








The Open Public Health Journal

Content list available at: <https://openpublichealthjournal.com>



RESEARCH ARTICLE

Utilizing the Health Belief Model in Determining the Association between Perceptions on Obesity and Exercise Behavior of Saudi University Students

Yasser Taher Al-Hassan¹ , Eduardo Fabella^{2,*} , Edric Estrella³ , Hassan Abdulfatah Al-Ramadan¹  and Abdullah Hassan Bujbara¹ 

¹Al-Ahsa Public Health Directorate, Ministry of Health, Hofuf, Al-Ahsa, Saudi Arabia

²Quality Assurance and Academic Development Unit, College of Applied Medical Sciences, King Faisal University, Hofuf, Al-Ahsa, Saudi Arabia

³Public Health Department, College of Applied Medical Sciences, King Faisal University, Hofuf, Al-Ahsa, Saudi Arabia

Abstract:

Objective:

To determine the association between the perceptions on obesity of Saudi university students and their Physical Activity (PA) as measured by Metabolic Equivalents (METs) Score.

Methods:

This study utilized an analytical cross-sectional design. The level of perception on obesity was determined based on the responses to the Obesity Health Belief Model questionnaire while the Global Physical Activity Questionnaire (GPAQ) was used to measure the students' activity levels. Students with METs scores of less than 600 were classified as inactive. Descriptive and inferential statistics were computed using Epi Info version 7.

Results:

Majority (75.54%) of participants had a high level of perception of the seriousness of obesity. Only half of the participants had a high level of the perception of susceptibility towards becoming obese. Although most (93.53%) of the students had a high level of perception of the benefits of physical activity on obesity prevention, 98.2% had a moderate to high perception of the barriers to engage in physical activity. The prevalence of physical inactivity was 44.6% (95% CI: 38.67 - 50.66%) and was higher among female (51.71%) than male (24.66%) students. There was a positive linear relationship between the university students' perception of obesity and their level of physical activity with a β coefficient = 72.6 (p value = 0.0003).

Conclusion:

Saudi university students have a high perception of the seriousness of obesity and the benefits of physical activity towards obesity prevention; however, only half of them believe that they are susceptible to becoming obese. The students' perceptions of obesity influence their physical activity.

Keywords: Obesity, Physical activity, Health behavior, Exercise behavior, Metabolic equivalents, Non-communicable disease.

Article History

Received: November 01, 2019

Revised: February 04, 2020

Accepted: February 08, 2020

1. INTRODUCTION

Non-communicable Disease (NCDs) now account for a great proportion of morbidity and mortality in most parts of the world. A dramatic rise in NCDs mortality and morbidity has been seen in the Gulf Region. It has been proposed that this

phenomenon is largely the result of urbanization – related reduction in the level of physical activity among the people in Gulf countries [1 - 4].

The World Health Organization defines physical activity as “any bodily movement produced by skeletal muscles that requires energy expenditure” [5]. The current recommendation is that adults between 18 to 64 years should engage in physical activity for at least 150 minutes of moderate-intensity or 75 minutes of vigorous-intensity per week. Moderate-intensity

* Address correspondence to this author at the Quality Assurance and Academic Development Unit, College of Applied Medical Sciences, King Faisal University, Saudi Arabia; Tel: +9664918736; E-mail: efabella@kfu.edu.sa

physical activity (approximately 3 - 6 METs) requires a moderate amount of effort and noticeably accelerates the heart rate. Physical activities such as brisk walking, gardening, housework, and carrying/moving moderate loads less than 20 kg fall into this category. Vigorous-intensity physical activity (approximately >6 METs) requires a large amount of effort and causes rapid breathing and a substantial increase in heart rate. Examples of vigorous-intensity activities include running, walking/climbing briskly up a hill, fast cycling, and carrying/moving heavy loads greater than 20 kg [6].

Physical inactivity has been acknowledged as the fourth leading risk factor for global mortality, causing an estimated 3.2 million deaths worldwide [5]. It is considered as one of the five main contributors to health threat in the Gulf Cooperation Council countries [1, 2]. Physical inactivity is associated with shortened life expectancy and is recognized as one of the major risk factors for NCDs such as cardiovascular diseases (CVDs) including hypertension, coronary heart disease (CHD), breast and colon cancer, and diabetes [2, 4, 7 - 12].

A nationwide study showed that the prevalence of physical activity is very low (men, 6.1%; women, 1.9%) while WHO estimates that 57% of children and 71% of adolescents in Saudi Arabia are physically inactive [2].

Obesity is one of the consequences of physical inactivity. Being overweight or obese is also linked to non-communicable diseases. The WHO defines being overweight and obese as "abnormal or excessive fat accumulation that presents a risk to health". A person is classified as overweight if his Body Mass Index (BMI) ranges from 25 to 29.9 kg/m² and obese when his BMI is equal to or greater than 30 kg/m² [13, 14].

The dramatic rise of global obesity rates, currently twice as high as those in the 1980s, in developed and developing countries is well documented such that it is regarded as a significant public health issue [15]. Obesity has been declared a global epidemic by the WHO because of rapid increases in global incidence observed in recent decades [16]. It is estimated that there are more than 1.9 billion overweight adults as of 2016, in which over 650 million were estimated as obese [17].

The Gulf region has experienced the most rapid increase in obesity rates around the world. The Kingdom of Saudi Arabia ranks second to Kuwait in terms of high rate of obesity in this region [18]. Obesity is highly prevalent in Saudi Arabia. The prevalence of obesity in the Kingdom is among the highest in the world for different age, occupation and gender groups [17].

Obesity and overweight represent an alarming threat to population health based on their high prevalence among Saudis [1, 14, 15]. It is believed that family history, genetic factors, marital status, diet and eating habits and lack of physical activity are the most important factors contributing to the rising trend of obesity in Saudi Arabia [17].

Obesity and physical inactivity are growing public health problems in Saudi Arabia and worldwide. Both conditions are

related to many health conditions such as cardiovascular disease, diabetes, and some forms of cancer [2, 7, 10, 11, 14, 15, 19 - 22]. The Saudi government spends nearly 20 billion riyals each year on obesity-related diseases [23].

A 2017 study conducted in a primary health care setting in Jeddah, Saudi Arabia, showed that the prevalence of overweight adult Saudi men and women are 30.7% and 28.4%, respectively. Whereas, the prevalence of obesity is 14% for adult Saudi men and 23.6% for adult Saudi women [15]. The trend of overweight and obesity was similarly reported in a 2016 published study in Saudi Medical Journal [14].

Obesity among young people is also at an alarming state. Globally, it is estimated that 41 million children and adolescents are obese [17]. According to the National Growth Study, the prevalence of obesity between children and adolescents has increased rapidly in Saudi Arabia. It is now estimated that the prevalence of overweight and obesity among Saudi adolescents is as high as 30% [24]. Although being overweight and obese are viewed as among the health conditions that can be prevented, inactivity and obesity among children and adults remain urgent public health challenges for Saudi Arabia [18]. It is deemed important to accurately determine the causes and factors that contribute to their development so that behavioral intervention strategies towards their prevention can be initiated.

Numerous public health problems are influenced by health behaviors. According to Kasl and Cobb (1996), health behavior is "any activity undertaken by a person who believes himself to be healthy for the purpose of preventing disease or detecting disease in an asymptomatic stage" [25]. The Health Belief Model is a commonly used model which explains and predicts preventive health behaviors [26].

Being physically active along with having a healthy diet are examples of healthy behaviors that have been documented to reduce obesity and NCDs such as CVDs and diabetes [22, 27 - 31]. Physical activity is an important component of general health that plays a vital role in the primordial and primary prevention of NCD. However, there are often discrepancies in perceived sufficiency of PA and actual PA [32].

Physical inactivity and obesity have been studied extensively in recent years, however the association between perceptions on obesity and their effect on physical activity has not been explored. This study, therefore, aims to determine whether the perceptions of university students on obesity influence their physical activity.

2. METHODS

This study utilized an analytical cross-sectional design to assess the association between the university students' perceptions on obesity and their level of physical activity (Fig. 1). Multi-stage sampling was performed to select the required number of study participants from the health science students of King Faisal University in Al-Ahsa, Saudi Arabia.

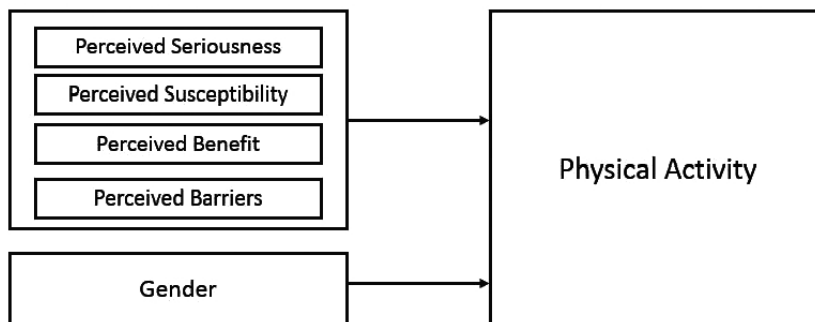


Fig. (1). Conceptual Framework.

The Global Physical Activity Questionnaire (GPAQ) was used to determine the students’ activity levels. This questionnaire assessed the duration of vigorous and moderately vigorous activities spent for work, transportation and recreation. The level of physical activity was determined from cumulative METs (Metabolic Equivalents). The physical activity of students was classified according to the cutoff score of 600 MET-minutes. Students were declared physically inactive if their METs score was less than 600 and active if the METs score was ≥ 600 [33].

The perceptions on obesity were measured using a validated researcher-developed questionnaire based on the four constructs of the Health Belief Model (HBM): perceived seriousness of obesity, perceived susceptibility to obesity, perceived benefit of physical activity in preventing obesity, and perceived barriers to physical activity in preventing obesity. The level of perception of obesity was determined based on the total score of the Obesity HBM Questionnaire and scores on individual domains.

Descriptive and inferential statistics were computed using Epi Info version 7. Estimation of the prevalence of physical inactivity was performed. Tests for differences in mean METs score and total perception score were computed using *t*-test while the association between the perception of obesity and physical activity was determined using linear regression.

Ethical clearance to conduct this study was obtained from the King Faisal University Research Ethics Committee (KFU - REC/2019-04-03). All participants provided consent to participate in the study. Confidentiality was maintained in all stages of this study.

3. RESULTS AND ANALYSIS

A total of 278 students were included in the study. Participants consisted of 205 (73.7%) female and 73 (26.3%) male students.

3.1. Perceptions on Obesity

The relative percentages of students with low, moderate and high levels of perceptions on obesity according to the four

domains of the Health Belief Model are depicted in Fig. (2). Ninety percent of the participants had a high level of perception regarding obesity. Among the students, 94.5% (95% CI: 86.1 - 97.9%) of males and 88.3% (95% CI: 83.0 - 92.0%) of females had high over-all perception on obesity.

The majority of participants (75.5%) had a high level of perception of the seriousness of being obese. Whereas few students (2.2%) had a low level of perception of the seriousness of being obese. Seventy-nine percent of male students had a high perception of the seriousness of obesity while only 74.1% of females perceived obesity as a serious health condition.

Half of the participants (139, 50.0%) had reported that they were at a high level of the perception of susceptibility towards obesity, closely followed by (47.1%) participants who had reported that they had a moderate level of susceptibility. Among male students, 52.0% and 47.9% had high and moderate perceptions, respectively, about their susceptibility to become obese. In contrast, only 9.2% of female students had high while 46.8% had moderate perceptions about their susceptibility to become obese. Among female university students, 3.9% did not even consider themselves susceptible to become obese.

The majority of the participants (93.5%) had a high level of perception of the benefits of physical activity in obesity prevention while only a few (1.80%) of them had a low perception of the benefits of being physically active. Among male university students, 98.6% had a high perception of the benefit of physical activity in preventing obesity while 97.7% of female students also did.

Slightly higher than the half (50.7%) of the participants had a high level of perception of the barriers to being physically active. It was closely followed by 47.5% who had a moderate level of the perception of barriers of being physically active. Among male students, 58.9% had high and 41.1% had a moderate level of perception regarding the barriers to physical activity. On the other hand, among female students, 47.8% had high and 49.7% had a moderate level of perception regarding barriers to physical activity.

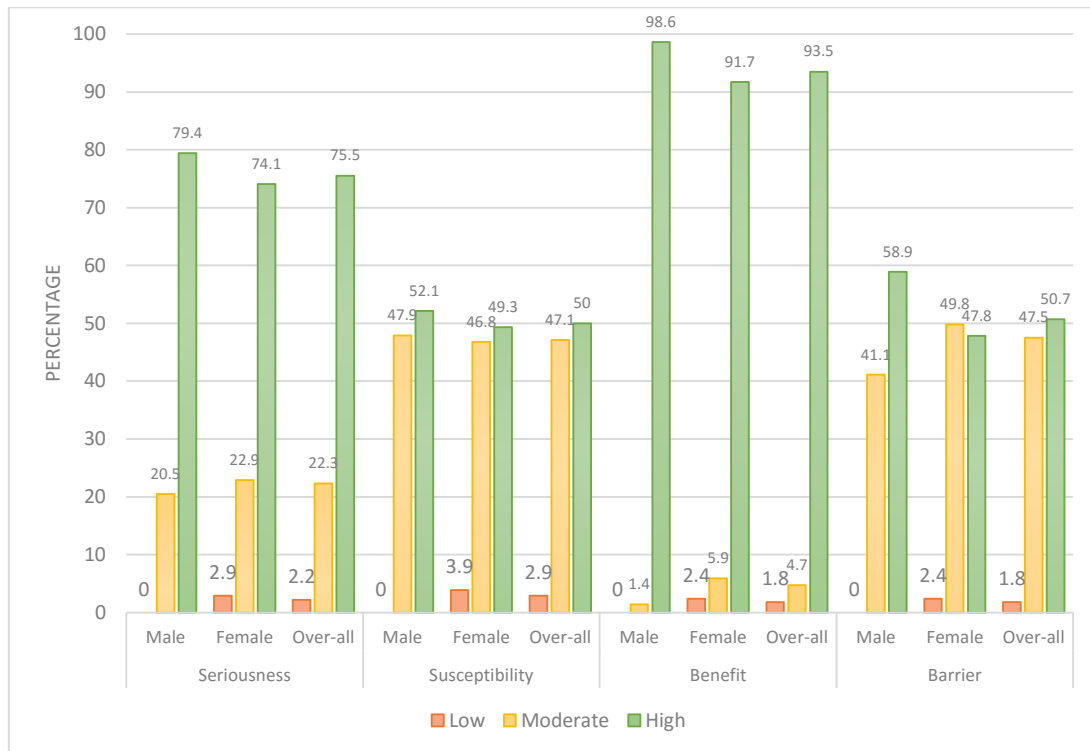


Fig. (2). Perceptions of university students on obesity by Health Belief Model domains.

There were significant differences in the perception of obesity between male and female students as reflected in the mean scores for perceptions across the four HBM domains (*t*-statistics = -2.9358, *p*-value = <0.0036).

3.2. Prevalence of Physical Inactivity

Among the 278 participants, 154 (55.4%, 95% CI: 49.3 - 61.3%) had MET ≥ 600, classified as active. The prevalence of physical inactivity was 44.6% (95% CI: 38.7 - 50.7%).

The male and female students differed significantly in their MET Scores (*t*-statistic = -5.1794, *p*-value = <0.0001). As seen in Table 1, the prevalence of physical inactivity differed between genders being higher among females (51.7%, 95% CI: 44.8 - 58.5%) than among males (24.7%, 95% CI: 16.04 - 35.9%).

Table 1. Cross-tabulation of physical activity of university students by gender.

Gender	Physical Activity		
	Active	Inactive	Total
Female	99	106	205
Row %	48.29%	51.71%	100.00%
Col %	64.29%	85.48%	73.74%
Male	55	18	73
Row %	75.34%	24.66%	100.00%
Col %	35.71%	14.52%	26.26%
Total	154	124	278
Row %	55.40%	44.60%	100.00%
Col %	100.00%	100.00%	100.00%

3.3. Association Between Perception of Obesity and Physical Inactivity

Linear regression was used to determine the association between the perception of obesity as measured by the total HBM perception and the physical activity as measured by MET scores. The β coefficient = 72.6 ± 20.111 with a *p*-value of 0.0003. For every unit increase in the Total HBM Perception, there was a corresponding 72.6 increase in MET minutes (*p*-value = <0.001).

4. DISCUSSION

Using the Health Belief Model (HBM), it was seen that university students had a high over-all perception of obesity. According to this model, the perception of the threat to a health condition is the result of the combined perception of its seriousness and a person’s perception of this susceptibility to develop the condition. Most of the university students (75.5%) had a high-level perception about the seriousness of obesity. However, only 50.0% had a high level of perceived susceptibility towards obesity. The discrepancy in perceived seriousness and perceived susceptibility to becoming obese therefore affects the perception of threat of obesity.

Male and female students did not significantly differ in their perception of the seriousness of obesity (*p*-value = 0.2823) however the mean values of their perception of their susceptibility differed significantly (*p*-value = 0.0182).

The benefit of physical activity in preventing obesity was perceived highly by a majority (93.5%) of the university students. While most of the students had a high perception of the benefit of physical activity, the mean scores differed

significantly among male and female students (p -value = 0.0453).

Interestingly, half of the study participants had a high perception of the barriers of engaging in physical activity as a means of preventing obesity. While both gender groups had high perceptions about the barriers for physical activity, the mean scores differed significantly among them (p -value = 0.0118).

The current study revealed that the prevalence of physical inactivity among university students was 44.6%. However, the prevalence of inactivity in the current study is still lower than what was seen in a previous study done in southwestern Saudi Arabia among students of a health college where the physical inactivity prevalence was 58.0% [7]. A study conducted in Riyadh reported the prevalence of physical inactivity to be almost 68.0% among 15 – 64-year-old Saudis [4]. Another study conducted among Saudi adults reported the prevalence of physical inactivity to be 58.5% [2].

As predicted, the prevalence of physical inactivity among female university students was significantly higher than among male university students. The result of the current study is consistent with the findings in a recent study involving health science students in Riyadh where almost half of the female students were not physically active [34 - 35].

Along with wrong food habits, lack of physical activity has been found to be strongly associated with the prevalence of obesity among adolescent Saudis [24].

Gender difference observed in the current study was also documented in several other studies reporting a higher prevalence of physical inactivity among women than among men [2, 4]. The prevalence of physical inactivity in women was reported to be 52.1% among working women in Riyadh [9].

A study among physicians in Riyadh reported lack of time, work duties, and embarrassment as the main reasons for failure to engage in physical activity [4, 8]. Among medical students in Jizan University, the most important reasons for the high prevalence of physical inactivity were heavy academic work and lack of places for physical activity [8].

The high prevalence of physical inactivity among women is due to several factors including school workload, lack of willpower, lack of resources, lack of knowledge about the benefits of physical activity, lack of social support, and lack of places for physical activity [8, 21, 37]. In addition, another study reported disinterest in exercise and having no one to exercise with as contributory to lack of physical activity among women. Women in KSA are at greater risk for inactivity due to harsh climate, transportation restrictions, and local traditions [9].

The researchers believe that other factors that play an important role in the high prevalence of physical inactivity among women include restrictive cultural expectations, workload at home and care-giving roles for other family members, health conditions, and lack of motivation. However, the lack of facilities rather than sociocultural factors was found to be the primary barrier for female students to engage in physical activity [20]. In addition, the lack of physical activity

program for the female university students was cited as a contributory factor to non-engagement in exercise activities [37].

A significant association was found between the students' perception of obesity and their physical activity. The current study utilized METs to express the intensity of the physical activity of health sciences students. MET is actually the "ratio of a person's working metabolic rate relative to the resting metabolic rate" [33]. The result showed a β coefficient of 72.6 METs. This implies that for every unit increase in the obesity perception score, the MET-minutes per week increases by 72.6.

This study has several limitations. Data collected were self-reported and therefore subject to bias. For instance, data on the duration of physical activity were mere approximations by the respondents. The collection of data from female respondents was complicated by cultural restrictions limiting clarification of concerns pertaining to questionnaire content. Reasons for the lack of physical activity were not explored in this study. It is therefore recommended for future researchers who will be attempting to investigate the same variables to ensure that bias resulting from self-reporting be minimized and that confounding variables such as other risk factors for physical inactivity be controlled.

The university students had a high perception of the benefit of physical activity as a means to prevent obesity. However, the perception of susceptibility was relatively low and therefore the perception of the threat of obesity and indirectly, the diseases related to obesity was low. For this reason, it can be predicted that the prevalence of physical inactivity will remain high unless this perception is modified. The barriers to physical activity must be addressed urgently.

Perceptions about obesity may be enhanced by improvements in self-efficacy to engage in physical activity. Continuous education about the importance of physical activity must therefore be provided to students. A lifestyle of physical activity must be promoted in the university in the form of sports competitions and elective courses on physical education. Infrastructure must be developed to accommodate female students to overcome sociocultural restrictions.

CONCLUSION

In conclusion, university students had a high perception of obesity and the benefit of physical activity as a means to prevent obesity. However, a significant proportion of students did not consider themselves susceptible to becoming obese and an equal proportion considered that barriers to engaging in physical activity were high. Physical inactivity was common among both male and female health students. Perceptions regarding obesity were found to influence physical activity as a health behavior. The university must, therefore, take initiatives to further increase the perception of the threat of obesity and the benefit of physical activity. Opportunities for students to engage in physical activities by creating programs and providing access to facilities must be prioritized.

LIST OF ABBREVIATIONS

KSA = Kingdom of Saudi Arabia

PA = Physical Activity
METs = Metabolic Equivalents
GPAQ = Global Physical Activity Questionnaire
HBM = Health Belief Model
NCDs = Non-communicable Diseases
CVDs = Cardiovascular Diseases
CHD = Coronary Heart Disease
BMI = Body Mass Index
WHO = World Health Organization
KFU-REC = King Faisal University Research Ethics Committee

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

Ethical Approval for this study project was obtained from the King Faisal University Research Ethics Committee Saudi Arabia, Reference Number KFU – REC/2019 – 04 – 03 (dated 04/28/2019).

HUMAN AND ANIMAL RIGHTS

Not applicable

CONSENT FOR PUBLICATION

All participants provided consent to participate in the study.

AVAILABILITY OF DATA AND MATERIALS

The data set analyzed in this study is available at <https://data.mendeley.com/datasets/zt95dmh67y/draft?a=0476a0ee-97a8-4b7b-a535-6e80de29a90c>

FUNDING

None.

CONFLICT OF INTEREST

The authors have no conflicts of interest associated with the material presented in this paper

ACKNOWLEDGEMENTS

Declared None

REFERENCES

- [1] Mabry R, Koohsari MJ, Bull F, Owen N. A systematic review of physical activity and sedentary behaviour research in the oil-producing countries of the Arabian Peninsula. *BMC Public Health* 2016; 16(1): 1003. [http://dx.doi.org/10.1186/s12889-016-3642-4] [PMID: 27655373]
- [2] Alahmed Z, Lobelo F. Physical activity promotion in Saudi Arabia: A critical role for clinicians and the health care system. *J Epidemiol Glob Health* 2018; 7(Suppl. 1): S7-S15. [http://dx.doi.org/10.1016/j.jegh.2017.10.005] [PMID: 29801594]
- [3] Al-Nuaim AA, Al-Nakeeb Y, Lyons M, *et al.* The prevalence of physical activity and sedentary behaviours relative to obesity among adolescents from Al-Ahsa, Saudi Arabia: rural versus urban variations. *J Nutr Metab* 2012; 2012417589 [http://dx.doi.org/10.1155/2012/417589] [PMID: 22315673]
- [4] Mandil AM, Alfurayh NA, Aljebreen MA, Aldukhi SA. Physical activity and major non-communicable diseases among physicians in Central Saudi Arabia. *Saudi Med J* 2016; 37(11): 1243-50. [http://dx.doi.org/10.15537/smj.2016.11.16268] [PMID: 27761564]
- [5] World Health Organization Geneva: Physical activity 2018. cited 2018 Dec 23 Available from: http://www.who.int/topics/physical_activity/en/
- [6] World Health Organization Geneva: Global Strategy on Diet, Physical Activity and Health 2020. cited 2020 Jan 31 Diet Available from: https://www.who.int/dietphysicalactivity/physical_activity_intensity/en/
- [7] Awadalla NJ, Aboelyazed AE, Hassanein MA, *et al.* Assessment of physical inactivity and perceived barriers to physical activity among health college students, south-western Saudi Arabia. *East Mediterr Health J* 2014; 20(10): 596-604. [http://dx.doi.org/10.26719/2014.20.10.596] [PMID: 25356690]
- [8] Khalafalla HE, Mahfouz MS, Najmi MH, *et al.* Factors Associated with Physical Activity among Medical Students of Jazan University: A Cross-Sectional Study. *Glob J Health Sci* 2017; 9(4)
- [9] Albawardi NM, Jradi H, Al-Hazzaa HM. Levels and correlates of physical activity, inactivity and body mass index among Saudi women working in office jobs in Riyadh city. *BMC Womens Health* 2016; 16(1): 33. [http://dx.doi.org/10.1186/s12905-016-0312-8] [PMID: 27323844]
- [10] Naim Z, Anwar K, Rahman A, Zuliani N. Physical Inactivity Among Medical and Non-medical students: A cross sectional study. *International Journal of Public Health and Clinical Sciences* 2016; 3(5): 48-58.
- [11] Lee IM, Shiroma EJ, Lobelo F, Puska P, Blair SN, Katzmarzyk PT. Lancet Physical Activity Series Working Group. Effect of physical inactivity on major non-communicable diseases worldwide: an analysis of burden of disease and life expectancy. *Lancet* 2012; 380(9838): 219-29. [http://dx.doi.org/10.1016/S0140-6736(12)61031-9] [PMID: 22818936]
- [12] Al-Hassan YT, Fabella EL, Estrella E, Aatif M. Prevalence and Determinants of Dyslipidemia: Data from a Saudi University Clinic. *Open Public Health J* 2018; 11(1) [http://dx.doi.org/10.2174/1874944501811010416]
- [13] World Health Organization. Geneva: Obesity cited 2017 Dec 23 Available from: <http://www.who.int/topics/obesity/en/>
- [14] Alfadda AA, Al-Dhwayan MM, Alharbi AA, *et al.* The Saudi clinical practice guideline for the management of overweight and obesity in adults. *Saudi Med J* 2016; 37(10): 1151-62. [http://dx.doi.org/10.15537/smj.2016.10.14353] [PMID: 27652370]
- [15] Ss MA. A review of prevalence of obesity in Saudi Arabia. *J Obes Eat Disord* 2016; 2(2)
- [16] Alghamdi RQ. A randomized controlled trial of a 12-week intensive lifestyle intervention program at a primary care obesity clinic for adults in western Saudi Arabia. *Saudi Med J* 2017; 38(8): 837-45. [http://dx.doi.org/10.15537/smj.2017.8.20553] [PMID: 28762437]
- [17] World Health Organization. Geneva: Obesity and overweight cited 2018 Dec 23 2018. Available from: <http://www.who.int/mediacentre/factsheets/fs311/en/>
- [18] Balhareth A, Meertens R, Kremers S, Sleddens E. Overweight and obesity among adults in the Gulf States: A systematic literature review of correlates of weight, weight-related behaviours, and interventions. *Obes Rev* 2019; 20(5): 763-93. [http://dx.doi.org/10.1111/obr.12826] [PMID: 30653803]
- [19] Alharbi MM, Jackson RT. Physical Activity and the prevalence of general and abdominal obesity among Saudi women of reproductive age in Jeddah city. *J Obes Overweig* 2017; 3(1): 104.
- [20] Samara A, Nistrup A, Al-Rammah TY, Aro AR. Lack of facilities rather than sociocultural factors as the primary barrier to physical activity among female Saudi university students. *Int J Womens Health* 2015; 7: 279-86. [http://dx.doi.org/10.2147/IJWH.S80680] [PMID: 25834468]
- [21] Al-Eisa E, Al-Rushud A, Alghadir A, *et al.* Effect of motivation by "Instagram" on adherence to physical activity among female college students. *BioMed research international* 2016; 2016 [http://dx.doi.org/10.1155/2016/1546013]
- [22] Al-Zalabani AH, Al-Hamdan NA, Saeed AA. The prevalence of physical activity and its socioeconomic correlates in Kingdom of Saudi Arabia: A cross-sectional population-based national survey. *Journal of Taibah University Medical Sciences* 2015; 10(2): 208-15. [http://dx.doi.org/10.1016/j.jtumed.2014.11.001]
- [23] Ministry of Health-Saudi Arabia. Riyadh: Other diseases: obesity and overweight; c 2016. cited 2018 Dec 23 Available from: <https://www.moh.gov.sa/en/HealthAwareness/EducationalContent/Diseases/Otherdiseases/Pages/001.aspx>
- [24] El Azab EF, Elwasefy SA, Shaban HE, Mohamed FA, Alsharari AH.

- OBESEITY RELATED RISK FACTORS AMONG THE SAUDI FEMALE STUDENTS IN JOUF UNIVERSITY. *Journal of Health, Medicine and Nursing* 2019; 4(1): 38-49.
- [25] Rosenstock IM. The health belief model and preventive health behavior. *Health Educ Monogr* 1974; 2(4): 354-86. [http://dx.doi.org/10.1177/109019817400200405]
- [26] University of Twente. Netherlands: Health Belief Model cited 2017 Dec 25 Available from: https://www.utwente.nl/en/bms/communication-theories/sorted-by-cluster/Health%20Communication/Health_Belief_Model/
- [27] World Health Organization. Geneva: Physical Activity cited 2017 Dec 23 Available from: <http://www.who.int/dietphysicalactivity/pa/en/>
- [28] American Heart Association. Dallas: Healthy Living cited 2017 Dec 23 Available from: http://www.heart.org/HEARTORG/HealthyLiving/PhysicalActivity/Physical-Activity_UCM_001080_SubHomePage.jsp#
- [29] Centers for Disease Control and Prevention. Atlanta: Physical Activity for a Healthy Weight 2015.cited 2017 Dec 23 Available from: https://www.cdc.gov/healthyweight/physical_activity/
- [30] American Heart Association. Dallas: American Heart Association Recommendations for Physical Activity in Adults cited 2017 Dec 23 Available from: http://www.heart.org/HEARTORG/HealthyLiving/PhysicalActivity/FitnessBasics/American-Heart-Association-Recommendations-for-Physical-Activity-in-Adults_UCM_307976_Article.jsp#.WjrL_kqWbIU
- [31] Alarabi F, Alswat KA. Lifestyle Pattern Assessment Among Taif University Medical Students. *Brock J Educ* 2017; 5(1): 54-9.
- [32] Alsubaie AS, Omer EO. Physical activity behavior predictors, reasons and barriers among male adolescents in Riyadh, Saudi Arabia: evidence for obesogenic environment. *Int J Health Sci (Qassim)* 2015; 9(4): 400-8. [http://dx.doi.org/10.12816/0031229] [PMID: 26715919]
- [33] World Health Organization. Geneva: Global Physical Activity Surveillance cited 2017 Dec 21 Available from: <http://www.who.int/ncds/surveillance/steps/GPAQ/en/>
- [34] Alzamil HA, Alhakhbany MA, Alfadda NA, Almusallam SM, Al-Hazzaa HM. A profile of physical activity, sedentary behaviors, sleep, and dietary habits of Saudi college female students. *J Family Community Med* 2019; 26(1): 1-8. [http://dx.doi.org/10.4103/jfcm.JFCM_58_18] [PMID: 30697098]
- [35] Alhakhbany MA, Alzamil HA, Alabdullatif WA, Aldekhyyel SN, Alsuhaybani MN, Al-Hazzaa HM. Lifestyle Habits in Relation to Overweight and Obesity among Saudi Women Attending Health Science Colleges. *J Epidemiol Glob Health* 2018; 8(1-2): 13-9. [http://dx.doi.org/10.2991/j.jegh.2018.09.100] [PMID: 30859782]
- [36] Alghafri T, Alharthi SM, Al Farsi YM, Bannerman E, Craigie AM, Anderson AS. Perceived barriers to leisure time physical activity in adults with type 2 diabetes attending primary healthcare in Oman: a cross-sectional survey. *BMJ Open* 2017; 7(11):e016946 [http://dx.doi.org/10.1136/bmjopen-2017-016946] [PMID: 29102987]
- [37] Al-Hazzaa HM. Physical inactivity in Saudi Arabia revisited: A systematic review of inactivity prevalence and perceived barriers to active living. *Int J Health Sci (Qassim)* 2018; 12(6): 50-64. [PMID: 30534044]