Socio-demographic correlation with overweight and obesity among children of North India

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ABSTRACT

Background: Nutritional and epidemiological evolution over the past 3 decades has resulted in weight changes. The dramatic rise in childhood obesity is one of its adverse outcomes. **Objectives:** The aim of the study was to assess the prevalence and socio-demographic correlates of overweight and obesity among school children in the age group of 6–14 years in rural and urban Jammu. **Methods:** This cross-sectional community-based study was conducted in school going children of both sex aged 6–14 years in rural and urban areas of Jammu region. After explaining the purpose of the study, students were interviewed by the investigator and needful information regarding socio-demographic variables collected. Following the anthropometric assessment, body mass index (BMI) percentiles were obtained from the WHO age and gender-specific BMI charts. Among socio-demographic variables age, gender, residential area, type of school, type of family, education of parents, mother's occupation, family size, and birth order were analyzed for their relationship with overweight and obesity. **Results:** Of the 230 children surveyed in the age group of 6–14 years, which included 107 from urban and 123 from rural areas, the overall overweight and obesity observed was 8.2%. **Conclusion:** Sociodemographic and socioeconomic factors affect the nutritional status of children and adolescents. Overnutrition, as one of its adverse outcome, needs to be addressed with priority so as to prevent the pandemic of obesity and its metabolic consequences.

Key words: *Body mass index, Childhood, Obesity, Overweight, Socio-demographic variable*

India is currently facing a double burden of malnutrition with obesity emerging as an epidemic among the affluent. A significant value of the population has been found to be under-nutrition, which has been prevalent in different sections of the society. Worldwide, over 22 million children under the age of 5 years are obese, and one in ten children is overweight [1]. This epidemic has affected all socioeconomic groups irrespective of age, gender, and ethnicity [2]. Prevalence of childhood obesity fluctuates in different countries, with the prevalence of overweight in Africa and Asia averaging below 10% and in the Americas and Europe well above 20% [3-5]. If the current trend continues the number of overweight or obese infants and young children globally will increase to 70 million by 2025.

Using the WHO standards, 23.9% of overweight and obesity has been reported among children of 2–17 years age group [6]. Childhood obesity unfavorably affects physiological and psychological well-being, resulting in non-communicable diseases (NCD) including metabolic diseases, leading to increased morbidity and mortality and causing heavy expenditures and reduced social status [7-9]. In 2007, Central Board of Secondary Education, Global School Health Survey in the age group of 13–15 years studied various parameters including overweight and obesity. Percentage of students who were overweight and obese was 10.8% and 2.1%, respectively [10]. The

WHO NCD country profiles 2018 estimated NCD to account for 63% of all deaths in India across all age groups causing significant morbidity in both rural and urban population with considerable loss in potentially productive years of life [11]. According to the WHO estimates by 2020, NCD will account for approximately three-quarters of all deaths in the developing world [12].

The origin of obesity is complex and relates to both genetic and environmental driven factors. Genetic determinant alone cannot explain the recent dramatic rise in the prevalence of childhood obesity as the gene pool of a population is not so rapidly changing. It is primarily due to changes in the social and physical environment over the past three decades due to undergoing nutritional and epidemiological transition which has adversely influenced child's eating and physical activity behavior including attitudes and behavior of their parents. The current study is a community-based study to assess the prevalence and socio-demographic correlates of overweight and obesity among school going children (6–14 years) in rural and urban Jammu.

METHODS

This was a community-based, cross-sectional study carried out at block RS Pura (Zone Miran Sahib), and Zone Jammu

representing an urban unit of study. The study was conducted between November 2014 and November 2015. The study population comprised school going children aged 6–14 years of both sexes of rural and urban Jammu. After seeking permission from Institutional Ethics Committee, list of high schools of selected zones of block RS Pura and Jammu city were procured from the office of the Chief Education Officer Jammu.

The calculation of the required sample size was carried out using prevalence (p) as 15% (based on a pilot study conducted before the main study), an allowable error of 5% and using formula: $n=Z^2 \, p(1-p)/e^2$; where, n=estimated sample size, p=expected prevalence, Z=statistic for 95% level of confidence (1.96), and e=allowable error. Thus, the sample size calculated was 196. However, 230 students were studied, including a 10% margin for non-responders. Heads of selected institutions were contacted before the conduct of the study and a day convenient to the school authorities was selected. Six high schools each from rural as well as urban areas were selected randomly using a simple random sampling procedure, as shown in Figure 1.

On an initial couple of visits, the investigator prepared a class-wise list of all students aged 6–14 years. The number of students to be taken from each school and class was calculated on the basis of probability proportional to size technique. However, only five students (who were present on the day of visit) were requested for an interview after consultation with the teacher in charge on a particular day. The data collected included dietary practices and physical activity behavior; also, this article discusses the results pertaining to socio-demographic variables only. After explaining the purpose of the study, students were interviewed by the investigator. Each interview lasted for about 30 min. Parents/caregivers were contacted telephonically for their consent and needful information, especially for children in the younger age group.

The inclusion criteria consisted of students in the age group of 6–14 years without any significant history of chronic illness along with those who gave consent/whose parents gave consent to be part of this study whereas exclusion criteria consisted of those who did not gave consent/whose parents did not gave consent to participate, children's with a history of chronic illness, endocrinal problems and those not available on the day of the school visit. The total number of high schools in selected zones was 120 {as per U-DISE 2014–2015}, including 31 (12 government and 19 private schools) in Zone Miran Sahib (rural) and 89 (10 government and 79 private schools) in Zone Jammu (urban) area. Out of these, total 12 (10%) high schools were selected for the study.

Outcome variables were the proportion of children with overweight and obesity and their socio-demographic correlates. Students were subjected to anthropometric measurements. Height and weight were measured using the standard methodology as per the WHO guidelines [13]. Body mass index (BMI) was calculated using formula; $BMI=Weight \ (kg)/Height \ (m)^2$ and BMI percentile were obtained from the WHO age and gender-specific BMI charts [14]. Overweight was defined as BMI ≥85th and <95th percentile for children of the same age and sex, whereas obesity was defined as BMI ≥95th percentile for children of the same age and sex.

Statistical Analysis

Data were analyzed using CDC Epi Info (version: 7.2.2.6). Association of overweight and obesity with socio-demographic
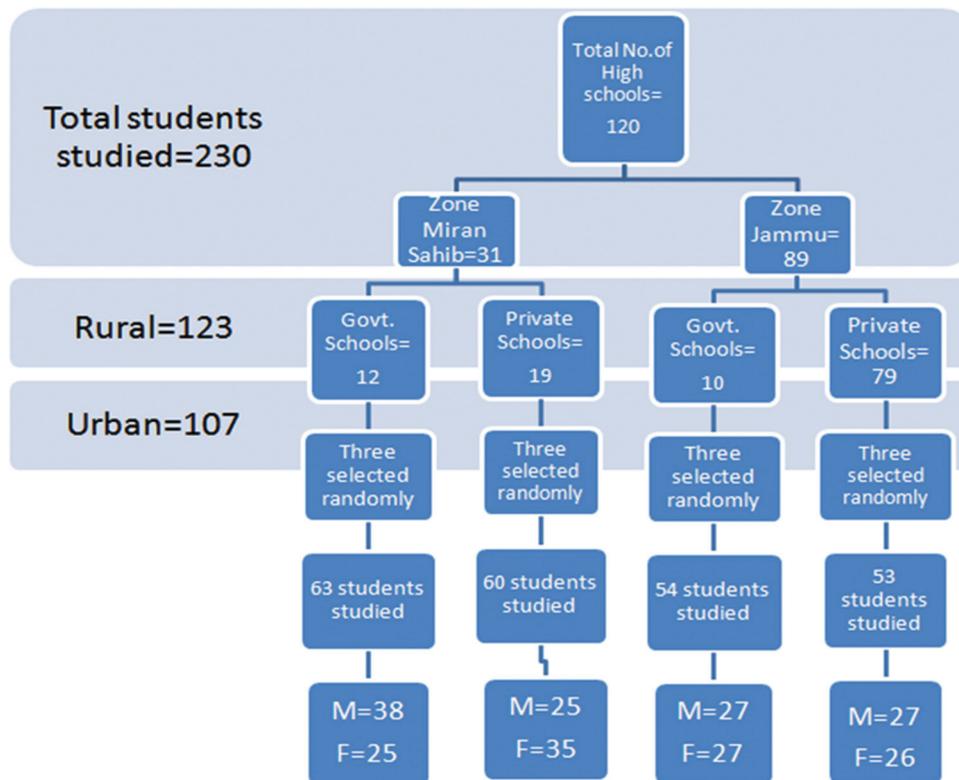
Figure 1: Flow chart showing sample covered

variables was done using the Chi-square test, and the strength of their association was computed using the odds ratio (OR) (95% confidence interval [CI]). For all statistical tests, $p<0.05$ was taken as significant level.

RESULTS

Total of 230 children was surveyed in the age group of 6–14 years, including 107 from urban and 123 from the rural area. Of 230 children studied, overall overweight and obesity observed were 8.2%. More females than males were overweight and obese. Overweight and obesity were more in urban than rural areas (males: 7.4% vs. 3% females: Urban 16% vs. 6.6% rural). Table 1 reveals that the maximum number of children studied was in the age group of 12–14 years. A higher proportion of sample comprised children from rural areas. The mean age of males was 10.6±2.41 years and females was 10.6±2.40 years.

Table 2 depicts that the proportions of children in the age group of 6–14 years in government and private schools surveyed were almost equal in both urban and rural areas of Jammu. More than 85% of children belonged to nuclear families in both urban and rural areas and nearly two-thirds with family size up to 5.40% of children from urban areas were having birth order of two as compared to 34% in rural areas whereas 28% of urban children were having birth order one as compared to 32% in rural areas. More than 60% of children in both urban and rural areas were having a family income of <Rs. 15,000/month.

It also depicts that the majority (73.5%) of parents had studied up to secondary level. More mothers were illiterate compared to fathers (23.5% vs. 4.6%). Fathers of nearly half of children were engaged in private services while one-fourth were engaged in own business and government services. Majority of the mothers (82.6% vs. 91.8%) were housewives in both urban and rural areas.

Table 3 depicts a relationship between socio-demographic variables with overweight and obesity. More than two-third of those overweight and obese children were females and were from urban areas. They were more than 2 times at a higher risk of overweight and obesity ([OR=2.4; CI=0.88–6.56]) and ([OR=2.6; CI=0.98–7.36]). The association was statistically significant (Chi-square$_{(1)}$=3.08; $p<0.05$) and (Chi-square$_{(1)}$=3.99; $p<0.05$). Total 52% among overweight and obese children were in the age group of 12–14 years and were 1.4 times at a higher risk ([OR=1.46; CI=0.43–4.89]), but the association was not significant statistically (Chi-square$_{(2)}$=0.78; $p=0.67$).

About 78.9% of those overweight and obese were studying in private schools and were 4.3 times at higher risk ([OR= 4.3; CI=1.38–13.46]). The association was statistically significant (Chi-square$_{(1)}$=7.3; $p<0.05$). Among overweight and obese children, more than 75% belonged to nuclear families. However, it showed an inverse relationship which was not statistically significant (Chi-square$_{(1)}$=1.17; $p=0.14$). Among overweight and obese children, more than 80% of their parents were literate. Children of a literate mother were 1.7 times at higher risk of overweight and obesity ([OR=1.7; CI=0.47–6.07]). However, the association was not statistically significant (Chi-square$_{(1)}$=0.68;

Table 1: Age and gender-wise distribution of children

Age (Years)	Males		Females	
	Urban n (%)	Rural n (%)	Urban n (%)	Rural n (%)
6–8	13 (24.0)	12 (19.0)	15 (28.3)	16 (26.6)
9–11	17 (31.4)	19 (30.1)	20 (37.7)	19 (31.6)
12–14	24 (44.4)	32 (50.7)	18 (33.9)	25 (41.6)
Total	54 (100)	63 (100)	53 (100)	60 (100)

Table 2: Socio-demographic characteristics of children

Socio-demographic characteristic	Urban (107) n (%)	Rural (123) n (%)
Type of school		
Government	54 (50.5)	63 (51.3)
Private	53 (49.5)	60 (48.7)
Type of family		
Nuclear	95 (88.7)	105 (85.4)
Joint	12 (11.3)	18 (14.6)
Number of family members		
Up to 5	68 (63.5)	68 (55.3)
6–8	32 (29.9)	44 (35.8)
>8	7 (6.6)	11 (8.9)
Birth order		
1	30 (28.1)	40 (32.5)
2	43 (40.2)	42 (34.1)
3	23 (21.4)	25 (20.3)
≥4	11 (10.3)	16 (13.1)
Education and occupation of parents		
Fathers education		
Illiterate*	4 (3.8)	7 (5.6)
Undergraduate**	78 (72.9)	101 (82.2)
Graduate***	20 (18.6)	15 (12.2)
Professional****	5 (4.7)	0 (0.0)
Occupation		
Private service	49 (45.8)	64 (52.0)
Business	24 (22.5)	32 (26.1)
Government service	34 (31.7)	27 (21.9)
Mothers education		
Illiterate*	26 (24.4)	28 (22.7)
Undergraduate**	66 (61.6)	93 (75.6)
Graduate***	14 (13.1)	2 (1.7)
Professional****	1 (0.9)	0 (0.0)
Occupation		
Housewife	88 (82.3)	113 (91.8)
Business	1 (0.9)	0 (0.0)
Government service	18 (16.8)	10 (8.2)

*Illiterate: Having little or no education especially one who is unable to read or write; **Undergraduate: One who has not received bachelor's degree; ***Graduate: One who holds an academic degree or diploma in any subject; ****Professional: One who does a job that requires special training, education, or skill

$p=0.2$). Mothers of 30% of those overweight and obese children were from the working class. Children of working mothers were 3.7 times at higher risk ([OR=3.7; CI=1.30–10.89]) with a statistically significant association (Chi-square$_{(1)}$=6.7; $p<0.05$).

Table 3: Relationship of socio-demographic characteristics with overweight and obesity

Variable	Overweight/obese n (%)	Normal weight n (%)	OR (95% CI)	Chi-square value	p value
Gender					
Female	13 (11.5)	100 (88.5)	2.4 (0.88–6.56)	3.08	0.03
Male	6 (5.1)	111 (94.9)	Reference		
Age (years)					
12–14	10 (10.1)	89 (89.9)	1.46 (0.43–4.89)	0.78	0.67
9–11	5 (6.6)	70 (93.4)	0.92 (0.23–3.62)		
6–8	4 (7.1)	52 (92.9)	Reference		
Region					
Urban	13 (12.1)	94 (87.9)	2.6 (0.98–7.36)	3.99	0.02
Rural	6 (4.8)	117 (95.2)	Reference		
School					
Private	15 (13.3)	98 (86.7)	4.3 (1.38–13.46)	7.3	0.003
Government	4 (3.4)	113 (96.6)	Reference		
Family					
Nuclear	15 (7.5)	185 (92.5)	0.52 (0.16–1.71)	1.17	0.14
Joint	4 (13.4)	26 (86.6)	Reference		
Fathers education					
Literate	18 (8.3)	200 (91.7)	0.99 (0.12–8.10)	0.00008	0.49
Illiterate	1 (8.3)	11 (91.7)	Reference		
Mothers education					
Literate	16 (9.1)	160 (90.9)	1.7 (0.47–6.07)	0.68	0.2
Illiterate	3 (5.5)	51 (94.5)	Reference		
Mothers occupation					
Working	6 (20.6)	23 (79.4)	3.7 (1.30–10.89)	6.7	0.004
Housewife	13 (6.5)	188 (93.5)	Reference		
Number of family members					
≤5	13 (9.5)	123 (90.5)	1.55 (0.56–4.23)	0.73	0.19
>5	6 (6.4)	88 (93.6)	Reference		
Birth order					
≤2	15 (9.6)	140 (90.4)	1.90 (0.60–5.94)	1.25	0.13
>2	4 (5.3)	71 (94.6)	Reference		

OR: Odds ratio, CI: Confidence interval

More than 60% of those overweight and obese belonged to families with a number of family members ≤5 and birth order <2 and were more than 1.5 times at a higher risk ([OR=1.55; CI=0.56–4.23]) and ([OR=1.9; CI=0.60–5.94]). However, the association was not statistically significant (Chi-square$_{(1)}$=0.73; p=0.19) and (Chi-square$_{(1)}$=1.25; p=0.13).

DISCUSSION

A potential public health issue for the developing countries is the rapidly increasing childhood obesity leading to an emerging epidemic of NCDs which, in turn, will create an enormous socioeconomic and public health burden in coming decades [15,16]. A number of studies conducted in recent years across various regions of India revealed a higher prevalence of overweight and obesity among adolescents, particularly among females [17-19]. It is a known fact that adolescent females are physiologically programmed to the deposition of extra adipose tissues due to the effect of the hormones during puberty [20].

This, to some extent, explains the relative predominance of overweight and obesity among females. The other reason for this occurrence relates to amplified consumption of fast foods and reduced physical activity.

Urbanized lifestyle including decreased physical activity and increased sedentary living with an unhealthy diet high in saturated fats, sugar, and refined food is the probable causes of the emerging childhood obesity epidemic in the developing countries undergoing nutrition transition [2,21]. Increased prevalence of overweight with urbanization has been reported both in developing and developed countries [2,22-24], and similar findings were also observed in the current study. Small family norm is an indirect indicator of higher SE class. The present study shows a relationship between obesity/overweight and small family a feature also shared by previous studies [25-27].

Positive association of childhood obesity with higher parental education has been observed in the developing countries, including this study [28,23]. However, studies in developed countries show an inverse relationship of parental education

with obesity [29,30]. Children of the working mother have significantly higher rates of overweight and obesity than those whose mother was a housewife. Female employment increases family income contributing to improved child health; however, it often adversely affects child nutrition due to effects on breastfeeding and maternal caregiving [31].

Findings of the current study reported more overweight and obesity in private schools as compared to government schools. Similar findings have been reported by Patnaik *et al.* and Sharma *et al.* as well [32,33]. These findings suggest that there is a need for the discrepancy in strategic planning, especially for private schools in terms of screening followed by counseling of parents and children. School health programs with a special focus on educating students and teachers regarding possible adverse effects of overweight and obesity should be carried out.

CONCLUSION

Sociodemographic and socioeconomic factors affect the nutritional status of children and adolescents with overnutrition as one of its adverse outcomes. Longitudinal studies are warranted to examine the association between socio-demographic factors and change in nutritional status over time in this population.

ETHICAL APPROVAL

The study was approved by the Institutional Ethics Committee of Government Medical College, Jammu, Jammu and Kashmir, India.

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