Prevalence of Metabolic Syndrome and Its Components in Adults with Central Obesity at Janakpur Zone, Nepal

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ABSTRACT

Background: Urbanization, surplus energy uptake, decreased physical activities are general risk factors of metabolic syndrome However, it's status, and associated components remain unexplored in the Terai region of Nepal. This study evaluated the prevalence of metabolic syndrome and its components among adults with central obesity of Terai region of Nepal using International Diabetes Federation criteria.

Methods: Community based cross-sectional study was conducted in three Terai districts of Janakpur Zone, Nepal. A total of 378 adults having central obesity were selected using cluster sampling by camp approach. Interview, physical and clinical examination, measurement of fasting blood sugar, and lipid profile were conducted for all participants. The prevalence of metabolic syndrome and its components with 95% CI were estimated.

Results: The metabolic syndrome prevalence was 74.9% (95% CI:70.2-79.2%), with no significant differences between male (77.7%, 95% CI:71.0-83.5%) and female (72.2%, 95% CI: 65.2-78.3%). The most common factors observed were low high density lipoproteins with highly significant differences between male (77.7%, 95% CI:71.0-83.5%)) and female (90.2%, 95% CI: 85.094.0%-; p=0.001) and hypertriglyceridemia with significant differences between male (57.6%, 95% CI: 50.1-64.5%) and female (46.9%, 95% CI: 39.7-54.2%; p=0.037).

Conclusions: Higher prevalence of metabolic syndrome and its risk factors in Janakpur of Nepal likely suggest lack of awareness and health promotion activities for metabolic syndrome and indicate an urgency for a public health program to maintain quality of life.

Keywords: Metabolic syndrome; Nepal; prevalence; risk factors; terai

INTRODUCTION

The metabolic syndrome (MetS) is an emerging major public health concern in the world.[1] MetS increases risk of developing type 2 Diabetes Mellitus (type 2 DM) by five-fold and cardiovascular disorder (CVD) by two-fold over the next five to ten years.[2] An individual with MetS has 2-4 times higher risk to develop stroke and 3-4 times higher risk of developing myocardial infarction (MI).[3]

Elevated triglycerides (TG), decreased high density lipoproteins (HDL), elevated arterial blood pressure, impaired blood glucose level along with central obesity are the major components of MetS.[4] Around one fourth of the world population is expected to have MetS.[5]

Like the other region of the world, the prevalence of MetS is rapidly increasing in developing countries.[6,7] Very few published studies on MetS have been documented in Nepal and particularly in the Janakpur zone.[8,9] This study was designed to assess the prevalence of MetS and its components among the adults of Janakpur zone, Nepal.

METHODS

This was a community based cross sectional study conducted during September to December 2019 in the

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three districts (Dhanusha, Mahottari, and Sarlahi) of Terai region of Janakpur zone, Nepal. According to population distribution record 2011 of National planning commission of Nepal, total population of these three districts recorded 2,152,086. The sample size for the study population was calculated with assumed 30% prevalence at 95% confidence level, which was found 323.[10] Four different camps were organized in each district for participants selection and sample collection. A joint approach between government health service network (district public health office, primary health center, health post) and research team were applied to inform the target community people about the research using different tools (radio, wall poster, volunteer mobilization). The participants for this study were selected based on their central obesity (waist circumference ≥ 90 cm in male and e ≥ 80 cm in female). A structured questionnaire was used to collect information about participants. Subjects below 18 years and having waist circumference <90 cm in male and <80 cm in female, alcoholics and smokers, suffering from any chronic diseases and having history of any abdominal surgery were excluded from the study. A total of 378 adults (age: 18 to 80) were selected from the three districts of Terai region of Nepal using cluster sampling by camp approach. Physical and clinical (waist circumference, height, weight, sitting blood pressure, pulse rate) examination were conducted for all participants. An appropriate amount of fasting venous blood samples were collected, maintaining aseptic conditions from the participants meeting inclusion criteria. Fasting blood glucose was determined by enzymatic (GOD/POD) method using Accent 200 fully automated biochemistry analyzer. The serum concentration of cholesterol, triacylglycerol (TAG), high density lipoprotein (HDL), and low-density lipoprotein (LDL) cholesterol were estimated by enzymatic method using Accent 200 fully automated biochemistry analyzer. International Diabetes Federation (IDF) criteria (central obesity with any two of following four components: triglycerides ≥ 150 mg/dl or specific medication for lipid abnormality, decreased HDL, raised blood pressure and raised fasting blood glucose or previously diagnosed type 2 DM) were used to assess MetS. All the data were entered into Microsoft excel and periodically checked for consistency, data entry error and missing values before analysis.

Data were analyzed using SPSS software. We used the chi-square test to compare the difference between male and female participants in their baseline parameters and the prevalence of MetS.

Ethical approval (reference number 110/071/071) for this study was obtained from the Institutional review board of Tribhuwan University, Institute of Medicine, Maharajgunj, Kathmandu.

RESULTS

Of the total 378 participants in the study, 184 (48.67%) were male, and 194 (51.32%) were female. It was established that lowered HDL cholesterol was the most prevalent defining criteria for MetS, observed in 318 (84.1%) of the participants with significant differences between male and female (male 77.8%, 95% CI:71.0-83.5% and female 90.2%, 95% CI: 65.2-78.3; p=0.001)). The 5th and 95th percentile range for HDL cholesterol in study participants were 26.3-52.1 mg/dL. Elevated triglyceride level was the second most prevalent defining criteria for MetS, observed in 197 (52.2%) with significant differences in male and female (male 57.6%, 95% CI: 50.1-64.5% and female 46.9%, 95% CI: 39.7-54.2%;p=0.037). The 5th and 95th percentile range for triglyceride was 72-309 mg/dL. Increased systolic and diastolic blood pressure were observed in 188 (49.7%) and 115 (30.4%), respectively, as the third most prevalent defining criterion for MetS. 207 out of 378 (54.76%) and 135 (35.71%) participant met criteria of stage 1 (systolic blood pressure between 130-139 mmHg or diastolic blood pressure between 80-89 mmHg) and stage 2 (systolic blood pressure≥140 mmHg, or diastolic blood pressure≥ 90 mmHg) hypertension respectively (Hypertension Clinical Guidelines2017). Impaired fasting blood glucose level (≥110 mg/dL) was observed in 125 (33.1%) participants with no significant differences between male (69, 37.5%) and female (56, 28.9%). The 5th and 95th percentile range for fasting blood glucose in study participants was 73-174 mg/dL. Overall, MetS was present in 283 (74.9%) participants (Table 1) with no significant difference between male and female (male 77.7% and female 72.2%).

More than one-fifth of the study subjects with MetS had one IDF component present, while more than two-thirds of the subjects with MetS had at least two IDF components present along with central obesity (Figure 1).

Table 1. Frequency distribution of baseline parameters and prevalence of metabolic syndrome by gender in study subjects from three districts of Janakpur zone, Nepal obtained using community based cross-sectional survey.

| Parameters	Number N=378(%)	Gender		x^2 Statistics	p-value
		Male n=184 (%)	Female n=194 (%)		
Systolic Blood Pressure					
<130 mmHg	190 (50.3)	83 (45.1)	107 (55.2)	3.81	0.051
≥130 mmHg	188 (49.7)	101 (54.9)	87 (44.8)		
Diastolic Blood Pressure					
<85 mmHg	263 (69.6)	120 (65.2)	143 (73.7)	3.21	0.073
≥85 mmHg	115 (30.4)	64 (34.8)	51 (26.3)		
Triglycerides					
<150 mg/dL	181 (47.9)	78 (42.4)	103 (53.1)	4.33	0.037*
≥150 mg/dL	197 (52.2)	106 (57.6)	91 (46.9)		
Fasting Blood Sugar					
<100 mg/dL	253 (66.9)	115 (62.5)	138 (71.1)	3.18	0.075
≥100 mg/dL	125 (33.1)	69(37.5)	56 (28.9)		
HDL Cholesterol					
≥40(M)/50(F) mg/dL	60 (15.9)	41 (22.2)	19 (9.8)	10.73	0.001*
<40(M)/50(F) mg/dL	318 (84.1)	144 (77.8)	174 (90.2)		
Metabolic Syndrome					
Absent	95 (25.1)	41 (22.3)	54 (27.8)	1.54	0.214
Present	283 (74.9)	143 (77.7)	140 (72.2)		

statistically significant (p ≤0.05)
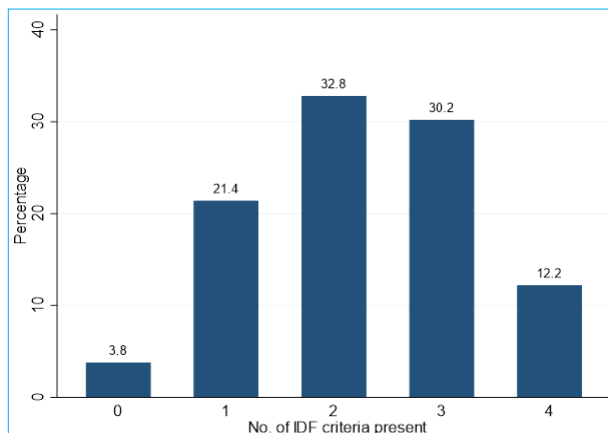
Figure 1. The distribution of subjects with none of the IDF criteria present (0), any one (1), two (2) or three (3) of the IDF criteria present or all four (4) of the IDF criteria present along with central obesity in study subjects from three districts of Janakpur zone, Nepal obtained using community based cross-sectional survey.

DISCUSSION

Nepal is a developing landlocked country of South Asia, geographically divided into Himal, Mountain, and Terai regions. Although Nepal is among the smallest county in the world, it has great geographical diversities. This study was designed to evaluate the prevalence of Mets in the Terai Region of Nepal using IDF Criteria. Participants from the community were selected based on their waist circumference. Central obesity was defined as waist circumference adjusted for ethnicity values for south Asians (≥ 90cm in male and ≥80 cm in female). We found that MetS was highly prevalent in in the three Terai districts of Nepal and both male and female participants were equally likely to have MetS. Our finding was in contrast to a few previous studies carried out in Nepal, which has reported 22.5% and 20.7% based on the IDF and NCEP criteria, respectively.[11] However, a similar prevalence of 71% of MetS was reported in a study carried out in Kathmandu among patients with Type 2 DM.[12] We also found that most of the subjects with MetS in our study had at least two of the components (as defined by IDF) present along with central obesity.

The high prevalence of MetS shown by the current study might be partially explained by the participants' selection criteria employed for the study. Such a high prevalence of MetS in the obese adults of Terai region of Nepal also reflects the rate of urbanization, changing lifestyle, and significant changes in food habits. A similar prevalence of MetS has observed in a study carried out in central India, which showed 72.7%, 50.2% and 53.9% using harmonized, NCEP ATP III and IDF criteria, respectively, with significantly higher prevalence in women with central obesity.[13] A variation in the prevalence of MetS

using different defining criteria for MetS in South Asia has been reported. The mean weighted prevalence of MetS has found as 14.0%, 26.1%, 29.8%, and 32.5% using WHO, ATPIII, IDF, and modified ATP III criteria, respectively.[14] Similarly, an increased prevalence of MetS has been reported in Saudi Arabia which has found 39.8% and 31.6% using ATP III and IDF criteria.[15]

The analysis of the variation in the frequency of the MetS components by gender has shown that decreased level of HDL (84%) and increased level of triglycerides (52.2%) were found as the most common abnormalities in the involved participants. The data analysis revealed that out of 194 female participants, 174 (90.2% of total female participants) had lowered HDL concentration, showing significant difference compared to male participants (144 out of 184, 77.8%) with *p-value* 0.001. In contrast, a significant high proportion of hypertriglyceridemia was observed in male (106 out of 184, 57.6%) than in female (91 out of 194, 46.9%) participants, with *p value* 0.037. Similar findings have been reported by many past studies.[4,16]

Impaired fasting blood glucose level was present in 125 out of 378 participants with no significant difference between males (69 out of 184, 37.5%) and females (56 out of 194, 28.9%) participants. Systolic blood pressure was found to be borderline significant (increased) in male participants (101 out of 184, 54.9%), compared to female participants (87 out of 194, 44.8%) with p-value 0.051. We also observed increased diastolic blood pressure in 64 (34.8%) male and 51 (26.3%) female participants with no significant difference between them.

For the components used to define the MetS for this study, we found that 21.4% of participants with MetS have at least one, 32.8% have at least two, 30.2 % have at least three, 12.2% have at least four abnormal components, while only 3.8 have no abnormal component (fig.1). Dyslipidemia (high triglyceride, total cholesterol, LDL, along with decreased HDL cholesterol) along with hypertension is known to be associated with increased risk of CVD. Furthermore, hyperlipidemia found to be associated with insulin resistance finally results in type II DM. The current study suggested that the increased prevalence of MetS in adults with central obesity might be one of the major crucial factors contributing to the increase in the prevalence of non-communicable diseases in this region of Nepal.

CONCLUSIONS

This study explored the baseline data for MetS and its components and found a very high prevalence of MetS in our study population. Central obesity, along with decreased HDL level, hypertriglyceridemia, and hypertension, were the common attributes among the study participants. Higher prevalence of MetS, along with its components in Terai region of Nepal, likely suggests a lack of awareness as well as health promotion activities for MetS and indicates an urgent need for intervention in the communities with public health programs in this region to maintain and improve the quality of life.

ACKNOWLEDGMENTS

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