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# Differences in the Prevalence of Metabolic Syndrome in Urban and Rural Kashmiri Population

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**Abstract:** ***Introduction: With the increasing urbanization of India and the putative link of urbanization to obesity, diabetes and hypertension, the prevalence of metabolic syndrome is likely to be higher among urban residents as compared to rural. There is scant data on the prevalence of metabolic syndrome from India, especially regarding urban–rural differences in the burden of metabolic syndrome. Aims & Objectives: To compare the prevalence of metabolic syndrome in Urban & Rural adults from our local kashmiri population. Material & Methods The study was a population based study and subjects were chosen from the general population. Subjects were chosen from both urban and rural areas. For Metabolic Syndrome two definitions were used.ATP III definition & IDF definition. Results: We examined a total of 370 subjects for our study. Age range was 18-80 years and mean age was 39.39± 12.45 years. Males were 119 and females were 251. Prevalence of M.S. was significantly higher in urban (39.4% with ATP and 46.5% with IDF) as compared to rural (14% with ATP III & 17% with IDF) population (p<0.001) Urban men and women had higher central obesity, Hypertension, triglycerides, impaired glucose tolerance than their rural counterparts Conclusion: There is a significant difference in the prevalence of metabolic syndrome between urban residents and adjacent rural residents in our local population. This urban– rural gradient in the prevalence of the metabolic syndrome may be explained by excess obesity in the urban population, possibly from altered lifestyle and diet related to urbanization.***

**Keywords:** Metabolic syndrome, Urban, rural

## 1. Introduction

Metabolic syndrome is one of the most focused subjects of research in the present day world, owing largely to the pandemic of obesity. Urbanization is associated with excessive consumption of energy-rich foods, a decrease in physical activity. This results in higher levels of body weight, blood cholesterol and glucose in urban populations, along with a decrease in insulin sensitivity. (1–4) These changes result in higher rates of coronary artery disease (CAD) and strokes in urban areas. (5) In India, also marked increases in both CAD prevalence and risk factors have been observed in urban residents as compared to rural population. (6) A meta-analysis reported a nine-fold increase in CAD rates in the urban population, as compared to a two-fold increase among rural residents. (7) Metabolic syndrome has been shown to predict an increased risk of CVD in diverse population groups. (8-15) With the increasing urbanization of India and the putative link of urbanization to obesity, diabetes and hypertension, the prevalence of metabolic syndrome is likely to be higher among urban residents as compared to rural. There is scant data on the prevalence of metabolic syndrome from India, 23 especially regarding urban–rural differences in the burden of metabolic syndrome. We tried to study this urban rural difference in prevalence of metabolic syndrome from our local population from Kashmir.

## 2. Aims & Objectives

To compare the prevalence of metabolic syndrome in Urban & Rural adults.

## 3. Material & Methods

The study was undertaken by SKIMS, Soura. It was a population based study and subjects were chosen from the general population. Adult age was defined as 18 years and above. Subjects were chosen from both urban and rural areas. From urban areas subjects included school teachers who were invited to participate in the study. Schools were selected as part of other concomitant study undertaken by the same department to find the prevalence of Metabolic Syndrome in school children. The study was approved by the ethical committee SKIMS Soura & Director Education Kashmir vide order no. DESK/Plg/conduct/Medical/283 approved the research protocol and informed consent. Four schools were selected from Srinagar city by simple random method. The teachers were pre-informed about the study and consent was taken beforehand. For selecting subjects from rural area, We conducted a screening camp at a far-flung rural site. Only adults were included in the study and after proper consent. Exclusion criteria included people suffering or suspected to be suffering from diseases that would interfere with the results, like hypothyroidism, Cushing's syndrome, certain obesity syndromes etc. Subjects requiring further medical advice were subsequently referred or put on follow up.Blood samples were taken after overnight fasting for following

assays: Blood glucose measured by the oxidase glucose method, Lipid profile, LFT and KFT was done by HITACHE. These investigations were carried out, after proper storage and transport at SKIMS Bio-Technology. Anthropometric and other clinical measurements were done as per WHO norms. For Metabolic Syndrome two definitions were used. ATP III definition (revised 2004. NHLBI/AHA) & IDF definition (REVISED 2005, 2006)

Statistical Analyses: Entire data was subjected to appropriate statistical analyses technique. Uni-variate analyses was done applying Chi-square test, t-test etc. The analyses were performed using SPSS statistical package 11.17.

## 4. Results

We examined a total of 370 subjects for our study. Age range was 18-80 years and mean age was 39.39± 12.45 years. Males were 119 and females were 251. The prevalence of metabolic syndrome was 30.5% using ATP III definition and 25.6% by IDF definition. Prevalence of M.S. was significantly higher in urban (39.4% with ATP and 46.5% with IDF) as compared to rural (14% with ATP III & 17% with IDF) population ($p<0.001$) Table 1., Fig 1. a, b, c, d. The Prevalence of individual parameters of Metabolic Syndrome in relation to dwelling and gender is shown in Table 2. Urban men and women had higher central obesity, Hypertension, triglycerides, impaired glucose tolerance than their rural counterparts. We also compared the prevalence of M.S. with respect to the BMI (body mass index) of the subjects. The prevalence rate went on, expectedly, increasing with increase in BMI in both males and females using both IDF and ATP III definitions. There was no case of M.S. in underweight subjects. There was a statistically significant high prevalence of M.S. in over weight and obese subjects with p-values < 0.001. (Table 3).

## 5. Discussion

In this study, we assessed urbanisation's impact on the risk of chronic diseases by comparing urban–rural differences in the prevalence of the metabolic syndrome. Rural population had a significantly lower prevalence rates than Urban population in our study (p-value<0.001). 14%[IDF] and 17%[ATP III] for rural population as compared to 39.4%[IDF] and 46.5%[ATP III] in the urban. Previous studies had reported a higher prevalence of MS in urban than in rural areas in China. Gu D. et al. performed a survey in a nationwide sample of 15, 540 Chinese adults aged 35- 74 years in 2000-01 and showed that the age-standardized prevalence of MS was higher in urban (18.6%) than in rural (12.7%) residents. Lao XQ et al. analyzed a provincial representative sample of 6468 residents aged 20 years or above in Guangdong province during 2002 and the results showed that the urban population had a higher prevalence. Reasons lied for most part in the fact that urban population were more obese than the rural counterparts. Though not evaluated in our study, lifestyle and dietary habits plays a part. (16, 17) This observation was consistent with that of many other studies. (18, 19, 20)OR for urban population to have MS as compared to that of rural population was around 4, implying a four fold chance for urban population to have MS than rural counterparts. Central obesity, components of the metabolic syndrome and plasma fibrinogen are strongly and inversely associated with socioeconomic status. To the best of our knowledge, the current study is the only study from our local population that demonstrated a clear urban–rural gradient in the prevalence of metabolic syndrome. Previous studies from Palestine, Turkey and Spain have failed to demonstrate a similar urban–rural gradient in the respective countries. The clear social demarcation between the rural and the urban population in our study might be the explanation for this disparity. Metabolic syndrome is a major determinant of cardiovascular mortality in diverse population groups, with a two- fold increase in the presence of metabolic syndrome. (21) Other studies have also demonstrated a strong association of metabolic syndrome and prevalent CAD for South Asians as compared to African-Americans. This evidence and our data suggest a cycle of urbanization leading to higher rates of metabolic syndrome, possibly due to accompanying lifestyle and diet changes. This, in turn, may be fuelling the CVD mortality explosion among South Asians. India may be an explanation.

Our study shows that urbanization contributes significantly to the prevalence of metabolic syndrome. Urbanisation results in adverse lifestyle changes in dietary habits such as increased saturated fat and sodium consumption and lower consumption of fibre, vegetables and fruits and low physical activity levels, all of which lead to for excessive weight and obesity. This is reflected in our study with higher central obesity in our urban population and in the increasing frequency of metabolic syndrome with increasing BMI levels.

## 6. Conclusion

There is a significant difference in the prevalence of metabolic syndrome between urban residents and adjacent rural residents in our local population. This urban– rural gradient in the prevalence of the metabolic syndrome may be explained by excess obesity in the urban population, possibly from altered lifestyle and diet related to urbanization.

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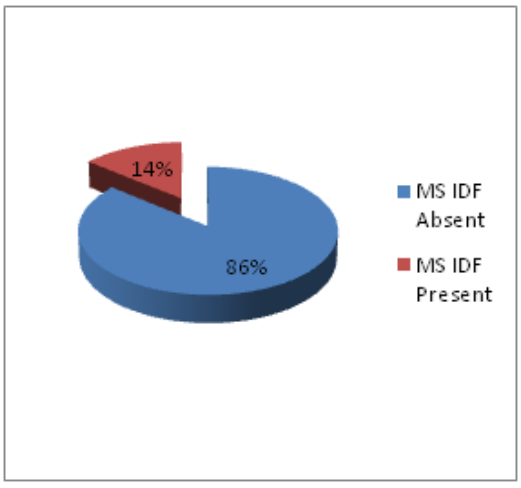
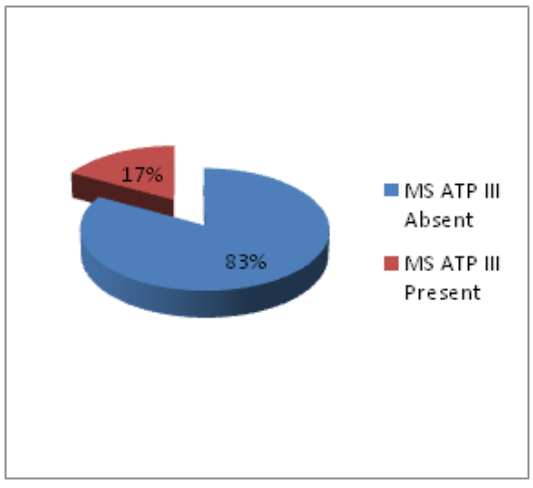
**Table 1:** Urban/rural distribution of metabolic syndrome

| Dwelling. | No. of subjects | METABOLIC SYNDROME | |
|---|---|---|---|
| | | IDF | ATP III |
| RURAL | 200 | 28 | 34 |
| | % prevalence | 14.00% | 17.00% |
| URBAN | 170 | 67 | 79 |
| | % prevalence | 39.40% | 46.50% |
| Total | 370 | 95 | 113 |
| | % prevalence | 25.60% | 30.50% |

p-Value = < 0.001




a

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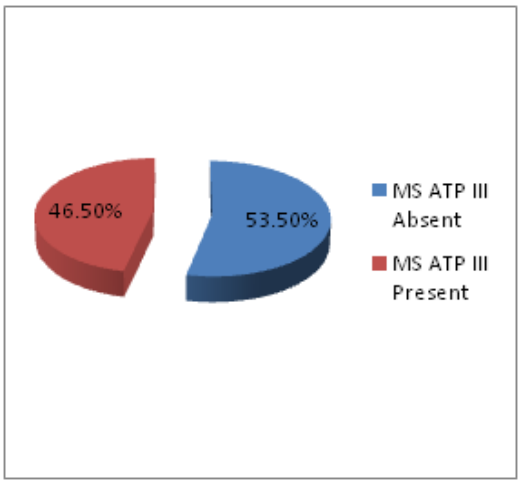


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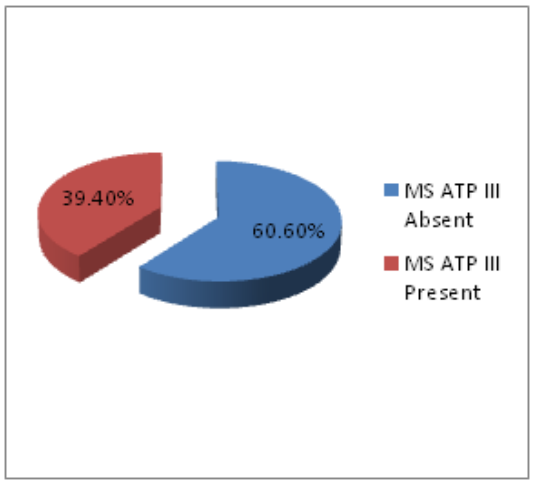


d

**Figure 1:** Pie chart representation of percentage prevalence of M.S. by both IDF and ATP III definitions in rural (a, b) and urban (c, d) areas

**Table 2:** Prevalence of individual parameters of Metabolic Syndrome in relation to dwelling and gender

| | **Male (Urban)** | **Male (Rural)** | **Female (Urban)** | **Female (Rural)** |
|---|---|---|---|---|
| | N=54 | N=65 | N=116 | N=135 |
| Central Obesity | 19 (35%) | 5 (8%) | 38 (33%) | 12 (9%) |
| | | P=0.0004 | | P=0.0001 |
| Increased BP | 21 (40%) | 12 (18%) | 44 (38%) | 23 (17%) |
| | | P=0.014 | | P=0.0003 |
| Increased TG | 32 (60%) | 30 (45%) | 64 (55%) | 54 (40%) |
| | | P=0.197 | | P=0.02 |
| Impaired Glucose Metabolism | 9 (16%) | 3 (4%) | 17 (15%) | |
| | | P=0.03 | | 5 (3%) |
| | | | | P=0.003 |
| Low HDL | 33 (60%) | 36 (55%) | 93 (80%) | 101 (75%) |
| | | P=0.57 | | P=0.36 |

**Table 3:** Distribution of M.S. in relation to BMI

| SEX | BMI group | No. of subjects | MS –IDF (%)* | MS –ATP III (%)* |
|---|---|---|---|---|
| MALES | Under Wt. | 17 | 0 (0%) | 0 (0%) |
| | Normal | 44 | 1 (2.2%) | 2 (4.5%) |
| | Over Wt. | 32 | 3 (9.3%) | 5 (15.6%) |
| | Obese Gr I | 21 | 10 (47.6%) | 12 (57.1%) |
| | Obese Gr II | 5 | 5 (100%) | 5 (100%) |
| FEMALES | Under Wt. | 31 | 0 (0%) | 0 (0%) |
| | Normal | 90 | 2 (2.2%) | 4 (4.4%) |
| | Over Wt. | 32 | 8 (25%) | 11 (34.3%) |
| | Obese Gr I | 80 | 53 (66.25%) | 59 (73.7%) |
| | Obese Gr II | 18 | 13 (72.2%) | 15 (83.3%) |

MALES: p-Value = <0.001
FEMALES: p-Value = <0.001
* = Percent of MS within BMI groups.