Original Research Article

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Prevalence of metabolic syndrome and associated factors in an urban area of Bihar

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ABSTRACT

Background: Metabolic syndrome is a conglomeration of physiological, biochemical and clinical abnormalities which include insulin resistance, hypertension and dyslipidemia and leads to increased risk of cardiovascular disorders, stroke and diabetes. Its prevalence ranges from 11-56% in India.

Methods: The present study was community based cross sectional in nature conducted upon 344 adults above 18 years of age and living in the urban area. Cluster sampling was done for selection of respondents. Pretested proforma was used for data collection which contained questions related to sociodemographic profile of the study subjects, anthropometric measurements and results of biochemical investigations.

Results: About one-fourth of the respondents were below 30 years of age. 52% were males. 32.8% were suffering from metabolic syndrome. Physical activity assessment revealed that 46.2% of them were having sedentary life style. 79.7% of them did not consume fruits and 82% of them did not consume vegetables as recommended.16% used tobacco in any form and 9.9% took alcohol. Lack of physical activity and less consumption of fruits & vegetables were significantly associated with metabolic syndrome.

Conclusions: Metabolic syndrome was significantly associated with age, education, socioeconomic status, physical activity and consumption of fruits & vegetables.

Keywords: Adults, Cross sectional study, Metabolic syndrome, Urban area

INTRODUCTION

India is now facing dual burden of communicable and non-communicable diseases. Among non-communicable diseases, cardiovascular disorders, diabetes and cancer constitute major part.¹

Metabolic syndrome has emerged as a significant clinical entity associated with non-communicable disorders. It is a conglomeration of physiological, biochemical and clinical abnormalities which include insulin resistance, hypertension and dyslipidemia. It leads to double risk of cardiovascular disorders and stroke and five times risk of diabetes.²

Various criteria for defining metabolic syndrome have been developed including the national cholesterol education program adult treatment panel III (NCEP ATP-III), international hyperglycemia federation (IDF), American association of clinical endocrinologists (AACE) and European group for the study of insulin resistance (EGIR). Most convenient among these is NCEP ATP- III definition which uses simple measurements and laboratory results.³

In India, the prevalence of metabolic syndrome ranges from 11-56% and it is higher in urban areas. Studies have reported that its prevalence is increasing.⁴ Stress, sedentary lifestyle and central obesity have been found to be associated with increased risk of metabolic syndrome.⁵

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Studies regarding prevalence of metabolic syndrome in this area is limited. Hence, the present study was conducted.

Aims & objectives of this study was to estimate the prevalence of metabolic syndrome among adult population of urban area and to assess the association between metabolic syndrome and sociodemographic and other risk factors of the respondents.

METHODS

Study design

The present study was community based cross sectional in nature.

Study place

The study was conducted in urban area of Patna.

Period of study

The study was conducted between May 2018 to April 2019. Data was collected between August 2018 to February 2019.

Study subjects

Subjects above 18 years of age living in urban area of Patna were selected for the present study.

Inclusion criteria

Adults above 18 years of age and residing in urban area of Patna were included.

Exclusion criteria

Seriously ill subjects, temporary visitors to the place and those who could not give consent were excluded.

Sampling

Sharma et al (2016) in their hospital-based study found that 37.6% of OPD patients/camp attendees were suffering from metabolic syndrome.⁴

Considering prevalence=0.376, confidence level=95%, relative error=20%, design effect of 2, sample size was calculated as follows-

 $n=[Z^2 \times p \times q/d^2] \times 2 = [(1.96)^2 \times 0.376 \times 0.624/(0.0752)^2] \times 2 = 319$

Considering non-response rate of 10%, the final rounded off sample size of 350 was considered for the present study.

Sampling technique

Cluster sampling was done for the present study. In the first stage, 14 wards out of a total of 75 wards in urban area of Patna were selected. From each ward, 25 subjects were selected. The center point of the selected ward was visited. Then, a random direction was chosen and households were visited proceeding in that direction. From each household, one person fulfilling selection criteria was selected. If the target of 25 individuals was not achieved, the same process was repeated by visiting the center of the ward and proceeding in another randomly selected direction. Study could not be completed in 6 cases due to various reasons (consent not given, subject discontinued mid-way, investigations could not be done). Thus, a total of 344 subjects were studied.

Study tools

After conducting reviews of literature, proforma was designed. It was translated into local language. Validation was done by back translating into English by another translator. Content validation was done by subject experts. Pilot testing of the tool was done and the proforma was revised on the basis of the findings. It contained questions related to sociodemographic profile of the study subjects, anthropometric measurements and results of biochemical investigations.

Data collection procedure

A team of residents and interns was constituted for data collection. The team visited the selected wards and informed the head of the family of the selected households. The study subject was selected and data collection was done. A good rapport was established and consent was obtained from participating subjects. The information was recorded in the predesigned and pretested schedule.

Anthropometric measurements were done by interns who were trained for the purpose. Body weight was measured using adult weighing scale with them having light clothes and no shoes or socks. Stadiometer was used to measure the height in standing position with feet together. Body mass index (BMI) was calculated as weight (in Kg)/ (height in meter).2 Waist circumference was measured using measuring tape at the midpoint between the lower costal cartilage and the highest points of iliac crest after exhaling. Blood pressure was measured using aneroid sphygmomanometer in the sitting position. Three readings were taken with a gap of one minute between the readings. For biochemical investigations, venipuncture was done after an overnight fast for 12 hours and blood sample was collected. It was sent for measurement of serum lipids and glucose.

For the diagnosis of metabolic syndrome, the criteria of NCEP ATP-III) was used. Based on NCEP ATP-III definition, Metabolic Syndrome was considered to be

present, if three or more of the following five criteria were met: waist circumference over 102 cm. (men) or 88 cm (women), blood pressure over 130/85 mmHg, fasting triglyceride (TG) level over 150 mg/dl, fasting high-density lipoprotein (HDL) cholesterol level less than 40 mg/dl (men) or 50 mg/dl (women) and fasting blood sugar over 100 mg/dl.

Data analysis

Data was collected in semi-structured proforma containing both open and closed ended questions. Preliminary scrutiny of the forms was done by the author. It was entered in Microsoft Excel 2016 after coding. Data analysis was done using Statistical Package for social sciences (SPSS) version 20. Summarization of categorical data was done as frequency & percentage and for numerical data as Mean±SD. Tests of significance were selected as appropriate and p value<0.05 was considered as statistically significant.

Ethical considerations

Approval of institutional ethics committee was taken. Informed consent was taken from all the respondents. They were free to discontinue during any stage of the

study. All the forms were kept securely and confidentiality of the records was maintained.

RESULTS

The present community-based study included 344 respondents.

Prevalence of metabolic syndrome- a total of 113 respondents (32.8%) were suffering from metabolic syndrome as per NCEP ATP-III criteria (Figure 1).

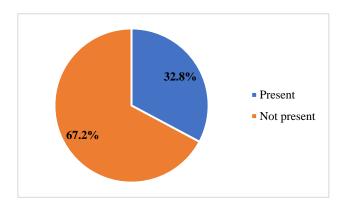


Figure 1: Prevalence of metabolic syndrome (n=344).

Table 1: Sociodemographic profile of the respondents in relation to metabolic syndrome.

| Sociodemographic factor | Values | Metabolic syndrome present (n=113) | Metabolic syndrome absent (n=231) | Significance | |
|-------------------------|--------------------|------------------------------------|--------------------------------------|--|--|
| | | N (%) | N (%) | | |
| Age (in years) | 18-30 | 20 (21.7) | 72 (78.3) | | |
| | 31-40 | 16 (21.6) | 58 (78.4) | 2 25 4 | |
| | 41-50 | 18 (30.5) | 41 (69.5) | $\begin{array}{c} \chi^2 = 25.4 \\ P = 0.000 \end{array}$ | |
| | 51-60 | 28 (45.9) | 33 (54.1) | | |
| | >60 | 31 (53.4) | 27 (46.6) | | |
| Sex | Male | 51 (28.5) | 128 (71.5) | $\chi^2 = 3.21$ | |
| | Female | 62 (37.6) | 103 (62.4) | P=0.07 | |
| Education | Illiterate | 34 (54.8) | 28 (45.2) | | |
| | Primary | 32 (56.1) | 25 (43.9) | $\chi^2 = 45.2$ | |
| | Secondary | 21 (28.8) | 52 (71.2) | P=0.00 | |
| | Graduate & above | 26 (17.1) | 126 (82.9) | | |
| Occupation | Housewife & Others | 38 (36.9) | 65 (63.1) | | |
| | Unemployed | 3 (42.9) | 4 (57.1) | 2 2 22 | |
| | Labourer | 8 (22.2) | 28 (77.8) | $ \begin{array}{c} -\chi^2 = 3.23 \\ -P = 0.52 \end{array} $ | |
| | Skilled | 50 (31.4) | 109 (68.6) | | |
| | Professional | 14 (35.9) | 25 (64.1) | | |
| Socioeconomic status | Upper | 10 (66.7) | 5 (33.3) | χ ² =10.9 P=0.03 | |
| | Upper middle | 16 (34.8) | 30 (65.2) | | |
| | Lower middle | 26 (37.1) | 44 (62.9) | | |
| | Upper lower | 35 (31.3) | 77 (68.8) | | |
| | Lower | 26 (25.7) | 75 (74.3) | | |
| Marital status | Unmarried | 6 (22.2) | 21 (77.8) | χ ² =2.93 P=0.23 | |
| | Married | 90 (35.3) | 165 (64.7) | | |
| | Widowed/divorcee | 17 (27.4) | 45 (72.6) | | |
| Religion | Hindu | 76 (30.8) | 171 (69.2) | $\chi^2=1.75$ P=0.42 | |
| | Muslim | 36 (38.3) | 58 (61.7) | | |
| | Others | 1 (33.3) | 2 (66.7) | | |

| Table 2: Risk factors of metabolic sync |
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| Risk factor | Values | Metabolic Syndrome present (n=113) N (%) | Metabolic Syndrome absent (n=231) N (%) | Significance |
|-------------------|-----------|--|---|----------------------------------|
| Physical activity | Sedentary | 68 (42.8) | 91 (57.2) | χ ² =13.42 P=0.001 |
| | Moderate | 29 (25.7) | 84 (74.3) | |
| | Heavy | 16 (22.2) | 56 (77.8) | |
| Fruits | Less | 104 (38) | 170 (62) | $\chi^2 = 26.2$ |
| | Normal | 9 (12.9) | 61 (87.1) | P=0.000 |
| Vegetables | Less | 103 (36.5) | 179 (63.5) | $\chi^2 = 9.6$ |
| | Normal | 10 (16.1) | 52 (83.9) | P=0.001 |
| Tobacco | Yes | 19 (34.5) | 36 (65.5) | $\chi^2 = 0.09$ |
| | No | 94 (32.5) | 195 (67.5) | P=0.77 |
| Alcohol | Yes | 15 (44.1) | 19 (55.9) | $\chi^2=2.18$ |
| | No | 98 (31.6) | 212 (68.4) | P=0.14 |

Sociodemographic profile

About one-fourth of the respondents were below 30 years of age. 52% were males. 44.2% were educated up to graduation and above. 46.2% were skilled labourers. 29.4% of them belonged to lower socioeconomic class. 74.1% were married. 71.8% of them were Hindus. Chisquare test revealed that age, education and socioeconomic status were significantly associated with presence of metabolic syndrome (Table 1).

Physical activity assessment revealed that 46.2% of them were having sedentary life style. 79.7% of them did not consume fruits and 82% of them did not consume vegetables as recommended. 16% used tobacco in any form and 9.9% took alcohol. Chi-square test revealed that physical activity and consumption of fruits & vegetables were significantly associated with metabolic syndrome (Table 2).

DISCUSSION

The present community-based study was conducted to estimate the prevalence of metabolic syndrome among adult population living in an urban area of Patna district and find its association with sociodemographic factors.

A total of 344 study subjects were selected by cluster sampling. 32.8% of them were suffering from metabolic syndrome using NCEP ATP-III criteria. Researchers have found varying rates in different parts of the country. Banerjee et al6 have seen that metabolic syndrome was present in 44.6% of the study subjects in urban area of West Bengal and Kaushal et al observed that 37.1% of the study subjects living in urban area of Agra had metabolic syndrome. On the other hand, Sawant et al in their campbased study in urban area of Mumbai reported prevalence of metabolic syndrome to be 19.52%. Kamble et al in their community-based study reported that only 5% of the adults living in rural areas of Wardha had the same

condition.⁸ Other researchers have also found similar results in various parts of India.^{2,3,5,9-12}

Sociodemographic factors

26.7% of the respondents were below the age of 30 years. Prevalence of metabolic syndrome was highest in those above 60 years of age. The difference was found to be highly significant statistically (p=000). Gupta et al and Sharma et al observed that the prevalence of metabolic syndrome increased with age and the difference was significant.^{4,13} Kaushal et al found that the prevalence of metabolic syndrome was highest in the age group of 35-54 years and the difference was significant.⁷ Increase in obesity and decrease is physical activity associated with aging may be responsible for this phenomenon which lead to increase in insulin resistance.⁴

Prevalence of metabolic syndrome was found to be higher in females. But the difference was not significant statistically (p=0.38) in the present study. Sharma et al also found similar results while Gupta et al reported this difference to be statistically significant. Verma et al found that gender difference was due to higher waist circumference in females. 14

It was more prevalent in respondents with lesser education with significant statistical association. But Kaushal et al found in urban areas of Agra that occurrence of metabolic syndrome was not associated with education. Chi-square test revealed that the association between occupation and occurrence of metabolic syndrome was not significant (p=0.52). Kaushal et al also reported similar results. Modified Kuppuswamy socioeconomic status scale was used to assess the socioeconomic status of the study subjects. It was observed that the association between socioeconomic status and metabolic syndrome was significant as also observed by Kaushal et al. An important reason for this difference may be the level of activity associated with different professions.

Though prevalence of metabolic syndrome was found to be higher in married as compared to those who are unmarried or widowed/ divorcee, the difference was not significant statistically (p=0.23). Similar observations were made by Venugopal et al 71.8% of the respondents were Hindus. The association between religion and occurrence of metabolic syndrome was not significant statistically (p=0.42).¹⁵

Risk factors

It was observed that metabolic syndrome was more prevalent in those with sedentary lifestyle (42.8%) as compared to those with moderate or heavy activity. The difference was statistically significant. Gupta et al found that sedentary activity was associated with increased chances of metabolic syndrome in males while in females, the difference was not significant statistically. Physical activity is one of the important factors associated with lifestyle disorders. Increased physical activity is protective against diabetes, cardiovascular diseases and many other conditions. It leads to reduction in obesity and increased insulin sensitivity. ¹³

Consumption of less fruits (less than one portion per day) was associated with higher prevalence of metabolic syndrome with significant association (p=0.000). Similar results were obtained by Prasad et al in West Bengal and Venugopal in Puducherry. Consumption of inadequate amount of vegetables (less than three portions per day) was also associated with increased chances of metabolic syndrome and the association was found to be statistically significant. However, Venugopal et al found it to be insignificant. Consumption of tobacco as well as alcohol and occurrence of metabolic syndrome were not associated statistically. Similar results were obtained by Venugopal et al. 15

CONCLUSION

India is facing double burden of communicable and non-communicable diseases. Lifestyle changes have resulted in increase in obesity and reduced physical activity. Identification of high-risk group becomes important to control the problem. Prevalence of metabolic syndrome was found to be high in urban area of Patna. It was significantly associated with age, education, socioeconomic status, physical activity and consumption of fruits & vegetables. Application of primary preventive measures in high-risk groups will be very much helpful in controlling NCDs in this area.

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Ethical approval: The study was approved by the

Institutional Ethics Committee

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