Prevalence of Obesity and its Association with Academic Performance and Other Factors among Jazan University Medical Students: A Cross-Sectional Study

Eman Hurissi [a], Maram Allami [a], Altaf Alhazmi [a], Halimah Alsomaili [a], Sarah Gharawi [a], Amal Kamili [a], Jawahir Homadi [a], Fadiyah Ageeli [a], Amirah Moafa [a], Amani Abdelmola [a], Asmaa Zanquti [a], Abdulaziz H. Alhazmi [a*] and Saleh Ghulaysi [a]

[a] Faculty of Medicine, Jazan University, Jazan, Saudi Arabia.

Authors' contributions

This work was carried out in collaboration among all authors. Authors EH, AHA, FA, SG wrote the first draft of the manuscript. Author AHA did the data analysis. Editing, writing and review was done by author AHA. Author AHA revised the manuscript. Authors MA, A. Alhazmi, HA, SG, AN, AK, JH, FA, A. Abdelmola and AZ participated in data analysis, review the manuscript, concept, and design of the study. Authors AHA, A. Abdelmola supervised the work. All authors read and approved the final manuscript.

Original Research Article

Corresponding author: E-mail: abalhazmi@jazanu.edu.sa;

ABSTRACT

Obesity is a condition when excessive adipose tissue accumulates in the body and that negatively affects health through predisposition to the development of many diseases and complications such as diabetes mellitus, cardiovascular disease, hypertension, and hyperlipidemia. Previous studies reported that obesity could influence the academic performance of the affected individual. Thus, we aimed in this study to measure the prevalence of obesity and its associated risk factors among medical students at Jazan University, and how it could affect academic performance.This is a descriptive, observational cross-sectional study that was conducted on medical students of Jazan University, Saudi Arabia, using questions that assess students' demographic, academic performance and obesity. Data analyzed using t-test and chi-square test. We included 331 participants, most of them female (74%). About half of the participants have normal weight and recorded a high-grade point average (GPA) of 4 or more (out of 5). The highest GPA (4 or more out of 5) was achieved by 31% of students with normal weight, compared to 12% of underweight, 8% of overweight, and 5% of obese students. Being non-obese is associated with a higher GPA. Further, a significant relationship was observed between obesity and GPA (p-value= 0.013), in which obesity has a negative impact on the GPA of the affected students.In conclusion, our study showed that the medical students at Jazan University with normal weight achieved higher GPAs than other weight groups. We also found that food consumption is increasing with stress in overweight and obese students. This result highlights the importance of prevention measures and awareness to improve academic performance among affected students as obesity has well-known complications.

1. INTRODUCTION

Overweight and obesity are described as excessive or anomalous fat accumulation that pose a health risk. They are evaluated via the body mass index (BMI) which is represented as a person's weight divided by a height square [1]. When BMI is 30 or greater an individual, is considered obese. Obesity is classified according to BMI in which BMI between 30.0 and 34.9 is classified as class I obesity, while BMI between 35.0 to 39.9 is class II obesity, and class III obesity is when BMI is equal to or greater than 40.0 [2]. Obesity and excess weight have become the most prevalent health concerns in the world, putting additional pressure on the healthcare system. According to the last report from the World Health Organization (WHO) in 2016, the prevalence of overweight and obesity in children and adolescents aged 5-19 was over 340 million [2]. In addition, more than 1.9 billion adults aged 18 years and older, were overweight. Of these, over 650 million were obese. It is predicted that if the current trend continues, nearly half the world's adult population will be obese by 2030. According to the center for disease control and prevention (CDC), the prevalence of obesity for children and adolescents aged 2-19 years in 2017-2020 was 19.7%. Obesity has become one of the most influential public health issues.

2. MATERIALS AND METHODS

2.1 Study Design and Participants

This is a descriptive, observational, cross-sectional online study, using Google Form platform, containing a survey sent to medical students at Jazan university using social media websites (Twitter, Facebook, Whatsapp….). The sample size proposed for this study was calculated to be 252 participants using http://www.raosoft.com/samplesize.html. This calculation was based on the prevalence of obesity in Saudi Arabia of 24% [3] and a 95% confidence interval, with an error rate of less than 5% and a affecting people of all ages, and both sexes [2]. Obesity is a significant risk factor for many diseases including type 2 diabetes, hypertension, heart disease, and some cancers. The risk rises with increasing rates of obesity. Obesity also has a strong association with mental health and eating disorders [4]. Obesity can increase glucocorticoid action by enhancing other conditions such as chronic stress, consumption of food with a high glycemic index, and a reduced amount of sleep. This showed a vicious circle, where elevated glucocorticoid may *;* levels and action can amplify obesity and stress [5]. Obesity can affect academic performance through its ability to mediate multiple diseases, and it is also linked to a lack of physical activity,

an action that could affect mental activities [6]. Moreover, obesity can aggravate emotional and mental health problems such as low self-esteem and poor social connection. An analysis of Health- Behaviors in School-based Children (HBSC) data suggests that children who suffer from obesity are more prone to being bullied by association between obesity, poor academic performance, and stress among medical students. To clarify this issue, we conducted this study to measure the prevalence of obesity and to determine its associated risk factors among medical students at Jazan University, and how academic performance could be affected. population size of one thousand that represents the number of students at the faculty of medicine at Jazan university.

2.2 Survey

The pretested questionnaire is designed in Arabic language consisting of questions such as sex, age, academic level, weight, GPA, and chronic diseases, such as diabetes, blood pressure, heart diseases, and the relationship of obesity to that. In addition, the questionnaire contained a section on stress and food consumption, weight gain, physical activity, and the availability of sports facilities at the university.

from students' perspectives. A pilot study was conducted on 20 participants to test if the questionnaire's wording was clear and understandable. Each participant was asked to read and sign a consent form before the start of data collection. The data from the pilot study excluded from the analysis.

2.3 Statistical Analysis

After receiving electronic responses, the data has been verified and entered into the SPSS program v.23. Descriptive data were analyzed using suitable tools such as ANOVA test and regression analysis.

3. RESULTS

3.1 Demographic Factors

Frequencies have been calculated for the demographic factors of the respondents and the results were as follows. Most of the respondents were female 74%, with an age average of 23 years. Most of the respondents 56% have a high GPA of 4-5. Most of the

respondents 91% are single, and most of them 60% live in villages. Most of the respondents 83% live with their parents. By analyzing BMI of the respondents, results reveal that most of them 52% are normal according to the body mass index, 19% are underweight, and at another hand, those who are overweight represent 16% of the sample size. The Prevalence of obesity class 1, 2, 3 was 6%, 5%, and 2%.

3.2 Gender and BMI

Males showed a higher rate of obesity class 1 than females (58% vs. 42%). In contrast, overweight, obesity class 2, 3 in females were higher when compared to males. The percentage of overweight and obesity class 2, 3 in females was 57%, 53%, and 71% respectively (Table 2).

3.3 BMI and GPA

We analyzed the relationship between BMI and GPA (Fig. 1). The result showed a significant relationship (p value= 0.006) between the two factors which means obesity has an impact on the GPA of the students. Students with normal weight have the highest GPA at about 31% compared to 12% for underweight, 8% for overweight, and 5% forobese.

3.4 Weight Satisfaction

Regarding the potential impact of school stress on food consumption, results reveal that there are. Table 3 shows the percentage of weight satisfaction in students with different BMI. The percentage of students who are not satisfied with their weight is 58%, 21%, 81%, and 95% for underweight, normal weight, overweight, and obese respectively.

3.5 School Stress and Food Behavior

The school stress and students' practice and attitude towards food consumption have been analyzed to find if there is a relationship between these factors. Significant discrepancies according to the answer to the question that says do food consumption increase with stress, 70% of the underweight students respond with no. Students who are overweight or have obesity class 1, 2, and 3 responded with yes and the percentage rate was 66%, 84%, 87%, and 71% respectively. we found that the number of meals increased with the increase in weight, students who have obesity class 2 eat 3 meals per day,

and those who have obesity class 3 eat more than 3 meals per day (Table 3).

3.6 Sports

Table 3 shows the percentage of the participants who exercised is 75% (i.e., at least once for 30 minutes per week) versus 25% who don't exercise. The percentage of the underweight, normal weight and overweight who exercise was 67%, 76%, and 79% respectively. The overweight participants exercise more than the normal and underweight participants. The percentage of obesity class I, II, and III who exercise was 84%, 60%, and 71% respectively. Regarding the relationship between physical activity and GPA, the analysis showed no significant difference (p= 0.799).

3.7 University Sports Availability

Table 3 shows students' perspectives regarding the availability of sports facilities at the university. The percentage was found to be 14% for underweight students, 32% for normal, 36% for overweight, 21% for obesity class I, 40% for obesity class II, and 57% for obesity class III.

4. DISCUSSION

This study aimed to measure the prevalence of obesity and its associated risk factors among medical students of Jazan University. In our study, we found a significant difference between the GPA and BMI of the students in which students with normal weight had a higher GPA when compared to underweight, overweight, and obese students. These findings are in line with local, regional and international studies. For example, in a study conducted by Suraya et al in 2017 among Saudi female medical students at King Saud University, Riyadh, Saudi Arabia. About 44% of the female students were having normal BMI whereas 27.75% were underweight, 18.32% were overweight, 6.81% were obese, and 2.5% have severe obesity. The authors reported that students who had normal or overweight achieved a higher GPA compared to female medical students who had obesity or severe obesity [7]. Further, in 2017 Adaili et al. conducted a retrospective cohort study at the various high schools, which include five female schools, in Riyadh. They aimed to predict the association between academic performance and overweight/obesity among high school students. The authors observed that academic

Table 1. Demographic factors of included students in this study

Demographic factors		n	%
Sex	Male	87	26%
	Female	244	74%
Age(average;SD)		22.2	2
BMI(average; SD)		23.3	6
	Underweight	64	19%
	Normal	173	52%
	Overweight	53	16%
	Obese-I	19	6%
	Obese-II	15	5%
	Obese-III	7	2%
Marital status	Single	302	91%
	Married	28	8%
	Divorce	1	0%
Residence	City	133	40%
	Village	198	60%
Living with	Single	16	5%
	Students	7	2%
	Parents	274	83%
	Spouse	27	8%
	relatives	7	2%
GPA (out of 5)	2 to 3	31	9%
	3 to 4	116	35%
	4 to 5	184	56%

SD: Standard deviation. BMI: Body mass index. GPA: Grade Point Average

Table 2. The difference in BMI according to the gender

Sex	Underweight	Normal	Overweight	Obese-I	Obese-II	Obese-III
Male	14%	20%	43%	58%	47%	43%
Female	86%	80%	57%	42%	53%	71%
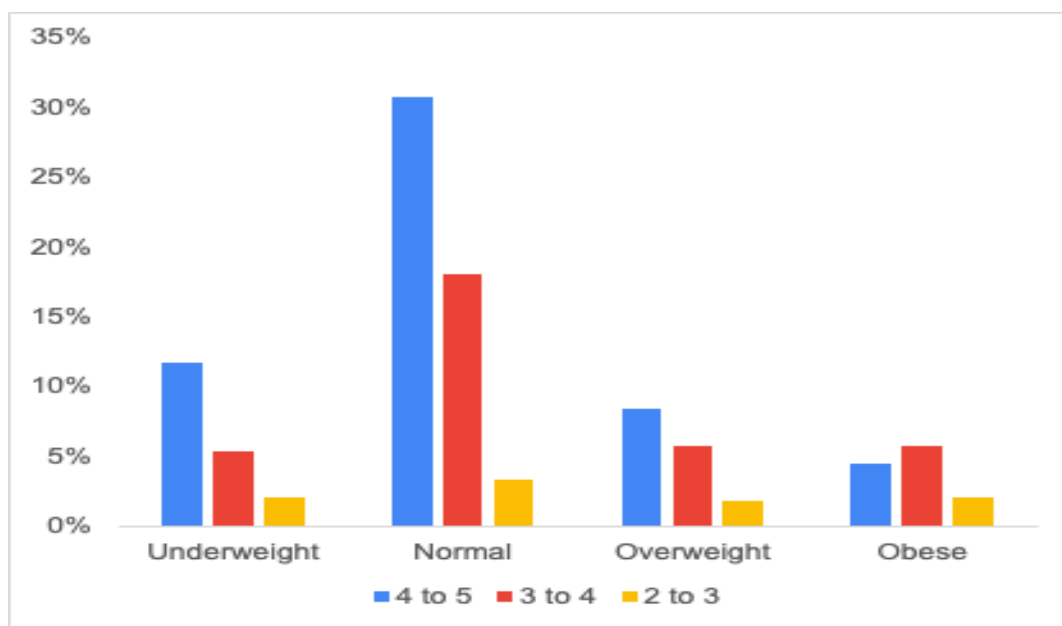
Fig. 1. GPA of students classified based on their BMI

Table 3. Weight satisfaction, school stress, and food behavior

	Underweight	Normal	Overweight	Obese-I	Obese-II	Obese-III	P-value
Did daily school stress increase your food consumption?							0.0001*
Yes	30%	64%	66%	84%	87%	71%	
No	70%	35%	34%	16%	13%	29%	
How many meals per day do you consume?							0.020*
1	16%	6%	11%	5%	0%	0%	
2	50%	54%	53%	63%	40%	29%	
3	33%	32%	28%	26%	53%	29%	
>3	2%	7%	8%	5%	7%	43%	
Are You Satisfied with your weight							0.0001*
Yes	28%	52%	6%	0%	0%	14%	
No	58%	21%	81%	95%	100%	86%	
Indifferent	14%	26%	13%	5%	0%	0%	
Sports							0.346
Yes	67%	76%	79%	84%	60%	71%	
No	33%	23%	21%	16%	40%	29%	
Availability of university sports facilities							0.023
Yes	14%	32%	36%	21%	40%	57%	
No	86%	67%	64%	79%	60%	43%	

* The alpha criterion for p-value was set to 0.05.

performance declined by more than one standard deviation in marks between the 10th and 12th grades. Adjustment of other variables such as sociodemographic characteristics, study-related lifestyle, and self-esteem was done by a multiple logistic regression model, and the

decline in academic performance was associated with overweight/obesity. it was reported that subsequent academic performance is negatively affected by overweight/obesity among female high-school students [8]. In Iran, another study was published in 2014 and aimed to investigate the relationship between overweight and obese Iranian students and academic performance. The authors found that overweight students had lower GPAs [9]. The international figure was not different from what was reported in Saudi Arabia and the Middle East, including findings of the current study. For example, a survey was carried out in 2014 among college students in the United States. In comparison to their peers who were of normal weight, overweight and obese female students reported lower GPAs, lower levels of academic self-efficacy, and higher levels of depressive symptoms. The association between BMI and GPA was mediated by academic self-efficacy [10]. Taken together, these findings elucidate the challenges that students with chronic diseases, such as obesity, encounter and stir education officials in our region into action to overcome these challenges, since they add another burden that could negatively affect the quality of life of students with higher BMI [11].

In our study, we found that the prevalence of overweight represented 16% of the sample size, and the prevalence of obesity classes I, II, and III were 6%, 5%, and 2%, respectively. In Saudi Arabia. Different studies were done to assess the prevalence of obesity among students. For example, a study conducted by Alenazi et al. in the Arar northern region of Saudi Arabia in 2015 among male students with a mean age of 16.7. The prevalence of obesity is 30.4% and 17.2% were overweight [12]. In our study, we found a lower number of students with overweight and obesity, and this could be attributed to the nature of our sample being medical students who are frequently exposed to the information regarding side effects of obesity, and probably they are more aware than the high school students that participated in the previous study. However, when it comes to studies that reported the prevalence of obesity among medical students, we found a similar prevalence. For example, Thomas et al. conducted a study in India in 2019 and reported an increased prevalence of overweight/obesity (30.6%) among medical students, a percentage that is close to what we reported in the current study (28%) (Tables 1,2) [13]. However, older studies reported a lower prevalence of obesity among medical students. For example, in another study conducted by

Gudegowda et al. in Bangalore in 2014, involving 424 medical students, a lower prevalence of overweight and obesity were reported (9.7% and 6.8% respectively) [14]. Another cross-sectional study, conducted at AIMST University in Malaysia in 2012 August among medical students, conducted by Gopalakrishnan et al. showed that the prevalence of overweight and obesity is 14.8% [15]. These findings are in line with what was reported by various health officials about the alarming increase in obesity rates among all populations, and medical students are no exception to that [2]. Thus, we strongly recommend that medical schools should integrate more courses about obesity and its negative consequences in the curricula as they will be future healthcare providers.

Regarding factors associated with obesity. We found that the percentage of overweight and obesity is higher in females when compared to males (Table 1). These results are consistent with a Malaysian study, and the authors showed a higher percentage of overweight and obesity in females than males (15.7% and 13.7%) respectively [15]. However, some studies showed different results, for example, overweight and obesity were more prevalent in boys compared to girls (5% and 4.5%, respectively) in the Bangalore study [14]. Moreover, an Indian study reported that 40% of boys were overweight/obese compared to 25% of girls. However, when they measured waist circumference to assess abdominal obesity, it was seen in about 44.3% of females whereas only 24.6% of males had abdominal obesity. There was no significant association between behavioral factors such as sleep, dietary habits, and physical activity with BMI [13]. Further, in the current study, we observed that stress can increase food consumption among medical students and a significant difference was found regarding the impact of stress on food consumption. The response of the underweight students suggested that their food consumption did not increase during stress in about 70% of the responses (Table 3). Students who are overweight or have obesity responded that their food consumption did increase during stress time and the percentage rate was 66%, 84%,87%, and 71% respectively (Table 3). Moreover, we found a positive association between the number of meals per day and weight gain. Students who have obesity type 2 eat 3 meals per day, and those who have obesity class iii eat more than 3 meals per day.

Our result is supported by a study conducted in 2002 at Ain Shams University by Baker et al. and the study showed that the most impactful lifestyle factors responsible for obesity are food consumption during stressful times and snacking between meals [16]. Thus, universities are required to provide students on on-campus activities that may reduce stress and more courses are required to train students on time management and to cope with stress [17,18].

In 2021, Johnson investigated the evidence for physical activity in the reduction of weight and adipose tissue and the prevention of weight gain. The author concluded that aerobic activity of at least moderate intensity, >150 minutes per week, is required to prevent weight gain [19], and at least moderate intensity is required for 300 to 420 minutes per week for weight loss [19]. In our study, we asked the participants if they do a physical activity of low intensity at least once per week, the percentage of the underweight, normal weight, and the overweight who do exercise was 67%, 76%, and 79% respectively, and more participants of overweight

students reported to exercise compared to those of the normal and underweight participants. This finding may be due to the efforts of students to reduce their weight as they show a very low percentage of weight satisfaction of 6% only. Further, the proportion of participants with obesity of class I, II and III who exercise was 84%, 60%, and 71% respectively. The obesity class I participants showed a higher percentage than the overweight, while the overweight percentage was higher than the obesity of class II and III. However, the analysis showed no significant differences between the physical activity and the participants' GPA and this result was supported by Whitford and others [20,21]. Thus, larger studies with other variables that assess academic performance and different physical levels are deemed essential to confirm this correlation.

This study has many limitations. As an online survey, there is possible self-selection bias because not all people have access to the Internet. Furthermore, the results of this study cannot be generalized to other populations because of possible sampling errors. The study sample has an overrepresentation of females as most of the authors are female and the distribution of the survey was depending on their network. However, this study is one of the few in the region of its kind and calls attention to the importance of early therapeutic intervention and lifestyle modification to improve college performance and general health.

5. CONCLUSIONS

In conclusion, our study showed that the medical students at Jazan University with normal weight achieved higher GPAs than other weight groups. We also found that food consumption is increasing with stress in overweight and obese students. In addition, there is no significant relationship between GPA and physical activity in this study. Further studies are required to include students of various regions and to assess how obesity could affect academic performance. Obesity prevention programs are deemed crucial to improve academic performance among affected students.

CONSENT AND ETHICAL APPROVAL

Ethical approval number REC42/1/039 was granted on 06 Dec 2020 from the Scientific Committee at Jazan University, and informed consent has been obtained from all participants. We conducted this study following the ethical guidelines of the Helsinki Declaration and the guidelines of the National Committee of Bioethics, Saudi Arabia. Participants in this study were requested to sign a consent to participate before data collection. All collected information was kept confidential and used for only the purpose of research. Also, the questionnaires did not include any information about participants' identifiable data or any other methods of identification.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Panuganti P, Mehreen TS, Anjana RM, Mohan V, Mayer-Davis E, Ranjani H. Influence of socioeconomic status on knowledge of obesity and diabetes among adolescents in Chennai, South India. Children. 2017;4(8):61. Available:https://doi.org/10.3390/children4 080061
2. Obesity and Overweight Available:https://www.who.int/newsroom/fa ct- sheets/detail/obesity-and-overweight accessed on 2 September 2022.

3. Althumiri NA, Basyouni MH, AlMousa N, AlJuwaysim MF, Almubark RA, BinDhim NF, &Alqahtani SA. Obesity in Saudi Arabia in 2020: prevalence, distribution, and its current association with various health conditions. In Healthcare. 2021;9 (3):311.
DOI:10.3390/healthcare9030311.

4. Pi-Sunyer X. The medical risks of obesity. Postgraduate medicine. 2009;121(6):21.
doi: 10.3810/pgm.2009.11.2074

5. Van der Valk ES, Savas M, van Rossum EF. Stress and obesity: are there more susceptible individuals?. Current obesity reports. 2018;7:193-203.
DOI:10.1007/s13679-018-0306-y.

6. Devaux M, Vuik S. The Relationship between Childhood Obesity and Educational Outcomes. In The Heavy Burden of Obesity; OECD. 2019;101–123.
ISBN 9789264330047.

7. Suraya F, Meo SA, Almubarak Z, Alqaseem YA. Effect of obesity on academic grades among Saudi female medical students at College of Medicine, King Saud University: Pilot study. JPMA. The Journal of the Pakistan Medical Association. 2017;67(8):1266- 1269.

8. Adaili MA, Mohamed AG, Alkhashan H. Association of overweight and obesity with decline in academic performance among female high-school students, riyadh, Saudi Arabia. EMHJ-Eastern Mediterranean Health Journal. 2016;22(12):887-893.
DOI:10.26719/2016.22.12.887.

9. Heshmat R, Larijani FA, Pourabbasi A, Pourabbasi A. Do overweight students have lower academic performance than their classmates? A pilot cross sectional study in a middle school in Tehran. Journal of Diabetes & Metabolic Disorders. 2014; 13:1-5.
DOI:10.1186/s40200-014-0087-0.

10. Aimé A, Villatte A, Cyr C, Marcotte D. Can weight predict academic performance in college students? An analysis of college women's self- efficacy, absenteeism, and depressive symptoms as mediators. Journal of American College Health. 2017;65(3):168-176.
DOI:10.1080/07448481.2016.1266639.

11. Alhazmi A, Hakami K, Abusageah F, Jaawna E, Khawaji M, Alhazmi E, Qumayri G. TheImpact of Sickle Cell Disease on Academic Performance among Affected Students. Children. 2021;9(1):15.
DOI:10.3390/children9010015.

12. Alenazi SA, Koura HM, Zaki SM, Mohamed AH, Prevalence of Obesity among Male Adolescents in Arar Saudi Arabia: Future Risk of Cardiovascular Disease. Indian J. Community Med. 2015;40:182–187,
DOI:10.4103/0970-0218.158864.

13. Thomas E, Geethadevi M. Prevalence and determinants of overweight and obesity amongmedical students. National Journal of Physiology, Pharmacy and Pharmacology. 2019; 10(1):42-42.
DOI:10.5455/njppp.2020.10.1035506112019.

14. Gudegowda KS, Vengatesan S, Sobagiah RT. Prevalence of overweight and obesity amongmedical college students, Bengaluru. Int J Community Med Public Health. 2018;5(5):1881-6.
DOI:10.18203/2394-6040.ijcmph20181692.

15. Gopalkrishanan S. Ganeshkumar P, Prakash MV, Christopher AV. Prevalence of Overweight/Obesity among Medical students, Malayasia. Med J Malayasia. 2012;67:442-4.

16. Bakr EM, Ismail NA, Mahaba HM. Impact of life style on the nutritional status of medical students at Ain Shams University. The Journal of the Egyptian Public Health Association. 2002;77(1-2):29-49.

17. Finnerty R, Marshall SA, Imbault C, Trainor LJ. Extra-curricular activities and well-being: Results from a survey of undergraduate university students during COVID-19 lockdown restrictions. Frontiers in Psychology. 2021;2316.
DOI:10.3389/fpsyg.2021.647402.

18. Hendi A, Mahfouz MS, Alqassim AY, Makeen A, Somaili M, Shami MO, Alhazmi AH. Admission grades as predictors of medical students' academic performance: a cross-sectional study from Saudi Arabia. European Journal of Investigation in Health, Psychology and Education. 2022; 12(11):1572- 1580.
Available:https://doi.org/10.3390/ejihpe12110110

19. Johnson NA, Sultana RN, Brown WJ, Bauman AE, Gill T. Physical activity in the management of obesity in adults: A position statement from Exercise and Sport Science Australia. Journal of Science and Medicine in Sport. 2021;24(12):1245-1254.
DOI:10.1016/j.jsams.2021.07.009

20. Whitford TC. A correlational study on physical activity and GPA among college students. The Owl–Florid State University's Undergraduate Research Journal. 2021; 11(2):59-69.
Available:https://journals.flvc.org/owl/issue/view/5932

21. Gonzalez EC, Hernandez EC, Coltrane AK, Mancera JM. The correlation between physicalactivity and grade point average for health science graduate students. OTJR: occupation, participation andhealth. 2014;34(3):160-167.
DOI:10.3928/15394492-20140714-01