Study of Obesity in University Students, Causes and its Physical and Biological Effects

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Abstract

In both developing and wealthy countries overweight and obesity have become major public health problem. There is a link between higher levels of physical activity and a decreased rate of obesity. The goal of this study was to compare BMI to physical activity in a sample of Baghdad universities students in order to determine anthropometry as a predictor for changes in weight and body composition-related metabolic risk factors. This study was performed among (120) students of Baghdad universities, data were collected by direct interview including self – efficacy in dieting and physical activity. Blood pressure was measured. BMI was calculated, blood samples were collected in order to diagnose HDL, TG, and Blood glucose. The results of the study indicated that students with overweight were 30.88% and 26.92 % for male and female respectively while the students with obese were 17.65% male and 13.46% female. The male (Mean \pm SD 27.05 \pm 4.1) students were gained more weight than female (Mean \pm SD 24.08 \pm 5.2). According to the findings, there was a significant proportion of students with high BMI, particularly among students over 20 years old and with male students outnumbering female students. The research showed that obesity and overweight were common among students and were linked to low physical activity.

Keywords: students, obesity, overweight, university, Iraq.

Abbreviation: BMI body mass index. BP blood pressure. TG tri glycerides.

دراسة السمنة بين طلبة الجامعات اسبابها وتاثيراتها البدنية والحيوية

الخلاصة

في جميع الدول المتطورة والنامية تعد السمنة من المشاكل المهمة في هذه المجتمعات لانها تتعلق بالصحة العامة وهناك رابط مهم بين المستويات العالية من النشاط البدني وانخفض معدلات السمنة. تهدف هذه الدراسة الى مقارنة الفعالية البدنية لمجموعة مختارة من طلبة الجامعات في مدينة بغداد لتحديد قياس العوامل الأنثروبومترية كمتنبئ للتغيرات في الوزن والبينة الجسمانية وتشخيصها كعوامل خطر ايضية. تم انجاز هذه الدراسة باستخدام عينة من 120 طالب جامعي من جامعات مدينة بغداد وجمهت البيانت باستخدام المقابلة المباشرة لمعرفة مستويات النشاط البدني واسلوب التغذية المتبعة وكذلك قياس ضغط الدم والطول والوزن , واخذ عينة الدم لاجراء التحليلات الخاصة بقياس HDL,TG,BLOOD GLUCOSE. واظهرت النتائج وجود زيادة في الوزن 30.88% للذكور و 26.92 للاناث. حيث وجد زيادة في وزن الذكور اكثر من الاناث (Mean ±SD 27.05 ±4.1) (Mean ±SD 24.08 عالية معتبرة بين الطلبة باعمار اعلى من 20 سنة BMI واكبر وباعداد الذكور تين الطلبة باعمار اعلى من 20 سنة واكبر وباعداد الذكور تفوق الاناث . هذا البحث بين ان السمنة وزيادة الوزن لدى الطلبة الجامعيين متر ابطة مع انخفاض النشاطات البدنية.

الكلمات المفتاحية : الطلبة ، السمنة ، زيادة الوزن ، جامعة ، العراق.

Introduction

Obesity is a pandemic which diffused relentlessly across communities in all over the world during the last three decades. [1] Excess body fat, or obesity, has long been recognized as a major risk factor for a variety of non-communicable diseases. [2,3] Obesity is a disorder caused by excessive fat buildup in the adipose tissue, which causes serious health problems. Environmental and behavioral changes, as well as genetic abnormalities, have been linked to an increase in overweight and obesity, according to epidemiological studies. [4:5-7] The periods of evolution from teenage to young adulthood are critical for illness prevention and health promotion. [8:9] At this time persons are at danger for developing harmful eating habits, which can lead to weight fluctuations. Students at universities are seen to be prime targets for unfavorable weight gain. [8] The transition from high school to university is seen a significant time for young people' body weight fluctuations and adoption of an unhealthy lifestyle. [10]. Many students are responsible for their own accommodation and meals for the first time when they enroll in university. [11]

The greatest public health concerns, particularly among young adults transitioning to university life, unhealthy habits negative positive are eating and or weight fluctuations.[12.13]College students represent the community's youngest age group, and they are more likely to engage in poor eating habits and consume unhealthy foods during their college years, which can negatively impact their health and raise their risk of obesity, diabetes, and coronary heart disease.[14.15] Obesity and overweight are substantial causes to early mortality and are strong risk factors for cardiovascular diseases and diabetes. [16:17] Physical activity seems to be the greatest changeable component of energy consumption of energy, and as a result, behavioral therapies to reduce body weight have been used. There is currently a considerable amount of data that physical activity is important in disease prevention. [18-20]

Method

A random sample of (150) students (68) male and (52) female from Baghdad universities was surveyed. Their age were (18 -26) years for the period of (2018 - 2019), direct interviewing was used to gather information contain the students age, family history, eating habits, weight and height, physical activities, Blood samples were collected to specify metabolic risk factors included BP (120/80 - 130/83) mmHg, random blood glucose \geq 110 mg/dl, HDL <40 mg/dl for male or < 50 mg/dl for female, TG \geq 150 mg/dl.

Results

According to the findings of this study, table (1) there is a high incidence of BMI (mean of $27.05 \pm 4.1 \text{Kg/m}^2$) in male students compared to $(24.08 \pm 5.2 \text{Kg/m}^2)$ in female students and a significant prevalence of obesity among samples of university students which were high in male (17.65%) than female (13.46%). As presented BMI groups for all students samples shows that the percentage of underweight were about (10.29%), (9.62%) for male and female respectively. The rest of students participants were within normal range (41.18%) for male while (50%) for female. Table (2) displays subject characteristics by age and gender. A total of 120 study samples were collected, with 68 male and 52 female with age ranging between 18-25 years old. This study discovered that there was a considerable difference in ages between groupings of students, in which students under the age of 22 have normal weight (32.69 %) in female compared to male (29.41%). Higher physical activity level was linked with a preferable weight status. Table (3).by clarification of the levels of physical activities male was active (27.5%) than female (10.0%) as illustrated in table (4) Female had a higher proportion of normal BMI in case of healthy diet and a lower proportion of having unhealthy diet than male table (5) we planned to investigate food patterns behavior because dietary habits have been linked to weight modification. The majority of students (12.5 %) female were regularly diet and (19.1%) male were irregularly diet.

There was statistical significance between family history of obesity and weight status of the students (p<0.001) table (6). From the conclusions of this study for metabolic risk variables showed male more likely to be higher BP, unregularly levels of both TG and blood sugar in contrasted with female. Table (7)

| Variables | | | BMI kg/m ² | | | | | | | | |
|--------------|-----|----------------------|-----------------------|---------------------------|---------------|---------------|--------|--|--|--|--|
| | | <18.5 Underweight | 18.5-24.9 Normal | 25-29.9 Overweig ht | ≥ 30 Obese | Mean± SD | р | | | | |
| Male (68) | NO. | 7 | 28 | 21 | 12 | 27.05±4. 1 | 0.008 | | | | |
| | % | 10.29 | 41.18 | 30.88 | 17.65 | | | | | | |
| Female (52) | NO. | 5 | 26 | 14 | 7 | 24.08±5. 2 | 0.0072 | | | | |
| | % | 9.62 | 50.0 | 26.92 | 13.46 | | | | | | |

Table (1): The clarification of BMI values for male and female participants.

 Table (2): Correlation between ages and BMI of male and female participants.

| Age (year) | | BMI kg /m ² | | | | | | | | | | |
|---------------|--------|------------------------|-------|-------------|-----------|-------|-------|--------|--|--|--|--|
| | Gender | | <18.5 | 18.5 - 24.9 | 25 – 29.9 | ≥30 | Total | Р | | | | |
| 18-22 | Male | No. | 6 | 20 | 6 | 4 | 36 | 0.001 | | | | |
| | | % | 8.82 | 29.41 | 8.82 | 5.88 | | | | | | |
| | Female | No. | 4 | 17 | 4 | 2 | 27 | 0.0078 | | | | |
| | | % | 7.69 | 32.69 | 7.69 | 3.85 | | | | | | |
| ≥23 | Male | No. | 2 | 7 | 16 | 7 | 32 | 0.007 | | | | |
| | | % | 2.94 | 10.29 | 23.53 | 10.29 | | | | | | |
| | Female | No. | 2 | 8 | 10 | 5 | 25 | 0.0065 | | | | |
| | | % | 3.85 | 15.38 | 19.23 | 9.62 | | | | | | |
| Total | | | 14 | 52 | 36 | 18 | 120 | | | | | |

Table (3): Distribution of BMI for the participants based on the levels of physical activity.

| Variables | BMI <25 kg/m2 | | BMI ≥25 kg/m2 | | Р |
|-----------------------------|---------------|------|---------------|-------|--------|
| Levels of Physical activity | NO. | % | NO. | % | |
| Active | 22 | 18.3 | 23 | 19.17 | 0.041 |
| Moderately active | 14 | 11.7 | 10 | 8.33 | 0.0031 |
| Inactive | 30 | 25.0 | 21 | 17.5 | 0.005 |
| Total | 66 | 55.0 | 54 | 45.0 | |

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| Variables | Male | | Female | | P |
|-----------------------------|------|------|--------|------|--------|
| Levels of Physical activity | NO. | % | NO. | % | |
| Active | 33 | 27.5 | 12 | 10.0 | 0.003 |
| Moderately active | 14 | 11.7 | 10 | 8.3 | 0.0051 |
| Inactive | 21 | 17.5 | 30 | 25.0 | 0.004 |
| Total | 68 | 56.7 | 52 | 43.3 | |

Table (4): Comparison of the levels of physical activity for male and female.

Table (5): The relation between the dietary criteria and BMI for male and female participants.

| Varia | bles | BMI <25 kg/m2 | | BMI ≥25 | Р | |
|---------------|--------|---------------|------|---------|------|--------|
| Diet criteria | | NO. | % | NO. | % | |
| Unregularly | Male | 21 | 17.5 | 23 | 19.1 | 0.008 |
| | Female | 16 | 13.3 | 9 | 7.5 | 0.0076 |
| Regular | Male | 14 | 11.6 | 10 | 8.3 | 0.0045 |
| | Female | 15 | 12.5 | 12 | 10.0 | 0.0055 |

Table (6): Distribution of BMI values according to family history of male and female participants.

| Variables | | | BMI < 2 | 5 kg /m2 | $BMI \ge 2$ | - | |
|-----------|------------------|----------------|---------|----------|-------------|-------|--------|
| | | | NO. | % | NO. | % | Ч |
| | БΠ | Father | 8 | 11.76 | 10 | 14.7 | 0.004 |
| e | г.н. (n=47) | Mother | 10 | 14.7 | 20 | 29.4 | 0.006 |
| Mal | | Brother,Sister | 7 | 10.29 | 10 | 14.7 | 0.0046 |
| | N.F.H. (n=21) | | | | | | |
| | F.H. | Father | 12 | 23.07 | 7 | 13.4 | 0.0033 |
| Female | (n=30) | Mother | 9 | 17.3 | 10 | 19.23 | 0.005 |
| | | Brother,Sister | 7 | 13.4 | 4 | 7.69 | 0.008 |
| | N.F.H (n=22) | | | | | | |

Table (7): Comparison between male and female participants' based on metabolic risk factors.

| Variables | | TG | HDL | GLU | BP | Total | Р |
|-----------|-----|------|------|------|------|-------|-------|
| Male | NO. | 16 | 19 | 12 | 21 | 68 | 0.001 |
| | % | 23.5 | 27.9 | 17.7 | 30.9 | 100 | |
| Female | NO. | 7 | 28 | 5 | 12 | 52 | 0.003 |
| | % | 13.5 | 53.8 | 9.6 | 23.1 | 100 | |

Discussion

It's critical to identify reliable obesity indicators as assessment methods for predicting metabolic risk variables associated with obesity. The outcome of this research table (1) indicated a relatively high BMI among university students, about (54) students with (BMI less 25 Kg/m²) normal range of weight, around (35) found to be with overweight and nearest to (19) being with obese. While (12) students were underweight. These findings are equivalent to those of other research performed on students of Latin American university. [22, 23] Excess weight of the university students is one of the most serious public health issues that confronting modern society and its well recorded in the global writings [24-27]

According to our research, table (2) there is a substantial difference between subgroups in which students under the age of 22 are underweight (10), normal weight (37) and students above the age of 22 are overweight (26) or obese (12). Several studies show that students' body weight tends to rise during their academic years. [28-31] These figures are consistent with the results presented in our study. The review of studies that looked into the progression of body weight of the students after their first year of university [32-36] which indicated less weight increase in following years, the probable explications for this occurrence were that it happen because students are better accustomed to academic life after the first year, reducing the influence of the early stress. [37,38]. As mentioned in table (1) the predominance of overweight and obesity were common between males students contrasted to females. (33) and (21) respectively. Many studies have looked at the impact of gender on weight and body fat than women. [39-43]

Physical activity has physical and psychological benefits, as well as improving body composition and lowering the risk of metabolic disease. [44 •45] Sample's cases of physical activity for the students who took part in this research were categorized into three groups. The first level is inactive group for students who do not engage in any sports activity and rely on transportation from home to college and back, moderate physical activity level is for students who practice sports, but with spaced intervals, while third group is for intense physical activity for the students who exercise regularly at least three times a week. Despite the benefits revealed by physical activity, our findings as showed in table (3) that a large majority of teenagers were inactive or sedentary participants, similar to other studies. [45-47] The proportion of physical activity participants was low, while male (27.5%) was more active than female (10%).

Our findings were consistent with those of another Lebanon-based investigation. Several harmful behaviors, primarily obesity, personal motivation, health and social environments in which students live influence this inadequacy in physical activity. [48-51] Inactivity was found to be higher among Female than among male, which was submitted in table (4) which is likely due to societal conventions and gender roles in Arab civilizations, where Female are confined to their homes, either due to social traditions or pressing family obligations, Female have less opportunity to participate in sports events. [52] It was noted in table (5) the majority of the participants were having their meals irregularly Despite the fact that people with a high BMI were less likely to follow health dietary guidelines, compliance with these guidelines was lower in our study. The explanation for this could be that university students have unhealthy eating habits and inadequate nutrient intake, and it is during this period that young adults usually take responsibility for their diet for the first time, and they have been labeled as a nutritionally sensitive population.[53-55]Stresses experienced by college students have been reported to have a negative impact on their weight and lead to bad eating habits due to the high expense of healthy meals and the easy availability of fast food. Previous research has found that university students fall short of their optimal body weight to some extent. [56] There are many cases in which the weight is irregular despite the regularity of eating habits and this is due to the lack of commitment to exercise or physical activities. Recent research have shown that one of the risk factors for the obesity is a family history [57, 58], thus we looked into this among the contributors. Table (6). We discovered that obesity is the most common, and that it is associated in family history with the fact that their mothers were originally obese. Contrary to popular belief, slim persons were no link to the family history was discovered. There were some participants who were also related in family history with their father, mother, and other family members. [59]

The metabolic risk measurements from table (7) pointed that male was highest probability to have high metabolic risk factors. According to other study showed a higher prediction of direct body fat for obesity- related complication and metabolic risk factors. [60, 61] A participant with an aberrant metabolic risk elements will score higher than a randomly chosen individual with a normal metabolic risk factors. [62]

References

- **1.** Luke and Richard C., "Physical activity does not influence obesity risk: time to clarify the public health message," Int. J. Epidemiol, 2013.
- 2. Choi B., et al., "Sedentary work, low physical job demand, and obesity in US workers," Am J Ind Med, 2010.
- **3.** B. Moghimi, et al., "Overweight and Obesity and Related Factors in Urban Iranian Population Aged between 20 to 84 Years," Ann Med Health Sci Res, 2013.
- 4. Suriani Hassan, Nur Amira Abdol Rahman, Khadizah Ghazali, Norlita Ismail, and Kamsia BudinPerception on obesity among university students: A case study using factor analysis. Volume 1605, Issue 1 > 10.1063/1.4887722.Full Published Online: 17 February 2015. AIP Conference Proceedings 1605, 973 (2014).
- 5. S. A. A. Al-Rethaiaa, A. E. Fahmy and N. M. Al-Shwaiyat, Journal of Nutrition 9(39), 1-10 (2010).
- M. Y. Azmi, R. Junidah, A. Siti Mariam, M. Y. Safiah, S. Fatimah, A. K. Norimah, B. K. Poh, M. Kandiah, M. S. Zalilah, W. M. Wan Abdul Manan, M. D. Siti Haslinda & A. Tahir, Mal J Nutr 15(2), 97–119 (2009).
- 7. BeritaHarian.16Nov.2010.Retrievedfrom:http://www.bharian.com.my/bharian/articles/16_2j utarakyatalamikegemukan/Article.
- **8.** Ahamd A, Suleiman K, Alboqai Y, Jabar M; Prevelance of and factors associated with overweight and obesity among Jordan University students. J Bio Sci., 2009; 7: 738-745.
- Rabanales-Sotos J, Evangelina Villanueva-Benites M, Jacinto-Magallanes-Castilla J, Leitón-Espinoza ZE, López-González Á, López-Torres-Hidalgo J. Prevalence of Overweight and Obesity among Health Sciences Students in the Amazonia Region of Peru. Healthcare (Basel). 2020 Dec 4;8(4):538. doi: 10.3390/healthcare8040538. PMID: 33291580; PMCID: PMC7761865.
- **10.** Ruiz MNS, Ontonso IA, Armayor NC, Guillén-Grima F, de Mendoza JH, Monzo IS, Fernández BM. Changes in body weight of the university students at university. Nutr Hosp 2015; 31(6): 2400-2406.
- **11.** PRADO, Leila; SILVA, Nathalia; NASCIMENTO, Maria do and CABRAL, Poliana. Changes in weight and body composition among students after entering the university: a systematic review. Rev. chil. nutr. [online]. 2019, vol.46, n.5, pp.614-621. ISSN 0717-7518. http://dx.doi.org/10.4067/S0717-75182019000500614.
- **12.** Boo NY, Chia GJQ, Wong LC, Chew RM, Chong W, Loo RCN; The prevalence of obesity among clinical students in a Malaysian medical school. Singapore Med J., 2010; 51(2):126-32.

- **13.** Banwell C, Lim L, Seubsman SA, Bain C, Dixon J, Sleigh A; Body mass index and healthrelated behaviors in a national cohort of 87,134 Thai Open University students. J Epidemiol Community Health, 2009;63:366-72.
- 14. Genena, Doaa & Salama, Amany. (2017). Obesity and Eating Habits among University Students in Alexandria, Egypt: A Cross Sectional Study. 10.12691/jnh-5-3-1.
- **15.** Al-Qahtani MH. Dietary Habits of Saudi Medical Students at University of Dammam. Int J Health Sci (Qassim). 2016 Jul; 10: 353-362.
- **16.** WHO Regional Office for the Eastern Mediterranean. www.emro.who.int/health-topics/obesity/ accessed at 15 May 2017.
- **17.** Norgan NG; Body mass index and body energy stores in developing countries. Eur J ClinNutr., 1990; 44: supply 1:79-84.
- **18.** P. Kokkinos, et al., "Physical Activity, Health Benefits, and Mortality Risk," ISRN Cardiol, 2012.
- **19.** Mora S., et al., "Physical Activity and Reduced Risk of Cardiovascular Events: Potential Mediating Mechanisms,"Circulation, 2007.
- **20.** Ulf E., et al., "Physical Activity and Metabolic Risk in Individuals with a Family History of Type 2 Diabetes,"ADA, 2007.
- **21.** De Piero, A.; Bassett, N.; Rossi, A.; Sammán, N. Trends in food consumption of university students. Nutr. Hosp.2015, 31, 1824–1831.
- **22.** Rangel Caballero, L.G.; Rojas Sánchez, L.Z.; Gamboa Delgado, E.M. Overweight and obesity in Colombiancollege students and its association with physical activity. Nutr. Hosp. 2014, 31, 629–636.
- **23.** L. Nasreddine, et al., "Trends in overweight and obesity in Lebanon: evidence from two national cross-sectional surveys (1997 and 2009)," BMC Public Health, 2012.
- **24.** Ruiz MNS, Ontonso IA, Armayor NC, Guillén-Grima F, de Mendoza JH, Monzo IS, Fernández BM. 2015Changes in body weight of the university students at university. Nutr Hosp 2015; 31(6): 2400-2406.
- **25.** Lloyd-Richardson E, Bailey S, Fava J, Wing R. 2009 A prospective study of weight gain during the college freshman and sophomore years. Prev Med 2009; 48(3): 256-261.
- **26.** Racette S, Deusinger S, Strube M, Highstein G, Deusinger R.2008 Changes in weight and health behaviors from freshman through senior year of college. J Nutr Educ Behav 2008; 40(1): 39-42.

Al-Nisour Journal for Medical Sciences

- **27.** Crombie A, Lui P, Ormsbee M, Ilich J. 2012 Weight and body composition change during the college freshman year in male general population students and army reserve officer training corps (ROTC)cadets. Int J Sport Nutr Exerc Metab 2012; 22(6): 412-421.
- **28.** Hoffman D, Policastro P, Quick V, Lee S. 200.Changes in body weight and fat mass of men and women in the first year of college: a study of the "Freshman 15". J Am Coll Health 2006; 55(1): 41-45.
- **29.** Levitsky D, Garay J, Nausbaum M, Neighbors L, Dellavalle D. 200.Monitoring weight daily blocks the freshman weight gain: a model for combating the epidemic of obesity. Int J Obes 2006; 30(6): 1003-1010.
- **30.** Wengreen H, Moncur C. Change in diet.2009. Physical activity, and body weight among young-adults during the transition from high school to college. Nutr J 2009; 8(32): 1-7.
- **31.** Morrow ML, Heesch KC, Dinger MK, Hull HR, Kneehans AW & Fields DA. Freshman 15:2006. fact or fiction? Obesity 2006; 14: 1438-1443.
- **32.** Gropper S, Newton A, Harrington P, Simmons K, Connell L, Ulrich P.2011. Body composition changes during the first two years of university. Prev Med 2011; 52(1): 20-22.
- **33.** Gropper S, Simmons K, Connell L, Ulrich P. 2012.Weight and body composition changes during the first three years of college. J Obes 2012; 2012(634048): 1-6.
- **34.** Gropper S, Simmons K, Connell L, Ulrich P. 2012. Changes in body weight, composition and shape: a 4-year study of college students. Appl Physiol Nutr Metab 2012; 37(6): 1118-1123.
- **35.** Hull H, Morrow M, Heesch K, Dinger M, Han J, Fields D. 2007.Effect of the summer months on body weight and composition in college women. J Women's Health 2007; 16(10): 1510-1515.
- **36.** Hull H, Morrow M, Dinger M, Han J, Fields D.2007. Characterization of body weight and composition changes during the sophomore year of college. BMC Women's Health 2007; 7: 21.
- **37.** Irazusta A, Hoyos I, Irazusta J, Ruiz F, Díaz E, Gil J.2007. Increased cardiovascular risk associated with poor nutritional habits in first-year university students. Nutr Res 2007; 27(7): 387-394.
- **38.** Greaney ML, Less FD, White AA, Dayton SF, Riebe D, Blissmer B, et al.2009. College students' barriers and enablers for healthful weight management: a qualitative study. J Nutr Educ Behav. 2009; 41(4): 281-286.
- **39.** Gropper SS, Simmons KP, Gaines A, et al. 2009. The freshman 15- a closer look. J Am Coll Health 2009; 58: 223-232.

- **40.** Mifsud G, Duval K, Doucet E. 2009.Low body fat and high cardiorespiratory fitness at the onset of the freshmen year may not protect against weight gain. Br J Nutr 2009; 101(9): 1406-1412.
- **41.** Deliens T, Clarys P, Van Hecke L, De Bourdeaudhuij I, Deforche B. 2013. Changes in weight and body composition during the first semester at university. A prospective explanatory study. Appetite 2013; 65: 111-116.
- **42.** Hootman KC, Guertin KA, Cassano PA.2017. Longitudinal changes in anthropometry and body composition in university freshmen. J Am Coll Health 2017; 65(4): 268-276.
- 43. Lorenzini, R.; Betancur-Ancona, D.A.; Chel-Guerrero, L.A.; Segura-Campos, M.R.; Casterllanos-Ruelas, A.F. 2015. Nutritional status of university students from méxico in relation with their lifestyle, versión On-line ISSN 1699-5198versión impresa ISSN 0212-1611Nutr. Hosp. vol.32 no.1 Madrid jul. 32, 94–100. https://dx.doi.org/10.3305/nh.2015.32.1.8872.
- **44.** Sanchez-Guette, L.; Herazo-Beltrán, Y.; Galeano-Muñoz, L.; Romero-Leiva, K.; Guerrero-Correa, F.;Mancilla-González, G. 2019. SEDENTARY BEHAVIOR IN UNIVERSITY STUDENTS. Rev. LATIN AMERICAN HYPERTENSION . Vol. 14, No. 4 (2019), 232–236.
- **45.** SOLERA SANCHEZ, Alba and GAMERO LLUNA, Amparo . Healthy habits in university students of health sciences and other branches of knowledge: a comparative study. Rev Esp Nutr Hum Diet [online]. 2019, vol.23, n.4, pp.271-282. Epub 13-Oct-2020. ISSN 2174-5145. https://dx.doi.org/10.14306/renhyd.23.4.762.
- **46.** Healthy lifestyles in nursing students at the Universidad Cooperativa de Colombia / Healthy lifestyles in nursing students at Universidade Cooperativa de Colombia / Laguado Jaimes, Elveny ; Gomez Diaz, Martha Patricia . Towards promotion health ; 19(1): 68-83, Jan.-Jun. 2014. Tab.Article in Spanish | LILACS | ID: lil-729271.
- **47.** Sánchez-Ojeda MA, De Luna-Bertos E. HÁBITOS DE VIDA SALUDABLE EN LA POBLACIÓN UNIVERSITARIA [Healthy lifestyles of the university population]. Nutr Hosp. 2015 May 1;31(5):1910-1919. Spanish. doi: 10.3305/nh.2015.31.5.8608. PMID: 25929358.
- **48.** M. Al-Tannir, et al., "Prevalence of Physical Activity among Lebanese Adults: A Cross-Sectional Study," Journal of Physical Activity and Health, vol. 6, pp. 315-320, 2009.
- **49.** Barberio A. and McLaren L., "Occupational physical activity and body mass index (BMI) among Canadian adults: does physical activity at work help to explain the socio-economic patterning of body weight?" Can J Public Health, vol/issue: 102(3), pp. 169-73, 2011.
- **50.** P. T. Katzmarzyk, "Physical Activity, Sedentary Behavior, and Health: Paradigm Paralysis or Paradigm Shift?" ADA, 2010.
- **51.** Sandrine D., et al., "Work-related and Dietary Factors Associated with Weight Gain over the Period of Employment in Paramedics," Occupational Medicine & Health Affair, 2014.

- **52.** Soha Hourani, Nagham Hamadeh, Mohamad Al-Iskandarani, Sarine El Daouk, Maha Hoteit. 2017 Physical Activity and Obesity Indicators: National Cross Sectional Study on Lebanese Adults. International Journal of Public Health Science (IJPHS) Vol.6, No.1, March 2017, pp. 1~6 ISSN: 2252-8806 DOI: 10.11591/.v6i1.6525.
- 53. Cervera Burriel, Faustino; Serrano Urrea, Ramón; Vico García, Cruz; Milla Tobarra, Marta; García Meseguer, María José. PY 2014/12/01. [Hábitos alimentarios y evaluación nutricional en una población universitaria / Food habits and nutritional assessment in a university population] VL 28(2):438-446. DO 10.3305/nh.2013.28.2.6303 Nutricion hospitalaria : organo oficial de la Sociedad Espanola de Nutricion Parenteral y Enteral.
- 54. Godoy Cumillaf, A.; Valdés Badilla, P.; Fariña Herrera, C.; Cárcamo Mora, F.; Medina Herrera, B. Asociación entre la condición física, estado nutricional y rendimiento académico en estudiantes de educación física./ASSOCIATION BETWEEN FITNESS,NUTRITIONAL STATUS AND ACADEMICPERFORMANCE IN PHYSICAL EDUCATIONSTUDENTS. Nourish Hospital. 2015; vol.32 (4):1722-1728ISSN 0212-1611 •https://dx.doi.org/10.3305/.
- **55.** Landeros Ramirez, P.; Gómez Cruz, Z.; Rimoldi Rentería, M.J.; Parada Barrera, G.; Núñez-Hernández, A.Índice de Masa Corporal y Rendimiento Académico en Estudiantes Universitarios./ Body Mass Index and Academic Performance in University Students. Rev. Salud Pública Nutr.2018, vol. 17(4), 34–40. [CrossRef]
- **56.** Abdelhamid K; Evaluation of nutritional status of United Arab Emirates. Emir. J. Agric. Sci.,2003;15: 42-50.
- **57.** BEllisle F, Monneuse MO, Stepoe A, Wardle J;Weight Concerns and eating patterns: a survey of university students in Europe. Int JobesRelatMetabDisord., 1995; 10: 723-30.
- **58.** Norah M. AL Qauhiz; Obesity among Saudi Female University Students: Dietary Habits and Health Behaviors. J Egypt Public Health Assoc., 2010; 85:45-59.
- **59.** Elmabsout, Ali & Senussinouh, Manal & Nasser, Ryma & Hussein, & Nouh, Faiza. (2016). Body Weight among Medical Students at Benghazi University in Relation to BMI Based Weight Status and Socioeconomic Factors. Scholars Journal of Applied Medical Sciences. 4. 653-663.
- **60.** Kobayashi J., Murano S., Kawamura I. et al. The relationship of percent body fat by bioelectrical impedance analysis with blood pressure, and glucose and lipid parameters. J Atherosclers Thromb 2006; 13: 221–226.
- **61.** Lee K, Song YM, Sung J. Which obesity indicators are better predictors of metabolic risk? Healthy twin study. Obesity (Silver Spring). 2008 Apr; 16(4):834-40. doi: 10.1038/oby.2007.109. Epub 2008 Jan 24. PMID: 18239595.
- **62.** Schneider HJ, Glaesmer H., Klotsche J. et al. Accuracy of anthropometric indicators of obesity to predict cardiovascular risk. J Clin Endocrinol Metab 2007; 92: 589–594.