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Obesity and Academic Performance in Adolescents

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ABSTRACT The present sample of adolescents (n: 160; 13 to 16 years in age) was drawn from ten schools located in the city of Ludhiana, Punjab. Height (cm) and weight (kg) of each selected subject were measured and Body Mass Index was calculated for each one. On the basis of BMI for age and sex, the subjects were classified into normal-weight and obese categories. The obese and the normal-weight samples were equally distributed over the two sexes. It was ascertained that all selected adolescents belonged to middle and upper-middle socio-economic strata. A significant negative correlation was found between BMI and academic performance of girls and boys. Normal-weight status adolescent boys and girls showed better academic performance than their obese counterparts. Normal-weight boys' academic performance was significantly lower than normal-weight girls. On the other hand, obese girls' and boys' performance was at par with each other and significantly lower than their normal-weight counterparts. The gap between obese and normal-weight girls' academic performance was much wider than what was found between obese and normal-weight boys, thus girls' weight status had a stronger association with academic performance as compared to boys. It may be that there is no causal link between body weight and academic performance, but rather an association that is explained by unobserved individual-level characteristics. It calls for targeting obesity-reduction measures to adolescents that may not only improve their health outcomes, but may also have a positive impact on human capital accumulation.

INTRODUCTION

The epidemic of obesity is now visible at all age levels, all socio-economic strata and in most of the countries of the world including developed as well as developing. There are many easily decipherable factors which are contributing to physical inactivity leading to obesity among children and adults alike. In this context the home environment has changed significantly more than the school environment and has made remarkably easy to become fat. Such a situation has arisen with the advent of digital, screen-based activity as the preferred form of activity at home for children and teens, particularly in urban settings. It is also related with the changes in the way urban middle and upper middle class families in India nowadays eat which allows much higher percentage of overall calories consumed outside the home, with no control over the ingredients, mode of preparation or portion size etc.

As a result of extensive research, the negative connection of obesity with various kinds of health hazards is well established (Charney et al. 1976; Shear et al. 1988; Williams et al. 1992; Berenson et al. 1993; Guo et al. 1994; Pinhas-Hamiel 1996; Dwyer et al. 1998; Dietz 1998) and it may be mentioned here that the list of studies quoted here is by no means complete and exhaustive. Similarly, there are studies that report the multiple ways in which sociological effects of obesity on children and adolescents manifest themselves both interpersonally and academically (Baum and Forehand 1984; Strauss et al. 1985). Hendry and Gillies (1977) found obese students to be both socially and educationally disadvantaged. It has been reported that obese children and adolescents are also more likely to do less well academically, have poor job prospects and be socially isolated (Levine 1987). The obesity has also been proven to lead to mental and emotional problems, such as anxiety and depression (Bagully 2006). The social (anti-fat bias) (Hendry and Gillies 1977) and psychological (low self-concept) consequences may lead to poor academic performance among obese adolescents. These psycho-social consequences of obesity seem to be the function of intensity of cultural acceptability/non acceptability of fatness and, accordingly, may or may not lead to negative consequences.

There are studies on children that report no negative association between obesity and academic achievement (Freeman 1990; Mo-suwan

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et al.1999; Datar et al. 2004), however, Mosuwan et al. (1999) report a significant correlation between GPA and BMI for grades 7–9 (pre-teens' sample). There is some uncertainty regarding the effect of obesity on academic performance. The findings from earlier studies, thus, indicate that it is reasonable to expect that obesity impacts student's academic performance negatively, especially for adolescents. However, the results from previous studies are based on small sized samples and focused more on children and, therefore, the inferences drawn by these studies may not be applicable to adolescents. Thus, there is a need to conduct empirical studies to further examine the issue of obese and academic performance, as obesity among adolescents has become too visible to be ignored.

In the state of Punjab [The state of India that could boast of being number two, Delhi being number one, in obese statistics, (Agrawal 2002)], Ludhiana city abounds with affluence and as a result fatness has become symbolic of belonging to a well-to-do family. To the best of our knowledge, no empirical study has ever been taken to find whether or not the obese adolescents from Punjab (Ludhiana) are at par with their normal-weight counterparts with respect to academic performance? Or is there any association between obesity and academic performance among adolescents?

METHODOLOGY

Adolescents (n: 160; 13 to 16 years in age) were drawn from ten schools located in the city of Ludhiana, Punjab. Height (cm) and weight (kg) of each selected subject were measured (using standard methods as given by Jelliffe 1966) and BMI (Body Mass Index) was calculated for each one. On the basis of BMI for age and sex, the subjects were classified into 'normal-weight' and 'obese' categories following Garrow et al. (2000). Adolescents showing BMI values 27.5 to 40 and above were classified as obese (n: 80) and whose BMI ranged from 18.5 to 22.9 were classified as normal-weight (n: 80). The obese and the normal-weight samples were equally distributed over the two sexes. It was ascertained that all selected adolescents belonged to middle and upper-middle socio-economic strata as per Socio-economic STATUS SCALE by Bharadwaj (1971).

The academic performance was assessed through the aggregate percentage of marks achieved by the adolescents in the last class examination (held two months earlier prior to this investigation) in the school.

RESULTS

Table 1 shows the frequency distribution of obese and normal-weight adolescent boys and girls in different grades of academic performance ('Very good'; 'Good'; 'Average' and 'Below average'). It was found that obese adolescent boys and normal-weight boys did not differ significantly in frequency distribution for all grades of academic performance. No significant difference was observed for the percentage of obese and normal-weight girls for the 'Good' grade of academic performance. Normal-weight girls' percentage (50%) for 'Very good' academic performance significantly surpassed that of their obese (0%)) counterparts. There was none among normal-weight adolescent girls in 'below average' academic performance grade as against 25% of obese girls falling in this grade and this difference was found to be statistically significant. There was significant preponderance of obese girls (47.5%) in 'Average' performance grade, the normal-weight girls being only 12.5% for this grade. These observations seem to indicate that significant differences in academic performance were confined to girls (in favour of normal-weight girls) and not to the boys. Larger percentage (72.5%) of obese girls' academic performance was either average or below average, whereas, 87.5 per cent of normal-

Table 1: Per cent distribution of obese and normal-weight adolescents on the basis of academic performance

S. No.	*Category/Score*	*Obese boys (n=40)*	*Normal-weight boys (n=40)*	*Z value*	*Obese girls (n=40)*	*Normal-weight girls (n=40)*	*Z value*
1.	Very good (>70)	1 (2.5%)	5 (12.5%)	1.69	0	20 (50%)	5.16*
2.	Good (62-70)	10 (25%)	14 (35%)	0.96	11 (27.5%)	15 (37.5%)	0.96
3.	Average(54-62)	19 (47.5%)	16 (40%)	0.68	19 (47.5%)	5 (12.5%)	3.42*
4.	Below average (<54)	10 (25%)	5 (12.5%)	1.43	10 (25%)	0	3.38*

weight adolescent girls' performance was graded as either 'Good' or 'Very good'. Thus obesity appears to effect girls more than boys with respect to their academic performance.

Table 2 shows that there were significant differences between the mean academic performance scores of obese and normal-weight adolescents. Normal-weight girls scored highest mean percent score of 69.29 whereas both obese girls and boys obtained lowest mean percent score of 57.12 and 57.53, respectively and the difference in their scores was statistically non-significant. Obese boys' mean percent score was observed to be 60.77% which was found to be significantly higher than their obese counterparts among boys and girls. Normal-weight girls' academic performance in terms of percent mean scores was observed to be the best in comparison to all other counterpart groups being considered here.

Table 2: Analysis of variance of academic performance (mean% score) of obese and normal-weight adolescents

S. No.	*Adolescents*	*Mean percent score ± SD*	*df*	*F-ratio*
1.	Obese boys (n=40)	57.12±5.57	3,156	36.96*
2.	Normal-weight boys (n=40)	60.77±6.19		
3.	Obese girls (n=40)	57.53±4.83		
4.	Normal-weight girls (n=40)	69.26±6.62		
	MD_{12}=3.51	MD_{23}=3.19		
	MD_{13}=0.42	MD_{24}=8.24		
	MD_{14}=8.97	MD_{34}=9.47		

* Significant at 5% level

A significant negative correlation was found between BMI and academic performance of girls (r= -0.65*) and boys (r= -0.24*). This clearly indicated that with the increase in BMI in both adolescent boys and girls there was decrease of academic performance. The value of negative correlation coefficient is, however, much more pronounced among girls as compared to that for the boys, thereby, indicating that the girls' weight status has stronger affect on academic performance as compared to boys.

DISCUSSION

The results of the present study indicate a negative association between adolescent obesity and academic performance. Normal-weight status adolescent boys and girls showed better academic performance than their obese counterparts. Normal-weight boys' academic performance was significantly lower than normal-weight girls. Mitsos and Browne (1998) discussed various psycho-social reasons of 'under-achievement of boys'; conversely 'why girls do better than boys in education'?, On the other hand, obese girls' and boys' performance was at par with each other and significantly lower than their normal-weight counterparts of the present study. Several empirical studies have also reported similar results (Gortmaker et al. 1993; Sargent and Blanchflower 1994; Li 1995; Mo-Suwan et al. 1999; Cawley 2004; Crosnoe and Muller 2004; Robert and Chandra 2004; Datar et al. 2004; Datar et al. 2006 ; Sabia 2007).

A negative relationship between body weight and academic performance could be expected for several reasons. It may be that poor academic performance causes higher body weight for adolescents who may choose to eat excessively as a psychological reaction for doing poorly in studies. Obesity may stimulate negative attitudes among teachers toward obese students that may lead former to discriminate against later by awarding them poorer grades. Productive studying could be impeded due to adverse psychological and physiological effects of obesity.

The negative relationship between body weight and academic performance could also be the consequence of the heterogeneity bias due to unmeasured characteristics associated with both obesity and academic performance. Unobserved variables like level of personal discipline (where low levels have potential of inducing obesity and lesser time devoted to studies) and time and effort allocation for studies and physical health (where the most academically motivated individuals choose to devote more time to studying and less time to personal health care) could introduce bias in estimates of the effect of obesity on academic performance. It may be that there is no causal link between body weight and academic performance, but rather an association that is explained by unobserved individual-level characteristics. The results of Sabia's study (2007) reported pattern of findings across different models suggest consistent evidence of a significant negative relationship between body mass index and grade point average (GPA) for white females aged 14–17. Estimates reflect that a difference in weight of 50 to 60 pounds (approximately two standard devia-

tions) is associated with an 8 to 10 percentile difference in standing in the GPA distribution. For non-white females and males, there is less convincing evidence of a causal link between body weight and academic performance after controlling for unobserved heterogeneity. Sabia's (2007) findings indicate that adolescent obesity may have adverse academic consequences for white females. The findings reported by Ding and Bornhop (2005) reiterate the above inferences that adolescent obesity is associated with problems in school performance and social relationships, especially for female students. In the present study also the gap between obese and normal-weight girls' academic performance was much wider than what was found between obese and normal-weight boys.

Thus, it is imperative to target obesity-reduction measures to adolescents that may not only improve their health outcomes, but may also have a positive impact on human capital accumulation. However, for more effective and sustainable strategies for obesity prevention, a combination of a multilevel approach with a developmental perspective would be more desirable (Esposito et al. 2009).

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