ORIGINAL ARTICLE e-ISSN: 2349-0659 p-ISSN; 2350-0964

Prevalence of Metabolic Syndrome in Local Population of Indore According to IDF Criteria

Sadhna Sachdeva[1]*, Anand Kar[2], Kiran Billore[3]

Abstract

Abdominal obesity, insulin resistance, hypertension, and hyperlipidemia, all being non-communicable diseases (NCD) are the major health issues of the modern world. Present day has led to these pathological conditions known as metabolic syndrome. The prevalence of metabolic syndrome(MeS) greatly increases in urban population. The syndrome includes cardiovascular diseases, type 2 diabetes, and thyroid abnormalities. A cross-sectional survey was conducted for the prevalence of metabolic syndrome among 438 participants of Indore, Madhya Pradesh India. A pre-designed questionnaire was used to collect data, including demographic information; anthropometric and biochemical parameters from their medical reports. Using criteria of International Diabetes Federation (IDF), MetS was seen in 43.3% of subjects with a mean age of 50.53 yr consisting of 55% males and 45% females. The age-specific prevalence of MetS was observed more in the older group. Physical inactivity was found to be the major causative factor for this MetS. It can be improved by encouraging the patients to adopt a healthy lifestyle with the emphasis on regular physical activity and modifications of food habits.

Keywords: Cardiovascular diseases; Lifestyle; Metabolic syndrome; NCD; Physical activity.

Asian Pac. J. Health Sci., **(2022); DOI:** 10.21276/apjhs.2022.9.4.77

Introduction

A metabolic disorder is a non-communicable disease recognized by a cluster of factors, namely central obesity, glucose intolerance, low HDL (high-density lipoprotein) cholesterol, high triglycerides (TG), and systemic Hypertension[1]. The simultaneous presence of three or more of these factors has been termed as the metabolic syndrome (MetS) and is known to promote the development of cardiovascular diseases and type 2 diabetes[2]. The prevalence of MetS globally ranged from 10% to 84%, determined by gender, age, race, ethnicity, and area of residence (urban and rural) of the population examined,[3].

The International Diabetes Federation (IDF) estimates that one-quarter of the world's adult population has the MetS[4]. A sedentary lifestyle, higher socioeconomic status, and high body mass index were related to MetS[5]. It is thought that the differences in genetic background, diet, amounts of physical activity, smoking, family history of diabetes, all are known to influence the prevalence of the MetS [6].

This often predicted that about one-third of the urban population in India's major cities may have metabolic syndrome[7,8]. It was reported that the prevalence of MetS in Indian adults ranged from 11% to 56%[9,10]. However Indore, Madhya Pradesh (central part of India), has never been covered by any epidemiologist according to IDF criteria. Therefore, in th present study an attempt made to conduct an investigation on MetS.

Materials And Methods

Study Participants and Data Collection

The current cross-sectional study was conducted in Indore (Madhya Pradesh, India). A total of 438 subjects (197 females and 241 males) who were above 18 years of age and those without any critical illness participated in the study. Pregnant women, and lactating women, were excluded from the study.

[1]Government College Kaytha, Ujjain, Madhya Pradesh, India.

[2]School of Life Sciences, DAVV, Indore, Madhya Pradesh, India.

[3]Government Holkar Science College, Indore, Madhya Pradesh, India.

Corresponding Author: Sadhna Sachdeva, Govt. College Kaytha, Ujjain. E-mail: sadhna8.notwani@gmail.com

How to cite this article: Sachdeva S, Kar A, Billore K. Prevalence of Metabolic Syndrome in Local Population of Indore According to IDF Criteria. Asian Pac. J. Health Sci., 2022;9(4):410-413.

Source of support: Nil

Conflicts of interest: The authors declare no potential conflicts of interest with respect to research, authorship and/or publication of this article.

Received: 01/01/2022 **Revised:** 11/02/2022 **Accepted:** 23/03/2022

The information about the demographic, anthropometric profile (height, weight, and waist circumference), and pathological (blood pressure, fasting blood sugar, waist circumference, TG, and HDL) parameters were collected from the subjects on a pre-designed questionnaire. All the participants were explained the nature of the study in a language they understand easily. Ethical consideration was undertaken and informed consent was obtained from the patients. The clinical diagnosis was not performed by us but the information was collected from their recent medical reports.

Metabolic Syndrome Identification

For the present study, International Diabetes Federation (IDF) criteria were considered to measure the presence of the metabolic syndrome. The definitions and cut-offs are as follows

The new IDF definition for the metabolic syndrome included central obesity (ethnic-specific for South Asians, ≥ 90 cm and ≥ 80 cm for male and female, respectively) with any other two of the following four factors:

Raised triglycerides	(>150 mg/dL or 1.7mmol/L)*
Reduced HDL cholesterol	<40 mg/dL (1.03mmol/L) in males*
	<50mg/dL (1.29mmol/L) in females*
Raised blood pressure	SBP >130 mm Hg* or
	DBP >85 mm Hg*
Raised fasting plasma glucose	>100mg/dL (5.6 mol/L)*

*According to IDF

Statistical Analysis

The data were summarized as frequencies and percentages by using an online available chi-square test calculator. A *P*-value of <0.05 was considered statistically significant.

Results

Out of 438 cases of the total studied population, (231 males and 197 were females), 190 were found to have metabolic syndrome *i.e.* 43.37% prevalence according to IDF criteria. In 190 positive patients age range was 20-79 years (mean age 55.79±0.86 yr) consisted of 70(37%) males and 120(63%) females. The prevalence of disease in males and females is 29% (70/231) and 61% (120/197) respectively. The maximum number of patients were in the age group of 40-49 years (128/438, 29%) and 50-59 years (111/438, 25%) followed by 60-69 years (65/438, 14%) and 30-39 year (57/438, 13%) age groups. Minimum number of patients were in 70-79 and 20-29 years age groups (41/438, 9% and 32/438, 7%) respectively [Figure 1]. Metabolic syndrome was significantly more common in females than in males (x^2=44.81, p <0.00001).

Among the affected individuals maximum number of patients were there in the age group of 40-49 years (63/190, 33% followed by 50-59 years (57/190, 30%), >60-69 years (25/190, 13%), >70-79 years (19/190, 10%), and >30-39 year (18/190, 9.5%). The minimum number of patients was in the age group of <30 years (9/190, 4.73%) [Figure 2].

It was analyzed that in the entire studied population the major component of metabolic syndrome was central obesity (33%) followed by high fasting blood sugar (32%), high triglycerides (23%), high blood pressure, and low HDL (21.6% each) [Table 1].

MetS-Metabolic Syndrome, BP-Blood Pressure-Fasting Blood Sugar, WC-Waist Circumfernce,TG-Triglyceride,HDL-High Density Lipoprotein.

Fasting blood sugar (44% *vs* 22.4%), central obesity (44.6% *vs* 24%) and increased TG (30% *vs* 17%) were significantly higher in female patients. Although high blood pressure (25.8% *vs* 18%) and low HDL (22% *vs* 21%) were also high in females, their prevalence was not statistically significant (p > 0.05).

In metabolic syndrome diagnosed individuals decreasing order of prevalence in different age groups was 30.15% in 40-49 years, >30% in 50-59 years, >13% in 60-69 years, >10% in 70-79 years, >10% in 30-39 years and 4% in 20-29 years. The prevalence of metabolic syndrome is significantly high in females compared to males (X^2=44.81, p<0.00001).

In affected individuals prevalence of metabolic syndrome components in decreasing order is central obesity (76.8%) >increased fasting blood sugar (74%) >high triglycerides (53%) >high blood pressure and low HDL (50-50% both) [Table 2].

Age and sex-wise distribution of all metabolic syndrome positive cases have been shown in Table 3.

The prevalence of all the components of metabolic syndrome was more common in >40 years than <40 years of people in both genders. The prevalence of high blood pressure, fasting blood sugar, central obesity, high TG and low HDL among males of age >40 vs <40 years were 14.5% vs 3%, 17.8% vs 4%, 19.5% vs 4%, 15.7% vs 3% and 17% vs 4% respectively. Similarly in females the prevalence

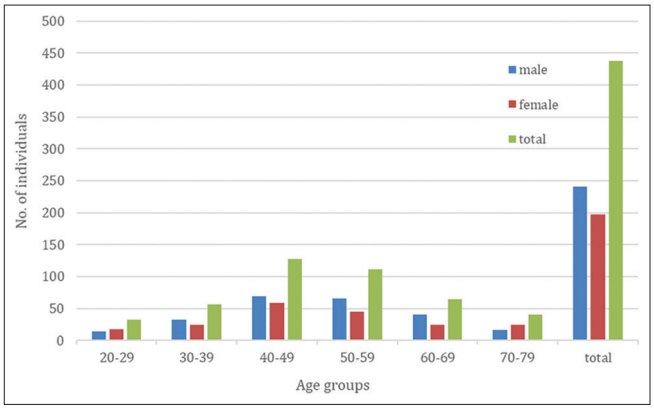

Figure 1: Gender and age group distribution of total subjects (n=438)

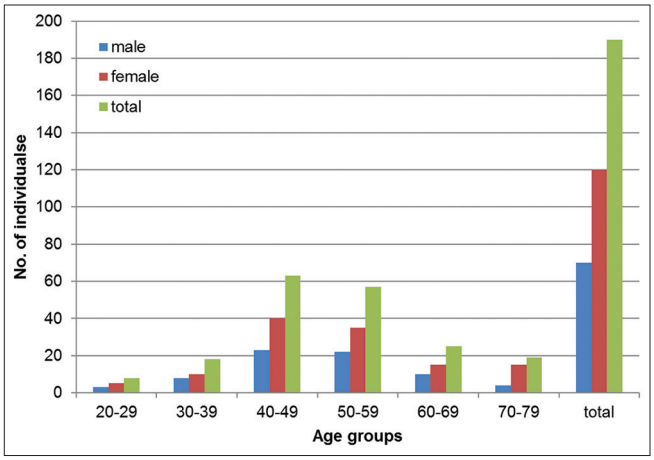

Figure 2: Gender and age group distribution of total subjects suffering from MetS (n=190)

Table 1: Prevalence of components of Metabolic syndrome in the study population (n=438)

Parameters of MetS	*Male (n=241), N(%) (+Ve)*	*Female (n=197) N(%) (+Ve)*	*Total (n=438) N(%) (+Ve)*	X^2	*p - value*
BP	44 (18)	51 (25.8)	95 (21.6)	7.32	0.00678
FBS	54 (22.4)	87 (44)	141 (32)	26.38	0.00001
WC	58 (24)	88 (44.6)	146 (33.3)	20.7	0.00001
TG	41 (17)	60 (30)	101 (23)	11.04	0.00089
HDL	51 (21)	44 (22)	95 (21.6)	0.08	0.766944

Table 2: Prevalence of components of Metabolic syndrome among the subjects of metabolic syndrome

Components of Metabolic syndrom	*Male (n=70), N(%) (+Ve).*	*Female (n=120) N(%) (+Ve)*	*Total (n=190) N (%)*	X^2	*P Value at P<0.05*
BP	44 (62.8)	51 (42.5)	95 (50)	7.32	0.006
FBS	54 (77)	87 (72.5)	141 (74)	0.49	0.480
WC	58 (82.8)	88 (73.3)	146 (76.8)	2.25	0.133
TG	41 (58.5)	60 (50)	101 (53)	1.30	0.253
HDL	51 (72.8)	44 (36.6)	95 (50)	23.16	0.000

Table 3: Prevalence of metabolic syndrome components in different age groups (gender wise)

MetS	*20-29 Years*		*30-39 Years*		*40-49 Years*		*50-59 Years*		*60-69 Years*		*70-79 Years*		*Total*	
Parameters	*M*	*F*	*M*	*F*	*M*	*F*	*M*	*F*	*M*	*F*	*M*	*F*	*M*	*F*
BP														
Positive	1	2	7	2	13	15	12	15	7	8	4	9	44	51
Negative	2	3	1	8	10	25	10	20	3	7	0	6	26	69
FBS													0	
Positive	3	2	8	5	18	30	16	30	6	10	3	10	54	87
Negative	0	3	0	5	5	10	6	5	4	5	1	5	16	33
WC													0	
Positive	3	2	8	6	20	30	18	30	6	10	3	10	58	88
Negative	0	3	0	4	3	10	4	5	4	5	1	5	12	32
TG													0	
Positive	0	1	3	3	15	20	15	20	5	8	3	8	41	60
Negative	3	4	5	7	8	20	7	15	5	7	1	7	29	60
HDL													0	
Positive	3	1	7	2	18	15	15	10	5	8	3	8	51	44
Negative	0	4	1	8	5	25	7	25	5	7	1	7	19	76

of high blood pressure, fasting blood sugar, central obesity, high TG and low HDL among age of >40 vs <40 years were 24% vs 2%, 30% vs 3.5%, 30% vs 4%, 28% vs 2% and 21% vs 1.5% respectively.

Discussion

In this study, the prevalence of MetS in a local population of Indore (Madhya Pradesh, India) using the IDF criteria was determined. The study also confers the ability to identify the most common component of MetS in males and females of the local population. Results of this study indicated that, depending on the participants and criteria used, the prevalence of MetS ranged from 11%-56%, nearly similar to an earlier report[11] and it is higher in urban area. Researchers have found varying prevalence rate in different parts of the country.In Indore, we found,out of 438 participants, 43.37% suffered from MetS as per IDF criteria.[12], some what near to the observations of earlier.

Misra *et al*. reported [12]44.6% of the participants in the urban area of West Bengal having MetS. According to Kaushal *et al*.[13], 37.1% of study participants living in the urban area of Agra have MetS. Prasad *et al*.[14] in their study reported the prevalence of MetS as 43.2% in the eastern part of coastal India. Other researchers have also found similar results in various parts of India[15,16,17].

Compared to males,the prevalence of MetS was found to be higher in females across the world[8]. In our study also, the prevalence of MetS was significantly higher in females (29% vs 61%, x^2=44.81). Similar results were also found earlier[14] where 34.25% vs 52.2% were reported in in eastern India. This observed higher prevalence of MetS in females might be due to gender bias in MetS characterization in waist circumference and, HDL value[18] Harmonal deficiency and menopause might also be because of the prevalence of MetS in females.

The maximum numbers of cases of MetS were in the age range of 40-49 years,followed by 50-59 years. About 80% of patients of MetS were above 40 years, that is similar to the earlier studies[14,15,19], which also reported nearly 95% of cases were above 40 years in the Gwalior region of India. It is obvious that with passing decades the incidence of various components of MetS increases.

In the present study, the prevalence of components of MetS in the total study population in decreasing order was central obesity (33%), high fasting blood sugar (32%), high triglycerides (23%), high blood pressure, and low HDL (21.6% each) Khan *et al*.[15] reported the prevalence of components of MetS in decreasing order was high blood sugar (29.2%), high TG (19.7%), central obesity (19.5%), high blood pressure (18.3%) and low HDL in 18.3% of cases.However Prasad *et al*.[14], reported the prevalence of the components of MetS as high blood pressure 63.11%, Obesity 48.9%, low HDL 46.9%, high TG 37.7%, and fasting blood sugar 31.2%. This may be noted that the spectrum of prevalence in our study seems completely different from the above-mentioned eastern Indian study. It may be due to different study populations and the use of different criteria for MetS. Although all the components of MetS were more prevalent in females of our study, only central obesity, hyperglycaemia, and high TG were significantly higher than males. In previous study it has been reported that central obesity and low HDL were more common in females where as blood pressure and TG were more common in males, rendering them to be more susceptible to heart attacks[20]. However, we did not find such differences between the two genders.

The prevalence of components of MetS among diagnosed individuals in decreasing order was central obesity (76.8%) >increased fasting blood sugar (74%)>high TG (53%) >high blood pressure & low HDL (50-50% both) [Table 2].[19] Yadav *et.al*. reported the prevalence of components among the patients of MetS with reported Diabetes mellitus (as per IDF definition) as follows: central obesity (87%) >high blood pressure (69%) >low HDL (59%) and high TG (44%).

The higher prevalence of central obesity in our study might be because of the IDF criteria used in the study (waist circumference 90 cm in males and 80 cm in females). Among its patients' high blood pressure and low HDL were equally distributed in both sexes, however, the rest of the three components were significantly high in females. In other studies, high blood pressure and low HDL were significantly higher in males is compared to females[15] Khan Y *et al*. 2018 in contrast to our study where central obesity, high triglycerides, and high fasting sugar were significantly higher in MetS positive females.

Conclusion

In this study, it is reported that according to IDF criteria the prevalence of MetS in a local population of Indore (Madhya Pradesh, India) is 43.37%. Although MetS is found more prevalent in the age group above 40 years in both genders, it starts increasing from the younger age. The female population was found to be more affected in having a higher ratio of hyperglycaemia,obesity, and high TG than males.It is therefore suggested that people should be more careful,particularly the females from healthcare point of view.

Acknowledgements

We would like to thank the people who participated in this study and give their consent.We also thankful to Dr.Jayesh Vaishnav,Dr. Manish Kumar Sharma and Dr.Lata Sunhare for their support.

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