



Original Research Article

Influence of Body Weight on Academic Achievement of the First Year Medical College Students

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ABSTRACT

Academic achievement of the student decides future status of that student. That's the reason why every parent and student is seriously concern about it. Childhood and adolescence phase of life is main period for the academic achievements. Overweight/obesity in children and adolescent is growing problem in developed as well as in developing countries. The present study was carried out to find the influence of weight on academic achievement of first year medical college student during their first academic year. The study included 92 healthy students who were appeared for all the examinations conducted in that academic year. These students were divided in three study groups on the basis of their Body mass index (BMI). Out of 92 students, 20 were overweight (BMI >23), 29 were underweight (BMI <18.5) and 43 were normal weight (BMI between 18.6 to 22.9). Their final university result was assessment of the student which considers all the examinations conducted in that year. So we took their final university result as their academic achievement indicator and compared it between three study groups. Statistical analysis was done by one-way ANOVA test. Findings of the study suggest that academic achievement of overweight student is less than normal weight and significantly less than underweight students. Psychosocial behavior and lack of physical activity in overweight students may be the cause of this finding. More research work is required to obtain precise relationship between bodyweight and academic achievement.

Keywords: Academic achievement, Body mass index, Overweight, Underweight, Normal weight.

INTRODUCTION

Student population is always desperately concern about their academic achievement. Even students studying in same class and taught by the same teacher

shows variation in academic achievement. Good academic achievement is directly related to good scoring in various entrance examinations and job opportunities so it has been always a matter of concern for both

parents as well as students. ^[1] Achievement in school is affected by a number of factors, including the quality of the school, characteristics of the student's family such as socioeconomic status and parent's educational level, and the characteristics of the child. ^[2] Inverse relationship between absenteeism and academic achievement has been found by researchers. ^[3] Motivation and home environment have a positive relationship with academic achievement. ^[4] In Spanish adolescent boys academic performance was more influenced by school-related factors such as their attitude to the school. ^[5] All of these studies have shown relationship of academic achievement with factors which are not directly related to the health.

Suboptimal sleep affects students learning process and academic achievement. ^[6] Intake of fruits and vegetables is positively associated with school performance among adolescents and same study also provide additional evidence that school performance is strongly affected by the dietary quality and the nutritional status of the adolescents. ^[7] Four healthy behaviors combined (physical activity, TV viewing, sleep and fruit consumption) has a positive influence on academic achievement in Spanish adolescent girls. ^[5] For school failure, prevalence of multiple factors such as social, school, psychological, environmental and health related factors was successfully highlighted. Both psychological and health related factors were found to be more prevalent. ^[8] Regular breakfast consumption has been linked with improvement in academic achievement, psychosocial functioning and cognition. ^[9] All of these studies have shown positive relationship of academic achievement and good health. Understanding of the relation between health and academic achievement of the student has significant implications. There is converging interest among public

health scientists and school policy makers in the health status of adolescents and its impact on their academic achievement. ^[10]

One of the leading global risks for mortality is overweight and obesity. ^[11] The Centers for Disease Control and Prevention in 2003, reported a 4-fold rise in child and adolescent obesity (ages 6-19) in 20 years. ^[12] Obesity often accompanied by a parallel rise in type 2 diabetes, ^[13] as well as increased rates of cardiovascular problems, hyperlipidemia, obstructive sleep apnea, asthma, orthopedic complications, nonalcoholic fatty liver disease, cancer, psychosocial complications, and lower measures of quality of life. ^[13] Overweight and obesity have been also linked with the academic achievement. Research study concluded that overweight children had significantly lower math and reading scores compared with non overweight children. ^[14] Obesity at 14 years of age was associated with a low school performance at 16 years and a low level of education persisting until at least age 31. ^[15] Youths who were overweight generally achieved relatively lower educational outcomes. ^[16]

Almost all first year students of medical colleges come after finishing their higher secondary. Being a professional college method of teaching is different and syllabus to which these students are exposed is also vast as compared to higher secondary. Most of the students have to stay away from their homes and so there might be many factors which may be affecting their academic achievement. The purpose of present study was to find out influence of weight on academic achievement of first year medical college students and the knowledge of study result can be use for policy making of medical colleges.

MATERIAL AND METHODS

The present study was conducted in the Department of Physiology, Dr. Ulhas

Patil Medical College (DUPMC) Jalgaon. Study was approved by the institutional ethical committee. There were total 109 first year students studying in DUPMC. They have to face examination of three subject anatomy, physiology and biochemistry for the first year. According to the rules of Maharashtra University of Health Sciences (MUHS) in medical colleges of Maharashtra three examinations, two internal and one final university examination are conducted in every academic year. Marks of these three examinations are considered for the final assessment of the students for that academic year. In this study we have considered their final university assessment result as their academic achievement indicator. Those students who were absent for the university examination of one or more subjects, were excluded and remaining 92 students were included in the study group. Written consent was taken from all the students before conducting the study. Anthropometrical measurements Age, Height and Weight were recorded along with preliminary clinical examination to exclude any systemic disorder affecting academic performance.

Anthropometry

(a) Body Weight

A digital weighing scale was used to measure the body weight with an accuracy of ± 100 grams. Subjects were weighed without their shoes and with light summer clothing.

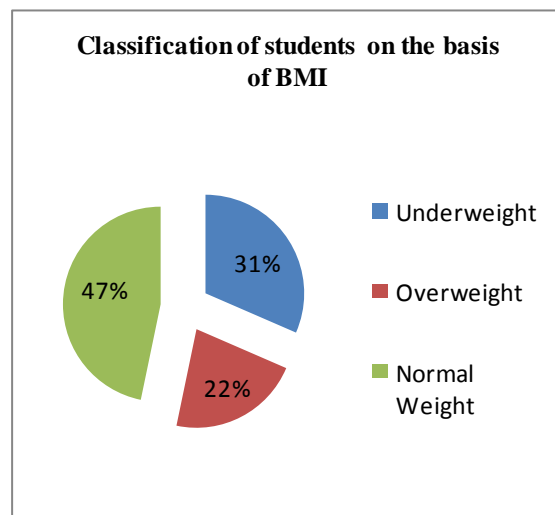
(b) Height

Standing body height was measured without shoes to the nearest 0.5 cm with the use of height stand with shoulders in relaxed position and arms hanging freely.

(c) Body Mass Index

BMI was calculated as body weight in kilograms divided by square of body height in meters.

According to the WHO classification of BMI for Asian countries we classified study group in three categories BMI > 23 as overweight, BMI < 18.5 as underweight and BMI 18.6 to 22.9 as normal weight students. [17, 18] Out of 92 students 29 were underweight, 43 were normal weight and 20 were overweight. First year academic achievement indicated by their final university result (Sum total of all three subjects), of these three groups was compared.



Statistical Analysis

A one-way ANOVA test was conducted to compare and see the influence of weight on academic achievement in three uneven study group underweight, normal weight and overweight students.

RESULTS AND OBSERVATIONS

Table1. Summary of the descriptive statistics results of comparison between three study groups to see the influence of body weight on academic achievement.

BMI based Classification	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
Underweight	29	335.38	44.587	8.280	318.42	352.34	271	447
Normal weight	43	310.09	44.958	6.856	296.26	323.93	209	409
Overweight	20	302.65	34.445	7.702	286.53	318.77	245	357
Total	92	316.45	44.355	4.624	307.26	325.63	209	447

Mean values in Table 1, suggest that different groups had scored differently in their final assessment with the underweight highest and the overweight group scoring lowest. Even the lower and upper bound values of 95% Confidence Interval for Mean were less in overweight group than the underweight and normal weight group. Minimum and maximum score values of the overweight group were also less than underweight group.

Table2. Summary of the ANOVA results for comparison of study groups to see the influence of body weight on academic achievement.

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	15937.723	2	7968.861	4.349	.016
Within Groups	163095.005	89	1832.528		
Total	179032.728	91			

Table3. Summary of the ANOVA multiple comparisons for studying the influence of body weight on academic achievement.

Post Hoc Tests
Dependent Variable : Marks

(I) group	(J) group	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval		
					Lower Bound	Upper Bound	
Bonferroni	under	normal	25.286*	10.286	.048	.19	50.39
		over	32.729*	12.443	.030	2.37	63.09
	normal	under	-25.286*	10.286	.048	-50.39	-.19
		over	7.443	11.586	1.000	-20.83	35.71
	over	under	-32.729*	12.443	.030	-63.09	-2.37
		normal	-7.443	11.586	1.000	-35.71	20.83

*. The mean difference is significant at the 0.05 level.

Table 2 shows the values of sum of squares and mean square between groups and within groups. To confirm whether the differences between groups were significant we consider the F value 4.349, whose

significance value of 0.016 is less than alpha = 0.05. Therefore the conclusion was that there was a significant influence of weight on academic achievement at the $p < 0.05$

level in the three study groups. [F (2, 89) = 4.349, p = 0.016]

Table 3 shows Post hoc multiple comparisons of academic achievement using the Bonferroni test between three study groups. Mean difference value < 0.05 was considered to be the significant. Therefore conclusion was that the mean difference of underweight and normal weight was significant (Sig. 0.048). The mean difference of underweight and overweight was also significant (Sig. 0.03). However, the mean difference of normal weight and overweight was not significant (Sig. 1.0).

Taken together, these results of three tables suggested that academic achievement was significantly influenced by body weight of the student. Specifically academic achievement of overweight students was significantly less than underweight students. Academic achievement of overweight students was also less than normal weight students but the difference was not statistically significant.

DISCUSSION

Now a day due to small family norms every parent wants to give best of their possible to their children or only child. Provide them the good education and food is a part of it. While giving a food, whether it is good for child's health or not the taste of the child is mainly considered and this may make them overweight. When parent provide a good education to the children they also expect a good academic achievement from them. Present study has shown that the academic achievement of the overweight students is less than the normal weight students and significantly less than the underweight student. Means weight is one of the factors which influence the academic performance significantly.

The International Task Force on Obesity has agreed that BMI is the most

practical tools available to define overweight or obesity and to screen for it. [19, 20, 21] Therefore we have considered calculation of BMI as a tool to classify the students as overweight, normal weight and underweight. As per the MUHS pattern of assessment, final performance of the first year medical students decided by final university examination and two internal examinations conducted by the college. Therefore we have considered their final university assessment result, the sum total of marks obtained in all three subjects to get an idea about their academic achievement throughout the year.

Key finding of this study is academic achievement of overweight students is less than normal weight and significantly less than underweight students. Our finding is consistent with the finding of WHO MONICA project which has shown statistically significant inverse association between educational level and BMI in all populations. In essence, the leaner participants of both sexes attained higher levels of educational attainment in both sexes. [22] Similar findings are also noted by Florin TA et al [23] and Taras H et al. [24] while a reason for this association is not explained in these studies.

Academic performance is influence by many factors [2] so it is difficult to conclude the cause for low performance in the overweight students. Obese females as adolescents may be at increased risk for development of depression or anxiety disorders. [25] Psychosocial variables, such as weight-based teasing is also a proposed factor for low performance. [26] Adolescents teased about their weight are at risk for disordered eating thoughts and behaviors and psychological morbidities. [27] Children with normal height/weight ratios have wider range of interests, better capacity for social adaptability, and greater speed and dexterity. [28] Potential social isolation of overweight

has been also observed. [29] There is substantial support for metabolic risk factors, internalizing disorders, attention-deficit hyperactivity disorder, and decreased health-related quality of life as co morbidities to obesity. [30] Therefore social, psychological and behavioral factors may be responsible for the lack of concentration leading to low academic achievement in overweight students.

Physical activity of the students is always less in professional colleges, as main stress is given on sitting for hours to do the study. Providing 45 minutes of daily physical activity can increase cognitive ability while increasing fitness and decreasing the prevalence of overweight and obese youth. [31] Physical activity can have an impact on cognitive skills and attitudes and academic behavior, all of which are important components of improved academic performance. These include enhanced concentration and attention as well as improved classroom behavior. [32] Systematic exercise programs may actually enhance the development of specific types of mental processing known to be important for meeting challenges encountered both in academics and throughout the lifespan. [33] Regular physical activity may reduce plasma noradrenalin. It may also increase the transfer of the serotonin precursor tryptophan across the blood brain barrier, having a calming effect in children and enabling them to sit and concentrate on academic pursuits. [34] Overweight or obesity is one of the components of metabolic syndrome. Lower cognitive performance and reductions in brain structural integrity have been documented among adolescents with metabolic syndrome, thus suggesting that even relatively short-term impairments in metabolism, in the absence of clinically manifest vascular disease, may give rise to brain complications. [35] All these studies directly or indirectly relate the physical

activity with the brain activity. Study on nationally representative sample in United States has shown that the obesity in adolescence is linked with poor physical quality of life. [36] So poor physical activity may be causing low academic achievement which is seen in overweight students.

There is a significant difference between academic performances of normal weight and underweight students. This is an unexpected finding which we come across. Reasons for this finding are difficult to explain but shows that academic performance may also be influenced by many other factors. Unexplainable reason for this finding may be that home sickness, lack of homemade tasty food and hot climatic conditions in the area may have decrease the weight of students who might be normal weight or overweight before starting academic session. This confounding factor might have produced bias in the statistical analysis.

Though research studies do not suggest that efforts to curb obesity are a primary strategy for improving academic performance, it is possible that efforts to improve student health and wellness could also result in improved academic outcomes for some students. [37] Similarly our study suggests that over weight students should be encouraged to make healthy changes in their life style so that their academic performance may be improved along with the psychosocial behavior. Same suggestion is also applicable to the normal weight as well as underweight students to maintain or even to improve their academic achievement.

Further detailed studies are required on a large scale to find out influence of weight along with the other factors on academic achievement. We are planning to expand the study considering their achievement of previous and next few academic years. We are also planning to include other parameters such as their

attendance in the academic sessions, birth history, family income, parent's education, nutritional history, family culture so as to obtain more precise correlation between factors influencing academic achievement.

CONCLUSION

Present study is based on the premise that the body weight of a student has an effect on his or her ability to learn and to achieve academically. More specifically the purpose of this study is to examine the influence of body weight/BMI of the student on their academic achievement. Based on the results of this study, negative relationship is observed between body weight, as rated by the BMI, and academic achievement. In other words, overweight students perform below their normal weight and underweight counterparts regarding academic achievement. Causes for this difference are difficult to explain but psychosocial behavior and lack of physical activity may be causing less academic achievement seen in overweight students. Unexpected finding in the present study is academic achievement of underweight students is more than normal weight students. This finding indicates that there may be other factors, which are also influencing the academic achievement. Our study suggest that professional institutes should encourage the students to improve health and wellness which can be also result in improved academic outcomes for some students.

REFERENCES

1. Kim H. Y. P, Frongillo E. A, Han S. S, Oh S. Y, Kim W. K, Jang Y. A, Won H. S, Lee H. S and Kim S. H. Academic performance of Korean children is associated with dietary behaviors and physical status. *Asian Journal of Clinical Nutrition*, 2003, 12, 186-192.
2. Grantham-McGregor S. Can the provision of breakfast benefit School performance? *Food and Nutrition Bulletin*, 2005, 26(2 Suppl. 2):S144–158.
3. Baxter Suzanne D; Royer Julie A; Hardin James W; Guinn Caroline H; Devlin Christina. The Relationship of School Absenteeism with Body Mass Index, Academic Achievement, and Socioeconomic Status among Fourth-Grade Children. *The Journal of School Health*, Volume 81, Number 7, July 2011, pp. 417-423(7)
4. J. M. Muola. A study of the relationship between academic achievement, motivation and home environment among standard eight pupils. *Educational Research and Reviews*, Vol. 5 (5), May 2010, pp. 213-217.
5. D. Martínez-Gómez, O. L. Veiga, S. Gómez-Martínez, B. Zapateral, D. Martínez-Hernández, M. E. Calle, A. Marcos. Gender-specific influence of health behaviors on academic performance in Spanish adolescents; AFINOS study. *Nutr Hosp.* 2012; 27:724-730.
6. Taras H, Potts-Datema W. Sleep and student performance at school. *J Sch Health*. 2005 Sep; 75(7):248-54.
7. A. Abudayya, Z. Shi, Y. Abed and G. Holmboe-Ottesen. Diet, nutritional status and school performance among adolescents in Gaza Strip. *EMHJ*; Vol. 17; No. 3; 2011.
8. Madeeha Kamal and Abdulbari Bener. Factors contributing to school failure among school children in very fast developing Arabian Society. *Oman Med J*. 2009 July; 24(3): 212–217.
9. S Affenito. Breakfast: A missed opportunity. *Journal of the American Dietetic Association*, 107(4):565-569. 2007.
10. Inga Do´ ra Sigfu´ sdo´ ttir, A´ lfgeir Logi Kristja´ nsson and John P. Allegrante. Health behaviour and academic achievement in Icelandic school children. *Health Education*

- Research; Vol.22 no.1; 2007; Pages 70–80.
11. Global Health Risks Mortality and burden of disease attributable to selected major risks.WHO Library Cataloguing-in-Publication Data 2009
 12. Centers for Disease Control and Prevention, National Center for Health Statistics. Percentage of Children Ages 6 to 18 Who Are Overweight by Gender, Race, and Hispanic Origin, 1976-1980, 1988-1994, and 1999-2002. National Health and Nutrition Examination Survey; 2003.
 13. Friedlander SL, Larkin EK, Rosen CL, Palermo TM, Redline S. Decreased quality of life associated with obesity in school-aged children. *Arch Pediatr Adolesc Med.* 2003 Dec; 157(12):1206-11.
 14. Datar A, Sturm R, Magnabosco JL. Childhood overweight and academic performance: national study of kindergartners and first-graders. *Obes Res.* 2004; 12(1): 58-68.
 15. Laitinen J, Power C, Ek E, Sovio U, Jarvelin MR. Unemployment and obesity among young adults in a northern Finland 1966 birth cohort. *Int J Obes Relat Metab Disord.* 2002;26(10):1329-1338.
 16. Christian Nsiah, Prathibha V. Joshi. The Academic Cost of Being Overweight: Rural vs. Urban Area Differences - A Quantile Regression Approach. *Research in Higher Education Journal* Vol4; September 2009; 1-13.
 17. Chamukuttan Snehalatha, Vijay Viswanathan, Ambady Ramchandran. Cutoff Values for Normal Anthropometric Variables in Asian Indian Adults. *Diabetes Care*, Volume 26, Number 5, May 2003; 1380-84.
 18. WHO expert consultation. Appropriate body-mass index for Asian populations and its implications for policy and intervention strategies. *The Lancet*; Vol 363 ; 2004; 157-63.
 19. Dietz WH, Robinson TN. Use of the body mass index as a measure of overweight in children and adolescents. *J Pediatr.* 1998; 132:191-193.
 20. Himes JH, Dietz WH. Guidelines for overweight in adolescent preventive services: recommendations from an expert committee. *Am J Clin Nutr.* 1994; 59:307-316.
 21. Zuguo Mei, Laurence M Grummer-Strawn, Angelo Pietrobelli, Ailsa Goulding, Michael I Goran, and William H Dietz. Validity of body mass index compared with other body-composition screening indexes for the assessment of body fatness in children and adolescents *Am J Clin Nutr.* 2002; 75:978–85.
 22. Anu Molarius, Jacob C. Seidell, Susana Sans, Jaakko Tuomilehto and Kari Kuulasmaa WHO MONICA Project. *American Journal of Public Health*, August 2000, Vol. 90, No. 8:1260-68.
 23. Florin TA, Shults J, Stettler N. Perception of overweight is associated with poor academic performance in US adolescents. *J Sch Health.* 2011 Nov; 81(11):663-70.
 24. Taras H, Potts-Datema W. Obesity and student performance at school. *J Sch Health.* 2005 Oct; 75(8):291-5.
 25. Sarah E. Anderson, Patricia Cohen, Elena N. Naumova, Paul F. Jacques and Aviva Must. Adolescent Obesity and Risk for Subsequent Major Depressive Disorder and Anxiety Disorder: Prospective Evidence. *Psychosomatic Medicine* 69:740–747 (2007)
 26. Krukowski RA, West DS, Philyaw Perez A, Bursac Z, Phillips MM, Raczynski JM. Overweight children, weight-based teasing and academic performance. *Int J Pediatr Obes.* 2009; 4(4):274-80.
 27. Libbey HP, Story MT, Neumark-Sztainer DR, Boutelle KN. Teasing disordered eating behaviors, and psychological morbidities among overweight adolescents. *Obesity (Silver Spring).* 2008 Nov;16 Suppl 2:S24-9.
 28. Campos AL, Sigulem DM, Moraes DE, Escrivão AM, Fisberg M. Intelligent quotient of obese children and

- adolescents by the Weschler scale. *Rev Saude Publica*.1996 Feb; 30(1):85-90.
29. Fonseca H, Gaspar de Matos M. Perception of overweight and obesity among Portuguese adolescents: an overview of associated factors. *Eur J Public Health*. 2005 Jun; 15(3):323-8.
30. Pulgarón ER. Childhood obesity: a review of increased risk for physical and psychological comorbidities. *Clin Ther*. 2013 Jan; 35(1):A18-32.
31. Reed JA, Maslow AL, Long S, Hughey M. Examining the Impact of 45 Minutes of Daily Physical Education on Cognitive Ability, Fitness Performance, and Body Composition of African American Youth. *J Phys Act Health*. 2012 Jun 12.
32. Phillip D. Tomporowski, Kate Lambourne and Michelle S. Okumura. Physical activity interventions and children's mental function: An introduction and overview. *Prev Med*. 2011 June 1; 52(Suppl 1): S3–S9.
33. Phillip D. Tomporowski, Catherine L. Davis, Patricia H. Miller, and Jack A. Naglieri. Exercise and Children's Intelligence, Cognition and Academic Achievement. *Educ Psychol Rev*. 2008 June 1; 20(2): 111–131.
34. Jennings G, Nelson L, Nestel P, Esler M, Korner P, Burton D, Bazelmans J. The effects of changes in physical activity on major cardiovascular risk factors, hemodynamics, sympathetic function, and glucose utilization in man: a controlled study of four levels of activity. *Circulation*. 1986 Jan; 73(1):30-40.
35. Yau PL, Castro MG, Tagani A, Tsui WH, Convit A. Obesity and metabolic syndrome and functional and structural brain impairments in adolescence. *Pediatrics*. 2012 Oct; 130(4): e 856-64.
36. Swallen KC, Reither EN, Haas SA, Meier AM. Overweight, obesity, and health-related quality of life among adolescents: the National Longitudinal Study of Adolescent Health. *Pediatrics*. 2005 Feb; 115(2):340-7.
37. James B. Hunt Institute's review of research, Childhood Obesity and Academic Outcomes, December 2008.

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