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CORRELATION BETWEEN ACADEMIC PERFORMANCE AND OBESITY IN SCHOOL-CHILDREN FROM ANAND DISTRICT

[*1]Dipika P. Shah
[2]Arun G. Maiya

ABSTRACT

Background: Growing childhood obesity epidemic is concerning the health of future generation in any country. Today's competitive world is increasing the never ending pressure on children to excel in academic performance to ensure bright future. Hence, it is the need of the hour to understand the correlation between obesity and academic performance for implementation of the policies related to obesity prevention and treatment.

Methods: 1034 school children were taken randomly according to inclusion and exclusion criteria, and they were divided into two groups: a) 5-11 years and b) 12-18 years. BMI (BMI), Waist Circumference (WC), the Waist-Height ratio (WHtR) and SSFT (Sum of Skinfold thickness) were taken to measure obesity, and the class teacher evaluated academic performance.

Results: The prevalence of obesity when assessed by WC revealed highest values as compared to Waist-Height ratio, IOTF-BMI and SSFT. Spearman correlation between obesity (WC) and academic performance revealed that there was a significant negative moderate correlation in urban boys (r = -0.4, p<0.05) and girls (r = -0.3, p<0.05) of 5 -11 years' age-group. There was no significant (r ranging from -0.02 to -0.7, p>0.05) correlation between obesity and academic performance in boys and girls of 12-18 years' age-group.

Conclusions: It is also concluded from the present study that obesity and academic performance of school children were negatively correlated in boys and girls of 5 -11 years of age but it was not found in 12-18 years of age. Influence of various confounding factors could not be isolated which could have also impacted the academic performance of the child.

Keywords: obesity, academic performance, school-children, body mass index, waist circumference, waist-height ratio.

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[2]Professor and Dr. TMA Pai Endowment Chair in Exercise Science and Health Promotion, Department of Physiotherapy, School of Allied Health Sciences, Manipal University, Manipal, India.

CORRESPONDING AUTHOR

[*1]Dipika P. Shah

Assistant Professor,
Ashok and Rita Patel Institute of Physiotherapy
CHARUSAT, Anand, India.
Email: drdipika83@gmail.com

INTRODUCTION

The prevalence of obesity has risen in leaps and bound in last few years, which has made it a major threat under the category of non-communicable diseases. In the life of an individual, childhood has been considered to be an important phase which is found to be associated with increased vulnerability to obesity [1]. This is also the prime chapter where academic accomplishments predicate the prospective of the individual's success. Scholastic conduct is usually akin to the intellectual and memory functions. It is likely that the negative correlation of obesity with various cerebral functions can also have an adverse effect on the academic performance of the child [2]. However, the community health studies regarding the association between the existence of obesity and academic excellence are insufficient, particularly concerning Indian children.

A complete explanation of the aspect of adiposity concerning academic attainment is needed as schools play more and more crucial part in the struggle against obesity. A study done by Arora T, 2012 and Yu CCW, 2006; has evaluated the affiliation of obesity and academic achievements. A study in Los Angelesby Huang TTK, 2006has found obesity to be associated with poor school performance in the adolescent stage but not in mid-childhood [3]. Increased absence in the class and likeliness of being inhibited in schools has also been associated with obesity. To our knowledge, threeIndian studies have been undertaken concerning obesity and academic performance in Punjab [4] by Jaswal R, 2012, in Lucknow [5]by Bansal N,2016 and West Bengal [6] by Mukherjee R, 2014, where they have found a negative correlation between the overweight and academic performance of children.

But these studies are of smaller sample size, have involved adolescent age group, and the extent of obesity prevalence is also varying as compared to the statistics of Gujarat district. Hence, till date, no studies are related to the influence of obesity on an academic performance done in the children from Gujarat. With the growing rates of overweight and obesity and its striking effect on children and adolescents, it has raised the concerns of healthcare professionals associated with obesity and a spectrum of after-effects now proven increasing the threat to community health. With this aim in focus, we tried to explore the research domain of the correlation of obesity with academic performance in children taking a broad age range from 5 to 18 years.

METHODS

The present study was carried out in Anand district between the age of 5 years and 18 years. The sampling techniques used were Stratified Random Sampling to collect the sample from the population. The population was broadly divided into four strata viz. i) Boys from schools of the rural area, ii) Girls from schools of the rural area, iii) Boys from schools of the urban area, and iv) Girls from schools of the urban area.

School children from both sexes in the age-group of 5-18 years, belonging to Government and Private schools, located in four different geographical zones in Anand district were studied from October 2011 to April 2015. The study protocol was approved by the Institutional Review Board of our Institute i.e. Ashok and Rita Patel Institute of Physiotherapy. The approval number was ARIP/IRB/12/004. A prior consent for the study was taken from the school administration. Selection of subjects was done randomly. In children below seven years of age, written consent was taken from the school teacher (legal guardian). In children above seven years of age, a written consent form was signed by the respective class teacher (legal guardian) in addition to the written assent given by the child.

Obesity was evaluated using BMI (IOTF Classification), Waist Circumference (WC) and the Waist-Height ratio (WHtR). The whole group of 1034 children was assessed for their stature and weight and calculation of BMI was done. Stature was measured utilizing a stadiometer with the subject standing straight with head held in the flat plane. Subject's weight, without shoes on with light garments on was measured to utilizing a computerized scale. Stature and weight estimations were taken twice, and the mean of two estimations was utilized to ascertain BMI, which was characterized by the proportion of body weight to body height squared, communicated in kg/m2. Each morning, the measuring scale and stadiometer were adjusted with standard weight and height separately. The cut-off estimations of IOTF BMI grouping, at each age and for every sexual orientation, were utilized to arrange children as Overweight and Obese.

WC and tallness for each subject was measured with the child remaining, without extra external clothing, utilizing a tape. The WC was measured at the level halfway between the lower rib edge and the iliac crest, at the umbilicus, with the child breathing out delicately. From the WC and height, the waist to height proportion was computed.For the Skinfold measurement, three sites over the body were selected: 1. Anterior-Abdominal (Rt), 2. Supra-iliac (Rt) and 3. Anterior Thigh (Rt) were selected as all these sites were indicative of central fat deposition commonly found in Asian children. The method of assessment: i. Anterior Abdominal: It is a vertical fold, located 5 cm adjacent to the umbilicus on the Right side. ii. Supra – Iliac: It is a diagonal fold, located 1 cm above the Right Anterior Superior Iliac Crest. iii. Anterior Thigh: It is a vertical fold on the anterior aspect of the thigh, located at the midpoint between the patella and the inguinal fold on the Right side.

RESULTS

From the total of 1034 children, statistical analysis was done for 237 obese children as per Waist Circumference, 214 obese children as per Waist-Height ratio, 206 obese children as per IOTF-BMI classification and 159 obese children as per SSFT. Table 1 depicts the academic performance of obese and overweight children.

Table 1: Academic Performance of Obese children

Outcome Measure	Category	Academic Performance					Total
		Poor	Fair	Good	Very Good	Excellent	
Obese and Over-weight	WC	47	85	73	18	14	237
	Waist-Height ratio	43	78	69	15	9	214
	BMI	39	77	66	12	12	206
	SSFT	29	58	50	9	13	159

Table 2 shows the correlation between academic performances for all the four obesity outcome measures.

Table 2: Correlation between Obesity and Academic Performance

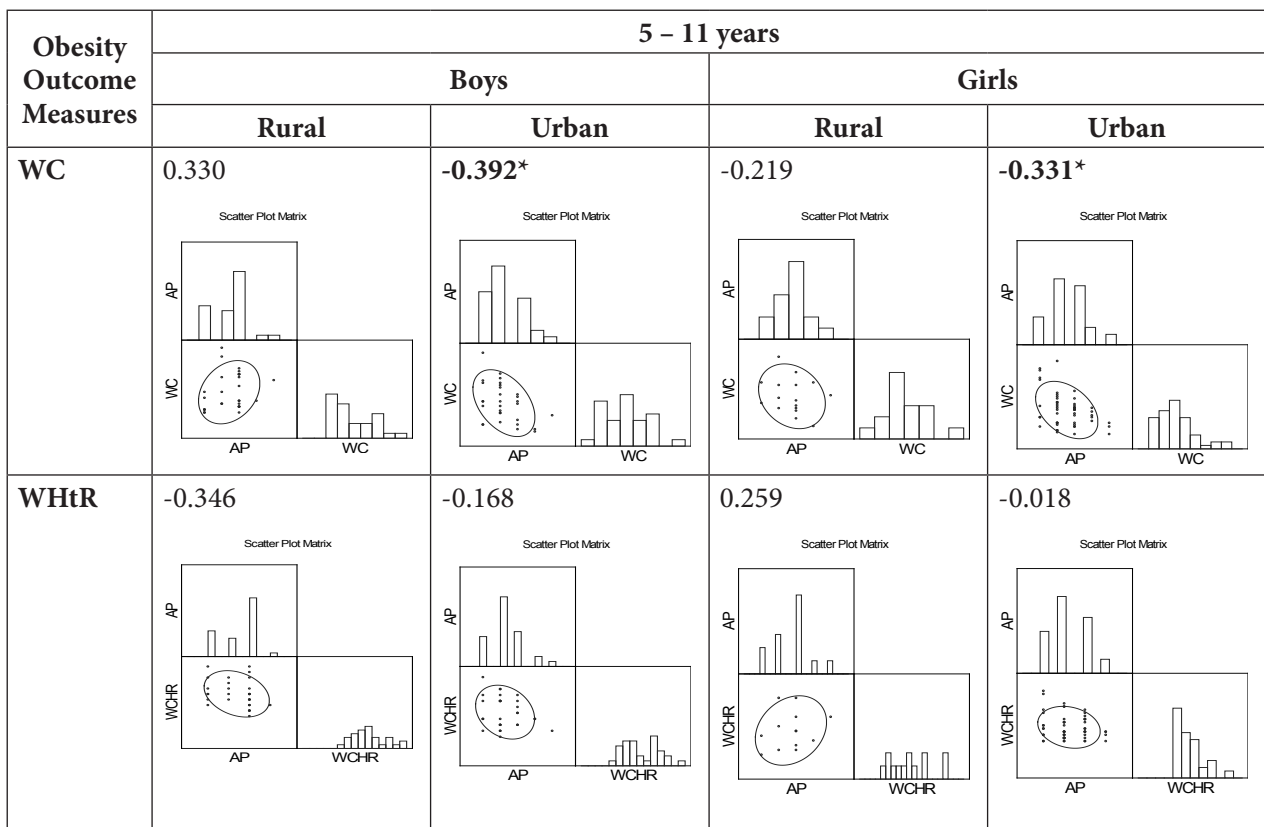| Obesity Outcome Measures	5 – 11 years				12 – 18 years			
	Boys		Girls		Boys		Girls	
	Rural	Urban	Rural	Urban	Rural	Urban	Rural	Urban
WC	0.330	**-0.392***	-0.219	**-0.331***	0.138	-0.022	0.274	-0.011
WHtR	-0.346	-0.168	0.259	-0.018	0.092	-0.352	-0.671	-0.068
BMI	0.036	-0.258	-0.311	-0.080	0.199	0.136	-0.025	0.235
SSFT	0.082	-0.350	-0.060	-0.282	0.143	-0.040	-0.253	-0.013

($* = p<0.05$)

The ($*$) values were found to be having significance at p-value <0.05. Rest of the correlation had p-value> 0.05 hence they were not found to be significant. From above table, it was observed that there was a significant negative moderate correlation between obesity and academic performance in urban boys of 5-11 years of age-group and the significant negative low correlation between obesity(WC) and academic performance in urban girls of 5-11 years of age-group. It was found that there was no significant correlation between obesity and academic performance in boys and girls of 12-18 years of age-group.

The following figure 1, illustrates the scatter diagram of the correlation in the 5-11 years age-group.

Figure 1: Scatter diagram of the correlation (5-11 years age-group)

Obesity Outcome Measures	5 – 11 years			
	Boys		Girls	
	Rural	Urban	Rural	Urban
WC	0.330	**-0.392***	-0.219	**-0.331***
WHtR	-0.346	-0.168	0.259	-0.018

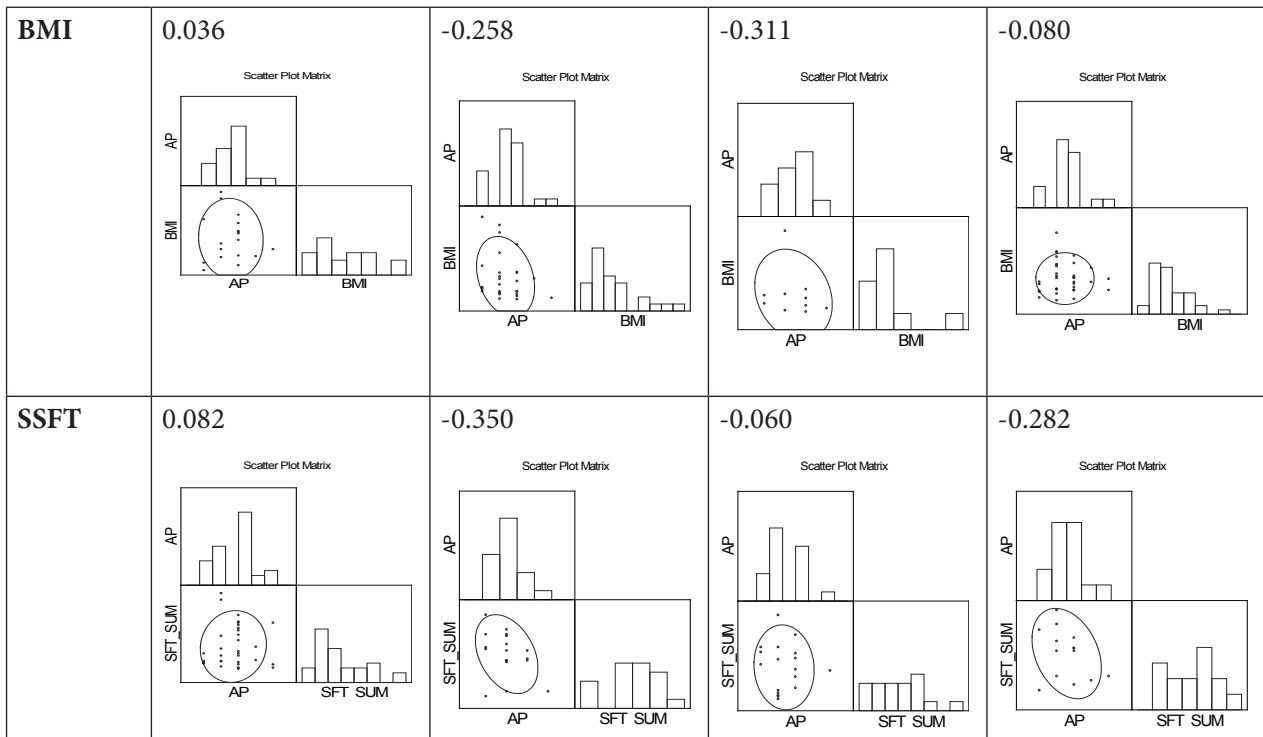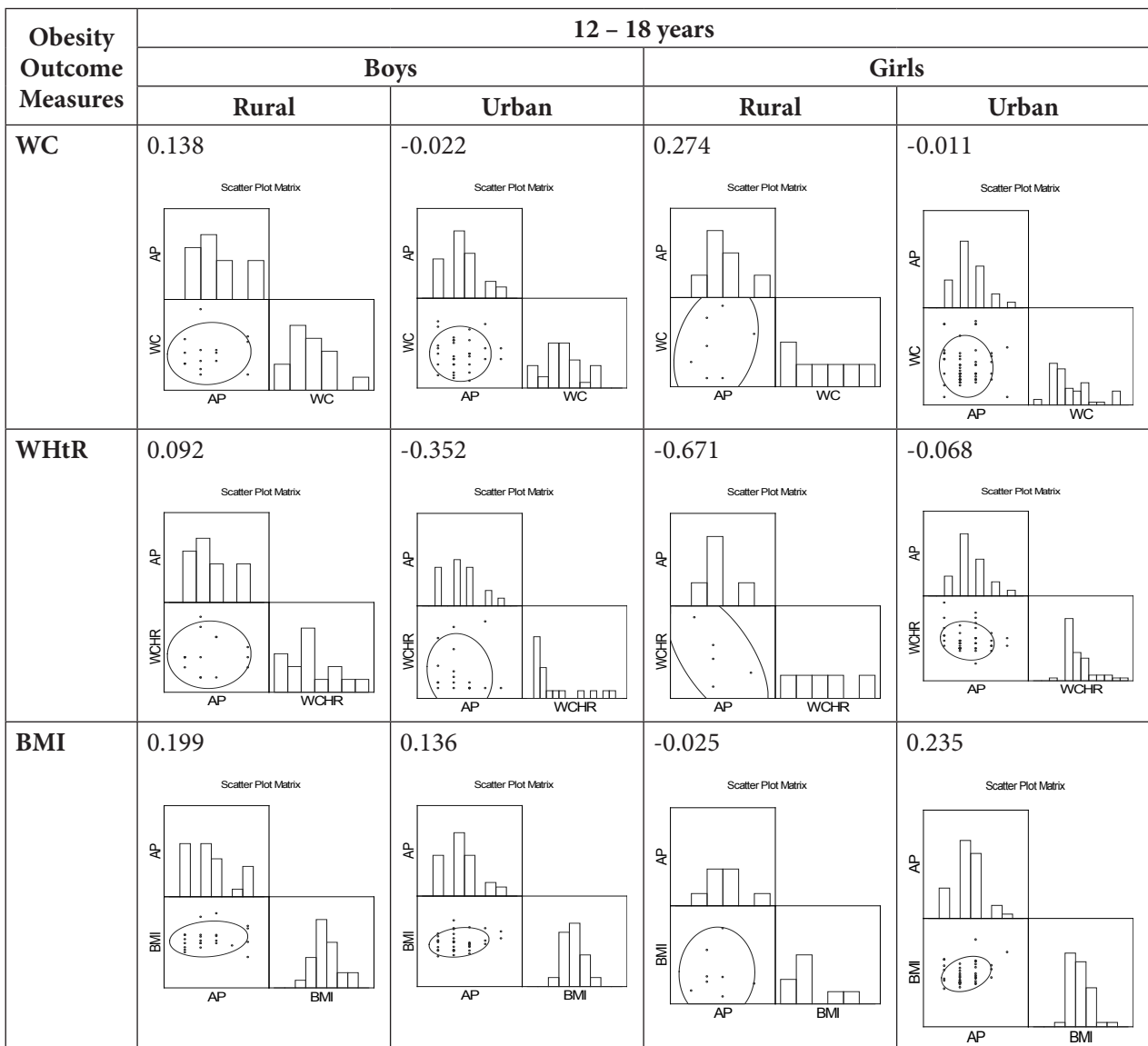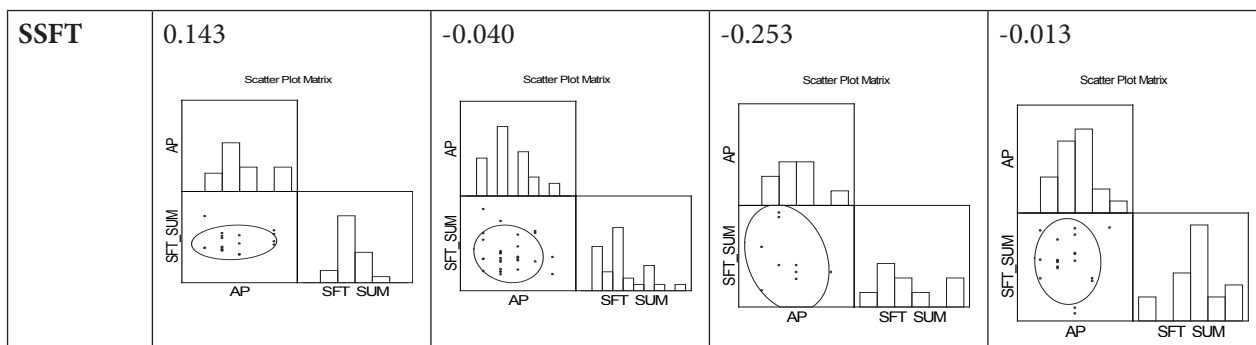| BMI	0.036	-0.258	-0.311	-0.080
SSFT	0.082	-0.350	-0.060	-0.282

Figure 2 illustrates the diagrammatic representation of the correlation in the form of scatter diagrams.

Figure 2: Scatter diagram of the correlation (12-18 years age-group)

Obesity Outcome Measures	12 – 18 years			
	Boys		Girls	
	Rural	**Urban**	**Rural**	**Urban**
WC	0.138	-0.022	0.274	-0.011
WHtR	0.092	-0.352	-0.671	-0.068
BMI	0.199	0.136	-0.025	0.235

SSFT	0.143	-0.040	-0.253	-0.013

Scatter Plot Matrix (AP, SFT SUM / AP, SFT SUM) — four panels

DISCUSSION

The results of our study found that in the age-group of 5-11 years, there was a negative correlation between obesity(WC) and academic performance. In our study, we found that there was no significant correlation between obesity (Waist-Height ratio, BMI, and SSFT) parameters and academic performance in rest of the groups which includes the subgroup of 12-18 years of age-group.

Regarding curricular expertise, we found that the influence of obesity was negative because they also had struggles related to social and emotional adjustment which made peer interaction difficult in the classroom thus hindering their classroom participation which was also taken into account when the teachers evaluated their academic performance [7].

The findings of our study are also supported by many other studies such as the one done in the UK by Arora T, 2012 and in Allahabad city by Bansal N, 2016 pointing out the fact that poor academic performance may be because of peer victimization which includes teasing and bullying and related absenteeism [1,5]. Children from cities are more exposed to junk food consumption which may be the reason for poor scores in mathematics and reading subjects thus making the overall academic excellence level low. Poor academic performances bring about emotional breakdowns which can initiate abnormal eating behavior which results in obesity. Stigmatization by the teachers because of obesity can also lead to the poor marks being allotted. Obesity creates an overall increase in the size of the body, which requires the blood to be circulated to those parts of the body ultimately compromising the blood to be reaching the parts of brain responsible for cognitive tasks required as a portion of academic tasks and activities [6].

The reasons for the insignificant correlation between obesity and academic performance in 12-18 years age-group are explained as follows. Firstly, obese children who were studied in the present study were belonging to both urban and rural schools. Obese children who are hailing from low-income homes have been associated with less school success than students from high socio-economic families. Parents within low-income group have been found to be having lower academic expectations and less supervision of children's school work. On the other spectrum, parents with higher educational qualifications have a high level of awareness and are instrumental in creating an environment that would facilitate learning [8,9].

However, the implications of the results of the present study demonstrate the immaterial relationship amongst being obese and scholastic execution does not propose that obesity is not crucial for scholarly execution, there are likely possibilities that the harmful impacts may show up on the long trail. This is confirmed in the investigation where the impact of adiposity was seen just in grades 7 to 9 yet not in grades 3 to 6. The noteworthy impact in the Finnish examinations was additionally seen among more elder children. It is conceivable that a noteworthy impact of adiposity can be promptly watched just in more established adolescents [10]. More longitudinal investigations are expected to analyze the connection between scholastic execution and weight in the youngsters with bigger specimen size [3]. Overweight in immature young ladies is fundamentally connected with negative mental results which may, like this, influence their scholarly execution. These discoveries show that overweight/heftiness can be a marker, yet not a causative factor which can influence the scholastic performance [11,12].

As far as anyone is concerned, this is the principal research on the relationship of obesity with academic performance in a group of majority Gujarati children. For example, among youthful US youngsters, in spite of the fact that Datar A, 2004 demonstrated a noteworthy impact of obesity on scholarly attainment, the authors found that adiposity was, in reality, a substitute of economical inequalities among people and did not appear to assume a causal role in scholastic performance. Our data reinforce that adiposity or overweight status as such is not a hazard factor for bringing down academic performance [3].

Many public health studies were done by Nino CT, 2014; Naticchioni, 2013; Shore SM, 2008; Li Y, 2008, have been successful in proving the association between high BMI and lower academic performance on intellectual tasks relevant to physical function and recollection [13]. The explicit cause of this correlation is still unclear, as is the system underlying intellectual disorders related to overweight. On comparing the present study and previous studies undertaken in this domain, we found that outcome measures of obesity and academic performance vary widely in all the studies. For obesity, the most preferred measures wereBMI, BMI percentile, ideal weight percentage or skinfold thickness measures. Variables of academic performance in all the referred articles scoping from comprehension scores or GPA to standardized tests related to each subject who was included to evaluate their academic skills [14,15].

Apart from these differences, some of the studies have also displayed the influence of different cultural backgrounds. There are other vital pathways that should be taken into account for the sources of confounding. Fetal nutritional status or the genetic setup of the child could also influence the poor development of body systems including the nervous system [2,12].

In addition to all the factors mentioned above, the limitation of the present study is the study's design which is cross-sectional in nature, therefore, disabling a causality inference [12,16]. The most apt design for the present study would be a randomized controlled trial with blinding which can potentially remove the possible confounding factors.Also, a study adopting the same design but having a long-term follow-up would be ideal to affirm the association between obesity and scholastic performance confidently [15,16]. When the assessment of the academic accomplishments is done comprehensively involving the focus group discussion, then the detailed psychological statistics can be revealed which can be involved in the future prospective studies. Also looking at the influence of obesity on the physical fitness of the child, it can be much intriguing to know in future about the rate of decline of physical fitness as compared to academic performance, once a student becomes obese.

CONCLUSION

Overweight and obesity are increasing at an alarming rate. At present, obesity may act as a surrogate measure and not show a direct influence on the academic performance of the child, but puts them in the health risk group which invites other pathologies affecting the class participation and hence academic performance. Genetic, cultural and economic factors can be controlled by complying with the ideal research design.

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