

Prevalence of Metabolic Syndrome in a Rural Population of India – A Pilot Study



Medical Science

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ABSTRACT

Metabolic syndrome (MS) refers to a cluster of features conferring the risk for cardiovascular disease and type 2 diabetes mellitus. Considering the fact that the rural populations are adopting certain urban lifestyle changes, this study intended to estimate the prevalence of MS in the rural population of South India by three widely accepted criteria. The study population included 188 adults. Blood pressure, anthropometric measurements, fasting blood sugar (FBS) and lipid profile were measured. This study identified MS as 6.9%, 22.9% and 16.5% by WHO, AHA/NHLBI and IDF criteria respectively. In males, the prevalence was 11.4%, 25% and 17%; in females, the prevalence was 3%, 21% and 16%.

INTRODUCTION:

The metabolic syndrome (MS) a cluster of visceral obesity, dyslipidaemia, hyperglycaemia, and hypertension has become one of the major public-health challenges worldwide.¹ Prevalence of the MS varied with the populations as the individual components of the syndrome varied. Differences in genetic background, diet, levels of physical activity, population age, gender proportion and nutrition influence the prevalence of both the metabolic syndrome and its components. Epidemiological studies have recorded a high prevalence of metabolic syndrome among Indians escalating the tendency to develop type 2 diabetes mellitus (T2DM) and coronary heart disease (CHD), the cause has been attributed to shift in lifestyle due to economic growth, affluence and urbanization.²

Life styles in rural areas are also been affected variedly by the above said factors. With this rationale, an effort to identify MS, this pilot study was undertaken in the rural population of our study field area, which is located in the outskirts of the state capital, Bangalore.

Since the prevalence of the MS varied with the criteria, prevalence was established using the three widely accepted criteria namely, WHO, American Heart Association (AHA/NHLBI) statement and International Diabetes Federation (IDF) criterias.³⁻⁶ Statistical comparisons were attempted to find the appropriateness of the cut-offs of the MS components for the study population.

MATERIALS AND METHODS:

This pilot study was undertaken by the Department of Community Medicine and Department of Biochemistry, M S Ramaiah Medical College at Kaiwara, the Rural Health training area of the college situated in the outskirts of Bangalore, the state capital in South India. The study obtained the approval of the institutional ethics committee and a written informed consent was obtained from all the study subjects (n=188). Blood pressure and anthropometric measurements were taken using calibrated standard instruments.⁷ The anthropometric measurements included weight, height, waist circumference (WC) and hip circumference (HC).

A blood samples were collected after an overnight fasting of 8-12 hours in gel vacutainers. Serum was separated and stored at 2-8°C in refrigerators and then transported with ice packs to the M S Ramaiah Hospital laboratory for the estimation of fasting blood sugar (FBS) and lipid profile. Assays were carried out on *cobas® 6000* analyzer using dedicated reagents. The data obtained was analyzed using SPSS. MS subjects were identified by WHO, AHA/NHLBI and IDF criteria. The proportions of MS subjects were compared between the criteria and the genders using chi-square test. p value <0.05 was considered as significant.

RESULTS:

The details of the criteria adopted in this study are shown in table 1. Of the 188 subjects who participated in the study, 88 were males and 100 were females. The analysis of the data is shown as table 2.

This study identified MS as 6.9%, 22.9% and 16.5% by WHO, AHA/NHLBI and IDF criteria respectively. In males, the prevalence was 11.4%, 25% and 17%; in females, the prevalence was 3%, 21% and 16%. The proportion of metabolic syndrome was highest by AHA/NHLBI (22.9%) criteria and it was statistically highly significant from WHO criteria.

AHA/NHLBI and IDF had higher proportion of subjects with low HDL and hypertension which was highly significant. It was also noted that AHA/NHLBI and IDF significantly identified high proportions of subjects with hyperglycemia. But, the proportion of obese individuals identified by WHO criteria was higher than other criteria and was statistically highly significant.

Similar analyses in male subjects showed WHO criteria identified more male obese individuals. There were more male hypertensives by AHA/NHLBI and IDF criteria. Metabolic syndrome was found to be significantly high in men by AHA/NHLBI criteria against the WHO criteria.

Comparison in female subjects yielded a similar pattern to that of males with respect to hypertension. But, the proportion of low HDL subjects was more with AHA/NHLBI and IDF criteria which was highly significant. Interestingly, WHO criteria had identified very low proportion (3%) of metabolic syndrome women compared against other two criteria and the difference was highly significant.

Gender differences in individual criteria showed that in WHO criteria, proportion of men was found to be more and statistically significant with respect to hypertriglyceridemia, obesity and metabolic syndrome. In AHA/NHLBI and IDF criteria only the proportion of hypertriglyceridemia men was more which was just significant and rest of the components did not shown statistically significant difference between the genders.

DISCUSSION:

Studies have revealed that South Asians are at high Cardio metabolic risk, due to rapid nutritional and lifestyle changes happening in urbanized areas in various countries in South Asia.⁸ Further, a study on Indian tribal population has shown that, the traditional societies like tribes are also not devoid of the risk for metabolic syndrome.⁹ With the percolation of elements of urbanization into the rural society, rural population can also be at risk for metabolic syndrome.

Therefore, with this background a pilot study was launched on MS as a part of our project on NCD in the rural area to estimate the burden of the metabolic syndrome.

This study identified MS as 6.9%, 22.9% and 16.5% by WHO, AHA/NHLBI and IDF criteria respectively. The Chennai Urban Rural Epidemiology Study (CURES), a large cross-sectional study done in Chennai a metropolitan city in South India, the population of which is racially closer to the present study population showed the prevalence of MS as 23.2%, 18.3% and 25.8% by WHO, ATPIII and IDF criteria respectively.¹⁰ Rural-urban

population difference may be the possible reason for the lesser prevalence of MS in the present study compared to CURES. Another study on rural population in central India also observed low levels of metabolic syndrome (9.3%) confirming rural urban difference.¹¹

This study noticed a male preponderance in the prevalence of MS by all the three criteria and it was statistically significant only by WHO criteria. Since the cut offs are tailored for genders statistically significant difference should not be present between the genders, in this regard WHO criteria needs the revision. A study in rural population that employed ATP-III criteria showed the prevalence of metabolic syndrome as 17.6% in men and 16.8% in women.¹² However, situation is not same in urban population. Gupta et al in their study on urban population have showed that prevalence was 22.9% in men and 39.9% in women.¹³

This study denotes that due to lower cut offs for hyperglycemia and hypertension in AHA/NHLBI criteria, the number of MS increased in both males and females. Also, gender differences were not statistically significant between the genders. Therefore, AHA/NHLBI criteria modified for South Asian population is appropriate for Indians and may be considered for further studies on MS. Since this was a pilot study, sample size was the limiting factor.

CONCLUSION:

The present study showed a considerable amount of prevalence of MS, though not to the extent of urban population shown in the other studies. The prevalence of MS differed with the criteria and the prevalence was comparatively high in the males. These findings may suggest the need for the interventional measures for the rural population also. Finally, AHA/NHLBI criteria eliminate the gender bias and with its lower cutoffs for Asian population may be appropriate to elicit MS in Indian population.

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Tables

Table 1: Shows various components of the metabolic syndrome criteria with respect to south Asian population

Criteria	Gender	Dyslipidemia		Hypertension (mm of Hg)	Hyperglycemia FBS (mg/dl)	Obesity	Cluster criteria
		TGL (mg/dl)	HDL (mg/dl)				
WHO	Males	≥150	<35	≥140 or 90	≥110	WH ratio >0.9	IFG with other 2 features
	Females	≥150	<39			WH ratio >0.85	
AHA/ NHLBI	Males	≥150	<40	≥130 or 85	≥100	WC ≥90	Any 3 of the 5 features
	Females	≥150	<50			WC ≥80	
IDF	Males	≥150	<40	≥130 or 85	≥100	WC ≥ 90	Increased WC with any other 2 features
	Females	≥150	<50			WC ≥80	

WH ratio: waist hip ratio, WC ratio: waist circumference, IFG: impaired fasting glucose, TGL: triglycerides, HDL: high density lipoproteins

TABLE 2: Comparison of the proportion of subjects who are characterized with the various components of metabolic syndrome under WHO, AHA/NHLBI and IDF criteria

Components		WHO (n=188) No[%]	AHA/NHLBI (n=188) No[%]	IDF n=188 No[%]	p value WHO vs AHA/ NHLBI	p value WHO vs IDF	p value AHA/NHLBI vs IDF
Hyperglycemia	Males	10 [11.4]	16 [18.2]	16 [18.2]	0.20	0.20	-
	Females	6 [6.0]	12 [12.0]	12 [12.0]	0.13	0.13	-
	Total	16 [8.5]	28 [14.9]	28 [14.9]	0.05	0.05	-
	p value#	0.18	0.23	0.23			

Hypertriglyceridemia	Males	36 [40.9]	36 [40.9]	36 [40.9]	-	-	-
	Females	27 [27.0]	27 [27.0]	27 [27.0]	-	-	-
	Total	63 [33.5]	63 [33.5]	63 [33.5]	-	-	-
	p value#	0.04	0.04	0.04			
Low HDL	Males	48 [54.5]	59 [67.0]	59 [67.0]	0.08	0.08	-
	Females	46 [46.0]	79 [79.0]	79 [79.0]	<0.01	<0.01	-
	Total	94 [50.0]	138 [73.4]	138 [73.4]	<0.01	<0.01	-
	p value#	0.24	0.06	0.06			
Hypertension	Males	12 [13.6]	24 [27.3]	24 [27.3]	0.02	0.02	-
	Females	12 [12.0]	24 [24.0]	24 [24.0]	0.02	0.02	-
	Total	24 [12.8]	48 [25.5]	48 [25.5]	<0.01	<0.01	-
	p value#	0.73	0.60	0.60			
Obesity	Males	52 [59.1]	21 [23.9]	21 [23.9]	<0.01	<0.01	-
	Females	39 [39.0]	29 [29.0]	29 [29.0]	0.13	0.13	-
	Total	91 [48.4]	50 [26.6]	50 [26.6]	<0.01	<0.01	-
	p value#	<0.01	0.42	0.42			
MS	Males	10 [11.4]	22 [25.0]	15 [17.0]	0.02	0.28	0.19
	Females	03 [3.0]	21 [21.0]	16 [16.0]	<0.01	<0.01	0.36
	Total	13 [6.9]	43 [22.8]	31 [16.5]	<0.01	<0.01	0.11
	p value#	0.02	0.51	0.84			

p value by chi squared test, p value#:males vs females

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