Original Article

Prevalence of Metabolic Syndrome among the Patients Attending for Master Health Check-up in Family Medicine Department

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ABSTRACT:

Introduction: Metabolic syndrome (MetS) is a cluster of conditions that occur together, increasing risk of heart disease, stroke and type 2 diabetes. The prevalence of MetS is increasing worldwide. The aim of the study is to determine the prevalence of MetS among patients attending for Master Health check-up at Family Medicine outpatient department, to find out common component and see the association of body mass index with MetS.

Methods: This cross-sectional observational study was done at family medicine outpatient department over a period of six months. There were total of 854 participants involved in the study and each subject was interviewed, anthropometric measured, biochemical parameter recorded in the Performa. The MetS was diagnosed according to modified National Cholesterol Education Program Adult Treatment Panel III (NCEP-ATP III) criteria.

Results: The MetS was diagnosed in 53.9 %(95% CI:50.56%-57.24%)of the study population on the basis of modified NCEP-ATP III criteria, with prevalence significantly higher among males (58.3%) than in females (48.6%)(P value <0.01). Abdominal obesity (70.7%) was the most common morbidity followed by increased fasting blood sugar (57.1%), high level of triglyceride (45.4%), high blood pressure (45.0%) and low level of high density lipoproteins (41.0%). Prevalence of metabolic syndrome was significantly (p-value=0.000) high among obesity (82.5%) and overweight (67.6%) individuals than those with normal weight (38.7%) and under-weight (7.1%).

Conclusion: The metabolic syndrome was seen in more than half of study population, with significantly higher among males than in females. The most common component in both genders was abdominal obesity. Presence of any one component should alert the primary care physician to look for other components so that definitive diagnosis can be made and timely intervention can be started with dietary measures, regular exercises and medical treatment.

Keywords: Metabolic Syndrome, Master Health Checkup, Body Mass Index.

Access this article Online	ArticleInfo.
QR Code	How to cite this article in Vancouver Style?
	Pant R, Lamsal DK, Dahal SC, Shankhadev R, KC D, Panta G. Prevalence of Metabolic Syndrome among the Patients Attending for Master Health Check-up in Family Medicine Department. Journal of Karnali Academy of Health Sciences. 2021; 4(1)
	Received: 25 September 2020 Accepted: 20 April 2021 Published Online: April 21. 2021
	Source of Support: Self Conflict of Interest: None

INTRODUCTION

Metabolic syndrome (MetS) is a constellation of high blood pressure, hyperglycemia, obesity and dyslipidemia. Diabetes, hypertension and obesity are among of the top five continuing risk factors for cardiovascular deaths in the world. Obesity is increasing substantially and is one of the major contributors of disease prevalence due to its patho-physiological link to other cardiovascular risks such as hypertension and diabetes.[1]

The World Health Organization describes MetS as the presence of type 2 diabetes or impaired glucose tolerance with any two of the following characteristics: obesity, high level of triglycerides, low level of high-density lipoprotein, and hypertension. The International Diabetes Federation (IDF) takes central obesity as a prerequisite for the diagnosis of MetS with the association of any two of the other factors that is high blood pressure, abnormal blood glucose, high levels of triglycerides, and low level of high-density lipoprotein. Also, the IDF has derived specific reference values for central obesity for different ethnicities.

The National Cholesterol Education Programme (NCEP) expert panel on detection, evaluation and treatment of high blood cholesterol in adult (adult treatment panel, or ATP III)[2], the International Journal of hypertension Heart, Lung and Blood Institute, and the American Heart Association[3] have released a report on the criteria for diagnosing and managing MetS. The panel describes MetS as the presence of any three of the following: abdominal obesity, dyslipidemia (high levels of triglycerides, low HDL), increased blood pressure, and elevated fasting glucose. Each criteria make use of different parameters with different cut offs. A modified NCEP-ATP III criterion is widely used in most of the epidemiological studies has been extensively reviewed and accepted by the greatest number of researchers. It is feasible to carry out among different population. It gives opportunity for early patient identification and education on proper health behavioral changes implicated in the development of the cardiovascular diseases.

For the purpose of this paper, the modified ATP III definition is used. Each component of MetS is known risk factor for the development of type 2 diabetes, atherosclerosis, and coronary artery disease (CAD). People with MetS are 3-10 times more likely to develop cardiovascular disease commensurate with a high risk of morbidity and mortality.[4,5] Central obesity, one of the components of MetS, predicts the occurrence of diabetes and overall cardiovascular risk.[6] The prevalence of MetS is increasing all over the world with different regions having individual clusters of epidemic risk factors[5,7] and in particular there is evidence of a high prevalence of MetS and diabetes in South Asians. However, in developing countries, many of these subclinical conditions are not diagnosed until the onset of complications such as myocardial infarction or stroke.[8] It is essential to initiate early detection of these chronic diseases in underdeveloped countries in Asia, such as Nepal, so that preventive action can minimize the consequences.

Worldwide prevalence of MetS ranges from <10% to as much as 84%, depending on the religion, urban-rural environment, composition (sex, age, race, and ethnicity) of the patient, and the definition used.[9] Regardless of the existing controversies in diagnosis and definition, MetS is still considered to be a useful diagnostic tool in primary care prevention.

Master health checkup is a form of preventive medicine practice which involves visit of an individual to health care provider, physical examination, baseline biochemical, hematological, and radiological assessment and consultation regarding the general health conditions.[10] The outcome of undergoing master health checkup will diagnose the non-communicable disease and enables to intervene by lifestyle modification, dietary changes and if necessary therapeutic intervention. There are only few studies done in the prevalence of MetS among master health checkup subjects. With this present background the present study aims to determine the prevalence of MetS among the patients attending for Master Health

check-up in Family Medicine out patients department and the specific objectives are to find out the prevalence of components of the MetS and see the association between Body Mass Index and MetS.

MATERIALS AND METHOD

This present study is a cross-sectional observational study done at the family medicine outpatient department of Civil Service Hospital Kathmandu Nepal, over a period of six months (July 1st 2019 to December 31st 2019). Ethical clearance was taken from the Institutional Research committee (IRC) of Civil Service Hospital; Kathmandu Nepal. Study subjects include both males and females of 20 years and above on age, came for master health checkup and fit the criteria. Each subject interviewed, anthropometric measured, biochemical parameter recorded in the Performa. Physical parameters like blood pressure, height by height scale measured in centimeter, weight by weighing machine in kilograms, waist circumference by inch tape in centimeters. The MetS is diagnosed when a patient had at least three of the five conditions from modified National Cholesterol Education Program Adult Treatment Panel III (NCEP-ATP III) criteria.

1. Central Obesity: Waist circumference ≥ 90cm in Asian male or ≥80cm in Asian female.
2. Hypertriglyceridemia: Triglyceride ≥150mg/dl or on specific medication.
3. Low HDL cholesterol: <40mg/dl in male or <50mg/dl in female or on specific medication.
4. Blood pressure: Systolic blood pressure ≥130mmHg or diastolic blood pressure ≥85mmHg or on specific medication.
5. Fasting plasma glucose ≥ 100mg/dl or on specific medication or previously diagnosed diabetes.

Body mass index (BMI) was calculated by dividing the weight in kilograms by the square of height in meters (kg/m^2). Data was entered in MS Excel and analyzed by Statistical Package for the Social Sciences (SPSS 16).

Obesity level classification based on body mass index – WHO's criteria:

Body Mass Index (kg/m^2)	Classification
<18.5	Low weight
18.5-24.9	Normal weight
25-29.9	Overweight
≥30	Obesity

Biochemical analysis:

Peripheral venous blood samples were collected after an overnight fasting. Serum was separated by centrifuging at 4000 rpm for 15 min. Blood glucose was estimated by hexokinase method on DXC AU700 analyzer. High density lipoprotein (HDL) and triglycerides (TG) were estimated by enzymatic method on DXC AU700 analyzer.

RESULTS

There were total of 854 participants involved in this study, among which males were 467(54.7%) and female 387(45.3%). About one third (34.54%) of the participants were below 40 years and two third (65.46%) of the participants were above 40 years of age. The mean ± standard deviation age of study population was 44.61± 12.68 years with minimum age of 20 years and maximum age was 80 years. More than half of the study population was overweight (41.9%) or obese (9.4%), while normal weight and underweight were 45.40% and 3.30% respectively. There was higher proportion of obesity and overweight in female (53.74%) in comparison with male (49.24%) and more normal weight participants were male. The mean ± standard deviation BMI of study population was 25.16± 3.75kg/m^2.

Table 1: Prevalence of metabolic syndrome

Metabolic Syndrome	Frequency	Percentage
Present	460	53.9
Absent	394	46.1

Table 2: Metabolic Syndrome and Gender

Gender	No MetS	MetS	P value
Females	199(51.4%)	188(48.6%)	<0.01
Males	195(41.7%)	272(58.3%)	

MetS: Metabolic syndrome

The MetS was diagnosed in 53.9 %(95% Confidence Interval: 50.56%-57.24%) of the study population on the basis of modified NCEP-ATP III criteria, with prevalence significantly higher among males with 58.3 %(95% CI: 56.62%-59.98) than in females with 48.6 %(95% CI: 45.25%-51.95%) (P value <0.01). There was 35.25% prevalence of MetS among below 40 years age group, while above 40 years showed 63.68% over all prevalence. When the entire study participants were further analyzed for presence of different components of MetS, abdominal obesity (70.7%) was the most common morbidity followed by increased fasting blood sugar (57.1%), high level of triglyceride (45.4%), high blood pressure (45.0%) and low level of high density lipoproteins (41.0%).

Among all MetS population in our study 77.39% of them were above 40 years of age and only 22.60% of them were below that age. Age group of 50 to 59 years showed the highest prevalence of MetS (69.1%) while 20 to 29 years showed lowest (24.6%). This showed the prevalence of MetS raised with the increasing age up to 60 years. There is slight decline in frequency after 60 years (59.3%). There is significant relationship between age group and MetS. The Figure 1 also shows the prevalence of different components of MetS increases with increasing age.

Females showed a greater proportion of abdominal obesity (high waist circumference) and low HDL in comparison to males. However, there were males who showed high BP, high fasting blood sugar and high TG compared to females. Prevalence of metabolic syndrome was significantly (p-value=0.000) high among obesity (82.5%) and overweight (67.6%) individuals than those with normal weight (38.7%) and under weight (7.1%) individuals. More than four-fifth of the obese and more than two-third of the overweight individuals were suffering from metabolic syndrome establishing the importance of obesity in pathogenesis of this syndrome (Table 3).

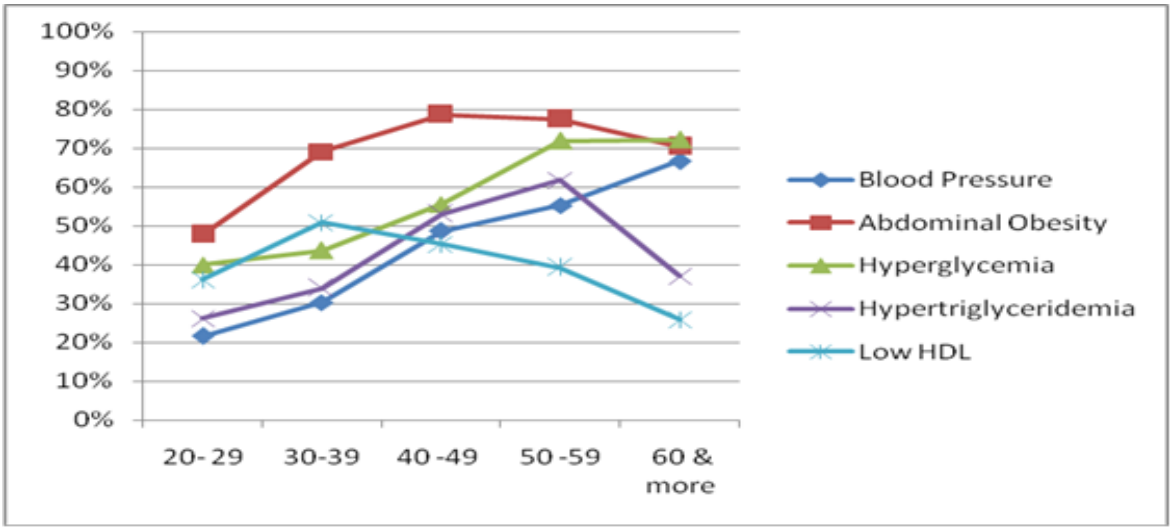

Figure 1: Prevalence of different components of metabolic syndrome with age groups.

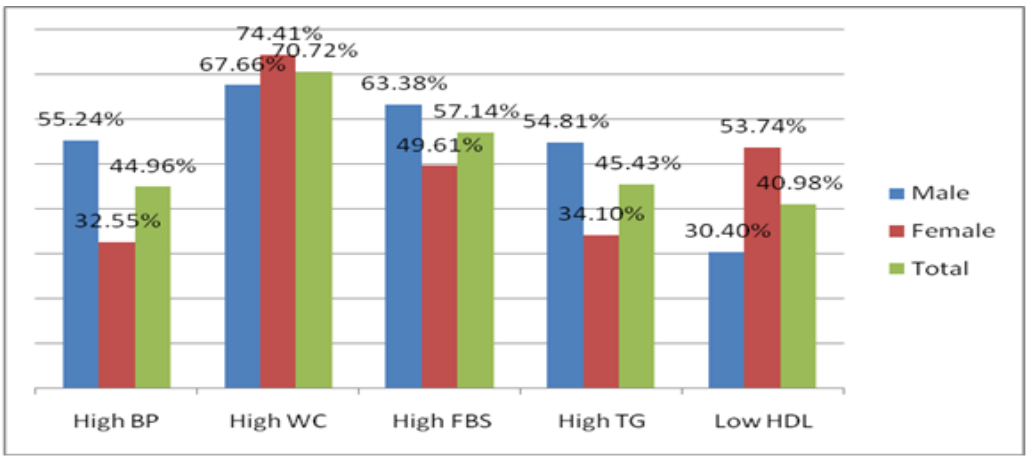

Figure 2: Bar diagram showing the components of metabolic syndrome with gender.
BP:Blood Pressure; WC: Waist circumference; FBS: Fasing blood Sugar; TG: Triglyseride; HDL: High density Lipoprotein

Table 3: BMI Category and Components of Metabolic syndrome

BMI Category	Component 0	Component 1	Component 2	Component 3	Component 4	Component 5
Under Weight	42.85% (12)	42.85% (12)	7.14% (2)	7.14% (2)	0	0
Normal Weight	10.82% (42)	23.19% (90)	27.31% (106)	22.68% (88)	10.82% (42)	5.15% (20)
Over Weight	0.55% (2)	6.14% (22)	25.69% (92)	31.84% (114)	28.49% (102)	7.26% (26)
Obesity	0	2.5% (2)	15% (12)	40% (32)	25% (20)	17.5% (14)

DISCUSSION

Present study showed the overall prevalence of MetS among the master health checkup subjects was to be 53.9 %, with 58.3% among males and 48.6% among the females according to modified NCEP ATP III criteria for Asian population. Similar study done in a teaching hospital of central Kerala[11] showed 76% of participants met the NCEP: ATP III criteria for MetS with prevalence among male was 80.4% and females 67.8%. Our study showed a very high prevalence of MetS in comparison with the community-based study done in eastern Nepal by Sharma SK et al [12], which showed a prevalence of 20.7% according to NCEP ATP III criteria. According to same criteria, 34.5% of the US adult population has been found to have metabolic syndrome.[13] In a hospital-based study done by Shakya D et al [14] showed 71% prevalence of MetS among the patients with Type 2 Diabetes. Most of the hospital based studies had showed higher prevalence of MetS in comparison with the community based study. This may be because people usually do not go to hospital unless they have noticeable medical problem. Also the modification of NCEP ATP III criteria for waist circumference in south Asian shows more prevalence of MetS in comparison to no modification on criteria.

The Indian Council of health Research task force collaborative study has revealed the prevalence of MetS in urban areas of Delhi to be 30% and 11% in rural Haryana using NCEP ATP III criteria. Using modified NCEP ATP III criteria, Ramchandra et al from Chennai have reported prevalence of 41% in urban areas among adults 20 to 75 years of age.[15] Our study showed 35.25%

prevalence of MetS below 40 years of age, while above that age showed 63.68% over all prevalence. This showed the prevalence of MetS raised with the increasing age up to 60 years. So it is imperative to undergo basic biochemical and anthropometric checkup in vulnerable age groups.

Our study showed abdominal obesity to be the commonest component of MetS, accounting for overall 70.7% of participants (67.66% of male & 74.41% of female). Similar result was seen in the study done at southern Srilanka, which showed raised waist circumference as most important predictor for MetS defined by all three World Health Organization (WHO), NCEP ATP III, and International Diabetes Federation (IDF).[16] Increased waist circumference is a strong indicator of central obesity and is a health risk factor. Specifically, waist circumference provides a simple and practical anthropometric measurement for assessing central adiposity, and an increasing number of studies are reporting strong associations between waist circumferences, visceral adipose tissue and obesity related health risks.[17] Second most common component encountered was increased fasting blood sugar or under medication for diabetes (57.1%), high level of triglyceride (45.4%), high blood pressure (45.0%) and low level of high density lipoproteins (41.0%). Thus, impaired lipid also seems to be a common problem. But individual components cannot singly predict MetS, hence one should actively look for all components.

In our study females showed a greater proportion of abdominal obesity (high waist circumference) and low HDL in comparison to males. However, there were males who showed high BP, high fasting blood sugar and high TG compared to females. Similar result has been showed in previous studies, reporting that central obesity and low HDL was more common in female and high blood pressure and triglyceride was more common in male patients, rendering the males to be more at risk for cardiovascular events. [18, 19]

In our obesity group all the participants had at least one or more components of MetS, while in underweight and normal weight category 42.85% and 10.82% of participants had no any components of MetS. In obesity category 17.5% of the participants had all five components of MetS, while it is seen on none of the individual from underweight category. Normal weight and overweight showed 5.15% and 7.26% respectively with all five components. It showed that the obesity is directly proportional to the number of components of MetS. In our study 14.8% of the participants had one component and 24.8% had two components of MetS. This group of population probably suffers from the syndrome within a short period if timely interventions are not taken and lifestyle is not changed. The number of components of MetS also shows evidence in the risk of development of cardiovascular diseases (CVD). Additionally, in our study 27.6%, 19.2% and 7% of study population had three, four and five components respectively. Only 6.6% of the total study population does not have any components of MetS.

The prevalence of MetS is increasing may be due to urbanization, high calorie diet and lack of physical activity. Primary care physician should be able to assess patient's knowledge about the relationship of their lifestyle to their health, and then provide a clear message about the importance of diet and exercise for their specific problem.

CONCLUSION

Metabolic syndrome is seen in more than half of study population with significantly higher among males than in females. There is higher proportion of obesity and overweight in females in comparison with male. The most common component of metabolic syndrome in both genders was abdominal obesity. Study showed that the obesity is directly related to the numbers of components of MetS. It is imperative to undergo basic biochemical and anthropometric checkup in vulnerable age groups. Presence of any one component should alert the primary care physician to look for other components so that definitive diagnosis can be made and timely intervention started. All the components can be controlled by

dietary measures, regular exercise and medical treatment.

Acknowledgement: The authors wish to thank all the participants who involve in study, family medicine OPD staff for their help in anthropometric measurement and data recording and finally IRC of civil hospital for approval and guidance to conduct this study.

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