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Research Article

THE ADVERSARY EFFECT OF OBESITY ON ACADEMIC ACHIEVEMENT AMONG ADOLESCENTS

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ABSTRACT

Objectives: This study aims to sough implications of the independent and combined demographic variables of weight status, age, food habits, and physical activity on academic achievement in adolescents.

Methods: The study sample consisted of 940 male students in the second secondary class; four secondary schools from Hail city in the Kingdom of Saudi Arabia participated in this study during April 2017. Weight status was assessed through body mass index (BMI) (kg/m^2). Participants filled the questioner to evaluate food habits and physical activity on academic achievement.

Results: The mean weight was 74.21±17.36 kg interquartile range (IQR) (45–125), while the mean height was 171.27±7.37 cm IQR (140–193). The mean BMI was 33.73 (IQR 22.0–39.8). The overall prevalence of childhood obesity was 49.6% while the prevalence of overweight was 9.04%. The mean academic score for the second secondary class was 70±9.99 IQR (44–99). BMI has endorsed negatively on academic achievement ($r=-0.322$, $p<0.05$).

Conclusion: We can summarize the independent variables as obesity ameliorates academic achievement in a counteractive way; high BMI affects total academic score in a negative pattern, whereas practicing mental games influenced positively the academic achievement and performance.

Keywords: Academic achievement, Body mass index, Kingdom of Saudi Arabia, Obesity, Physical activity.

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INTRODUCTION

Obesity is regarded as one of the most common medical problems which been highly correlated with several metabolic syndromes including diabetes and cardiovascular disorders [1]. As a concomitant implication of this intimate disorder, an exponential increase in obese patients endows chronic disease-related outcomes such as dysregulations in lipids, glucose, and blood pressure [2]. Aberrantly, scientific reports indicated a significant increase in the rate of obese patients spanning through the last two decades [3], suggesting an alarming deleterious reading in body mass index (BMI) values not limited to adult individuals but also reaching out to children and adolescent populations [4]. Recently, obesity has been classified as a significant medical issue posing a real burden on public health and negatively affecting patients' mortality and morbidity [5]. The prevalence of overweight students has been estimated about 31.8% in school children with a 7.9% obesity rate in Europe alone [6]. In the United States, the levels of BMI have shown a 4-fold increase in obesity levels among children and adolescents between the ages of 6 and 18 years [7], whereas in Saudi Arabia, around 28% of the male population were reported to be obese and 66% overweighted [8]. These figures are a point of concern for public health scientists generally and school policymakers specifically. This concern is not only regarded as the health status of adolescents but also some questions were raised about the impact of obesity on academic achievement [9,10]. Recently, several academic scientists have reported shreds of evidence about the concomitant link between personal habits such as time spent at TV watching and practicing physical activities on both cognitive performance and academic achievement [11-14]. Congruent studies have demonstrated a converging point between good state texture, health-promoting habits, and academic performance of students [15]. Ultimately, most of the studies on the implications of lifestyle on academic achievement have been conducted in the United States of America (USA) and Europe. The hallmark of our research is being the first study conducted in Kingdom of Saudi Arabia (KSA) to seek this type of interaction. The paucity of information's about factors influencing academic achievement in KSA has aroused us to compile data about the effect of demographical data and socioeconomic factors on academic achievement of a group of secondary school students in Hail city, KSA.

METHODS

Study sample

The study sample consisted of 940 male students in secondary schools. The ages ranged between 17 and 19 years; four secondary schools from Hail city in the KSA participated in this study in April 2017. The education system in Saudi Arabia is based on gender segregation in the second stage; hence, we covered only male students. The study questionnaires were distributed in four secondary schools in Hail (Al-Sedeeq Secondary School, Al-Farooq Secondary School, Najed Secondary School, and King Faisal Secondary School) covering four different geographical regions. Teachers were enrolled as supervisors on the participated students in the study to ensure that the questioner and measurements were filled properly. The students who attended school on the study day were enrolled in the study. The informed consent was signed by the parents before participating in the study and data were handled in privacy. Adolescents and their parents or guardians were informed of the nature and characteristics of the study, and all provided a written. Subsequently, participated students were kindly asked to finish the entire questionnaire and if they had a problem in understanding any question they had the opportunity to ask the teachers and the research team for clarification. After finishing off the questioner filling by the respondents, participant's weight and height were measured and documented by the teachers and the research

team. The study protocol was designed in accordance with the ethical guidelines of the Declaration of Helsinki 1961 and approved by the Ethics Committee of the University of Hail.

Measures

Academic achievement

In this study, we have adopted the academic achievement as the main dependent variable. To estimate the level of academic achievement, students were asked to report their average Ministry Exam Grade (MEG). The grades were documented according to the percentage grading system out of 100.

BMI

To calculate the BMI, weight and height of respondents were measured by the teachers and researcher team. BMI was calculated from the data with the following formula: weight in kilograms/(height in meters×height in meters). We have used the BMI classification published by the World Health Organization [16] to classify the respondents, <18.5 underweight, 18.5–25 normal, 25–30 overweight, 30–35 obese, and >35 severe obesities.

Diet

To measure the effect of nutrition on academic achievement, respondents were asked to self-report three major questions; first: What is the number of meals taken per day; 1 time, 2 times, 3 times, or more than 3 times. Second: What is the kind of the food consumed (i) rice (ii) shawarma (iii) pizza, and (iv) other. Subsequently, do you take the meals on exact proper meal times.

Physical activity

Physical activity is compulsory in the national curriculum for Saudi Arabia education system and is mainly given as one session for 45 min/week; students were asked to fill the self-report questions about the physical activity: "Do you practice sport?" "Type of sport do you practice" "How often do you participate in sport in a week?" "How often do you participate in sport per day?".

Data analyses

Statistical data were expressed as mean±standard deviation and the percentage for categorical variables. All samples were tested for normality using graphical and statistical (Kolmogorov–Smirnov test). t-test was used for continuous variables and Chi-square for nominal variables. Pearson's r correlation was used to examine the bivariate correlation between the continuous variables in the study. We used a series of multinomial logistic regression analyses to examine the like hood of achieving high academic achievement after the adjustment of BMI, bedtime, age, and sleeping duration while controlling for food habits, physical activity, playing mental games, and any potential interaction effects between these items. $p<0.05$ were significant. The SPSS program version 25 was used in the analysis.

RESULTS

The sociodemographic characteristics are summarized in Table 1. The mean age of the study population was 17.96±0.54 year with a median of 18 years. The mean weight was 74.21±17.36 kg interquartile range (IQR) (45–125) while the mean height was (171.27±7.34) cm IQR (140–193). The mean BMI was 33.73 (IQR 22.0–39.8). The overall prevalence of childhood obesity was 460 (49.6%; 95% confidence interval [CI]: 55.3–66.8%) while the prevalence of overweight was 85 (9.04%; 95% CI: 7.3–11.4%). The mean academic score for the second secondary class was 70±9.99 IQR (44–99). The MEGs were ranged from 60 to 99; the highest prevalence was in the category of 60–69, 457 students with an incidence of 48.93% (Table 2 and Fig. 1). According to the BMI scale, the proportion of obese and sever obese was 15.23% and 34.37%, respectively (Table 1 and Fig. 2). About 61.7% of the students have their food at exact times for meals. About 64.89% of the students prefer rice as the main dish. About 53.71% of students do not practice any sports activity. About 53.72% of the students are playing mental games.

Table 1: Sociodemographic characteristics of the 940 students at eleventh grade in male public secondary schools in Hail

Sociodemographic data	Frequency	Percent
Ministry Exam Grades		
90–100	45	4.79
80–89	150	15.95
70–79	285	30.32
60–69	460	48.93
Total	940	100
BMI		
<18.5 underweight	140	14.89
18.5–25 normal	245	26.06
25–30 overweight	85	9.04
30–35 obese	145	15.23
>35 severe obesity	325	34.37
Total	940	100
Age		
16	10	1.06
17	325	34.57
18	585	62.23
19	20	2.13
Total	940	100
Do you have your meals at an exact time		
Yes	580	61.7
No	360	38.3
Total	940	100
Preferred meal		
Rice	610	64.89
Shawarma	80	8.51
Pizza	40	4.26
Other	210	22.34
Total	940	100
Preferred drink		
Coffee	310	32.98
Cola	330	35.11
Juice	170	18.09
Other	130	13.83
Total	940	100
Number of drinks per day (times)		
2–4	690	73.4
5–7	190	20.21
8–10	35	3.72
Other	25	2.66
Total	940	100
Do you make sport		
Yes	435	46.29
No	505	53.71
Total	940	100
What type of sport		
None	275	29.26
Walking	280	29.79
Bodybuilding	40	4.26
Soccer	235	25
Other	110	11.7
Total	940	100
Number of sport practicing per week		
None	180	19.15
1	265	28.19
2	170	18.09
3	115	12.23
4	210	22.34
Total	940	100
Number of sport practicing per day (times)		
None	210	22.34
<1	325	34.57
1–2	280	29.79
2–4	90	9.57
More than 4	35	3.72
Total	940	100
Practicing mental games		
Yes	510	53.72
No	430	45.74
Total	940	100

BMI: Body mass index

Table 2: The distribution of the MEG according to the BMI (n=940)

MEG	BMI					Total
Grades	<18.5 underweight	18.5–25 normal	25–30 overweight	30–35 obese	>35 sever obesity	
90–100	10	15	10	8	5	48
80–89	34	40	25	20	30	149
70–79	25	65	45	50	100	285
60–69	37	80	67	95	180	458
Total	105	200	147	173	315	940

MEG: Ministry Exam Grades, BMI: Body mass index

Table 3: The multinomial logistic regression analysis for the effect of different factors on academic achievement

Parameter estimates				
MEG[a]	Sig.	Exp. (B)	95% confidence interval for Exp. (B)	
			Lower bound	Upper bound
90–100				
Intercept	0.001			
BMI	0.001.	3.55E-9	3.56E-09	3.56E-09
Age	0	4.644	3.16E-09	6.83E-07
80–89				
Intercept	0.001			
BMI	0.02	3.777	1.228	11.62
Age	0.998	0.027	0	0
70–79				
Intercept	0.074			
BMI	0.234	0.509	0.167	1.55
Age	0	5.42E-09	1.85E-09	1.59E-08

The reference category is 60–69. This parameter is set to zero because it is redundant. BMI: Body mass index

The adjusted R-squared (R^2) for the multinomial logistic regression model is represented by the Cox and Snell Pseudo R-square in the SPSS output for this model, with a value of 0.194.

DISCUSSION

We have conducted a comprehensive analysis on the compiled data from a population of 940 participants; nonetheless, there were substantially exciting outcomes but additionally, there are some limitations for our study. First, we conducted a cross-sectional study for correlational analyses, this type of analysis does not provide definitive conceiving evidence for the elements influencing academic achievement, but still, it is utilized and recommended in such tests [17]. Second, we counted on self-reporting for data collection; hence, it is predictable to have higher degrees than actual since the self-reporting of student grades endowed a degree of non-accurate grading. However, we could not extract the marks by our self's due to confidentiality restrictions, although the National Education Longitudinal Survey indicates that although students do generally overestimate their math grades by about one-third of a letter grade (r=0.72) [18].

One of the aims of our study is to clarify the implications associated with the academic achievement of adolescents in Hail, Saudi Arabia, and the concomitant variables of obesity and lifestyle. Namely, we explored the impact of BMI, practicing mental games, diet, number of meals, and physical activity on academic achievement. The confounding variables of practicing mental games demonstrated a significant direct relation in the predictive model while BMI showed a significant negative association with academic scores (Table 3). The academic achievement of school students was affected by many factors; first of all, BMI has impacted negatively the students' score (r=−0.322, p<0.005) as the proportion of obese students in the category of low grades of 60–69 was significantly higher 34% compared to 20% for the normal weight students. Several publications reported the negative correlation

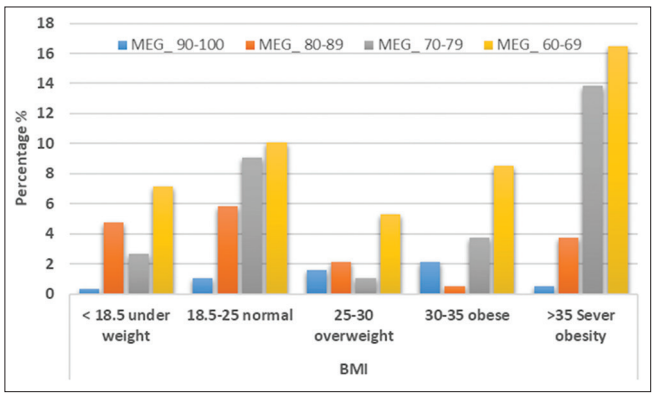

Fig. 1: The distribution of student's grades according to body mass index (BMI). When grades are appended to BMI, a high proportion of severe obese students is present in categories of 60–69 and 70–79

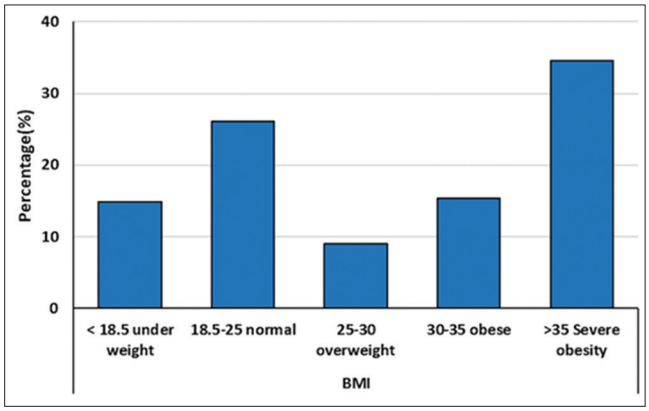

Fig. 2: Distribution of school students according to body mass index (n=940). A high prevalence of obesity between school students over 60% of the students was lining in the categories of overweight and obese

between BMI and academic achievement [11,10,19]. Direct links suggested the deleterious consequences of obesity on school absence, lack of self-confidence, and hyperactivity interfering with academic achievement [20]. The rational explanation behind these findings could be attributed to the lacking of confidence in the overweight and obese student's which subjects them to exploitation and criticism of other students leading to an increase in studying days' absence conferring lower academic achievement.

These results are consistent with Taras and Potts-Datema as they demonstrated poorer levels of academic achievement among obese children and adolescents in both regions of the USA and Europe. They concluded that generally, overweight students do not attend a school or perform as their healthy counterparts. Such findings are difficult to interpret; however, due to the fact that school performance is

confounded by school attendance and other factors such as mental health, low self-esteem, or depression [21].

The pertinent finding of our study was that the majority of the study population was categorized in the overweight and obese group. The substantial escalation in BMI readings could be the main contributor to different non-communicable diseases across the universe. The USA has shown a 4-fold increase in obesity among children and adolescents between the ages of 6 and 18 in the last decades [22]. In this study, the majority of respondents showed overweight and obesity (49.6%), which has become an increasing trend around the world with increasing prevalence rates in Saudi Arabia (63.6%) [23], Kuwait (43%), Qatar (33%) [24], the USA (36.5%) [25], Spain (29%) [26], and Jordan (31%) [2,27]. According to data analysis conducted in this study, the high prevalence of overweight and obesity is attributed to different factors; among them, over 50% of the respondents were involved in meals number and types ($r=0.723$, $p<0.0001$) as the rice was the common contributor. In addition, lacking physical activity ($r=0.872$, $p<0.002$) as 53.71% of the study population answered they do not practice any type of exercise has contributed positively with BMI values. These variables were not associated with academic achievement; rather, the number of meals or diet type and physical activity affected BMI levels, while the type of sport (soccer and walking) ($r=0.1$, $p<0.001$) and duration ($r=0.872$, $p<0.002$) has affected positively on the BMI values.

CONCLUSION

We can summarize the independent variables as obesity ameliorate academic achievement in a counteractive way; high BMI effects total academic score in a negative pattern, whereas practicing mental games influenced positively the academic achievement and performance.

AUTHORS' CONTRIBUTIONS

Dr. Abu Rayyan and Prof. Abu Dayyih have designed and performed the experiments. Dr. Batarseh, Dr. Majali, and Dr. Salem were involved in manuscript editing and finalization. Dr. Abu Rayyan and Prof. Abu Dayyih have designed the entire study project, contributed to experiment finalization, implementation, manuscript editing, and finalization.

CONFLICTS OF INTEREST

The authors declare that they have no conflicts of interest.

REFERENCES

1. Deavenport-Saman A, Piridzhanyan A, Solomon O, Phillips Z, Kuo T, Yin L. Early childhood obesity among underserved families: A multilevel community-academic partnership. Am J Public Health 2019;109:593-6.
2. Rayyan WA. Obesity influence on lead levels in blood and scalp hair among teenagesmokers in Jordan. Scholars J Appl Med Sci 2016;4:244-50.
3. Morais A, Kelly J, Bost JE, Vaidya SS. Characteristics of correctly identified pediatric obesity and overweight status and management in an academic general pediatric clinic. Clin Pediatr (Phila) 2018;57:1168-75.
4. Kim JH, So WY. Association between overweight/obesity and academic performance in South Korean adolescents. Cent Eur J Public Health 2013;21:179-83.
5. Kelly F. Obesity is now a Disease, American Medical Association Decides. Medical News Today; 2013. Available from: https://www.medicalnewstoday.com/articles/262226.php#1.
6. Jackson-Leach R, Lobstein T. Estimated burden of paediatric obesity and co morbidities in Europe. Part 1. The increase in the prevalence of child obesity in Europe is itself increasing. Int J Pediatr Obes 2006;1:26-32.
7. Ogden CL, Carroll MD, Fryar CD, Flegal KM. Prevalence of obesity among adults and youth: United States, 2011-2014. NCHS Data Brief 2015;219:1-8.
8. Al-Ghamdi S, Shubair MM, Aldiab A, Al-Zahrani JM, Aldossari KK, Househ M, *et al*. Prevalence of overweight and obesity 2018;17:134. based on the body mass index; a cross-sectional study in Alkharj, Saudi Arabia. Lipids Health Dis 2018;17:134.
9. Sui Z, Raman J, Han B, Burchell T, Coogan SC, Brennan B, *et al*. Recent trends in intensive treatments of obesity: Is academic research matching public interest? Surg Obes Relat Dis 2019;15:766-76.
10. Washington R. Negative association between obesity and academic performance-Physical fitness may help mediate the effects. J Pediatr 2018;198:2-3.
11. Muntaner-Mas A, Palou P, Vidal-Conti J, Esteban-Cornejo I. A mediation analysis on the relationship of physical fitness components, obesity, and academic performance in children. J Pediatr 2018;198:90-7.
12. Toh ST, Phua CQ, Loh S. Holistic management of obstructive sleep apnea: Translating academic research to patient care. Sleep Med Clin 2019;14:1-11.
13. Burns RD, Fu Y, Brusseau TA, Clements-Nolle K, Yang W. Relationships among physical activity, sleep duration, diet, and academic achievement in a sample of adolescents. Prev Med Rep 2018;12:71-4.
14. Adelantado-Renau M, Beltran-Valls MR, Migueles JH, Artero EG, Legaz-Arrese A, Capdevila-Seder A, *et al*. Associations between objectively measured and self-reported sleep with academic and cognitive performance in adolescents: DADOS study. J Sleep Res 2019;4:e12811.
15. Perkinson-Gloor N, Lemola S, Grob A. Sleep duration, positive attitude toward life, and academic achievement: The role of daytime tiredness, behavioral persistence, and school start times. J Adolesc 2013;36:311-8.
16. World Health Organization. Body Mass Index; 2012. Available form: http://www.euro.who.int/en/health-topics/disease-prevention/nutrition/a-healthy-lifestyle/body-mass-index-bmi.
17. Taras H, Potts-Datema W. Sleep and student performance at school. J Sch Health 2005;75:248-54.
18. Laura RH, Steven J, Judith P, Daniel J, Donald R, Jim R, *et al*. Educational Longitudinal Study of 2002 Base Year Field Test Report; 2003. Available from: https://www.nces.ed.gov/pubs2003/200303.pdf.
19. Judge S, Jahns L. Association of overweight with academic performance and social and behavioral problems: An update from the early childhood longitudinal study. J Sch Health 2007;77:672-78.
20. Santana CCA, Hill JO, Azevedo LB, Gunnarsdottir T, Prado WL. The association between obesity and academic performance in youth: A systematic review. Obes Rev 2017;18:1191-9.
21. Taras H, Potts-Datema W. Obesity and student performance at school. J Sch Health 2005;75:291-5.
22. Peiro-Velert C, Valencia-Peris A, Gonzalez LM, Garcia-Masso X, Serra-Ano P, Devis-Devis J. Screen media usage, sleep time and academic performance in adolescents: Clustering a self-organizing maps analysis. PLoS One 2014;9:e99478.
23. Ahmed HG, Ginawi IA, Elasbali AM, Ashankyty IM, Al-Hazimi AM. Prevalence of obesity in Hail region, KSA: In a comprehensive survey. J Obes 2014;2014:5.
24. ALNohair S. Obesity in Gulf countries. Int J Health Sci 2014;8:79.
25. May AL, Freedman D, Sherry B, Blanck HM, Centers for Disease Control and Prevention. Obesity United States, 1999-2010. MMWR Suppl 2013;62:120-8.
26. Soriguer F, Rojo-Martinez G, De Antonio IE, De Adana MR, Catalá M, Merelo M, *et al*. Prevalence of obesity in South-East Spain and its relation with social and health factors. Euro J Epidemiol 2004;19:33-40.
27. Bustami M, Abudayyih W, Batarseh YS, Al-Majali IS, Tamimi LN, Rahhal A, *et al*. Effect of smoking and obesity on the serum levels of Vitamin D3 in the central region of Jordan. Int J Biol Pharm Allied Sci 2019;8:17.