

## Childhood Overweight & Obesity: A Temporal Sequence Review

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### ABSTRACT

This research paper is the part of my Ph.D research study in Department of Physical Education, Guru Kashi University Talwandi Sabo, Bathinda, Punjab. Overweight and obesity in children are among the most important risks to children's long and short-term health. Overweight children are very likely to become overweight adults. The aim of the study was to explore the proportion of childhood obesity in the primary school children of middle and upper-middle income group in Ludhiana city and to gather information on their dietary pattern and physical activity. **Methods:** One hundred and fifty children (age  $9 \pm 1$  years, height (ht)  $118 \pm 20$  cm, weight (wt)  $36 \pm 8$  kg, wt/ht%  $126 \pm 24$ , mean  $\pm$  SD) were selected purposively from the DAV schools of Ludhiana city. On the basis of predefined scoring, subjects were classified as underweight, normal, overweight and obese if their weight-for-height values were 120% of median values for DAV children respectively. Dietary intake and energy expenditure of the study subjects were calculated by standard techniques. **Results:** The proportion of childhood overweight and obesity was 52% and 20%. The proportion of overweight and obesity was higher (78%) among girls compared to boys (54%). Similarly, height, weight and other anthropometrics indices were significantly ( $p < 0.05$ ) higher in girls compared to boys. The daily intake of carbohydrate and protein was significantly ( $p < 0.05$ ) higher among obese group. Total energy balance was significantly correlated with weight-for-height% ( $r = 0.541$ ,  $p = 0.0001$ ). A higher proportion of overweight and obesity had been found in girls' children than their counter parts in this study. Positive energy balance with higher energy intake from carbohydrate and fast/processed food culture habit were found among primary school children of middle and upper-middle income group in the Ludhiana city of Punjab.

**Keywords:** Ludhiana, Obesity, DAV School, Overweight.

### I. INTRODUCTION

According to the World Health Organization (WHO), obesity is one of the most common, yet among the most neglected, public health problems in both developed and developing countries<sup>1</sup>. According to the WHO World Health Statistics Report 2016, globally one in six adults are obese and nearly 2.8 million individuals die each year due to overweight or obesity<sup>2</sup>. Due to the increased risk of morbidity and mortality, obesity is now being

recognized as a disease in its own right. Additionally, obesity is strongly associated with other metabolic disorders including diabetes, hypertension, dyslipidaemia, cardiovascular disease and even some cancers. The risk for these disorders appears to start from a body mass index (BMI) of about 21 kg/m<sup>2</sup>. Obesity is generally classified as generalized obesity (GO) and abdominal obesity (AO). Individuals with obesity have higher rates of mortality and morbidity compared to non obese individuals.

Punjab, with 1.2 billion people is the second most populous country in the world and is currently experiencing rapid epidemiological transition. Under nutrition due to poverty which dominated in the past, is being rapidly replaced by obesity associated with affluence<sup>6</sup>. Industrialization and urbanization also contribute to increased prevalence of obesity. Studies from different parts of Punjab have provided evidence of the rising prevalence of obesity<sup>6-9</sup>. However, most reports have been region specific (mostly from urban areas). Further, different studies have used different methodologies, definitions and cut-off points for defining obesity, making comparisons difficult. To date, there has been no nationally representative study on the prevalence of obesity in Punjab. Here we present the prevalence of generalized and abdominal obesity in urban and rural Punjab based on phase I of the Punjab Council of Medical Research - Punjab Diabetes (ICMR-PUNJABB).

## **II. REVIEW OF LITERATURE**

The prevalence of childhood overweight/obesity has significantly increased in recent years, this has been documented in developed countries whereas data from the developing countries are scarce (Muthuri et al., 2014). For the few developing countries where studies have been done the prevalence is also increasing. Prevalence of obesity and overweight for both adult and children has increased significantly in the past three decades. There is a great disparities across countries in the levels and trends with distinct county patterns (Ng et al., 2014). People in all socio-economic groups, in both developed and developing countries, irrespective of age, sex or ethnicity are affected by obesity. Worldwide childhood obesity estimates projected that over 22 million children under the age of 5 years are severely overweight, and one in 10 children is obese (Kosti & Panagiotakos, 2006). Globally, in 2013 the prevalence of overweight and obesity in children in developed countries was 23.8% for boys and 22.6% for girls. However in developing countries the prevalence was 12.9% and 13.4% for boys and girls respectively (Ng et al., 2014).

## **III. SAMPLING STRATEGY**

A stratified multi-stage sampling design was adopted. The primary sampling units (PSUs) were villages in rural areas and census enumeration blocks (CEBs) in urban areas. Three-level stratification was done in both urban and rural areas, based on geography, population size and socio-economic status in order to obtain a representative sample of the region being studied. The estimation of the sampling error of the prevalence took into account both the multi-stage nature of the sampling design, and standardization to the age-sex composition

of the 2011 Census population. A two-stage design was used in rural areas, while a three-stage design was adopted in urban areas.

Ultimate stage units were households in both areas. In rural areas, the first stage of sampling involved selection of PSUs (villages) using the probability proportional to population size (PPS). In the second stage, households ( $n=56$ ) were selected by systematic sampling with a random start. In urban areas, due to the large population involved, a three-stage design was used. The first stage involved selection of wards by PPS method. In the next stage, one CEB was randomly selected from each ward (the CEBs were of approximately the same size), and in the final stage, households ( $n=24$ ) were selected from the CEBs by systemic sampling. In both rural and urban areas, only one individual was selected within each household using the World Health Organization (WHO) Kish method.

For Phase I, a total of 16,607 individuals (5,112 urban and 11,495 rural) were selected from 363 PSUs (188 urban and 175 rural) of whom 14,277 individuals responded (response rate, 86%). For the present study, 13,800 of the 14,277 subjects who participated in Phase I, for whom information on anthropometric measurements such as weight, height and waist was available, were included in the analysis (urban:  $n=4,063$ ; rural= $9,737$ ).

#### IV. STATISTICAL ANALYSIS

Statistical analyses were performed using SAS statistical package. One-way ANOVA or Student's  $t$  test were used to compare groups for continuous variables and chi-square test was used to compare proportions between two groups. Multiple logistic regression analysis was used to examine the association between various exposures and outcomes. For projections, Punjab population projections for 2011 for the Punjab were used.

#### V. RESULTS

It shows the clinical and biochemical characteristics of the study subjects. In all the four regions, urban residents had significantly higher weight, BMI, waist circumference, diastolic BP and fasting and 2 h post glucose CBG compared to rural participants. Overall, in both urban and rural areas, women had higher mean BMI values than men (Urban: women: 23.6 vs. men: 22.7 kg/m<sup>2</sup>,  $p<0.001$ ; Rural: women: 21.2 vs. men: 20.9, kg/m<sup>2</sup>,  $p<0.001$ ), but mean waist circumference values were higher in men than in women (Urban: women: 77.4 vs. men: 83.6 cm,  $p<0.001$ ; Rural: women: 71.7 vs. men: 78.1 cm,  $p<0.001$ ). Of the overall study population, 15.4 per cent smoked (males: 28.7 vs. females: 1.9%,  $p<0.001$ ), while the alcohol consumption was 19.8 per cent (males: 36.3 vs. females: 3.1%,  $p<0.001$ ).

Presents the prevalence of all the four regions studied. In all four regions studied, urban residents had a significantly higher prevalence compared with the respective rural population ( $p<0.001$ ). The overall prevalence of GO was 24.6, 16.6, 11.8 and 31.3 per cent among residents. While the corresponding prevalence of AO was 26.6, 18.7, 16.9 and 36.1 per cent. The highest prevalence of CO was observed in CH (26.6%) followed by TN (19.3%), MH (13.0%) and JH (9.8%).

Age and gender-specific prevalence of combined obesity in the study population. Except in Ludhiana (in the 25-34 yr group) and in Sangrur (in the 45-54 yr group), at every age interval, the prevalence of CO was higher in urban compared to the rural areas. Higher prevalence of CO was observed among women in Sangrur. Similar results were also obtained for GO and AO (data not shown). The overall prevalence of GO was highest in Sangrur (women: 38.7 vs. men: 24.2%,  $p < 0.001$ ), followed by Ludhiana (women: 28.4 vs. men: 20.6%,  $p < 0.001$ ), Patiala (women: 17.6 vs. men: 15.7%,  $p = 0.112$ ) and Fatehgarh Shahib (women: 12.1 vs. men: 11.5%,  $p = 0.606$ ), respectively. The prevalence of AO was highest in Sangrur (women: 44.5 vs. men: 28.0%,  $p < 0.001$ ), followed by Ludhiana (women: 32.3 vs. men: 20.5%,  $p < 0.001$ ), Fatehgarh Shahib (women: 19.1 vs. men: 14.7%,  $p = 0.001$ ) and Patiala (women: 18.8 vs. men: 18.7%,  $p = 0.965$ ).

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