



ISSN: 0975-833X

Available online at <http://www.journalcra.com>

International Journal of Current Research  
Vol. 11, Issue, 04, pp.2918-2921, April, 2019

DOI: <https://doi.org/10.24941/ijcr.35055.04.2019>

INTERNATIONAL JOURNAL  
OF CURRENT RESEARCH

## RESEARCH ARTICLE

### SOCIO-DEMOGRAPHIC CORRELATION WITH OVERWEIGHT AND OBESITY AMONG CHILDREN OF NORTH INDIA

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#### ARTICLE INFO

##### Article History:

Received 07<sup>th</sup> January, 2019

Received in revised form

14<sup>th</sup> February, 2019

Accepted 07<sup>th</sup> March, 2019

Published online 29<sup>th</sup> April, 2019

##### Key Words:

Socio-demographic variable,  
BMI, Overweight,  
Obesity, Childhood.

#### ABSTRACT

**Background:** Nutritional and epidemiological transition over the past three decades has resulted in weight changes. The dramatic rise in childhood obesity is one of its adverse outcomes. **Objectives:** To assess the relationship of socio-demographic variables with overweight and obesity among children. **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, BMI percentiles were obtained from 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:** Gender, residential area, type of school and mother's occupation were significantly associated with overweight and obesity. **Conclusion:** Socio-demographic 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.

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Citation: Dr. Quratul Ain Arifa, Dr. Nadeema Rafiq and Dr. Tauseef Nabi, 2019. "Socio-demographic correlation with overweight and obesity among children of North India", *International Journal of Current Research*, 11, (04), 2918-2921.

#### INTRODUCTION

India is currently facing a double burden of malnutrition with obesity emerging as an epidemic amongst the affluent and significant under-nutrition 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 (WHO, 2015). This epidemic has affected all socioeconomic groups irrespective of age, gender and ethnicity (Wang, 2006). Prevalence of childhood obesity fluctuate in different countries, with the prevalence of overweight in Africa and Asia averaging below 10% and in the Americas and Europe well above 20% (Manyanga, 2014; Mushtaq, 2011 and Beck, 2014). If the current trend continues the number of overweight or obese infants and young children globally will increase to 70 million by 2025. Using WHO standards, 23.9% of overweight and obesity has been reported among children of 2-17 years age group (Khadilkar, 2011). Childhood obesity adversely affects physiological and psychological well-being, results in non-communicable diseases including metabolic diseases, leads to increased morbidity and mortality and causes heavy expenditures and reduced social status (WHO, 2004; Must, 1999; Viner, 2005).

According to WHO estimates by 2020, non-communicable diseases (NCD) will account for approximately three-quarters of all deaths in the developing world (WHO, 2015). The origin of obesity is complex and relates to both genetic and environmental determinants. 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 behaviour including attitudes and behaviour 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 children in rural and urban Jammu.

#### MATERIALS AND METHODS

This was a community-based, cross-sectional study carried out at block RS Pura (Zone Miran Sahib) a rural field practice area of Department of Community Medicine GMC Jammu, and Zone Jammu representing an urban unit of study. The study was conducted between November 2014 to November 2015. The study population comprised of school going children aged 6 to 14 years of both sexes of rural and urban Jammu. After seeking permission from ethical committee GMC Jammu, list

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of high schools of selected zones of block RS Pura and Jammu city were procured from the office of the Chief Education Officer Jammu. 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. Heads of selected Institutions were contacted prior to the conduct of the study and a day convenient to the school authorities were selected. Class wise list of all students aged 6-14 years was prepared. Five students from each class were requested for an interview on a day after consultation with the teacher in charge. After explaining the purpose of the study, students were interviewed by the investigator. Each interview lasted for about 30 minutes. Parents were contacted telephonically for their consent and needful information. Students were subjected to anthropometric measurements. Height was measured using the standard methodology as per WHO guidelines (de Onis, 1996). BMI was calculated by using formula;  $BMI = \text{Weight (kg)} / \text{Height (m)}^2$ , and BMI percentile were obtained from WHO age and gender-specific BMI charts (WHO, ?). Overweight was defined as  $BMI \geq 85^{\text{th}}$  and  $< 95^{\text{th}}$  percentile for children of same age & sex. Whereas Obesity was defined as  $BMI \geq 95^{\text{th}}$  percentile for children of same age & sex.

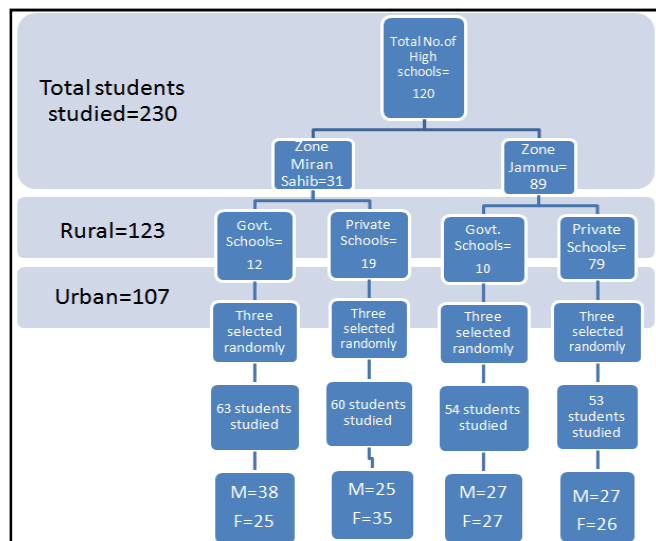


Figure 1. Flow Chart Showing Sample Covered

- Total number of High Schools in selected zones: 120 {As per U-DISE 2014-15}
- Zone Miran Sahib (Rural): 31 {12 government and 19 private schools, 26% of total}
- Zone Jammu (Urban): 89 {10 government and 79 private schools, 74% of total}
- Total No. of High Schools selected=12 {10% of total}

**Outcome variables:** The proportion of children with overweight and obesity and their socio-demographic correlates.

**Statistical analysis:** Data was analyzed using CDC Epi Info (version:7.2.2.6). Association of overweight and obesity with socio-demographic variables was done using the chi-square test and strength of their association was computed by using odds ratio (95% confidence interval). For all statistical tests  $p < 0.05$  was taken as significant level.

## RESULTS

Table 1 reveals that a maximum number of children studied were in the age group of 12-14 yrs. Higher proportion of

sample comprised of children from rural areas. The mean age of males was  $10.6 \pm 2.41$  years and females was  $10.6 \pm 2.40$  years.

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 depicts that the proportion of children in the age group of 6-14 yrs 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-third with family size up to 5.40% of children from urban areas were having birth order of 2 as compared to 34% in rural areas whereas 28% of urban children were having birth order 1 as compared to 32% in rural areas. More than 60% of children in both urban and rural areas were having a family income of less than Rs 15,000 per month. It also depicts that 72% of father's of urban children were undergraduate as against 82% in rural areas; 18% of them were graduate in urban areas as against 12% in rural areas and 4.6% of father's of urban children were professional as against none in rural areas. 3.7% of father's of urban children were illiterate as against 5.6% in rural areas. In the case of mother's 61% from urban areas were undergraduate as against 75% in rural areas; 13% were graduate in urban areas as against 1.6% in rural areas. Only about 1% of mother's were professional in urban areas as against none from rural areas.

Table 2. Socio-demographic characteristics of children

Socio-demographic characteristic	URBAN (107) n(%)	RURAL (123) n(%)
TYPE OF SCHOOL		
Government	54(50.4)	63(51.2)
Private	53(49.5)	60(48.7)
TYPE OF FAMILY		
Nuclear	95(88.7)	105(85.3)
Joint	12(11.2)	18(14.6)
NO. OF FAMILY MEMBERS		
Up to 5	68(63.5)	68(55.2)
6-8	32(29.9)	44(35.7)
>8	7(6.5)	11(8.9)
BIRTH ORDER		
1	30(28.0)	40(32.5)
2	43(40.1)	42(34.1)
3	23(21.4)	25(20.3)
$\geq 4$	11(10.2)	16(13.0)
EDUCATION & OCCUPATION OF PARENTS		
FATHER'S EDUCATION		
Illiterate	4(3.7)	7(5.6)
Undergraduate	78(72.9)	101(82.1)
Graduate	20(18.6)	15(12.2)
Professional	5(4.6)	0(0.0)
OCCUPATION		
Private service	49(45.7)	64(52.0)
Business	24(22.4)	32(26.0)
Government service	34(31.7)	27(21.9)
MOTHER'S EDUCATION		
Illiterate	26(24.3)	28(22.7)
Undergraduate	66(61.6)	93(75.6)
Graduate	14(13.0)	2(1.6)
Professional	1(0.9)	0(0.0)
OCCUPATION		
Housewife	88(82.2)	113(91.8)
Business	1(0.9)	0(0.0)
Government service	18(16.8)	10(8.1)

More mother's were illiterate as compared to father's (24% urban vs. 22% rural). Regarding occupation about 50% of father's were engaged in private service (45% urban vs. 52% rural); 22% of father's from urban areas were engaged in own business as against in 26% in rural areas whereas 31% were in Govt. service in urban areas as against 21% in rural areas. More mother's were a housewife (82% urban vs. 91% rural). About 16% of mother's from urban areas were in Govt. service as against 8% in rural areas. The table 3 depicts a relationship of 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 two 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)].

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

Variable	Overweight/obese n(%)	Normal weight n(%)	OR (95% CI)
<b>GENDER</b>			
Female	13(68.4)	100(47.4)	2.4(0.88-6.56)
Male	6(31.6)	111(52.6)	Reference
$\chi^2_{(1)}=3.08; p=0.03(\text{significant})$			
<b>AGE(YRS)</b>			
12-14	10(52.6)	89(42.2)	1.46(0.43-4.89)
9-11	5(26.3)	70(33.2)	0.92(0.23-3.62)
6-8	4(21.1)	52(24.6)	Reference
$\chi^2_{(2)}=0.78; p=0.67(\text{not significant})$			
<b>REGION</b>			
Urban	13(68.4)	94(44.5)	2.6(0.98-7.36)
Rural	6(31.6)	117(55.5)	Reference
$\chi^2_{(1)}=3.99; p=0.02(\text{significant})$			
<b>SCHOOL</b>			
Private	15(78.9)	98(46.4)	4.3(1.38-13.46)
Government	4(21.1)	113(53.6)	Reference
$\chi^2_{(1)}=7.3; p=0.003(\text{significant})$			
<b>FAMILY</b>			
Nuclear	15(78.9)	185(87.7)	0.52(0.16-1.71)
Joint	4(21.1)	26(12.3)	Reference
$\chi^2_{(1)}=1.17; p=0.14(\text{not significant})$			
<b>FATHER'S EDUCATIO</b>			
Literate	18(94.7)	200(94.8)	0.99(0.12-8.10)
Illiterate	1(5.3)	11(5.2)	Reference
$\chi^2_{(1)}=0.00008; p=0.49(\text{not significant})$			
<b>MOTHER'S EDUCATIO</b>			
Literate	16(84.2)	160(75.8)	1.7(0.47-6.07)
Illiterate	3(15.8)	51(24.2)	Reference
$\chi^2_{(1)}=0.68; p=0.2(\text{not significant})$			
<b>MOTHER'S OCCUPATIO</b>			
N	6(31.6)	23(10.9)	3.7(1.30-10.89)
Working	13(68.4)	188(89.1)	Reference
House wife			
$\chi^2_{(1)}=6.7; p=0.004(\text{significant})$			
<b>NUMBER OF FAMILY MEMBERS</b>			
≤ 5	13(68.4)	123(58.3)	1.55(0.56-4.23)
> 5	6(31.6)	88(41.7)	Reference
$\chi^2_{(1)}=0.73; p=0.19(\text{not significant})$			
<b>BIRTH ORDER</b>			
≤ 2	15(78.9)	140(66.4)	1.90(0.60-5.94)
> 2	4(21.1)	71(33.6)	Reference
$\chi^2_{(1)}=1.25; p=0.13(\text{not significant})$			

The association was significant statistically also (chi-square<sub>(1)</sub>=3.08; p<0.05) and (chi-square<sub>(1)</sub>=3.99; p<0.05). 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<sub>(2)</sub>= 0.78; p=0.67). 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 significant statistically also (chi-square<sub>(1)</sub>=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 significant statistically (chi-square<sub>(1)</sub>=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 significant statistically (chi-square<sub>(1)</sub>=0.68; p=0.2). Mother's of 30% of those overweight and obese children were from the working class. Children of working mother's were 3.7 times at higher risk [(OR=3.7; CI= 1.30-10.89)] with a significant statistical association (chi-square<sub>(1)</sub>=6.7; p<0.05). More than 60% of those overweight and obese belonged to families with 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 significant statistically (chi square<sub>(1)</sub>=0.73; p=0.19) and (chi square<sub>(1)</sub>=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 (WHO, 2000 and Han, 2010). 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 (Kotian, 2010; Goyal, 2016 and Mahajan, 2011). 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 (Rogol, 2000). This to some extent explains the relative preponderance of overweight and obesity among females. The other reason for this phenomenon relates to increased 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 are the probable causes of the emerging childhood obesity epidemic in the developing countries undergoing nutrition transition (Wang, 2006 and Chopra, 2002). Increased prevalence of overweight with urbanization has been reported both in developing and developed countries (Wang, 2006 and Wang, 2007), 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 (Apfelbacher, 2008 and Robinson, 2009). Positive association of childhood obesity with higher parental education has been observed in the developing countries including this study (Kocaoglu, 2005). However studies in developed countries show an inverse relationship of parental education with obesity (Brophy, 2009 and Shrewsbury, 2008), Children of the working mother has 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 because of effects on breastfeeding and maternal care giving (Ukwuani, 2003). 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 L, et al and Sharma SJ, et al as well (Patnaik, 2015 and Sharma, 2017). These findings suggest that there is a need for differential strategic plan 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

Socio-demographic 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.

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