Metabolic Syndrome (Ms) among Adults in Urban Slums – A Cross Sectional Study in Hyderabad, Andhra Pradesh, India

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Abstract

Background: The prevalence of Metabolic Syndrome is rapidly increasing in the world including India and other South Asian countries, leading to increased morbidity and mortality due to type 2 diabetes mellitus (T2DM) and cardiovascular disease (CVD). Hence this study has been taken.

Objectives: To estimate the prevalence of Metabolic Syndrome and its components in urban slums of Hyderabad.

Materials and Methods:
• Study design: Community based Cross sectional study.
• Study area: Randomly selected three Urban slums of Hyderabad (Sundernagar, Nehrunagar and Moulana Azad nagar).
• Study period: 6 months (Jan 2012 to June 2012).
• Tools: Mercurial sphygmomanometer (Diamond), Weighing machine, Reinforced fibre elastic tape, Stethoscope, a predesigned and pretested questionnaire.
• Sample size: 350 sampling: Systematic Random sampling procedure.
• Study variables: Blood pressure, BMI, socioeconomic status, waist circumference, fasting blood sugar and lipid profile.

Statistical analysis: Analyzed using Microsoft Excel 2007 and Epi info 3.5.3.

Results: The study population included 170 (48.6%) males and 180 (51.4%) females. Majority belonged to 41-60 years 165 (47.1%). Majority 126 (36.1%) belonged to upper lower class. The prevalence of Metabolic Syndrome was 23.6%, 17.1% in men and 29.4% in women. Increased Blood pressure above 130/84 mm of mercury was seen in 29.2% subjects with 25.7% in males and 32.4% in females. Fasting Blood Glucose above 100 mg/dl was seen in 26.4% subjects with 28.6% in males and 24.3% in females.

Conclusions: Metabolic syndrome and risk factors are high in the urban slums and measures to reduce them is the need of the hour.

Keywords: Metabolic syndrome; Adults; Urban slums; Hyderabad; India

Abbreviations: BMI: Body mass index; CVDs: Cardiovascular Diseases; DBP: Diastolic Blood Pressure; FBS: Fasting Blood Sugar; HDL-C: High Density Lipoprotein Cholesterol; MS: Metabolic Syndrome; SBP: Systolic Blood Pressure; T2DM: Type 2 diabetes mellitus; TC: Total Cholesterol

Introduction

Over the years, the disease pattern has witnessed epidemiological transition where the relative impact of infectious diseases has come down and chronic non-communicable diseases are on the surge. There is a surge in the worldwide incidence of Diabetes, Obesity and Metabolic syndrome, the major risk factors for cardiovascular diseases (CVDs). The epidemic started in the developed nations and is slowly engulfing the developing and underdeveloped world. Also, the prevalence is rapidly increasing in India and other South Asian countries, leading to increased morbidity and mortality due to cardiovascular diseases (CVD). A high prevalence of MS and its risk factors has been observed in urban Indian population, urban slums as well as rural areas, the main drivers being rapid nutrition, lifestyle and socioeconomic transitions, consequent to increasing afluenza, urbanization, mechanization, and rural-to-urban migration, bringing along with the prosperity the silent killers like CVD and Diabetes. The silver lining is that, recent scientific evidence suggests that it is possible to prevent or delay diabetes and CVD, thus slowing this epidemic. In most countries, about 20-30% of the adult population is predisposed to MS [1]. It was estimated that 20-25% of South Asians have developed MS and many more may be prone to it [2,3]. In India, prevalence rates have varied (11-41%) depending on the definition and cut-offs used as well as population characteristics [4-8].

However, the information available about this subject from urban slums of Hyderabad is sparse. Hence this study has been taken.

Aims and Objectives

To estimate the prevalence of Metabolic Syndrome and its components among adults in urban slums of Hyderabad, Andhra Pradesh.
Materials and Methods

It is a Community based Cross-sectional study (Table 1). The list of slums was obtained from the Urban Health Centre in the field practice area of Osmania Medical College and three slums (Sundernagar, Nehrunagar and Moulanar Azad nagar) were randomly selected. Each slum has 200 to 220 households with an average family size of five, making a population of about one thousand. Starting from the urban health centre in the direction of east, every third house was systematically chosen. Sample size was calculated by 4 pg/L \(^2\) which comes to 350 (p=26%), including 10% non-response rate. All adults above 20 years age available at the time of visit and consented to participate in the study were included. Pregnant females, disabled subjects and acutely ill subjects were excluded. All the participants were informed about the purpose of the study and consent was taken with their voluntary will to participate. The study was carried out for six months from Jan 2012 to June 2012.

A detailed questionnaire incorporating demographic profile, socioeconomic data, relevant history and symptoms was used to collect data by face to face interview. Data was collected from 350 adult individuals. Blood pressure was recorded in sitting position according to standard guidelines. Since a mercury sphygmomanometer was used, individuals. Blood pressure was recorded in sitting position according to standard guidelines. Since a mercury sphygmomanometer was used, individual. Blood pressure was recorded in sitting position according to standard guidelines. Since a mercury sphygmomanometer was used, individuals. Blood pressure was recorded in sitting position according to standard guidelines. Since a mercury sphygmomanometer was used, individual. Blood pressure was recorded in sitting position according to standard guidelines. Since a mercury sphygmomanometer was used, individual.

Anthropometric measurements

Weight was recorded in Kilograms using a Weighing machine and Height was recorded in centimeters to the nearest 0.1 cm using the height measuring rod. The Body mass index (BMI) was calculated by weight (kg)/height\(^2\) (m). Waist circumference was measured midway between iliac crest and lowermost margin of ribs to the nearest 0.1 cm using a reinforced fiber elastic tape.

Biochemical samples and analysis

A fasting venous blood sample was obtained after 12 hours of overnight fast for fasting blood sugar (FBS) and lipid profile. Estimation of total cholesterol (TC), serum triglycerides (TG) and high density lipoprotein cholesterol (HDL-c) was performed. FBS was estimated using Glucose Oxidase method and lipid profile using Eber-Mannhelm autoanalyser.

Definitions

Metabolic syndrome: Metabolic syndrome is diagnosed if any three of the five components are present (Table 2):

- Elevated waist circumference (≥ 90 cm in men, ≥ 80 cm in women)
- Elevated Triglycerides (≥ 150 mg/dl)
- Elevated Fasting Glucose (≥ 100 mg/dl)
- Elevated Blood pressure (≥ 130 mm Hg systolic or ≥ 85 mm Hg diastolic)
- Reduced HDL-Cholesterol (≤ 40 mg/dl in males and ≤ 50 mg/dl in females)

Obesity guidelines based on Western populations markedly underestimate the risk among all Asians because Asians have greater body fat at a given BMI. For BMI and abdominal obesity cut-off ranges, we referred to consensus guidelines for Asian Indians. A BMI of 20-

<table>
<thead>
<tr>
<th>Factor</th>
<th>Number</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sex</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Males</td>
<td>170</td>
<td>48.6%</td>
</tr>
<tr>
<td>Females</td>
<td>180</td>
<td>51.4%</td>
</tr>
<tr>
<td>Age Distribution</td>
<td></td>
<td></td>
</tr>
<tr>
<td>20-40 years</td>
<td>107</td>
<td>30.6%</td>
</tr>
<tr>
<td>41-60 years</td>
<td>165</td>
<td>47.1%</td>
</tr>
<tr>
<td>&gt;61 years</td>
<td>78</td>
<td>22.3%</td>
</tr>
<tr>
<td>Socioeconomic Status</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Upper middle</td>
<td>102</td>
<td>29.2%</td>
</tr>
<tr>
<td>Lower middle</td>
<td>83</td>
<td>23.6%</td>
</tr>
<tr>
<td>Upper lower</td>
<td>126</td>
<td>36.1%</td>
</tr>
<tr>
<td>Lower</td>
<td>39</td>
<td>11.1%</td>
</tr>
<tr>
<td>Type of Family</td>
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<td></td>
</tr>
<tr>
<td>Nuclear</td>
<td>142</td>
<td>40.6%</td>
</tr>
<tr>
<td>Joint</td>
<td>52</td>
<td>14.9%</td>
</tr>
<tr>
<td>Three generation</td>
<td>156</td>
<td>44.6%</td>
</tr>
<tr>
<td>Literacy Status</td>
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<tr>
<td>Literates</td>
<td>264</td>
<td>75.4%</td>
</tr>
<tr>
<td>Illiterates</td>
<td>86</td>
<td>24.6%</td>
</tr>
<tr>
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<tr>
<td>Professional</td>
<td>0</td>
<td>0%</td>
</tr>
<tr>
<td>Semiprofessional</td>
<td>44</td>
<td>12.6%</td>
</tr>
<tr>
<td>Clerical/Shop Owner</td>
<td>49</td>
<td>14.0%</td>
</tr>
<tr>
<td>Skilled worker</td>
<td>58</td>
<td>16.6%</td>
</tr>
<tr>
<td>Semi-skilled worker</td>
<td>18</td>
<td>5.1%</td>
</tr>
<tr>
<td>Unskilled worker</td>
<td>30</td>
<td>8.6%</td>
</tr>
<tr>
<td>Unemployed</td>
<td>151</td>
<td>43.1%</td>
</tr>
</tbody>
</table>

Table 1: Socio-Demographic Profile of the Study Population.

<table>
<thead>
<tr>
<th>Factor</th>
<th>Men (n=170) No (%)</th>
<th>Women (n=180) No (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) Increased Waist Circumference</td>
<td>58 (34.3)</td>
<td>87 (48.6)</td>
</tr>
<tr>
<td>2) Increased Blood Pressure</td>
<td>44 (25.7)</td>
<td>58 (32.4)</td>
</tr>
<tr>
<td>3) Increased Triglycerides</td>
<td>49 (28.6)</td>
<td>68 (37.8)</td>
</tr>
<tr>
<td>4) Increased Fasting Blood Sugar</td>
<td>49 (28.6)</td>
<td>44 (24.3)</td>
</tr>
<tr>
<td>5) Reduced HDL-Cholesterol</td>
<td>63 (37.1)</td>
<td>73 (40.5)</td>
</tr>
<tr>
<td>6) Metabolic Syndrome</td>
<td>29 (17.1)</td>
<td>53 (29.4)</td>
</tr>
</tbody>
</table>

Table 2: Prevalence of Components of Metabolic Syndrome in Men and Women.

22.99 is taken as Normal, 23-29.99 as overweight and ≥ 30 as obese for both males and females [9,10]. Central (Abdominal) Obesity is defined as waist circumference above 102 cm in males and above 88 cm in females in Western population. Lower waist circumference cut point (e.g., ≥ 90 cm (35 inches) in men and ≥ 80 cm (31 inches) in women) appears to be appropriate for Asian Americans/Indians [11]. Fasting blood sugar ≥ 126 mg/dl is defined as Diabetes and 100 to 125 mg/ dl as Impaired Fasting Glucose [12]. Blood pressure is defined as per the JNC VII criteria [13] and Dyslipidemias by the criteria laid down by the NCEP Adult Treatment Panel III [9]. Modified Kuppuswamy classification is used for socioeconomic status classification.

Statistical Analysis

Data was entered into an excel spreadsheet and double checked for errors. Analyzed using Epi-info version 3.5.3. Pearson’s chi-square test was applied to test the relationship of categorized independent and dependent variables. A p value (significance) of <0.05 is deemed statistically significant. A significance of 0.000 should be read as p<0.0001 (very highly significant).

Ethical clearance was obtained from the ethical committee of Osmania Medical college, Hyderabad.

Results and Observations

A slightly higher proportion of females (51.4%) to males (48.6%)
were seen in this study. A high proportion of people were seen in the age group 41-60 years (47.1%) and among the upper lower class (36.1%). More than three-fourths were literate.

The prevalence of Metabolic Syndrome was 23.6%, 17.1% in men and 29.4% in women. The prevalence of components of metabolic syndrome was as follows: Abdominal Obesity was present in 34.3% males and 48.6% females. Elevated Triglycerides was seen in 33.3% subjects with 28.6% among males and 37.8% among females and reduced HDL-Cholesterol in 37.1% males and 40.5% females. Increased Blood pressure above 130/84 mm of mercury was seen in 29.2% subjects with 25.7% in males and 32.4% in females. Fasting Blood Glucose above 100 mg/dl was seen in 26.4% subjects with 28.6% in males and 24.3% in females.

The prevalence of Metabolic Syndrome was higher in 41-60 years age group 41.2% (Chi square=11.345, p=0.003) compared to other age groups (4.5% in 20-40 years and 12.5% in above 60 years). The prevalence of Metabolic syndrome was significantly higher in females (Chi square=8.094, p=0.0044). The prevalence of Metabolic syndrome was higher in upper middle class 52.4% (Chi square=14.621, p=0.002). As the Body Mass Index increased the prevalence of Metabolic syndrome increased (Chi square=36.482, p=0.0001). The prevalence of Metabolic syndrome was significantly higher in tobacco users, 34.3% (Chi square=19.78, p=0.0001) compared to nonusers 13.8%.

Discussion

The prevalence of MS in the present study was 23.6% with 17.1% in men and 29.4% in women which is similar to a study based on NCEP ATP III criteria in Jaipur (urban north Indian population) which reported the age-adjusted prevalence of Metabolic Syndrome to be 24.9%, 18.4% in men and 30.9% in women [14].

In the present study high prevalence of truncal obesity was seen, 34.3% in men and 48.6% in women similar to the results of Reddy et al. [15] who reported high prevalence of truncal obesity (waist hip ratio (WHR); men >0.95, women >0.85) in both urban subjects (men 39.1%, women 70.9%) as well as rural subjects (men 32.4%, women 42.3%) in Delhi. In a study conducted by Gupta et al. [6] the prevalence of abdominal obesity was 25.6% in men and 44.0% in women. In the present study low HDL-c was seen in high percentage of subjects, 37.1% men and 40.5% women, as also reported earlier by Enas et al. [16] who found that only 4% of Asian Indian men and 5% Asian Indian women had optimal HDL-c levels.

In the present study the prevalence of Metabolic syndrome was significantly higher in women (p=0.0044) which is comparable to other studies in India, which showed MS prevalence in women to be 1.5–2 times higher than in men [7,17]. The prevalence of MS was significantly higher in 41–60 years age group (p=0.003) which is comparable to the findings in a study by Gupta et al. [6]. As the Body Mass Index increased, the risk of Metabolic syndrome increased as seen in other studies [18]. The prevalence of Metabolic syndrome was higher in the upper middle class (p=0.002) which is similar to the other studies. The prevalence of Metabolic syndrome was significantly higher in tobacco users- 34.3% (Chi square= 19.78, p= 0.0001) as also reported by Apurva Sawant et al. [18].

The prevalence of MS in the present study is much lower than that reported in an earlier study in urban Indian adults aged (20–50years) in which the prevalence was reported to be 41.1% [5]. The prevalence of MS based on ATP III criteria in Jaipur (urban north Indian population) was 24.9% [4]. In Chennai urban population Study (CUPS), [19] the prevalence of MS as defined by EGIR was found to be 11.2%. In the study of 10 industrial settings, prevalence of MS was 26.6% [20]. Among Asian Indian, Immigrants living in US showed the prevalence of MS to be 32%. Thus it is seen that a significant difference exists even within an urban environment in different socio-economic groups.

Conclusions

The components of MS are also a constellation of risk factors that precede Diabetes and CVD. Indians are at high risk for CVD and their predispositions like MS. The present study indicates that Metabolic syndrome with its contributory risk factors are highly prevalent in the urban slum dwellers. The prevalence of MS was high in females. The study also revealed MS to be more prevalent in 41–60 years and in the Upper Middle class, suggesting that these groups are at increased risk of developing CVD. Also, high percentage prevalence of overweight and obesity was one of the major driving forces in the development of MS. Therefore, early identification of the metabolic abnormalities and appropriate intervention is of primary importance in populations especially like ours having high prevalence of risk factors for CVD such as MS.

Recommendations

People in the age group of 41-60 years are to be subjected to screening regularly. Regular screening of upper middle class subjects is to be implemented. Obesity to be tackled by regular physical exercise and dietary modifications. The people should be made aware of the risk factors through health education. The need for regular health check-ups is to be emphasized. These measures are important especially since many of the risk factors like obesity, physical inactivity, etc. are modifiable. Adopting a healthy lifestyle beginning in childhood and adolescence is warranted in view of the malignant nature of CAD among Asian Indians [21,22]. Urgent preventive measures based on primordial and primary prevention need to be taken especially from early childhood to modify the lifestyle and behavior of the people of the slum community, otherwise the epidemic of metabolic syndrome and non communicable diseases may get out of hand.

Limitations

As the study was done in small sample, more studies need to be done on large populations to unveil the hidden epidemic and its characteristics to prevent further occurrences.

Acknowledgements

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References


