Prevalence and risk factors for metabolic syndrome in Asian Indians: A community study from urban Eastern India

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ABSTRACT

Objectives: To determine the prevalence of metabolic syndrome and to identify predictors for the same, specific to an underdeveloped urban locale of Eastern India. **Materials and Methods:** *Study design:* Population-based cross-sectional study, with multistage random sampling technique. *Setting:* Urban city-dwellers in Orissa one of the poorest states of Eastern India bordering a prosperous state of Andhra Pradesh of Southern India. *Participants:* 1178 adults of age 20–80 years randomly selected from 37 electoral wards of the urban city. *Definition of Metabolic Syndrome:* We followed a unified definition of the metabolic syndrome by joint interim statement of five major scientific organizations – the International Diabetes Federation, the National Heart, Lung, and Blood Institute, the American Heart Association, the World Heart Federation, the International Atherosclerosis Society, and the International Association of the Study of Obesity. Individuals who meet at least three of five clinical criteria of abdominal obesity, hypertriglyceredimia, low HDL, hypertension, and hyperglycemia are diagnosed as having the condition; presence of none of these criteria is mandatory. Explicit cut points are defined for all criteria, except elevated waist circumference, which must rely on population and country-specific definitions. *Main Outcome Measure:* Prevalence and significant predictors of metabolic syndrome. *Statistical Analysis:* Both descriptive and multivariable logistic regression analyses. **Results:** Age-standardized prevalence rates of metabolic syndrome were 33.5% overall, 24.9 % in males and 42.3% in females. Older age, female gender, general obesity, inadequate fruit intake, hypercholesterolemia, and middle-to-high socioeconomic status significantly contributed to increased risk of metabolic syndrome. **Conclusion:** Metabolic syndrome is a significant public health problem even in one of the poorest states of India that needs to be tackled with proven strategies.

Key words: Asian Indians, coronary heart disease, cardiovascular disease, diabetes, obesity, metabolic syndrome, South Asians, urban population

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INTRODUCTION

Metabolic syndrome refers to a cluster of various interrelated cardiometabolic risk factors that promote the development of atherosclerotic cardiovascular disease (CVD) and Type 2 diabetes mellitus (T2DM).[1] It is now well known that metabolic syndrome is a risk factor for increased cardiovascular mortality and morbidity. Current definitions of metabolic syndrome differ and cardiovascular risk

appears to differ according to which component risk factors present. The prevalence of obesity and metabolic syndrome is rapidly increasing in India and other South Asian countries, leading to increased mortality and morbidity due to CVD and T2DM.[2,3] Approximately about one third of urban South Asians have evidence of the metabolic syndrome.[4] Moreover, insulin resistance was observed to be there in nearly 30% of Asian Indian children and adolescents and many exhibit features of metabolic syndrome.[5] Since metabolic syndrome and obesity track into adulthood, these clinical entities need to be recognized early in the life-course for effective prevention of T2DM and CVD.[6] A high prevalence of metabolic syndrome and associated cardiovascular risk factors have also been observed within rural to urban migrant population belonging to lower socioeconomic population groups residing in urban slums.[7,8] The main drivers are related to rapid nutritional changes, lifestyle and socioeconomic transitions, consequent to increasing affluence, urbanization, mechanization, and rural-to-urban migration.[8,9] Data also indicate that atherogenic dyslipidemia, glucose intolerance, thrombotic tendency, subclinical inflammation, and endothelial dysfunction are proportionately higher in Asian Indians than Caucasians. [2,10] Many of such manifestations are more severe and are seen at an early age in Asian Indians than Caucasians.[2,10] Metabolic syndrome and cardiovascular risk in Asian Indians/ South Asians are also heightened by their relative increase in body fat mass, truncal subcutaneous fat mass, intra-abdominal fat mass, and also in ectopic fat deposition. Cardiovascular risk cluster also manifests at a lower level of adiposity and abdominal obesity.[2,3]

Asian Indians have an increased prevalence of coronary heart disease (CHD) and T2DM amongst all ethnic groups. [2,11] This Asian Indian or South Asian Paradox refers to the fact that high prevalence of diabetes is seen in people originating from South Asian nations of Bangladesh, India, Nepal, Pakistan, and Sri Lanka, despite lower rates of obesity (as defined by conventional body-mass-index criteria).[2,3] South Asians also seem to have a peculiar body phenotype known as South Asian Phenotype, characterized by increased waist circumference, increased waist hip ratio, excessive body fat mass, increased plasma insulin levels and insulin resistance, as well as an atherogenic dyslipidemia, with low levels of HDL cholesterol and increased triglyceride levels.[2,3] All such factors predispose South Asians not only to T2DM but also to premature CHD. In addition, unique genetic markers could potentially make South Asians more susceptible to cardiometabolic risks.[2,10,12]

Unfortunately, representative periodic nationwide data on cardiovascular risk factors for monitoring and surveillance are lacking in India[13,14] let alone data from specific states within India. Earlier we reported that the state of Orissa, one of the poorest states of Eastern India bordering a prosperous state of Andhra Pradesh of Southern India, showed interesting variations in classical coronary risk factors within an urban population. Such a unique geographic location is an "open door" to cultural and socioeconomic interactions. Metabolic syndrome is a lifestyle disease and factors contributing to recent changing patterns in metabolic syndrome prevalence in this particular geographic region may provide interesting insights into tackling the ever-rising burden of T2DM and CVD within a wider context of South Asians. The present study has two important research questions: First, to update on changing patterns of metabolic syndrome in a unique urban Eastern Indian population; second, to quantify factors significantly contributing to such an underlying pattern.

MATERIALS AND METHODS

Sampling design and survey methods

This was a cross-sectional population survey and the study population was selected using a multistage random sampling technique. Details of study methodology have been published elsewhere.[15] In brief, the sampling frame constituted 37 electoral wards spread across the urban population of Berhampur city of Orissa state in Eastern India. A total of 1178 subjects who are 20 years of age finally participated in this study out of 1200 eligible subjects from an estimated population of 307,724 in 2001. Demographic, socioeconomic, and self-reported behavioral information (smoking, alcohol, physical activity, and diet), objective measures of anthropometry (height, weight, waist, and hip circumferences), biochemical (plasma glucose, total cholesterol, triglycerides, and HDL cholesterol levels), and electrocardiographic data were collected from all study participants. Detailed interviews were performed through a previously validated questionnaire based on the guidelines of World Health Organization.[16]

Metabolic syndrome definitions

Various diagnostic criteria have been proposed by numerous national/international organizations for