risk of developing diabetes and/or cardiovascular disease. Women are equally prone as men. Results show a shift toward a sedentary lifestyles, alcoholism and smoking.

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