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Physical Inactivity and Sedentary Lifestyle among Adults in Jeddah City

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ABSTRACT
Objective: The aim of the present study was to explore the variations in weight, obesity and physical inactivity (PA), sedentary lifestyle in relation to age and gender of adults living in Jeddah city, Kingdom of Saudi Arabia (KSA). **Method:** A cross sectional design was applied on two hundred participants. 100 males and 100 females were arbitrarily chosen by a multistage stratified cluster sampling. Evaluation involved weight, height, body mass index (BMI), screen time watching television (TV), computer use, and PA. The validated self-report questionnaire relative to PA patterns, sedentary lifestyle allows calculating the total energy expenditure in metabolic equivalent (MET-min) weekly. **Results:** : Levels of PA and DH were evident among the adults, with females being generally spent more time in moderate and vigorous physical activity/ week and were more energetic than males. The adults with higher BMI showed lower PA level and higher sedentary times. All adults- male and female could not reach the recommended daily PA levels (≥ 2520 MET- min/week, moderate to vigorous intensity and spending more than 2h/d guidelines recommended screen time. The large majority of the adults (males & females) reported skipping breakfast. **Conclusion:** These findings highlight the obesity diverse nature, overweight and PA forms of adults in different Saudi populations in Jeddah.
Keywords: Physical activity, inactivity, sedentary lifestyle, male and female adult

INTRODUCTION

Kingdom of Saudi Arabia has turn into progressively westernized through the previous few years and nowadays reached one of the uppermost occurrence proportions of overweight as well as obesity due to lack of PA, increases in sedentary lifestyle. Putting the people at higher risks for increasing incidence rate of non-communicable disease (NCD) death. [1] Conferring to the World Health Organization (WHO), [2] the greatest significant threat factors of NCD in the Gulf area include hypertension, higher cholesterol levels, insufficient fruit and vegetables consumption, overweight, obesity and inactivity.

Completing cultures is partially to blame as the combination of persisting traditional Saudi cultural changes, and economical wealth has produced an obesogenic environment which encourage junk food consumption, sedentary life style and weight gains. Both overweight and obesity are predominant in Saudi females than males. [1] Physical inactivity increases dietary intake of light-fat energy dense food and substantial factors to weight gains, triggering overweight and obesity; which are two uniquely defined disorders conferring to the center of the disease control (CDC) and prevention. [3]

The occurrence of overweight and obesity in Arab nations is greater than before significant rise in the previous sixty years. [4] An experiment directed in Riyadh, KSA displayed that 82% of contributors were overweight and obese. [5] Rapid development in standards of living and raised modernization over the previous twenty five years in the KSA caused notable variations in PA and eating styles. [6] The majority of KSA population now lives in major cities where sedentary lifestyle, ingestion of too much unhealthy foodstuffs and shortage of PA are common. [6] Besides physical inactivity is widespread in Saudi inhabitants. Approximately 70% of the whole Saudi populace are not executing sufficient quantity of PA and physical inactivity is greater in Saudian females than males. [7]

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Domestic questionnaire data in KSA displayed that self-reported physical inactivity in females rise from 84.7% to 98.1% in 1996 and 2011 respectively, while in males it rise from 43.3% to 93%. [8] Unfortunately, adults hardly practice sport and classically fill their free time in sedentary actions. [9]

Saudi females occupy great quantity of their time at home. [9, 10] Additionally performing PA is very restricted for females in relations of available sport places, suitable physical apparel prototypes. [9] While in males, lack of facilities and time restrictions are significant and frequently quoted obstacles. [7]
There are several experiments evaluated the relationship of Arab adolescents' nutritional behaviors with PA &/or inactive lifestyle in large and symbolic sample sizes via reliable and valid tools. [11] In addition, few studies were also conducted among Saudi adolescents and children reported a significant positive relationship between physical inactivity, sedentary lifestyle and eating habits relative to obesity. [14] However, it is not recognized if physical inactivity levels and inactive lifestyle of adults are independently linked with definite nutritional behaviors or whatever effects gender have as well. Previous study assessed PA levels amid Saudi adult males and females, besides examining the PA relation with BMI, waist circumference (WC) and incidence of obesity. Study showed inactivity incidence (96.1%) was actually great between adult males and females. Considerably more sedentary females (98.1%) were noted than males (93.9%). Sedentariness was higher in the central and the lowermost provinces in KSA. Further, energetic persons showed lesser BMI. [15]

Recently a systematic review has been also reported [16] about the association between sedentary lifestyle and physical inactivity among adults aged 18-60 years. All studied showed that types of (Sedentary Lifestyle) were associated with lower levels of (PA) in adults. Findings of this review suggested inverse associations between (Sedentary Lifestyle) and (PA) were weak to moderate. [13]
Furthermore, TV viewing associated with obesity due to reduction of energy expenditure or increase caloric intake and it may result in difficulty to be physically active. [17]

Most Saudi adults did not achieve the required physical activity to promote health and protection from diseases [15] therefore, sedentary lifestyle patterns become prevalent, especially among adults of Saudi society. However, there are no recent studies discussed the impact of the change in lifestyle, such as (PA), (Sedentary Lifestyle) and (DH) among obesity and overweight Saudi adults living in capital city like Riyadh, KSA.
The aim of this study was to test the incidence of PA and sedentary lifestyle amongst obese and overweight Saudi adults, using representative samples drawn from city of Jeddah, KSA. In addition to examine the interrelation between the lifestyle factors, plus investigating if there are gender variances as well.

MATERIAL ANDMETHODS

Subjects

Two hundred subjects (100 male and 100 female) were selected randomly from Saudi population living in Jeddah, KSA. Informed consent was obtained from all participants free from any physical health problems. The study had an ethical approval by the Ethics Committee of Faculty of Medical Rehabilitation Sciences, King Abdulaziz University, Jeddah, Saudi Arabia.

Anthropometric measurements were carried out at rest by an expert investigator consistent with printed identical measures. The weight and height were recorded to the closest 100 g and 100 cm respectively by a standardized moveable gauge and measures were done with the participant in minimal clothing without shoes. The BMI considered as dividing the weight in kilograms by the squared height in meters. Adult BMI cutoff reference values for all contributors identified by using WHO considering 25 to 29.9 kg/m2 as overweight and ≥30 as obese. [18]

Physical activity assessment:

A valid self-report questionnaire was applied for assessing PA levels, inactive lifestyle and nutritional behaviors of all selected sample. This tool was formerly tested for reliability and validity and was proved as highly reliable and valid. [22]

Assessment of PA was done via a self-described questionnaire. The tool was formerly been proved as reliable and valid. [19, 20] The PA survey covered a wide range of activities across different PA fields (transportation, household, fitness and sport activity). PA was categorized as light, moderate and vigorous intensity according to MET levels consistent with the collection of PA. [21] Whole quantity of exercises per week was conveyed in MET-min/week by 4 and 8 MET for moderate and vigorous intensities, correspondingly. [22]

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To classify the participants who met every day PA references were considered via two MET- min cut-off points [23] (i) moderate PA of 1h/d, matching to 1680 MET- min/week (60min/d X 7d/week X 4MET); and (ii) moderate to vigorous physical activity of 1 h/d, that corresponds to a total of 2520 MET- min/week (60min/d X 7d/week X 6 MET). MET values were oscillated on a scale from (light <3 METs; moderate, 3-6 METs; vigorous > 6 METs).

Sedentary lifestyle questionnaire

Questionnaire on sedentary lifestyle was used for defining significant evidence of adult participants linked to usual everyday period expended on inactivity, comprising watching television (TV), video gaming and the use of computer. Applicants were requested to deliver usual sum of daily hours expended in every activity with no differentiation between week days and weekends. Regarding total screen time cutoff points, the American Academy of Pediatrics guides with an extreme of 2 hours daily was used. [24]

Dietary habits questionnaire

The dietary questionnaire was intended to define the incidence of definite nutritional behaviors. Participants reported the number of times/week they consumed breakfast, vegetables (prepared and raw), fruit, milk and dairy product, sugar-sweetened drink (counting any soft drink), junk food, donut/cake, sweet, chocolate and any energy drink. Participants had to select answers starting from zero consumption to extreme consumption of 7 days/week.

Statistical analysis

Data were statistically analyzed using the statistical software package SPSS, version 21. Descriptive statistics was used as means and standard deviations. Individual distribution were analyzed using explore procedure and normalcy estimated with Shapiro-Wilk. Kruskal-Wallis test was used to determine alterations in the proportions of males and females for PA, sedentary lifestyle and dietary habits. Finally, Pearson correlation coefficients were calculated for assessing the relations between BMI and certain lifestyle aspects, with significance as $p \leq 0.05$.

RESULTS

The main findings and descriptive data, stratified by gender and study areas are summarized in tables 1-3. Demographic data presented in table 1 shows that out of the 200 applicants, there were equal gender ratio (males 100, females 100). Females were slightly older than males in mean age. Overall, males were significantly heavier and taller, than female (both *p values* <0.000) and there were substantial variance in total BMI among males and females (*p value* < 0.05).

Table 1. Demographic features of the adult males (100) and females (100) Living in Riyadh city (*n* = 200)

Characteristic	Males			Females		
	Overweight	Obese	All Males	Overweight	Obese	All Females
Age (years)	23.4±1	23.2±8	23.3 ± 09.6	23±8	22±2	22.5±10.1
Weight (kg) **	83±8	113.6±2	104.2 ± 25.3	73±4	93±1	83.8±16.4
Height (cm) **	171±5	176.3±6	173.1 ± 13.6	161±3	162±5	162.2±6.0
All BMI (wt/ht^2) **	30±1	42±2	37.9 ± 8.3	29±1	38±3	33.7±6.7
Systolic blood pressure mm Hg	113±2	119.4±5	118.6 ± 17.2	116±10	125±2	121.2±19.0
Diastolic blood pressure mm Hg	76±1	68.5±9	71.7 ± 17.2	69±8	73±1	71±11.1

** Significantly different at < 0.01 level between groups using Kruskal-Wallis test.

The mean ± SD values for sedentary lifestyle, PA procedures and nutritional behaviors related to gender as presented in Table 2. No significant difference was observed for all variables.

Compared with females, Saudi males were more inactive, particularly in rapports of moderate and vigorous PA/week. A large difference among males and females particularly in rapports of total and vigorous PA was noted. Obese females appeared lesser active than overweight, mainly in rapports of total moderate and vigorous PA. Less common consumption of breakfast, matched with overweight males was noted.

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A very high percentage of participants (male and female) watches TV and uses computers lasting above 2 hours daily. Therefore, they do not come across the suggested screen-time guides of 2 hrs or lesser daily. Overweight male spends more total screen time/day than female (overweight) however, overweight female and both obese male and female were found to spend about equal time /day watching TV and using a computer.

Majority of adults were not having their daily consumption of breakfast. It is worth noting that all males and females consumes breakfast > 3 days weekly.

Regarding daily PA guidelines adult male and female do not met the recommended one hour of moderate to vigorous PA. Concerning moderate to vigorous PA cutoff points, all participants were only able to meet the minimal PA (<1600 MET-min/week).

Compared with females, males on average were considerably more inactive (11 versus 8 hours/ day, for the combined TV and computer time, less energetic (130 vs. 155 METs-min/week), particularly for moderate PA (512 versus 852 METs-min/week) and on lesser times weekly consuming breakfast. Total inactive time for the male was round 147% that of the female, whereas the total energy expenditure in METs-min/week for male was round 293% that of female. Expressed in minutes/week, the total PA time for male and female was 147 and 293 mins, correspondingly.

The total times spent/week and totalMET-min score per week was significantly higher in overweight and obese females than in counterpart males. However, both female and male do not meet the suggested moderate: vigorous PA level of 1 hr./d.

Compared with female (overweight), male (overweight) spent more time watching TV (6.73±1.44 hours/day) while female (overweight) spending more time on a computer (5.04±1.2 hours/day). The mean TV viewing and computer use was higher in males (overweight) but not significantly different between the obese genders. Both male and female consuming greater than the suggested screen time guiding principle (2 hr./d). Comparatively a lot of overweight males than females ingest breakfast weekly still; no significant variances in the occurrence of breakfast ingesting in obese was noted.

Table 2. Sedentary lifestyle, PA measures and nutritional behaviors for Saudi adults

Variables	Overweight		Obese	
	Male	Female	Male	Female
TV Watching (hours/day)	6.73±1.44	3.14±1.2	3.78±1.0	3.69±1.2
Computer use (hours/day)	4.38±0.8	5.04±1.2	5.06±1.1	5.30±1
Breakfast consumption (frequency/week)	5.08±1.5	4.44±1.3	4.22±1.2	4.73±1.4
Sleep duration (hours/night)	5.5±0.3	5.4±0.3	5±0.2	5.5±0.6
Time min spend in Moderate PA/ week	130.08±20	275.3±51	130.61±14	215.7±24
Time min spend in Vigorous PA/week	15.67±53.3	6.96±20.22	12.18±30.93	18.85±61.34
Total min Time spend in Moderate and Vigorous PA/ week	147.5±27	293.5±51	146.9±17	230.2±28
All METs-min/week of Moderate PA (4MET)	510.31±99	107±20	512.4±55	852.8±96
All METs-min/week of Vigorous PA (8MET)	130.3±47	60.7±19	102.4±28	155.8±52
Total METs-min/week of Vigorous and Moderate PA	667.9±13	119.4±20	671.3±80	100.2±13
Kcal. Wk^{-1} Moderate PA	750±123	1206±231	938±99	1244±143
Kcal. Wk^{-1} Vigorous PA	210±74	170±21	206±56	223±76
Total Kcal. Wk^{-1} Moderate and Vigorous physical activity	1020±208	1441±242	1259±158	1500±191

Kruskal-Wallis Test shows no significant differences between all variables, Kcal.Wk^{-1} (kilocalorie per week), physical activity (PA)

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Table 3. Reasons for being active and barriers to PA of random cluster-sampling of Saudi adult

Variable	Overweight		Obese	
	Male	Female	Male	Female
Reason for being active (%)				
Well-being	57.4	44.6	46.7	47.9
Weight loss	44.3	44.6	31.7	42.7
Recreation	7.3	5.4	11.8	3.6
Meet friends	0	5.4	3.3	3.3
Others	0	0	6.5	2.5
Total	100	100	100	100
Barriers (%)				
Lack of time	64.5	80	73	65.2
Activity is not important	0	1	2.0	2.3
Lack of proper place	26.5	5	14.4	14.7
Health problems	0	5	2.3	3.5
Awkwardness	0	1	0	2.4
Others	9.0	8	8.3	11.9
Total	100	100	100	100

In Table 3 participants stated that both well-being and weight loss are the greatest relevant reason for being active however, lack of time and lack of suitable place were the main reason impeded participants from doing exercise regularly. Only a smallnumber of female obese indicated that embarrassment is the only barrier.

DISCUSSION

In spite of the formidable daily life variations practiced by Saudi people through latest years, limited studies have instantaneously been directed to PA, inactive lifestyle anddietary habits of Saudi adolescents. [12,14]

The current cross-sectional experiment revealed occurrence of daily life issues including PA level, inactive lifestyle and nutritional behaviors between obese and overweight adults agedyears existing in Jeddah city, KSA. We are not aware of any other adult study carried out in KSA that has characterized lifestyle behaviors comprising nutritional behaviors of those people by a valid survey which is inclusive for gathering data concerning PA forms as frequency, duration and intensity by setting down it to MET-min measure. Findings of this experiment deliver indication on the raised incidence of inactive way of life and lower level of PA, particularly between males.

It is valuable observing the mutual occurrence of overweight and obesity in several native and provincial experiments is greater in males than in females. [25] Nevertheless, gender variances in degrees of obesity between adults are usually slight and unpredictable. [26] It is worth perceiving that experiments on economic state and obesity propose that the ratio of obesity is advanced amongst people with lower salary in advanced nations, besides in higher economic state people in rising nations. [26]

Moreover, inadequate vigorous PA was revealed as a threat for greater BMI in the United States. [27] A previous experiment in Saudi Arabia similarly displayed that insufficient PA was connected with being obese as adolescent. Likewise, a diminished exercises are as important threatening cause for being obese between teenagers from southwestern Saudi Arabia.[28] Findings about contrary relation of vigorous- intensity PA in obese adults is similarly widely reinforced in the literatures.

Moreover, it is assumed that inactive daily life is connected to contrary health consequences and appear dissimilar from that recognized as absent PA. [29] Total screen periods accompany being overweight or obese. Identical numerous previous experiments have stated substantial relations among screen viewing times with being obese child and adolescent. Conversely, cultural as well as social issues might, also partially, affect the relations amid screen inspecting times and being obese. [30]

Experiments suggest a correlation between screen watching periods and PA that might affect the association amid being obese and inactive daily life. They assessed the mutual influence of PA andwatching TV on the threats of being overweight and stated that female with too much times watching TV and lower PA had uppermost possibility of becoming overweight. [31]

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No important variances amid watching TV time and computer usage with regard to being overweight or obese; so, they joined these behaviors as one sole factor.

Between the whole nutritional behaviors evaluated, being overweight and obese was related to fewer ingesting of breakfast. These results approve several experimental results. Certainly, missing breakfast is a solid forecaster of becoming overweight and obese adult in numerous nations. [32]

In a trial, they considered 1680 METs-min/week as cutoff point to relate to one hour of everyday moderate PA, while 2520 METs- min/week as cutoff point related to one hour of everyday moderate to vigorous PA which was considered performing recommended PA. [23] Grounded on the WHO cutoff points, a significantly great occurrence of PA, among adults particularly males living in Riyadh city and they do not met the current recommendations [23] Previous studies using objective PA measurement specified 60% of males and 71% of females are not engaging in well-being via PA of adequate duration and frequency. [7,33] Main reasons leading to sedentariness in Saudi Arabia comprise dependence on cars relatively than ambulation for minimal distances.

Males are not only considerably further inactive than females, however they are greatly less dynamic as well. Insufficient PA was revealed as a threateningcause for greater BMI for grownup male than female.

Current lifestyle greatly lowered the over-all energy outgoings. Additionally, urban life with associated surrounding factors might similarly be recognized as significant threatening cause for inactivity in evolving nations experiencing financial evolution. [34] Earlier to this current financial development, that is taking place since thirty years, society in main capitals in Saudi Arabia were intended to backup pedestrian mobility as a usual everyday event. Dissimilarity, main Saudi Arabian towns are nowadays renovated, with great highway linkages and discrete zones for housing and markets. This scheme necessitates using cars for every tour and, consequently, entirely discouraging ambulation.

Dominance of inactivity amongst grown-ups is unusually great. The American Academy of Pediatrics (AAP) had stated the extent of periods spent watching TV and had allotted outlines that screen times must not go beyond 2 hours daily. [24] All studied male and female adults really did not come across the AAP recommended guidelines regarding everyday screen duration. Association of these findings assures the necessity for lessening hours that adult expend for watching TV and using computers. Furthermore, nowadays we recognize that inactive daily life accompany hazardous consequences which are dissimilar from these related to reduced PA. [29]

The current study revealed that males were not only less dynamic, particularly in forceful actions, than females, but males as well stated that they spend extra times inactive, like viewing TV and working with computers. The present study revealed that majority of male and female spend >2 hr/d in front of screens.

Food consumption which is reflected as healthy comprise everyday consumption of breakfast. Missing breakfast is well-known as unhealthy dietetic behavior and we similarly detected a significant adverse relationship of how many days of breakfast ingestion with BMI. [35] A comparable relationship was similarly stated for Saudi adolescent males and females. The current study discovered that all male and female adults do not consume breakfast everyday. A comparable ratio of Saudi teen-agers were too seen missing an everyday breakfast diet. [36]

Additionally, together body exercises and diet ingestion outlines of the adult seems to be different conferring to sexual category. [37] Considering gender difference in daily life interrelated hazard issues of being overweight and obese as adults living in Jeddah city is critical for planning community health approaches and operative plans for preventing and treating fatness. Even though these chief concerns, no systematic reviews amongst Saudi adults for characterizing their physical activity, inactive daily life and nutritional behaviors concurrently. The current study assessed PA, inactive lifestyle and nutritional behaviors of adults living in Riyadh city, KSA and reported gender dissimilarities.

Barriers to PA in a cohort of obesity and overweight in adults- male and female in Saudi Arabia are currently limited. Deprived engagement as the greatest significant obstacle for adequate PA. Likewise, it was a commonly referred obstacle in diverse cohort studies of older adults in researches directed worldwide. [38-40]

Results of the current experiment must be understood regarding its strong point as well as limits. The current experiment collectively examined several lifestyle factors in a representative sample of Saudi adults living in Jeddah, via a valid and inclusive PA survey, engaging METs to compute energy consumption in PA. Evidence slowing as of the current study must augment the present information around daily life issues in a culture

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undergoing a food changeover. Of the limits of the present study we can consider that the data was grounded on self-reporting, while we completed all efforts for minimizing any potential over- or under-recording via all contributors. Since it is a cross-sectional experiment, the temporality of the relations among inactive lifestyle, PA andnutritional behaviors cannot be definite; though, numerous perceived relations adapt to biologic probability.

Despite these limitations, the outcomes of this experiment are supported via a realistic sample size as well as using a sound, valid tool to bring about evidence.

This trial affords evidences for both the community health and education experts in KSA about the advantageous PA properties, Sedentary Lifestyle and healthy nutritional behaviors inavoiding being overweight or obese, that are now certainly recognized. Appropriate interferences must start to house PA in healthcare as well as educational curriculums in KSA. Regular physical exercises must be involved in the everyday activities.

Prospect researches need to state all demographic, socioeconomic and environmental elements of the daily life for commencing interventions and programs for promoting healthy nutrition and dynamic active practices and reducing inactive lifestyle amid adult males and females in KSA.

CONCLUSIONS

Briefly, results of the current study on Saudi adults also revealed a number of important findings: (i) All adults-males and females did not meet the present international recommendations for PA; (ii) almost all males and females expend >2 hrs daily inactive; (iii) These adults do not eat breakfast daily. Furthermore, the reduced movement level and great screen times of Saudi males are excessively alarming. Disparity in PA and weight status might be because to Saudi traditional and ecological variances as the deficient opportunity for exercising, because of social customs and restraints in addition tolifestyle behaviors.

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REFERENCES

1. Mabry, R., Koohsari, M. J., Bull, F., & Owen, N. (2016). A systematic review of physical activity and sedentary behaviour research in the oil-producing countries of the Arabian Peninsula. BMC public health, 16(1), 1-22.
2. World Health Organization. (2002). The world health report 2002: reducing risks, promoting healthy life. World Health Organization.
3. Fletcher, G. F., Ades, P. A., Kligfield, P., Arena, R., Balady, G. J., Bittner, V. A., ... & Williams, M. A. (2013). on behalf of the American Heart Association Exercise, Cardiac Rehabilitation, and Prevention Committee of the Council on Clinical Cardiology, Council on Nutrition, Physical Activity and Metabolism, Council on Cardiovascular and Stroke Nursing, and Council on Epidemiology and Prevention. Exercise standards for testing and training: a scientific statemalet from the American Heart Association. Circulation, 128(8), 873-934.
4. Musaiger, A. O., Al-Mannai, M., Tayyem, R., Al-Lalla, O., Ali, E. Y., Kalam, F., ... & Chirane, M. (2012). Prevalence of overweight and obesity among adolescents in seven Arab countries: a cross-cultural study. Journal of obesity, 2012.
5. Al-Haqwi, A., Al-Nasir, M., Ahmad, N., Masaudi, E., Alotaibi, S., & Hamad, B. (2015). Obesity and overweight in a major family practice center, central region, Saudi Arabia. Saudi Journal of Obesity, 3(1), 12-12.
6. Al-Nuaim, A. R. (1997). Population-based epidemiological study of the prevalence of overweight and obesity in Saudi Arabia, regional variation. Annals of Saudi medicine, 17(2), 195-199.
   Azzeh, F. S., Bukhari, H. M., Header, E. A., Ghabashi, M. A., Al-Mashi, S. S., & Noorwali, N. M. (2017). Trends in overweight or obesity and other anthropometric indices in adults aged 18–60 years in western Saudi Arabia. *Annals of Saudi medicine*, *37*(2), 106-113.
7. Al-Hazzaa H. M. (2004). Prevalence of physical inactivity in Saudi Arabia: a brief review. Eastern Mediterranean health journal = La revue de sante de la Mediterranee orientale = al-Majallah al-sihhiyah li-sharq al-mutawassit, 10(4-5), 663–670.
8. AlQuaiz, A. M., Kazi, A., Tayel, S., Shaikh, S. A., Al-Sharif, A., Othman, S., ... & Sulaimani, R. (2014).

ISSN:0975-3583,0976-2833 VOL12,ISSUE05,2021

Prevalence and factors associated with low bone mineral density in Saudi female: a community based survey. BMC musculoskeletal disorders, 15(1), 1-10.

9. Ng, S. W., Zaghloul, S., Ali, H. I., Harrison, G., & Popkin, B. M. (2011). The prevalence and trends of overweight, obesity and nutrition-related non-communicable diseases in the Arabian Gulf States. Obesity Reviews, 12(1), 1-13.
10. Al Othaimeen, A. I., Al Nozha, M., & Osman, A. K. (2007). Obesity: an emerging problem in Saudi Arabia. Analysis of data from the National Nutrition Survey. EMHJ-Eastern Mediterranean Health Journal, 13 (2), 441-448, 2007.
11. Musaiger, A. O., Bader, Z., Al-Roomi, K., & D'Souza, R. (2011). Dietary and lifestyle habits amongst adolescents in Bahrain. Food & nutrition research, 55.
12. Allafi, A., Al-Haifi, A. R., Al-Fayez, M. A., Al-Athari, B. I., Al-Ajmi, F. A., Al-Hazzaa, H. M., ... & Ahmed, F. (2014). Physical activity, sedentary lifestyle and dietary habits among Kuwaiti adolescents: gender differences. Public health nutrition, 17(9), 2045-2052.
13. Al-Nakeeb, Y., Lyons, M., Collins, P., Al-Nuaim, A., Al-Hazzaa, H., Duncan, M. J., & Nevill, A. (2012). Obesity, physical activity and sedentary behavior amongst British and Saudi youth: a cross-cultural study. International journal of environmental research and public health, 9(4), 1490-1506.
14. Al-Hazzaa, H. M., Abahussain, N. A., Al-Sobayel, H. I., Qahwaji, D. M., & Musaiger, A. O. (2012). Lifestyle factors associated with overweight and obesity among Saudi adolescents. BMC public health, 12(1), 1-11.
15. Al-Nozha, M. M., Al-Hazzaa, H. M., Arafah, M. R., Al-Khadra, A., Al-Mazrou, Y. Y., Al-Maatouq, M. A., ... & Al-Shahid, M. S. (2007). Prevalence of physical activity and inactivity among Saudis aged 30-70 years. Saudi Med J, 28(4), 559-568.
16. Mansoubi, M., Pearson, N., Biddle, S. J., & Clemes, S. (2014). The relationship between sedentary behavior and physical activity in adults: a systematic review. Preventive medicine, 69, 28-35.
17. Foster, J. A., Gore, S. A., & West, D. S. (2006). Altering TV viewing habits: an unexplored strategy for adult obesity intervention?. American journal of health behavior, 30(1), 3-14.
18. World Health Organization. (2000). Obesity: preventing and managing the global epidemic.
19. Al-Hazzaa, H. M., Al-Sobayel, H. I., & Musaiger, A. O. (2011). Convergent validity of the Arab Teens Lifestyle Study (ATLS) physical activity questionnaire. *International journal of environmental research and public health*, *8*(9), 3810-3820.
20. Abdulrahman Musaiger, Berivan A Al-Mufty, Hazzaa Al-Hazzaa. Eating Habits, Inactivity, and Sedentary Behavior among Adolescents in Iraq: Sex Differences in the Hidden Risks of Non-communicable Diseases. 2014, Food and Nutrition Bulletin 35(1):12-9. DOI: 10.1177/156482651403500102
21. Ainsworth, B. E., Haskell, W. L., Herrmann, S. D., Meckes, N., Bassett Jr, D. R., Tudor-Locke, C., ... & Leon, A. S. (2011). 2011 Compendium of Physical Activities: a second update of codes and MET values. Medicine & science in sports & exercise, 43(8), 1575-1581.
22. Ridley, K., Ainsworth, B. E., & Olds, T. S. (2008). Development of a compendium of energy expenditures for youth. International Journal of Behavioral Nutrition and Physical Activity, 5(1), 1-8.
23. Janssen, I., & LeBlanc, A. G. (2010). Systematic review of the health benefits of physical activity and fitness in school-aged children and youth. International journal of behavioral nutrition and physical activity, 7(1), 1-16.
24. Committee on Public Education. (2001). Children, adolescents, and television. Pediatrics, 107(2), 423-426.
25. Musaiger, A. O. (2011). Overweight and obesity in eastern mediterranean region: prevalence and possible causes. Journal of obesity, 2011.
26. Sweeting, H. N. (2008). Gendered dimensions of obesity in childhood and adolescence. Nutrition journal, 7(1), 1-14.
27. Patrick, K., Norman, G. J., Calfas, K. J., Sallis, J. F., Zabinski, M. F., Rupp, J., & Cella, J. (2004). Diet, physical activity, and sedentary lifestyle as risk factors for overweight in adolescence. Archives of pediatrics & adolescent medicine, 158(4), 385-390.
28. Al-Rukban, M. O. (2003). Obesity among Saudi male adolescents in Riyadh, Saudi Arabia. Saudi medical journal, 24(1), 27-33.
29. Tremblay, M. S., Colley, R. C., Saunders, T. J., Healy, G. N., & Owen, N. (2010). Physiological and health implications of a sedentary lifestyle. Applied physiology, nutrition, and metabolism, 35(6), 725-740.

ISSN:0975-3583,0976-2833 VOL12,ISSUE05,2021

30. Lowry, R., Wechsler, H., Galuska, D. A., Fulton, J. E., & Kann, L. (2002). Television viewing and its associations with overweight, sedentary lifestyle, and insufficient consumption of fruits and vegetables among US high school students: differences by race, ethnicity, and gender. Journal of school health, 72(10), 413-421.
31. Eisenmann, J. C., Bartee, R. T., Smith, D. T., Welk, G. J., & Fu, Q. (2008). Combined influence of physical activity and television viewing on the risk of overweight in US youth. International journal of obesity, 32(4), 613-618.
32. Duncan, S., Duncan, E. K., Fernandes, R. A., Buonani, C., Bastos, K. D., Segatto, A. F., ... & Freitas, I. F. (2011). Modifiable risk factors for overweight and obesity in children and adolescents from São Paulo, Brazil. BMC public health, 11(1), 1-9.
33. Al-Hazzaa, H. M. (2002). Physical activity, fitness and fatness among Saudi children and adolescents. Saudi Med J, 23(2), 144-150.
34. Popkin B. M. (2001). The nutrition transition and obesity in the developing world. The Journal of nutrition, 131(3), 871S–873S. https://doi.org/10.1093/jn/131.3.871S.
35. Platat, C., Perrin, A. E., Oujaa, M., Wagner, A., Haan, M. C., Schlienger, J. L., & Simon, C. (2006). Diet and physical activity profiles in French preadolescents. British journal of nutrition, 96(3), 501-507.
36. Taveras, E. M., Field, A. E., Berkey, C. S., Rifas-Shiman, S. L., Frazier, A. L., Colditz, G. A., & Gillman, M. W. (2007). Longitudinal relationship between television viewing and leisure-time physical activity during adolescence. Pediatrics, 119(2), e314-e319.
37. Sallis, J. F., Zakarian, J. M., Hovell, M. F., & Hofstetter, C. R. (1996). Ethnic, socioeconomic, and sex differences in physical activity among adolescents. Journal of clinical epidemiology, 49(2), 125-134.
38. Bird, S., Kurowski, W., Feldman, S., Browning, C., Lau, R., Radermacher, H., ... & Sims, J. (2009). The influence of the built environment and other factors on the physical activity of older female from different ethnic communities. Journal of Female & Aging, 21(1), 33-47.
39. Al-Hazzaa, H. M., & Albawardi, N. M. (2019). Activity energy expenditure, screen time and dietary habits relative to gender among Saudi youth: interactions of gender with obesity status and selected lifestyle behaviors. Asia Pacific journal of clinical nutrition, 28(2), 389-400.
40. Alhwaikan AM, Alshammar SA. (2017). Physical activity, sedentary lifestyle and dietary habits among adults living in Riyadh city, Kingdom of Saudi Arabia. Int J Health Sci Res. 7(4):199-209.