INTER-RELATIONSHIP BETWEEN NUTRITIOUS FOOD HABIT, OBESITY, ANXIETY AND ACADEMIC ACHIEVEMENT OF THE PRIMARY SCHOOL CHILDREN OF KOLKATA, WEST BENGAL

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The development of a nation is closely interlinked with the educational level of its future citizens. Various studies have provided enough evidence of the importance of proper nutrition to the cognitive development of an individual which also affects their educational achievements. Anxiety disorders are the most prevalent mental disorders in developed countries. On the other hand, obesity is recognized to be one of the greatest public health problems worldwide. The present study was designed for understanding the interrelationship between nutritious food habit, obesity, anxiety and academic achievement of the primary school children. Standard questionnaires were adopted and applied on the target population to measure the different attributes. The collected data were statistically analyzed by one-way ANOVA and Pearson correlation coefficient ($P<0.05$). Study revealed a significant negative relationship between academic achievement and obesity (measured by body mass index or BMI) of the children (-0.474, $P<0.01$).Similar kind of relationship was also observed among nutritious food habit score and obesity (-0.795**, $P<0.01$).But there exist a positive significant relationship between anxiety and obesity (0.223*, $P<0.05$). It is interesting to note that moderate anxiety enhances academic achievement of the student rather than low or severe anxiety. It is suggested from the present study that the childhood i.e golden period for learning should provide better nutrition .Therefore the importance of nutrition in primary school curriculum and improvement of the learning environment related to nutrition need to be emphasized on school campuses.**

The development of a nation is closely interlinked with the educational level of its population. Various studies have provided enough evidence of the importance of proper nutrition to the cognitive development of an individual which also affects their education achievements. The American Heritage Dictionary formally defines obesity as condition of increased body weight that is caused by an excessive accumulation of fat .Obesity has been termed the new 'epidemic' in both adults and children. In 1998 the World Health Organization (WHO) designated obesity as a global epidemic (Anrig, 2003).

It is a fact that a nation's progress depends upon its students' academic achievements and development. That's why every nation emphasizes students' academic achievements. The academic achievements of the students are badly affected due to increase in anxiety in the society. There is no denying to the fact that anxiety has increased in the society it not only affects education but also students' personalities which linger throughout their lives. Today, anxiety is a common phenomenon of everyday's life. It plays a crucial role in human life because all of us are the victims of anxiety in different ways.

Although childhood obesity has become a major public health issue in India, little evidence exists regarding the impact of being overweight on academic performance. This

paper accordingly examines the relationship between nutritious food habit, obesity, anxiety and academic achievement of the primary school children of Kolkata, West Bengal. Result of the present study may provide a base line data for the future researchers who will attempt the in depth study in this area.

REVIEW OF RELATED RESEARCH AND STUDIES

The potential for health to improve cognitive function, learning and academic achievement in children has received attention by researchers and policy makers (Ivanovic D and Marambio M., 1989). It is widely accepted that health and well-being are essential elements for effective learning (Popkin BM, Lim-Ybanez M., 1982). It is also seen that education is a strong predictor of lifelong health and quality of life in different populations, settings, and time (Keeley TJH, Fox KR. 2009). But as to how education leads to better health and longer life expectancy are still not clearly understood. It is widely held, however, that education, health, and social outcomes are very closely interdependent (Kolbe LJ. 2002) .

Falkner *et al*. (2001) found that compared with their average weight counterparts, obese youth of both genders are more likely to consider themselves poor students, obese girls are more likely to be held back a grade, and obese boys are more likely to expect to quit school. Using the same data, Mellin *et al*. (2002) reported that overweight boys rated their school performance as lower than did non- overweight boys, and both overweight girls and boys reported lower expectations of their educational future than did non-overweight youth. Mikkila *et al*. (2003) made a survey over 60000 Finnish adolescents, ages 14-16 years. The study revealed that good school performance was inversely associated with being obese for both boys and girls. Datar *et al*. (2004) studied 11,192 first time kindergartners .Early Childhood Longitudinal Study revealed that math and reading test scores of kids who were overweight kindergarteners were significantly lower than were those of other kids both in kindergarten and in first grade. These could be attributed to socioeconomic and behavioural variables, indicating that overweight may be a marker, but not a causal factor, of low test scores. Hannah Schmunk (2010) tried to find out the relationship between nutritional status, obesity and academic achievement of the students. The study contributes to the growing evidence of significant connections between school meal programs, nutritional status, and students' academic achievement.

In 1997, the Canadian Medical Journal revealed that the cost of obesity amounted to 1.8 billion dollars in Canada. The high incidence of obesity causes increased blood pressure, diabetes and also increased levels of low self-esteem and depression in the population (Neiman, 2004). Low self-esteem and depression do not seem to be a direct effect of obesity, but Dr. Neiman (2004) points out that obese child might have many social and physiological problems. For example, many children who are obese are also often teased and ostracized because of their weight. A study has found that obese boys are four times as likely to suffer from depression when compared to their thinner peers. Researchers have shown that discrimination against fat kids begin as early as kindergarten (Patridge, 2003). The Journal of Medical Association has also shown that obese children consider their quality of life "significantly impaired" to the same degree as children being treated for cancer (Partridge, 2003).Obese children and teenagers have a greater chance of becoming overweight adults

(Anrig, 2003).

Nadeem *et al.* (2012) made a study on the impact of anxiety on the academic achievement of students having different mental abilities at University level in Bahawalpur (Southern Punjab) Pakistan. The results show that anxiety had its impact on academic achievement of students. When anxiety increases, academic achievement decreases in both sexes but there is more impact of anxiety on female students as compared to male students.

From the related literatures on nutritious food habit, obesity, anxiety and academic achievement of the students it is observed that considerable amount of studies were conducted so far in this area. But most of the studies were performed abroad. No such attempt was made to explore the interrelationship between nutritious food habit, obesity, anxiety and academic achievement of the primary school children of Kolkata, West Bengal. So the present treatise was attempted.

OBJECTIVES OF THE PRESENT STUDY

1. To find out the relationship between nutritious food habit and obesity of the children.
2. To find out the impact of obesity on their level of anxiety and academic achievement.
3. To evaluate the impact of anxiety levels on the academic achievement of the children.
4. To study the interrelationship, if any, between the different variables under study.

METHODOLOGY

Recording of height and weight of the subjects were carried out with the help of an anthropometer and a weighing machine respectively which was calibrated every day before the start of work. All the anthropometric measurements were taken following the standard techniques recommended by Lohman *et al*. (Lohman, T G, Roche A F, Martorell R, 1998.) .Obesity of the students for the present study were measured through Body Mass Index (BMI). BMI was calculated as per WHO norms. It is calculated as the weight in kilograms divided by the square of the height in meters (kg/m2). BMI is age-independent and the same for both sexes (World Health Organization, 1983).

Body Mass Index = Body weight in Kg/Body height in m^2

On the basis of the BMI value, students were categorized into four groups viz. underweight (<18.50), Normal (18.5 – 24.9), Overweight (25.0- 29.9) and Obese (> 30). Dietary survey was conducted on each individual for a period of seven days. From this data, the nutritional status of each individual was calculated with the help of food composition table (Gopalan C, B V Ramasastri, S C Balasubramaniam, 2004). Standard Diet survey questionnaire as used by National Institute of Nutrition and ICMR modified as per local requirement was used in the collection of food consumption data.

Academic performance of the students were assessed by the marks scored by the students in the last term exam conducted by the school. Since the students had a combination of subjects, so to bring in parity in assessment, the percentage of the total marks scored by the students were taken into consideration to rule out bias.

Anxiety level was measured by using Hamilton Anxiety Rating Scale (Hamilton,M.,1959).on the basis of anxiety score, students were categorized into three categories viz. Mild (<17), Moderate (18-24) and Severe (>25). Statistical analysis (Descriptive Statistics, ANOVA and

Pearson Correlation) were done using SPSS version 20 to find out the interrelationship among different variables under study.

HYPOTHESES

The following hypotheses will be tested

1. There exists no significant difference in nutritious food habit among the students belonging to different category of obesity.

2. There is no significant difference in anxiety value among the students belonging to different category of obesity.

3. There exists no significant difference in academic achievement among the students belonging to different category of obesity.

4. There exists no significant difference in nutritious food habit among the students belonging to different category of anxiety.

5. There exists no significant difference in academic achievement among the students belonging to different category of anxiety.

6. There is no significant relationship between obesity of the students and their level of anxiety.

7. There is no inter-correlation among the different variables under study.

SAMPLE

The sample was drawn on the basis of its categories viz. gender and status of the children from two Primary School of Kolkata under West Bengal Board of Primary Education. Altogether 50 students (Class IV) were selected at random for the present study. Necessary permission was taken from the School Authority.

ANALYSIS

The obtained scores were statistically analysed and the SPSS version 20 was used for this purpose. The descriptive and inferential statistical findings helped to analyse the data. Minimum, Maximum, Means and Standard deviation were calculated for the scores from the nutritious food habit, obesity, anxiety and academic achievement of the primary school children of Kolkata. Analysis of variations (ANOVA) was done to evaluate the significant relationship (if any) between the variables. Statistical results were considered to be significant at $p \leq 0.05$.

RESULT AND DISCUSSION

The physical measurement was taken and the questionnaire was administered on the sample. Response sheet were examined thoroughly and scores were attributed to each individual. The scores were then tabulated and analyzed to achieve the stated objectives of the study and to test the stated hypotheses. The mean and standard deviation of scores of the variables under study have been tabulated as follows:

Table 1
Descriptive Statistics of the variables under study

Variable	N	Minimum	Maximum	Mean	Std. Deviation
NFH	50	9.00	18.00	13.8400	1.99346
BMI	50	13.25	31.52	18.0250	4.28395
Anx	50	14.00	30.00	20.1400	4.90319
AA	50	31.00	92.00	63.8200	13.34119

Note: NFH-Nutritious food habit score, BMI–Body Mass Index, Anx-Anxiety value, AA-Academic Achievement score

Means of scores were compared with the ANOVA technique for testing the hypotheses.

Table 2
Result of one way ANOVA regarding nutritious food habit, anxiety and academic achievement of the students belonging to different category of obesity.

ANOVA Table						
SOURCE		Sum of Squares	df	Mean Square	F	Sig.
NFH*BMIC	Between Groups (Combined)	141.818	3	47.273	41.105	.000
	Within Groups	52.902	46	1.150		
	Total	194.720	49			
Anx*BMIC	Between Groups (Combined)	169.383	3	56.461	2.575	.065
	Within Groups	1008.637	46	21.927		
	Total	1178.020	49			
AA*BMIC	Between Groups (Combined)	2120.405	3 46	706.802	4.925	.005
	Within Groups	6600.975	49	143.499		
	Total	8721.380				

Note: BMIC - BMI Category, NFH - Nutritious food habit score, Anx - Anxiety value, AA - Academic Achievement score

Hypotheses 1. There exists no significant difference in nutritious food habit among the students belonging to different category of obesity.

It is found from the Table 2 that computed value of 'F' is greater than the table value of 'F' at 0.01 level of significance. Therefore the null hypothesis is rejected and it can be interpreted that there lies significance difference between the students belonging to different category of obesity (i.e. underweight, normal, overweight and obese) in respect to nutritious food habit. On scrutiny of Table 3 it is observed that mean value of nutritious food habit score is lowest among the obese people followed by overweight people. It is quite well

Table 3
Mean value of different variables in respect to different category of obesity

BMI Category (BMIC)		NFH	Anx	AA
underweight	Mean	14.9118	19.9706	66.7941
	N	34	34	34
	Std. Deviation	1.13798	4.70000	12.50401
Normal	Mean	12.1667	19.1667	61.5833
	N	12	12	12
	Std. Deviation	.93744	4.56933	10.61267
Overweight	Mean	10.5000	20.0000	55.0000
	N	2	2	2
	Std. Deviation	.70711	7.07107	12.72792
Obese	Mean	9.0000	29.0000	35.5000
	N	2	2	2
	Std. Deviation	.00000	.00000	6.36396
Total	Mean	13.8400	20.1400	63.8200
	N	50	50	50
	Std. Deviation	1.99346	4.90319	13.34119

Note: NFH-Nutritious food habit score, Anx-Anxiety value, AA-Academic Achievement score

accepted fact that to reduce obesity nutritious food habit plays a very important role.

Hypotheses 2. There is no significant difference in anxiety value among the students belonging to different category of obesity.

It is found from the Table 2 that computed value of 'F' is even lesser than the table value of 'F' at 0.05 level of significance. Therefore the null hypothesis is accepted and it can be interpreted that there lies no significance difference between the students belonging to different category of obesity in respect to their level of anxiety. Although from Table 3 it can be concluded that obese people are comparatively more anxious than their counterpart (Mean=29).

Hypotheses 3. There exists no significant difference in academic achievement among the students belonging to different category of obesity.

Values from the Table 2 clearly indicate that computed value of 'F' is greater than the table value of 'F' at 0.01 level of significance. Therefore the null hypothesis is rejected and it can be interpreted that there lies significance difference between the students belonging to different category of obesity in respect to their academic achievement. The mean academic achievement values of primary school children (Table 3) illustrate that good academic achievement is inversely associated with being obese. This view is well supported by several researchers (Laitinen 2002, Mikkila 2003, Datar *et al*.2004).

Hypotheses 4. There exists no significant difference in nutritious food habit among the students belonging to different category of anxiety.

It is found from the Table 4 that computed value of 'F' is even lesser than the table value

Table 4
Result of one way ANOVA regarding nutritious food habit, academic achievement and obesity of the students belonging to different category of anxiety.

ANOVA Table						
SOURCE		Sum of Squares	df	Mean Square	F	Sig.
NFH*ANXC	Between Groups (Combined)	5.620	2	2.810	.698	.502
	Within Groups	189.100	47	4.023		
	Total	194.720	49			
AA*ANXC	Between Groups (Combined)	3656.080	2	1828.040	16.962	.000
	Within Groups	5065.300	47	107.772		
	Total	8721.380	49			
BMI*ANXC	Between Groups (Combined)	52.728	2	26.364	1.464	.242
	Within Groups	846.531	47	18.011		
	Total	899.259	49			

Note: ANXC-Anxiety Category NFH-Nutritious food habit score, Anx-Anxiety value, AA-Academic Achievement score

of 'F' at P<0.05. Therefore the null hypothesis is accepted and it can be interpreted that there lies no significance difference between the students belonging to different category of anxiety (i.e. Mild, Moderate and Severe) in respect to their nutritious food habit. Although from Table 5 it can be concluded that the child with nutritious food habit shows comparatively less anxiety than their counterpart (Mean = 13.55).

Hypotheses 5. There exists no significant difference in academic achievement among the students belonging to different category of anxiety.

Values from the Table 4 clearly indicate that computed value of 'F' is greater than the table value of 'F' at P<0.01. Therefore the null hypothesis is rejected and it can be interpreted that there lies significance difference between the students belonging to different category of anxiety in respect to their academic achievement.

It is very interesting to observe that children with moderate anxiety shows maximum mean academic achievement (Mean=74) than with least level of anxiety (Mean=55.2). Nadeem *et al*. (2012) observed that when anxiety increases, academic achievement decreases both in male and female students. But present study suggests that moderate anxiety enhances academic achievement of the student rather than low or severe anxiety.

Hypotheses 6. There is no significant relationship between obesity of the students and their level of anxiety.

It is found from the Table 4 that computed value of 'F' is even lesser than the table value of 'F' at P<0.05. Therefore the null hypothesis is accepted and it can be interpreted that there lies no significance difference between the students belonging to different category

Table 5
Mean value of different variables in respect to different category of anxiety

Report				
Anxiety category (ANXC		NFH	AA	BMI
Low	Mean	13.5500	55.2000	18.5945
	N	20	20	20
	Std. Deviation	1.84890	9.82264	4.21542
Moderate	Mean	14.2500	74.0000	16.8095
	N	20	20	20
	Std. Deviation	1.88833	8.63896	3.18298
Severe	Mean	13.6000	60.7000	19.3170
	N	10	10	10
	Std. Deviation	2.50333	14.19742	5.92930
Total	Mean	13.8400	63.8200	18.0250
	N	50	50	50
	Std. Deviation	1.99346	13.34119	4.28395

of anxiety in respect to their obesity (BMI).Although mean value (Table 5) suggest that the student with severe anxiety possess comparatively high BMI value.

Hypotheses 7. There is no inter-correlation among the different variables under study.

Table 6
Correlation between different variables under study

Pearson Correlation		BMI	Anx	AA
AFH	Pearson Correlation	-.795**	-.123	.348*
	Sig. (2-tailed)	.000	.395	.013
BMI	Pearson Correlation		.223	-.474**
	Sig. (2-tailed)		.120	.001
Anx	Pearson Correlation			.096
	Sig. (2-tailed)			.509
**. Correlation is significant at the 0.01 level (2-tailed). *. Correlation is significant at the 0.05 level (2-tailed).				

The inter-correlation among the different variables were measured and presented in Table 6.

The calculated r values of the above table (Table 6) indicates that nutritious food habit has maximum significant and negative correlation (-0.795**) with BMI whereas BMI has maximum significant and negative correlation (-0.474**) with academic achievement of the students. Therefore it can be concluded that increase level of nutritious food habit have

a negative influence on the obesity (BMI) of the students i.e. nutritious food habit is the prime controlling factor to reduce obesity of the children. This fact is also established from the result of ANOVA and mean values (Table 2 and 3). The analysis shows that gaining weight and being overweight or obese significantly decreases academic performances. It is interesting to note that among the different variables nutritious food habit shows significant positive correlation with academic achievement of the students (0.348*). So, good academic performances need higher level of nutritious food habit. Hence on the basis of the above mentioned result hypotheses 7 is rejected ad it can be concluded that variables under study are inter-correlated.

CONCLUSION

This paper investigates the nature of the relationship between nutritious food habit, obesity, anxiety and academic achievement of the primary school children of Kolkata, West Bengal. The analysis shows that gaining weight and being overweight or obese significantly decreases academic performances. Given the almost complete absence of information on interactions between bodyweight and academic performance, our study contributes to the growing academic literature on overweight and obesity simply by showing the robustness of the strong negative partial correlation between the two quantities.

An important question that our research fails to address regards the mechanism through which the causal effect of bodyweight on academic performance operates. One possibility is that the impact occurs indirectly through health problems from which overweight students are more likely to suffer. Another is that carrying additional bodyweight literally reduces the energy available to allocate towards schoolwork. A third is that being overweight brings about social isolation, through avoidance or ridicule, which leads to psychological problems that impair school performance. More information on this issue would clearly help policymakers, school administrators, teachers, parents and students choose the optimal mix of policies to reduce the academic performance burden associated with being overweight or obese. Present study suggests that moderate anxiety enhances academic achievement of the children rather than low or severe anxiety. Statistical analysis of the collected data with that of their academic achievement provides valuable insight into the role of various nutrients in academic achievement of these students. It was found that BMI are negatively correlated with academic achievement. Thus from the above study and analysis of the data generated, we can conclude that nutritional status and anxiety level of primary school children has definite relationship with his/her academic achievement.

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