Original Article

A Study on the Prevalence of Metabolic Syndrome and its Components among Adults Aged 18–49 Years in an Urban Area of West Bengal

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Abstract

Context: Metabolic syndrome (MetS) is recognized as a major epidemic of the 21st century. People with MetS have twice the likelihood of developing and dying from cardiovascular diseases and more than seven times the risk of developing diabetes. **Aims:** This study was undertaken to determine the prevalence of MetS and its components among adults who were in their first three decades of adulthood. **Settings and Design:** This was a community-based cross-sectional study among 388 subjects aged 18–49 years selected by multistage random sampling in an area of Kolkata, India. **Subjects and Methods:** Data collection was done using a structured questionnaire along with anthropometry, blood pressure (BP) measurement, and relevant blood tests. Physical activity was classified by The International Physical Activity Questionnaire-Short Form questionnaire. **Statistical Analysis Used:** Data were analyzed using the SPSS software version 16.0 and descriptive statistics were calculated as frequency and percentage. **Results:** The prevalence of MetS was 44.6% (35.4% in males and 55.6% in females) and prevalence of central obesity, elevated fasting plasma glucose, raised triglyceride, raised BP, and reduced high-density lipoprotein cholesterol were 68.6%, 41.5%, 36.1%, 45.1%, and 64.9%, respectively, among the study participants. **Conclusions:** This research revealed the high prevalence of MetS and its components in the community. Effective primordial and primary level of prevention along with prevailing secondary or tertiary level of prevention should have been implemented to curtail the epidemic of MetS.

Keywords: Components of metabolic syndrome, metabolic syndrome, noncommunicable diseases

Introduction

Metabolic syndrome (MetS) is recognized as a major epidemic of the 21st century.[1] In 2015, 39.5 million of the 56.4 million deaths globally were due to noncommunicable diseases (NCDs);[2] among all these NCD, MetS has been the real scourge globally.[3] It is prevalent across all ages starting from adolescent to the elderly irrespective of gender, socioeconomic status, ethnicity, and family history.[4-6] There is an overwhelming moral, medical and economic imperative to identify those individuals with MetS early, and hence that lifestyle interventions and treatment may prevent the development of diabetes and/or cardiovascular disease.[7] With this background, this study was undertaken to determine the prevalence of MetS and its components among adults who were in their first three decades of adulthood. People of this age have to take maximum load in one's life though their health is often neglected. It is worthwhile to mention that most of them are symptomless though they are harboring risk factors of various NCDs in them.

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Subjects and Methods

This study was a part of a large community-based observational cross-sectional study conducted among 388 permanent residents aged 18–49 years of the ward number: 66 under Kolkata Municipal Corporation (KMC) of West Bengal over 2 years from November 2016 to October 2018.

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Sampling details

Based on the prevalence of MetS, among adults aged between 20 and 40 years in a previous study which was 20.61%,[8] sample size was estimated at 407 at 95% confidence level, 20% relative error and assuming 10% non response.

Ward number 66 under KMC had 71 parts. Among those, 4 parts were selected by simple random sampling (SRS). Sampling unit of this study was individual aged 18–49 years. Voter list was collected for each part from ward office, and line listing was done for individual aged 18–49 years in each part. Four selected parts were renamed for the study purpose such as Part 41, 56, 68, and 70 as I, II, III, and IV, respectively.

Number of subjects of the defined age group for this study, i.e., 18–49 years in Part I, II, III, and IV was 678, 789, 837, and 992, respectively. All together total adults in the age group 18–49 years were 3296. On the basis of population proportionate to size from each part 84, 97, 103, and 123, subjects were selected using SRS. Total sample size was 407, of which 19 were excluded as they did not come for the blood test and anthropometry during the study. Hence, the final analysis was performed on 388 subjects.

Inclusion criteria

1. Adults aged 18 years to 49 years living in Ward no: 66 permanently for the past 6 months.

Exclusion criteria

1. Critically ill subjects
2. Mentally challenged persons
3. Pregnant/lactating women
4. Those who did not give informed written consent.

Study technique

Informed written consent of the participants was obtained before starting interview with the schedule. After that, the participants were invited to attend a camp to a nearby club on the next sunday for blood test and anthropometry in empty stomach. Blood collection was done for fasting plasma glucose (FPG), and lipid profile following standard procedure after 12 h of overnight fasting and anthropometry and blood pressure (BP) was measured following standard operating procedure after allowing the participants to take rest for at least 10 min. Two days per week were spent for data collection, and 5–6 participants were interviewed each day.

Operational definition

1. MetS was diagnosed using the International Diabetes Federation (IDF) 2005[9] criteria which stated that to diagnose Metabolic Syndrome, one must have central obesity: Waist circumference (WC) ≥90 cm (males); WC ≥80 cm (females) (for Asian) along with any two of the following four factors:
    - Triglyceride (TG) ≥150 mg/dL (1.7 mmol/L) or specific treatment for this lipid abnormality
    - High-density lipoprotein-cholesterol (HDL-C) <40 mg/dL (1.03 mmol/L) in males or <50 mg/dL (1.29 mmol/L) in females or specific treatment for this lipid abnormality
    - Systolic BP ≥130 or diastolic BP ≥85 mmHg or the treatment of previously diagnosed hypertension
    - FPG ≥100 mg/dL (5.6 mmol/L) or previously diagnosed type 2 diabetes.
2. Physical activity was classified by the International Physical Activity Questionnaire-Short Form[10]
3. Diet score: As shown in Table 1, it has 10 components
4. Current smoker:[12] Currently smoking cigarette or bidi daily or occasionally and consumed 100 of those in lifetime.
5. Past smoker: Did not smoke in the last 1 year.
6. Passive smoker: Did not smoke actively, but family member usually smokes inside house.
7. Current Smokeless tobacco (SLT) user: Using SLT (Jorda/Guthka/Gudaku/Khaini/Snuff) one or more daily for the last 1 year or more.
8. Past SLT user: Use SLT before 1 year.

Ethical clearance was obtained from the Institute Ethical Committee. Data were analyzed using the Statistical Package for the Social Sciences, Version 16.0 for Windows (SPSS Inc., Chicago, IL, USA) and descriptive statistics were calculated as frequency and percentage. Median (interquartile range [IQR]) was calculated instead of the mean (standard deviation) as the data were not distributed normally.

Results

More than half of the study participants were male (54.6%) and most of the participants (43%) belonged to 29 and 39 years age group, followed by 40–49 years age group (39.3%) and 18–28 years age group (17.8%). The median (IQR) age was 36 (32–44) with 18 years and 49 years as the age of the youngest and oldest participants. Majority of the study participants were Hindu (86.9%), followed by Muslim (9.5%) and others (3.6%). Majority of the study participants were married (71.6%) and 41.8% had Per Capita Income (PCI) more than 4000 rupees. Almost half of the participants were engaged in moderate physical activity and 1/3rd in the low physical activity. Addiction of smoking tobacco was seen among 22.7% and smokeless tobacco among 14.4%, whereas 23.5% had a history of passive smoking at home. The median (IQR) of diet score was 4.0 (3.0–5.0) and more than 2/3rd of the participants had diet score of 4 or less. The prevalence of MetS was 44.6% (35.4% in males and 55.6% in females).

In the age group of 18–28 years, 31.9% had MetS, whereas in 29–39 years and 40–49 years 46.7% and 48.0% were suffering from MetS, respectively. Hence, the prevalence of MetS was increasing with age. Almost half of the married participants (49.3%) were suffering from MetS in this study.

Central obesity came to be the most prevalent (68.6%) factor of MetS out of all five elements and elevated TG was the least common one (36.1%). Elevated BP was found to be the most common findings (71.4%) closely followed by elevated

FPG (70.8%) and elevated TG (70.7%) among the participants suffering from MetS [Table 2].

Discussion

In this study, the prevalence of MetS was 44.6% (35.4% in males and 55.6% in females). In the age group of 18–28 years, 29–39 years, and 40–49 years, the prevalence of MetS was 31.9%, 46.7%, and 48.0%, respectively. The prevalence of different components was as follows: 68.6% had elevated waist circumference, 41.5% had elevated FPG, 36.1% had elevated TG, 45.1% had elevated BP, and 64.9% had reduced HDL-C. In a study conducted by Khan *et al*.,[13] the prevalence of MetS was 40.9% according to the NCEP ATP III criteria and it was 26.3% in males and 59.0% in females, which closely matches with the findings of the current study. The prevalence of MetS in the same study[13] was 1.1%, 17.4%, 29%, 31.9%, and 20.3% in different age groups such as under 30 years, 30–39 years, 40–49 years, 50–59 years, 60 years, and above, respectively. Hence, the prevalence was increasing steadily till sixth decade of life just like our study where it was increasing with age till 49 years (our study includes only those who having age between 18 and 49 years). This study[13] also found that that the elevated FPG was present in 29.2% of participants, elevated TG in 19.7%, obesity in 19.5%, elevated BP in 18.3%, and reduced HDL-C in 18.3% of participants. The difference may arise due to different study setting, different diagnostic criteria and inclusion of older adults (>50 years) in the study. Harikrishnan *et al*. in a community-based study[11] in Kerala has found that the prevalence of MetS was 29% according to IDF criteria and it was 20.0% in males and 28.0% in females. Elevated FPG was found in 36.1% participants, elevated TG in 24.3%, obesity in 58.6%, elevated BP in 42.2%, and reduced HDL-C in 36.7% of study participants. These findings do not match with the current study which may be due to different study setting and large sample size of the study[11] (n = 5063).

Singh *et al*., in their study,[14] in Haryana has found that prevalence of MetS was 26.6% by IDF criteria and it was 38.2% in females and 14.2% in males. In this study also the prevalence among female is quite above than that of male, just like our study, though the overall prevalence was much higher in our study and the difference may arise due to different study area and population. Among the components reduced HDL-C was found to be the most common factor out of all five components; although in our study, central obesity was the most common factor out of five.

Limitation

Information regarding addiction, diet, physical activity, and income was collected using a schedule. Hence, a chance of recall bias was present in the study. Despite assurance made by the researcher regarding the maintenance of anonymity and

Table 1: Description of diet score

Components	Satisfactory	Unsatisfactory
1a. Fruit consumption (days/week)	≥3 days/week	<3 days/week
1b. Fruit consumption (number of bowl/day)	≥1/day	<1/day
2a. Vegetable consumption (days/week)	≥5 days/week	<5 days/week
2b. Vegetable consumption (number of bowl/day)	≥2/day	<2/day
3. Salt consumption/day/person	≤5 g/day	>5 g/day
4. Extra salt consumption with food	No	Yes
5. Oil consumption/day/person[11]	≤20 ml/day	>20 ml/day
6. Sugar consumption/day/person (25^{th} percentile of sugar consumption in this study was 12)	≤12 g/day	>12 g/day
7. Fast food consumption (roll, chowmein etc.) in last month	Never or rarely (≤3 times/month)	Sometimes (1-2 days/week) or often (≥3 days/week)
8. Junk food consumption (chips, ice cream etc.) in last month	Never or rarely (≤3 times/month)	Sometimes (1-2 days/week) or often (≥3 days/week)
9. Sweet consumption in last month	Never or rarely (≤3 times/month)	Sometimes (1-2 days/week) or often (≥3 days/week)
10. Red meat consumption in last month	Never or rarely (≤3 times/month)	Sometimes (1-2 days/week) or often (≥3 days/week)

Table 2: Distribution of components of metabolic syndrome in the study participants* (n=388)

Components of MetS[9]	MetS present, n (%)			MetS absent, n (%)			Total, n (%)
	Total	Male	Female	Total	Male	Female	
Elevated WC	173 (65.0)	75 (43.4)	98 (56.6)	93 (35.0)	46 (49.5)	47 (50.5)	266 (68.6)
Elevated FPG	114 (70.8)	42 (36.8)	72 (63.2)	47 (29.2)	38 (80.9)	9 (19.1)	161 (41.5)
Elevated TG	99 (70.7)	44 (44.4)	55 (55.6)	41 (29.3)	33 (80.5)	8 (19.5)	140 (36.1)
Elevated BP	125 (71.4)	59 (47.2)	66 (52.8)	50 (28.6)	31 (62.0)	19 (38.0)	175 (45.1)
Reduced HDL-C	153 (60.7)	62 (40.5)	91 (59.5)	99 (39.3)	61 (61.6)	38 (38.4)	252 (64.9)

*Multiple response. WC: Waist circumference, FPG: Fasting plasma glucose, TG: Triglyceride, BP: Blood pressure, HDL-C: High-density lipoprotein-cholesterol

confidentiality of the data obtained, there remained a scope for deliberate fabrication by the respondents on certain information regarding diet, addiction, income, and physical activity.

Conclusion and Recommendation

This research revealed the high prevalence of MetS and its components in the study population. Interventions aimed at reducing these factors can go a long way in alleviating this hidden problem in the society. Secondary or tertiary level of prevention which has been employed to curtail the overwhelming NCD epidemic will not suffice. Primordial and primary level of prevention in the form of very strong, effective, and heart reaching Information Education Communication (IEC) and behavioural change communication are required at individual, at-risk, family and community level to generate awareness regarding this grave problem along with periodic screening of all the risk factors as

"The power of community to create health is far greater than any physician, clinic or hospital" – Mark Hyman.

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Conflicts of interest

There are no conflicts of interest.

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