

The Effectiveness of Lifestyle on BMI in Adult People in Saudi Arabia

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Abstract: The benefits of exercise have been known a long time ago, physical activity and physical fitness are important factors in reducing the risk of unhealthy weight gain and related illnesses, and moderate to high fitness brings about health benefits, also certain types of foods and eating habits have been linked to weight and BMI.

Objectives: To explore the impact of lifestyle factors on adult body mass index in Saudi Arabia.

Methods: This study (2017) was carried out among a sample of 750 adults aged between 18 and 45 years old. To assess adults' demographic and lifestyle factors and their association with body BMI, A pre-tested, pre-designed close ended questionnaire was distributed randomly to consenting adults after collecting their anthropometric measurements and calculating their BMI. The data were verified and analyzed using SPSS version 22.

Results: The sample is consisted of 69,2% women and 30,8% men. Among the respondents 28,9% were overweight and 12,8% obese. The proportion of physically inactive persons was elevated (57,3%) compared to active ones 42,7% and we found 70,3% as having acceptable eating habits. The results of the study showed a statistical significant association between exercise, smoking and eating habits since $p < 0,05$ (respectively $p = 0,03$, $p = 0,014$ and $p = 0,04$).

Conclusion: Bad lifestyle habits, such as sedentarily, bad eating habits and the consumption of addicts in the Saudi population, are becoming more and more common. Thus it becomes necessary to revise the academic medicine programs and awareness programs that aim the population in order to face these problems, to improve subjects' lifestyle and to prevent possible complications such as cardiovascular diseases.

Keywords: lifestyle, food, exercise, body mass index, health, habits, weight, smoking.

1. BACKGROUND

In recent years, obesity among children and adolescents has emerged as a global epidemic¹. In Saudi Arabia, a country that has experienced marked nutritional changes and rapid urbanization in recent decades, it was estimated that 26.6% and 10.6% of adolescents aged 13–18 years are overweight or obese, respectively². Furthermore, evidence from serial cross-sectional assessments of body mass index (BMI) or percent body fat that were carried out in Saudi children and adolescents have confirmed the rising trend in obesity over the last two decades^{3,4,5}. In Saudi Arabia and other Gulf countries, the remarkable economy growth has affected the population lifestyle in a negative way including dietary habits. Fat consumption has increased, fast food outlets are everywhere and processed food has become a major constituent in every meal⁶. Economic development in Saudi Arabia has been blamed for these changes in nutritional and lifestyle habits⁷. Moreover, the rising trends in body mass index (BMI) in KSA are indicative of increasing rates of obesity that needs immediate preventive measures⁸. In order to construct health-care programs that help to combat the increasing prevalence of obesity in our region, risk factors must be explored. Such risk factors include both non-modifiable factors like age, sex, ethnicity, and family history, as well as factors that are modifiable such as lifestyle habits⁹. Previous research has shown that factors such as low level of physical activity¹⁰, eating behaviors¹¹, food consumption¹², and socioeconomic conditions are all associated with the obesity¹³.

Objectives:

1. To measure the proportion of overweight and obese Saudi adults.
2. To measure the proportion of Saudi adults who practice exercise.
3. To measure the proportion of Saudi adults who have good eating habits.
4. To find out the relationship between exercise, smoking, eating habits and BMI.

2. METHODOLOGY

Research design: cross sectional based study design.

Study area and population: The study was conducted in Kingdom of Saudi Arabia, it includes female and male adults and contains different areas.

Sample size and technique: The study covered a sample of 750 male and female adults from 18 to 45 who were chosen randomly.

Data needs: A questionnaire was constructed to contain personal information, eating habits, sleeping and the frequency of doing exercise. The validity and reliability were checked before doing the study. Weight and height scale used for anthropometric measurements.

Data collection method: The data collection was for one week. A pre-tested, pre-designed close ended questionnaire was distributed randomly to adults after knowing their anthropometric measurements and calculating their BMI.

Data analysis:

After gathering the data, it will be cleared and then analyzed by SPSS. Statistical tests will be performed then the result will be presented in tables and percentages as mentioned in the dummy tables at the annex.

Eating habits score assessment included 8 questions. Higher scores were given to answers that represent better lifestyle way. For each subject, a maximum score of 17 was calculated. A scoring system was applied to assess respondents' eating habits. The score was categorized into 3 levels indicated by bad eating habits (0-5), poorly, acceptable eating habits (6-11) and good eating habits (12-17).

Data statistical analysis were performed using the Statistical Package for Social Science (SPSS) program (version 22), for windows. Frequency and range verifications were carried out initially to detect errors in the data entry. Then detected errors were corrected by reverifying the original data forms. Proportions and percentages were used to summarize category variables. We used Chi-square test to examine the relation between lifestyle characteristics, and BMI. P-values ≤ 0.05 were considered for statistical significance.

Ethical consideration:

Before conducting the study a verbal consent was taken from each participating, confidentiality of the data was promised and maintained.

3. LITERATURE REVIEW

The increase in overweight and obesity levels in the past decades shows an urgent need for a better understanding of its causes across the lifespan. Research on balancing energy intake and expenditure through adequate nutrition and physical activity (PA) habits can be considered as a primary focus in this understanding. Minor changes in food intake and PA can have sizeable effects on body weight and obesity. However, it is less clear which specific diet and PA patterns contribute to the risk of weight gain in specific populations.

A study conducted by Chauhan published in 2014, India, titled Association between eating habits and body mass index (BMI) of adolescents, it aimed to assess the eating habits and BMI among adolescents. To find the correlation between eating habits and (BMI) of adolescents. It was done on a 150 adolescents of 14-15 years. The majority of the adolescent

had healthy eating habits. It was also found that there was no correlation between BMI and eating habit. There are low prevalence of unhealthy eating habits, obesity and overweight. (14)

A Cross-Sectional study conducted by Gunesin 2012, Turkey, titled The relation between eating habits and a high BMI among freshman students, aimed to examine the relation between eating habits and a high (BMI) in first-year freshman university students and included 2525 students 18 to 22 years old from a Turkish population. 17% were overweight or obese. Multivariate analyses identified male gender, recent weight change, and high number of meals as independent predictors of obesity/ overweight. Frequent consumptions of beer, alcoholic drinks other than wine (e.g., spirits including whisky, gin, raki, vodka), coffee, tea, coke, red meat, variety meat, and eggs were associated with a significantly higher risk of obesity/overweight, whereas frequent consumption of snacks was associated with a low risk of obesity/overweight.(15)

A study was conducted in 2010 by Al-Rethaiaa, Obesity and eating habits among college students in Saudi Arabia on 357 male students aged 18-24 years who were randomly chosen from a college in Al-Qassim. The aim was to determine the prevalence of overweight and obesity in a sample of male college students in KSA and to determine the relationship between the students' body weight status and composition and their eating habits. The result showed that 21.8% of the students were overweight and 15.7% were obese. The most common eating habits encountered were eating with family, having two meals per day including breakfast, together with frequent snacks and fried food consumption. Vegetables and fruits, except dates, were not frequently consumed by most students.(16)

A study conducted by Alfawaz in Riyadh in 2012 on the relationship between fast food consumption and BMI among university female students. The study aimed to know the relationship between (BMI) and the pattern of consumption of fast food in 141 female university students, overweight and obesity were present in female students. Fast food consumption frequency of one to two times per week was high among them. There was no significant relationship between BMI and the pattern of consumption of fast food. Data showed that 25% of female students were overweight and obese. There was a significant positive relationship between increase in size of fish sandwich meal and increase of BMI. However, there was no significant relationship between portion size of other food types and BMI. Frequency of consumption fast food was high among students.(17)

Another study to determine the correlation of BMI to dietary intake, fitness level and eating and exercise attitudes of college students was done by James, 2010, USA, with a sample of 772 students between the ages of 18-25 between the years of July 2004-July 2009, in which students 20 years old and younger, the adequacy of their diet was found to be correlated to their attitudes about food and body image. This was not true in the students who were 21 and older suggesting that the diet of the freshman and sophomore students were more impacted by negative eating attitudes. Results from the research also found that in the younger students, the adequacy of their diet was positively correlated to their attitudes about exercise whereas in the students 21 years old and older no correlation was found. So, they concluded that BMI had a significant positive correlation to their attitudes about food and body image. As BMI increased, the subjects' cardiovascular fitness levels decreased.(18)

A study titled Variation in dietary intake and PA pattern as predictors of change in BMI Z-score among Brazilian adolescents 2004-2005, it was done by Enes. The aim of the study was to assess whether changes in dietary intake and PA pattern are associated with the annual BMI z-score change among adolescents. The study was conducted in public schools in Brazil (431 adolescents). Among variables related to PA pattern only playing videogame and using computer increased over the year. The intake of fruits and vegetables and sugar-sweetened beverages increased over one year. An increased consumption of fatty foods and sweetened natural fruit juices was positively associated with the rise in BMI z-score unhealthy dietary habits can predict the BMI z-score gain more than the PA pattern. (19)

Another study titled Perceived and desired weight, weight related eating and exercising behaviors, among thin, overweight, obese or normal weight Australian children and adolescents. It was conducted in 2011 by O'Dea, in Australia. The aim was to compare perceived weight status, desired weight, eating and exercise behaviors and advice received from parents among thin, overweight, obese or normal weight Australian children and adolescents. The sample included 8550 school children aged 6 to 18 years selected from every state and territory of Australia .The result of the study showed distribution of weight status .Thin children were significantly less likely than obese children to respond positively to statements such as "I am trying to get fitter" or "I need to get more exercise." Parents were significantly less likely to

recommend exercise for thin children compared with other weight groups. So as a conclusion, thin children, as well as those who are overweight or obese, are less likely than normal weight children to consider their weight about right. Thin children differ from children of other weights in that thin children are less likely to desire to get fitter or be encouraged to exercise. Both extremes of the spectrum of weight, from underweight to obese, may have serious health consequences for the individuals, as well as for public health policy.(20)

To explore a relationship of PA and dietary habits with BMI in the transition from childhood to adolescence, a study was performed (Haerens, 2010, Belgium), in which the baseline sample consisted of children with mean age was 10 years. During the first measurement year (2002), data on 1670 participants were gathered. For most of the dietary behaviors included in the study, no significant relationships with BMI, and it suggests that eating breakfast consistently may be important for long-term management of body weight and increasing breakfast consumption in children and adolescents might be beneficial to reduce high BMI. On the other hand, there was a relation between higher BMI and skipping breakfast. Regarding PA, frequency, but not duration, of sports participation played a substantial role in weight management. However, it is also possible that children with higher BMI are less likely to participate in sports activities due to their fears of teasing or because they are less athletic.(21)

A study titled Lifestyle factors associated with overweight and obesity among Saudi adolescents 2012, it was done by Al-Hazzaa . The aim of the study was to evaluate the associations between obesity measures and several lifestyle factors, including physical activity, sedentary behaviors and dietary habits among Saudi adolescents. The study was conducted in three cities in Saudi Arabia (Al-Khobar, Jeddah and Riyadh(2906 secondary school). Compared with non-obese, obese males and females were significantly less active, especially in terms of vigorous activity, had less favorable dietary habits (e.g., lower intake of breakfast, fruits and milk), but had lower intake of sugar-sweetened drinks and sweets/chocolates. Logistic regression analysis showed that overweight/ obesity (based on BMI categories) or abdominal obesity (based on WHtR categories) were significantly and inversely associated with vigorous physical activity levels and frequency of breakfast and vegetable intakes, and consumption of sugar-sweetened beverages.(22)

A study conducted by James in Lincoln IN 2010 , Assessing Dietary Intake, Eating and Exercise Attitudes and Fitness Levels in College-Aged Students. The study aimed To determine the correlation of BMI to dietary intake, fitness level and eating and exercise attitudes of college students. that BMI had a significant positive correlation with the Eating Score. As BMI increased the subjects’ cardiovascular fitness levels decreased. CONCLUSIONS AND IMPLICATIONS The majority of college students studied did have a BMI in the normal range yet, most did not consume an adequate diet. Any education programs targeted to this population should include information about nutrition facts labels, portion sizes, exercise recommendations, and body image.(23)

4. RESULTS

Demographics of the studied subjects:

The socio-demographic characteristics are shown in Table 1.

Table 1: Socio-demographic characteristics of study participants

		Frequency	Percent (%)
Age	18-25	378	50,4
	26-35	222	29,6
	36-45	150	20,0
	Total	750	100,0
Gender			
	Female	519	69,2
	Male	231	30,8
	Total	750	100,0

Our study included 750 male (30,8%) and female (69,2%) adults residents in Kingdom of Saudi Arabia (Figure 1). Most participants fall in the 18-25 year range (50,4%), 222 respondents are in the 26-35 year range (29,6%) and 20% answered that they were 36-45 years old (Figure 2).

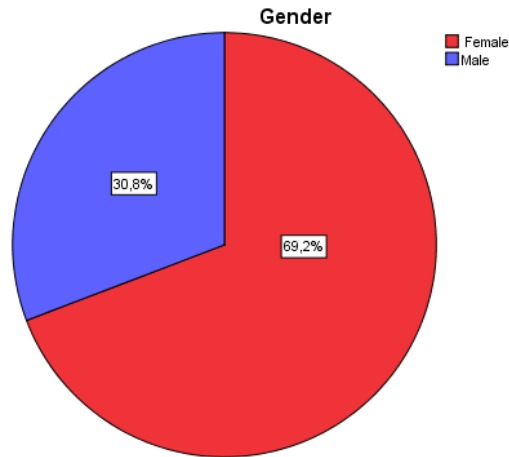


Figure 1: Distribution according to gender

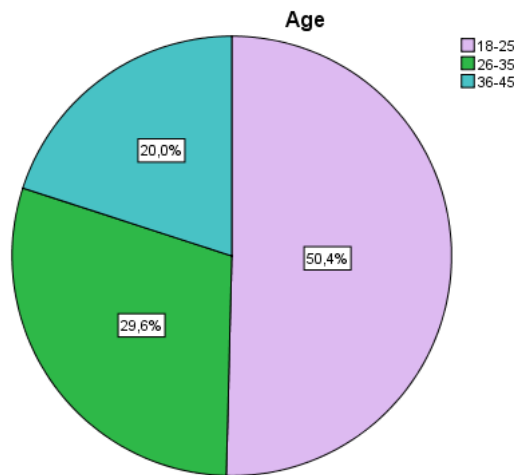


Figure 2: Distribution according to age categories

Lifestyle characteristics of the participants:

Table 2: Lifestyle characteristics of the participants

	Frequency	Percent (%)
BMI classifications		
Underweight	58	7,8
Normal	297	39,7
Overweight	216	28,9
Obese	96	12,8
Severely obese	47	6,3
Morbid obese	34	4,5
Total	748	100,0
Exercise		
No	430	57,3
Yes	320	42,7
Total	750	100
Eating habits		
Bad eating habits	64	8,5
Acceptable eating habits	527	70,3
Good eating habits	159	21,2
Total	750	100,0

By looking at table 2, related to the distribution of respondents according to lifestyle factors, the proportion of participants with a normal BMI was 39,7 % , while overweight respondents presented 28,9% and obese ones 12,8%, then individuals with underweight with a proportion of 7,8%, then the obese (6,3%), then the morbid obese (4,5%) (Figure 3). Out of 750 respondents to the survey, only 42,7% are physically active compared with the majority of subjects who were physically inactive (Figure 4). Of adults surveyed, the majority had acceptable eating habits (70,3%), those who adopted bad eating habits presented 8,5%, while only 21,2% of participants had good eating habits (Figure 5).

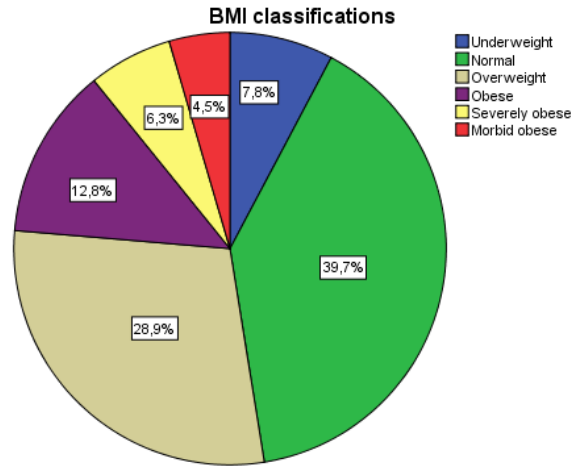


Figure 3 : BMI classifications

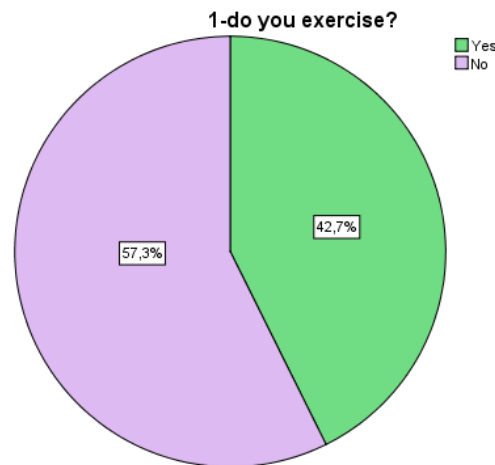


Figure 4 : Physical activity

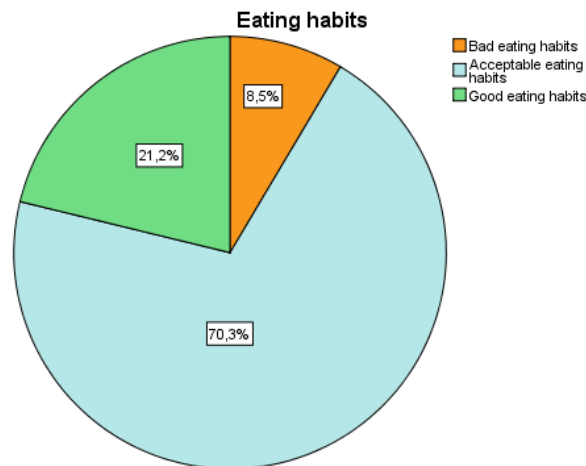


Figure 5 : Proportions of eating habits

Relationship between exercise, smoking, eating habits and BMI:

Compared to inactive respondents, almost the half of active participants (46,6%) had normal weight vs 34,6% among inactive ones, while nearly the quarter (26,9%) of participants who reported practicing physical activity were overweight vs 34,4% among inactive participants. The proportion of individuals with normal weight was significantly more observed among non smokers 41,3% vs 28,3% among smokers, whereas overweight is observed in the majority of smoker respondents 43,5% vs 26,8% among non smokers. Eating habits did play an important role with regard to weight. In fact, proportion of normal weight subjects is more important among persons with acceptable and good eating habits (respectively: 39,6% and 45,3%) vs 26,6% among participants who reported bad eating habits. In our survey, exercise, smoking, eating habits are found related to BMI, they are significantly associated with BMI since $p < 0,05$, (respectively $p = 0,03$, $p = 0,014$ and $p = 0,04$).

***Exercise**

Crosstab					
			I-do you exercise?		Total
			Yes	No	
BMI classifications	Underweight	Count	15	43	58
		% within I-do you exercise?	4,7%	10,0%	7,8%
	Normal	Count	149	148	297
		% within I-do you exercise?	46,6%	34,6%	39,7%
	Overweight	Count	86	130	216
		% within I-do you exercise?	26,9%	30,4%	28,9%
	Obese	Count	39	57	96
		% within I-do you exercise?	12,2%	13,3%	12,8%
	Severely obese	Count	14	33	47
		% within I-do you exercise?	4,4%	7,7%	6,3%
	Morbid obese	Count	17	17	34
		% within I-do you exercise?	5,3%	4,0%	4,5%
Total		Count	320	428	748
		% within I-do you exercise?	100,0%	100,0%	100,0%

Chi-Square Tests			
	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	18,328 ^a	5	,003
Likelihood Ratio	18,780	5	,002
Linear-by-Linear Association	,316	1	,574
N of Valid Cases	748		

a. 0 cells (0,0%) have expected count less than 5. The minimum expected count is 14,55.

***Smoking**

Crosstab					
			I/do you smoke cigarettes?		Total
			yes	no	
BMI classifications	Underweight	Count	4	54	58
		% within I/do you smoke cigarettes?	4,3%	8,2%	7,8%
	Normal	Count	26	271	297
		% within I/do you smoke cigarettes?	28,3%	41,3%	39,7%
	Overweight	Count	40	176	216
		% within I/do you smoke cigarettes?	43,5%	26,8%	28,9%
	Obese	Count	11	85	96
		% within I/do you smoke cigarettes?	12,0%	13,0%	12,8%
	Severely obese	Count	8	39	47
		% within I/do you smoke cigarettes?	8,7%	5,9%	6,3%
	Morbid obese	Count	3	31	34
		% within I/do you smoke cigarettes?	3,3%	4,7%	4,5%
Total		Count	92	656	748
		% within I/do you smoke cigarettes?	100,0%	100,0%	100,0%

Chi-Square Tests			
	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	14,190 ^a	5	,014
Likelihood Ratio	13,836	5	,017
Linear-by-Linear Association	2,400	1	,121
N of Valid Cases	748		

a. 1 cells (8,3%) have expected count less than 5. The minimum expected count is 4,18.

***Eating habits:**

		Eating habits				Total
		Bad eating habits	Acceptable eating habits	Good eating habits		
BMI classifications	Underweight	Count	12	40	6	58
		% within Eating habits	18,8%	7,6%	3,8%	7,8%
	Normal	Count	17	208	72	297
		% within Eating habits	26,6%	39,6%	45,3%	39,7%
	Overweight	Count	15	159	42	216
		% within Eating habits	23,4%	30,3%	26,4%	28,9%
	Obese	Count	9	64	23	96
		% within Eating habits	14,1%	12,2%	14,5%	12,8%
	Severely obese	Count	6	28	13	47
		% within Eating habits	9,4%	5,3%	8,2%	6,3%
	Morbid obese	Count	5	26	3	34
		% within Eating habits	7,8%	5,0%	1,9%	4,5%
Total		Count	64	525	159	748
		% within Eating habits	100,0%	100,0%	100,0%	100,0%

Chi-Square Tests			
	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	25,998 ^a	10	,004
Likelihood Ratio	24,520	10	,006
Linear-by-Linear Association	,102	1	,749
N of Valid Cases	748		

a. 3 cells (16,7%) have expected count less than 5. The minimum expected count is 2,91.

5. DISCUSSION

Table 3: Distribution of BMI by gender

Gender	BMI classifications	Frequency	Percent (%)
Female	Underweight	41	7,9
	Normal	212	41,0
	Overweight	141	27,3
	Obese	70	13,5
	Severely obese	30	5,8
	Morbid obese	23	4,4
	Total	517	100,0
Male	Underweight	17	7,4
	Normal	85	36,8
	Overweight	75	32,5
	Obese	26	11,3
	Severely obese	17	7,4
	Morbid obese	11	4,8
	Total	231	100,0

In the current study, the majority of participants (39,7%) had normal BMI while (28,9%) were overweight and (12,8%) were obese. The distribution of BMI according to gender showed also similar results (Table3). Using a national survey data from 1990 -1993, Alsaif, Mohamed A. et al. (2002) (24) reported higher prevalence of obesity (49,1% in women vs 29,9% in men) and overweight (31,5% in women vs 41,9% in men). A high overweight and obesity proportion was also found by Hussain G.A. et al. (2014) (respectively 36% and 35,6%) in their study published in the Journal of obesity and that concerned 5000 Saudi in Hail Region, KSA (25), they reported that according to Forbes, Saudi Arabia ranks 29 on a 2007 list of the fattest countries (63,5% of subjects had a BMI >25).

The current findings showed high proportion of inactive subjects (57,3%). Higher prevalence of sedentarity (80,5% in Saudi adults) was seen in the work of Hazzaa M. Al-Hazzaa (2004), he explained the increase of inactivity and changes in eating habits, as risk factors of coronary heart disease, by the enormous changes in the lifestyle of Saudis (using of cars, closer shopping centers, TV watching, computer use...) and the absence of physical activity surveillance system in the country (26). In 2006 Prof Hazzaa M. Al-Hazzaa described lifestyle transformation by dramatic because according to him it is thought to have contributed to the elevation in the prevalence of obesity among Saudi youth (27). In comparing our results with findings of Shigeo Tanaka (2012) it was found in Japanese people, that 72,8% of men aged between 20 and 49 years old practice regular exercise in 2010 vs 42,6% of women.

A strong relationship between exercise, smoking, eating habits and BMI was found in our work and in many other studies (23,28, 29), not only among adults but also in all age categories since overweight in young age is related with higher chance of obesity in adulthood. In fact, due to changes in nowadays life, bad eating habits, smoking and sedentarily have increased, impacting closely the BMI rates and causing the increase of overweight and obesity. As an attempt to mime West way of life, Saudi people consume frequently fast food with increased portion size and low nutritional value of aliments, they nibble more and show lot of snacking and breakfast skipping, night eating, associated with low physical activity and addictive behaviors such as smoking and alcohol drinking, knowing that bad habits may lead to obesity especially among young people, who are easily influenced by advertising and friends lifestyle habits, and especially with the enormous economic transition occurring in the Gulf countries for the past three decades (30). However people who develop healthy eating (fruits and vegetables eating, high fiber meals and home prepared food eating) and lifestyle habits (regular exercise...) early in life are likely to conserve them later in the adulthood and thus develop less diseases.

6. CONCLUSION

Our findings suggest that body mass index is closely related to healthy life habits (exercise, non smoking and eating healthy food), however an important proportion of young adults in our study reported adopting bad habits; therefore, personal and society efforts should be conducted to provide and get behind healthy eat and way of life to promote mental and physical health.

7. RECOMMENDATIONS

- According to this study the following is recommended:
- Regular exercise and walking at least 20 minutes 3 times per week can help to achieve ideal BMI.
- Practicing exercise is the best way to achieve and maintain ideal BMI.
- Avoid fast eating.

REFERENCES

- [1] Lobstein T, Baur L, Uauy R. IASO International Obesity Task Force; IASO International Obesity Task Force. Obesity in children and young people: a crisis in public health. *Obes Rev.* 2004;1(Suppl):4-104.
- [2] El Mouzan MI, Foster PJ, Al Herbish AS, Al Salloum AA, Al Omer AA, Qurachi MM, Kecojevic T. Prevalence of overweight and obesity in Saudi children and adolescents. *Ann Saudi Med.* 2010;30:203-208.
- [3] Abalkhail B. Overweight and obesity among Saudi Arabian children and adolescents between 1994 and 2000. *East Mediterr Health J.* 2002;8:1-8.
- [4] Al-Hazzaa HM. Rising trends in BMI of Saudi adolescents: evidence from three national cross sectional studies. *Asia Pac J Clin Nutr.* 2007;16:462-466.

- [5] Al-Hazzaa HM. Prevalence and trends in obesity among school boys in Central Saudi Arabia between 1988 and 2005. *Saudi Medical J.* 2007;28:1569–1574
- [6] Al Shammari SA. Help seeking behavior of adults with health problems in Saudi Arabia. *Fm Pract Res J.*1992; 12: 75-82.
- [7] Al Qauhiz NM. Obesity among Saudi Female University Students: Dietary Habits and Health Behaviors. *J Egypt Public Health Assoc* 2010; 85: 45- 59.
- [8] Al-Hazzaa HM. Rising trends in BMI of Saudi adolescents: evidence from three national cross sectional studies. *Asia Pac J Clin Nutr.* 2007;16(3):462-6. Epub 2007/08/21. PubMed PMID: 17704028.
- [9] Ainy E, Azizi F. Women, occupation and cardiovascular risk factors: findings from the Tehran Lipid and Glucose Study. *Public Health.* 2007;121(12):950-3. Epub 2007/07/25. doi: 10.1016/j.puhe.2006.12.016. PubMed PMID: 17645903.
- [10] Erlichman J, Kerbey AL, James WP. Physical activity and its impact on health outcomes. Paper 2: Prevention of unhealthy weight gain and obesity by physical activity: an analysis of the evidence. *Obes Rev.* 2002;3(4):273-87. Epub 2002/12/03. PubMed PMID: 12458973.
- [11] Abalkhail B. Overweight and obesity among Saudi Arabian children and adolescents between 1994 and 2000. *East Mediterr Health J.* 2002;8(4-5):470-9. Epub 2004/12/18. PubMed PMID: 15603027.
- [12] Al Qauhiz NM. Obesity among Saudi Female University Students: Dietary Habits and Health Behaviors. *J Egypt Public Health Assoc.* 2010;85(1-2):45-59. Epub 2010/11/16. PubMed PMID: 21073847.
- [13] Dupuy M, Godeau E, Vignes C, Ahluwalia N. Socio-demographic and lifestyle factors associated with overweight in a representative sample of 11-15 year olds in France: results from the WHO-Collaborative Health Behaviour in School-aged Children (HBSC) cross-sectional study. *BMC Public Health.* 2011;11:442. Epub 2011/06/09. doi: 10.1186/1471-2458-11-442. PubMed PMID: 21649892; PubMed Central PMCID: PMC23212.
- [14] Chauhan U. Association between eating habits and body mass index (BMI) of adolescents. *Int J Med Sci Public Health* 2014; 3(8): 940-43.
- [15] Gunes F, Bekiroglu N. et al. Relation between eating habits and a high body mass index among freshman students: A Cross-Sectional Study. *Journal of the American College of Nutrition* 2012; 31(3).
- [16] Al-Rethaiaa A, Fahmy A, and Al-Shwaiyat N. Obesity and eating habits among college students in Saudi Arabia. *Nutrition Journal* 2010; 9(39).
- [17] Alfawaz H. Relationship between fast food consumption and BMI among university female students. *Pakistan Journal of Nutrition* 2012;11 (5): 406-10.
- [18] James K J. Assessing Dietary Intake, Eating and Exercise Attitudes and Fitness Levels in College-Aged Students. *Nutrition & Health Sciences Dissertations & Theses* 2010; 7.
- [19] Enes C, Slater B. Variation in dietary intake and physical activity pattern as predictors of change in body mass index (BMI) Z-score among Brazilian adolescents. *Revista Brasileira de Epidemiologia* 2013;16 (2) .
- [20] O'Dea J, Amy N. Perceived and desired weight, weight related eating and exercising behaviours, and advice received from parents among thin, overweight, obese or normal weight Australian children and adolescents. *International Journal of Behavioral Nutrition and Physical Activity* 2011;8.
- [21] Haerens L, Vereecken C, Maes L, Bourdeaudhuij I. Relationship of physical activity and dietary habits with body mass index in the transition from childhood to adolescence: a 4-year longitudinal study. *Public Health Nutrition* 2010; 13(10A), 1722–8.
- [22] Al-Hazzaa H M, Abahussain N A , Al-Sobayel H I, Qahwaji D M and Musaiger A O .Lifestyle factors associated with overweight and obesity among Saudi adolescents, Saudi Arabia (Al-Khobar, Jeddah and Riyadh): *BMC Public Health.* (2012);12
- [23] Katie J. James. Assessing Dietary Intake, Eating and Exercise Attitudes and Fitness Levels in College-Aged Students, Lincoln: *Nutrition & Health Sciences Dissertations & Theses.* (2010); 7

- [24] Alsaif MA, Hakim IA, Harris RB, Alduwaihy M, Al-Rubeaan K, Al-Nuaim AR, et al. Prevalence and risk factors of obesity and overweight in adult Saudi population. *Nutrition Research*. 2002 11//;22(11):1243-52.
- [25] Ahmed HG, Ginawi IA, Elasbali AM, Ashankyty IM, Al-hazimi AM. Prevalence of Obesity in Hail Region, KSA: In a Comprehensive Survey. *Journal of Obesity*. 2014 05/22/accepted;2014:961861. PubMed PMID: PMC4099258.
- [26] Al-Hazzaa HM. THE PUBLIC HEALTH BURDEN OF PHYSICAL INACTIVITY IN SAUDI ARABIA. *Journal of Family & Community Medicine*. 2004 May-Aug;11(2):45-51. PubMed PMID: PMC3410089.
- [27] Al-Hazzaa HM. OBESITY AND PHYSICAL INACTIVITY AMONG SAUDI CHILDREN AND YOUTH: CHALLENGES TO FUTURE PUBLIC HEALTH. *Journal of Family & Community Medicine*. 2006 May-Aug;13(2):53-4. PubMed PMID: PMC3410063
- [28] Abdel-Megeid FY, Abdelkarem HM, El-Fetouh AM. Unhealthy nutritional habits in university students are a risk factor for cardiovascular diseases. *Saudi medical journal*. 2011;32(6):621-7.
- [29] Al-Rethaiaa AS, Fahmy A-EA, Al-Shwaiyat NM. Obesity and eating habits among college students in Saudi Arabia: a cross sectional study. *Nutrition journal*. 2010;9(1):39.
- [30] Al-Shammari SA. Help-seeking behavior of adults with health problems in Saudi Arabia. *Family practice research journal*. 1992.