



Dietary and Nutritional Factors Influencing Obesity in Qatari Adults and the Modifying Effect of Physical Activity

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Abstract

Background: Qatar has one of highest obesity prevalence in the Arab world and globally. Unhealthy dietary habits and lack of physical activity are among the major factors that contribute to obesity epidemic.

Objectives: To examine the influence of physical activity and dietary factors related to the obesity prevalence among adult Qatari nationals.

Methods: Secondary data analysis of 2,496 Qatari adults (age 18-64) from WHO Qatar national STEP wise survey 2012 was executed. Multivariate binary logistic regression analysis was carried out to assess the role of physical activity, dietary characteristics and related covariates in obesity causation.

Results: The predominant form of physical activity was walking (76.4% of males versus 55.9% of females) followed by participating in intense sports in males and moderate physical activity in females. Consumption of sweet beverages was associated with obesity (OR = 1.06, 95% CI = 1.02-1.10, P < 0.01). No significant association was determined between obesity versus levels of consumption of fruit, vegetables, fast food, and food not prepared at home. Physical activity was significantly associated with a reduction in central obesity (OR = 0.72, CI = 0.57-0.90, P-value = 0.006) and with slight reduction in generalized obesity rates; however, this effect was not statistically significant (OR = 0.95, CI = 0.79-1.14, P-value = 0.58).

Conclusion: The findings from this study might assist in the development of evidence-based strategies to reduce and prevent obesity as well as obesity-related morbidity and mortality. The continued and effective use of multidimensional approaches will be beneficial in preventing disease and reducing its burden in Qatar.

Keywords

Obesity, Physical activity, Diet, Sweet beverages, Qatari nationals, STEP wise, Behavioral factors

intake and energy expenditure [1,2]. Obesity is also directly related to the socio-economic status, physical environment, and behavioral and cultural aspects of a community [1]. In addition, genetic factors may play an important role in the development of obesity, especially in the presence of particular environmental factors [3,4].

According to the World Health Organization (WHO), a measure of obesity in a population is Body Mass Index (BMI). A person with a BMI of 30 or more is generally considered to be obese [5]. Obesity is becoming the major nutritional and financial problem of the modern world, rapidly affecting many developed and developing countries [6]. The mean BMI of the world's population increased dramatically between 1980 and 2008, with an almost doubled prevalence of obesity since 1980 [7]. Globally in 2014, over 39% and 13% of adults were overweight and obese, respectively [7]. Overweight and obesity together are a major cause of morbidity and mortality; both are estimated to cause 3-4 million deaths per year, 4% of years of life lost, and 4% of disability-adjusted life-years worldwide [8].

Like the rest of the world, the prevalence of obesity has also increased over the past few decades in Arabic-speaking countries [9]. The State of Qatar, a peninsula located on the western coast of the Arabian Gulf, has experienced one of the highest prevalence rates of obesity in the region [9,10]. This thought to have been influenced by the recent rapid socio-economic development in the region [10]. Economic development has also impacted the lifestyles of Qatari nationals in terms of diet and physical activity [11]. Consumption of meat, saturated fats, and refined carbohydrates has increased, along with the low intake of fiber-containing foods [11]. Furthermore, easier access to cars, working conditions, and technological advancement have contributed to Qataris [11] as well as global population [12,13] being less physically active.

For obesity worldwide, dietary risk factors and physical inactivity are responsible for the largest disease burden [13]. According to the World Health Survey (WHS) 2006, 39% of Qatar population was overweight while 32% were categorized as obese. Furthermore, 40% of Qatari nationals were obese compared to 28% of non-Qataris in

Background

Obesity is a complex, chronic disorder characterized by excessive fat accumulation in the body due to an imbalance between calorie

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same category [14]. In 2013, Qatar was among the countries with an age-standardized, estimated prevalence of obesity of more than 40% and 50% in men and women, respectively [8]. In Qatar, three priority Non-communicable diseases (NCDs) are cardiovascular disease (CVD), Type 2 diabetes, and cancer, which together contribute to a large share of mortality. In 2012, the top three causes of NCD related deaths were due to the diseases of circulatory system as a top cause and endocrine (including diabetes) disorders as third leading cause of death after neoplasms as a second leading cause [15]. These NCDs are associated with modifiable risk factors, including excess weight and obesity; unhealthy nutrition, physical inactivity, and tobacco use [16-18].

This article examines the influence of physical activity and dietary factors related to the obesity prevalence among Qatari adults. The study further describes and quantifies the dietary and physical activity among Qatari adults, and explores changes in their diet and physical activity as two critical behavioral factors that could modify their obesity status. The findings of this study provide guidelines to develop and enhance evidence-based interventions to address the problem of obesity and its related risk factors in Qatar.

Materials and Methods

Study Population

The effects of dietary characteristics and physical activity on obesity were examined using data from the WHO-based Qatar National STEP wise survey for chronic diseases and risk factors. The survey was implemented between March and May of 2012; 2,496 Qatari nationals aged 18–64 years participated in the survey with an overall survey response rate of 88%. Interviewers used Kish selection method and created a roster of all survey-eligible individuals (who considered the sampled household to be their usual place of residence, and who were between the age of 18 and 64 years old) and excluded rest from the survey. For analytical purpose the pregnant women were excluded while calculating physical measurement parameters related to central and generalized obesity [19,20].

The survey was led by the Supreme Council of Health in collaboration with the Ministry of Development Planning and Statistics (MDPS) formally known as Qatar Statistics Authority. Technical assistance was provided by the WHO headquarters in Geneva and the WHO regional office for the Eastern Mediterranean.

STEP wise is a recommended surveillance tool for risk factors and morbidity specific to chronic diseases. The tool is designed to cover three different levels of risk factor assessment [20]:

- STEP 1 for gathering demographic and behavioral risk factors information by questionnaire
- STEP 2 for collecting physical measurements (weight, height, waist circumference and blood pressure)
- STEP 3 for taking blood samples for biochemical measurements

The sample of households and individuals who were interviewed were representative of all Qatari nationals. The sampling design took into account the WHO STEPS formula for calculating the sample size, as specified in the STEPS guidelines for participating countries [20]. Respondents were selected using multistage, systemic random sampling. In order to ensure that the data collection process was performed to the highest possible standards, intensive one week STEPS tool training workshop was conducted by WHO team for the whole team including the data collectors. The training program for the workshop covered management of administrative issues, fieldwork planning, utilization of the Personal Digital Assistant (PDA), consents and confidentiality process and requirements, how to conduct effective interviews and finally training on how to obtain the physical and biomedical measurements [19].

Ethical procedures were followed throughout the implementation of the survey. Written consent was obtained from participants, and

information regarding the study process and confidentiality was provided. The data set for the present study was free of any identifiers or personal patient information.

Dietary patterns: Dietary patterns were reviewed based on data collected through the STEP 1 tool. The tool provides information regarding fruit and vegetable consumption, including number of days per week and number of servings per day. The survey also covers information about daily consumption for various food groups, including whole grains, refined carbohydrate products, legumes, dairy products, different types of meats, sweet foods and sugary beverages, fresh fruit juices, and fast food.

Physical activity: Physical activity information was also reviewed and analyzed using the pre-collected data by the STEP 1 tool. The physical activity information was collected using Global Physical Activity Questionnaire [21]. The tool provides information on (a) the mean and median minutes of time spent by the respondents in total physical activity; (b) the mean and median minutes spent by the respondents per day at work, in transport, and engaged in recreation related to physical activity; (c) the percentage of respondents classified as doing no physical activity relating to work, transport, or recreational activity; (d) the percentage of work, transport, and recreational activity contributing to total activity; (e) the percentage of respondents not engaging in vigorous physical activity; and (f) the minutes spent in sedentary activity on a typical day. The levels of physical activity were classified by categories, namely low, moderate, and high, which are explained below.

- **Low:** Meets neither “moderate” nor “high” criteria. Total physical activity < 600 MET (Metabolic Equivalent of Task)-minutes per week
- **Moderate:** 150 minutes of moderate-intensity physical activity OR 75 minutes of vigorous-intensity physical activity per week OR moderate- or vigorous-intensity activities achieving a minimum of at least 600 MET-minutes per week
- **High:** Combined moderate- or vigorous-intensity activities achieving a minimum of at least 3000 MET-minutes per week

Weight assessment: Obesity status was determined by the BMI as well as waist circumference (WC). Data on weight parameters (weight, waist circumference, height) were collected one time per person using the STEP 2 tool as part of the survey process [19,20]. Weight and height measurements were taken using the 813 Seca digital floor scale with high capacity weighting-device and Seca height measure device 213 respectively [19]. The BMI was calculated and assigned to the categories according to the WHO classification [5]. The effects of nutritional and physical activity factors were compared with BMI \geq 30 kg/m². As per WHO STEPS protocol and recommendation, the WC measurements were made by the Figure Finder Tape Measure at the end of normal expiration in the mid-axillary line midway between the last rib and the superior iliac crest while the tape was horizontally across the back. The measurement was taken to the nearest 0.1 cm by the trained nurses [19,20]. A WC of 40 inches (102 cm) in men and 35 inches (88 cm) in non-pregnant women is considered as cut off values by WHO [22]. While calculating weight parameters pregnant women were excluded from the calculations.

Data Management and Statistical analysis

The data analysis was conducted in a standard way abiding by the guidelines of the WHO for STEPS survey analysis [20]. Epi info (version 7.1.4, CDC, Atlanta, GA) and Statistical Analysis Software (version 9.2, SAS Institute Inc., Cary, North Carolina) were used for data management and analysis. Descriptive statistics were used as frequency, percentage, mean and medians. Also, 95% confidence intervals around the means and rates were presented and used for the detection of significant difference among groups. To ensure that each household in Qatar and each Qatari national aged between 18 and 64 years old had an equal probability of being selected into the sample, the data were weighted during analysis to account for differential selection probabilities in order to have representative results for the

Table 1: The prevalence of obesity (categorized by BMI and WC) in Qataris adults who participated in STEP wise survey.

Characteristics	Ages 18-64			Ages < 40			Ages ≥ 40		
	Mean or %			Mean or %			Mean or %		
	(95% CI)			(95% CI)			(95% CI)		
	Both Sexes	Males	Females	Both Sexes	Males	Females	Both Sexes	Males	Females
Body Mass Index (Kg/m²)	29.2 (28.8-29.6)	28.8 (28.3-29.4)	29.5 (29.0-30.1)	28.1 (27.7-28.5)	28.6 (28.1-29.2)	28.5 (28.0-29.0)	31.1 (30.7-31.4)	29.5* (29.0-30.0)	33.0** (32.4-33.5)
Waist Circumference (cm)	-	99.9 (98.0 - 101.9)	90 (88.3-91.6)	-	98.3 (96.8-99.8)	86.2 (85.0-87.3)	-	104** (102.7-105.2)	100.4** (99.0-101.8)
Obesity (Based on BMI)	41.4% (38.8-44.0)	39.5% (35.5-43.6)	43.2% (40.1-46.3)	34.1% (33.6-34.5)	35.4% (31.4-39.3)	35.6% (32.3-38.9)	54.7% (54.1-55.3)	39.8% (35.5-44.1)	63.2%** (59.5-67.0)
Obesity (Based on WC)	-	46.7% (43.6-49.9)	58.6% (55.9-61.3)	-	40.1% (35.9-44.4)	42.4% (38.7-46.2)	-	54.33%** (49.7-58.8)	77.3%** (73.7-80.5)

*- group with age ≥ 40 is significantly different from age < 40 at p < 0.05.
** -group with age ≥ 40 significantly different from the age group < 40 at p < 0.001

Table 2: Dietary habits of study population categorized by age and sex

Age ≥ 40 years	Overall	Males	Females
Characteristic	Mean(95% CI)	Mean (95% CI)	Mean (95% CI)
Number of days fruit consumed in a typical week	4.2 (4.1-4.3)	4.6 (4.4-4.8)	3.9 (3.7-4.1)
Number of servings of fruit on average per day	1.54 (1.5-1.7)	1.6 (1.5-1.7)	1.5 (1.5-1.6)
Number of days vegetables consumed in a typical week	5.8 (5.7-5.9)	6.0 (5.9-6.2)	5.7 (5.5-5.9)
Number of servings of vegetables on average per day	1.8 (1.7-1.8)	1.7 (1.6-1.8)	1.8 (1.7-1.9)
Avg. number of meals/week eaten that were not prepared at a home	1.4 (1.3-1.5)	1.6 (1.4-1.8)	1.2 (1.1-1.3)
In a typical week, number of days you eat and drink the following:			
Sweets (chocolate, candy, cake, baklava, ice-cream, etc.)	2.7 (2.5-2.8)	2.3 (2.1-2.5)	3.0 (2.8-3.2)
Sugar sweetened beverages	1.4 (1.3-1.5)	1.7 (1.4-1.9)	1.2 (1.0-1.4)
Fast foods bought from a fast food restaurant	0.9 (0.8-1.0)	0.9 (0.8-1.0)	0.9 (0.8-1.0)
Age < 40 years	Overall	Males	Females
Characteristic	Mean(95% CI)	Mean (95% CI)	Mean (95% CI)
Number of days fruit consumed in a typical week	3.1 (2.9-3.2)	3.4 (3.2-3.6)	2.9 (2.7-3.1)
Number of servings of fruit on average per day	1.4 (1.3-1.5)	1.5 (1.4-1.7)	1.4 (1.3-1.5)
Number of days vegetables consumed in a typical week	5.4 (5.3-5.5)	5.6 (5.4-5.7)	5.3 (5.2-5.5)
Number of servings of vegetables on average per day	1.6 (1.5-1.7)	1.6 (1.5-1.7)	1.6 (1.5-1.7)
Avg. number of meals/week eaten that were not prepared at a home	2.7 (2.5-2.8)	3.1 (2.9-3.3)	2.4 (2.2-2.6)
In a typical week, number of days you eat and drink the following:			
Sweets (chocolate, candy, cake, baklava, ice-cream, etc.)	3.9 (3.8-4.1)	3.4 (3.2-3.6)	4.4 (4.2-4.5)
Sugar sweetened beverages	2.9 (2.7-3.1)	3.2 (3.0-3.4)	2.7 (2.5-2.9)
Fast foods bought from a fast food restaurant	2.2 (2.0-2.3)	2.4 (2.2-2.5)	2.0 (1.9-2.2)

whole population.

All continuous variables were tested for normality using *Kolmogorov-Smirnov* test. Comparisons between two age groups for continuous variables were done by using two-tailed unpaired *Student's* t-tests. All categorical variables were compared using chi-square tests and Fisher's exact test in contingency tables when the expected frequency in any cell was less than 5. In order to assess the effect of the sweetened beverages, fast food and sweets on obesity, we used multivariable binary logistic regression models, while controlling for all other statistically significant risk factors obtained from the analysis of the total sample. Differences were considered statistically significant at p-value ≤ 0.05. The comparison was made by sex as well as dividing participants into two age groups; less than 40 year old and equal or greater than 40 years old based on the assumption that these two groups had different characteristics due to the economic development in the country.

Results

Characteristics of the Study Population

The female-to-male ratio among the study population (18-64 years Qatari Nationals) was 1.37 (57.8% women and 42.2% men). The overall mean age of participants was 37.9 years. Overall 70.1% of Qatari nationals had a BMI equal to or above 25 kg/m² (classified as overweight and obese), 41% had BMI equal to or over 30 kg/m². Mean WC for men and women in age group ≥ 40 years was higher than their counterpart < 40 years old. Obesity parameters by age groups and sex

are shown in [table 1](#).

Dietary characteristics: The overall average number of combined fruit and vegetable servings was reported at 2.2 (95% CI = 2.0–2.5) servings per day. The vast majority (96.4%; 95% CI = 95.3–97.5) of respondents used vegetable oil for meal preparation in their households. This is due the fact that vegetable oil (mostly corn oil) is part of the subsidized food program in Qatar. [Table 2](#) shows that the participants aged less than 40 years were more likely to consume fewer servings of fruit and/or vegetables per day compared to their counterpart (≥ 40 year old). On the other hand consumption of sweets, sugar sweetened beverages and fast food was observed higher in the age group less than 40 years compared to ≥ 40 years old age group (p < 0.001) in both genders. Weekly mean sugary sweet beverages consumption was higher in men compared to women while mean sweet consumption was higher among women compared to men in both age group categories ([Table 2](#)).

Physical activity: Participants of age group less than 40 years were more physically active (56.1%) when compared to age group ≥ 40 years (45.3%), with men being more physically active in both groups compared to women ([Table 3](#)). The predominant form of physical activity in both age groups was walking (74.6% of men versus 55.3% of women < 40 years old, 76.7% of men versus 62.9% of women ages ≥ 40), followed by participating in intense sports in men and moderate physical activity in women. The overall median time spent of total physical activity per day was 37.1 minutes per day. However, the median value among the men was higher than that

Table 3: Levels of physical activity in study population categorized by age and sex

Age ≥ 40 years	Overall	Males	Females
	Characteristic	% (95% CI)	% (95% CI)
Work involves vigorous physical activity	12.2 (10.3-14.1)	16.5 (13.2-19.8)	8.9 (6.7-11.1)
Work involves moderate physical activity	24.4 (21.9-26.9)	24.3 (20.6-28.1)	24.5(21.1-27.8)
Walk continuously for 10 minutes	63.7 (60.9-66.5)	74.6 (70.8-78.5)	55.3 (51.4-59.1)
Play vigorous intensity sports	14.5 (12.4-16.5)	22.3 (18.7-26.0)	8.4 (6.3-10.6)
Play moderate intensity sports	23.0 (20.5-25.4)	31.0 (26.9-35.1)	16.8 (13.9-19.7)
Any of the above	45.3 (42.4-48.2)	51.9 (47.5-56.3)	40.2 (36.4-44.0)
Age < 40 years			
Work involves vigorous physical activity	15.2 (13.3-17.1)	21.7 (18.3-25.2)	10.7 (8.6-12.9)
Work involves moderate physical activity	30.2 (27.7-32.6)	32.9 (29.0-36.8)	28.3 (25.2-31.5)
Walk continuously for 10 minutes	68.5 (66.1-71.0)	76.7 (73.1-80.2)	62.9 (59.6-66.3)
Play vigorous intensity sports	21.6 (19.4-23.8)	38.2 (34.2-42.3)	10.1(8.0-12.2)
Play moderate intensity sports	32.8 (30.3-35.3)	43.6 (39.5-47.7)	25.3 (22.2-28.4)
Any of the above	56.1 (53.4-58.7)	67.1 (63.2-71.0)	48.4 (45.0-51.9)

Table 4: Logistic regression of generalized and central obesity on various nutritional variables

Independent variable	Obesity by BMI		Obesity by WC	
	Odds Ratio	p-value	Odds Ratio	p-value
	(95%CI)		(95%CI)	
Age (≥ 40 vs. < 40)	1.02 (1.01-1.03)	< 0.0001	2.12 (1.72-2.60)	< 0.0001
Gender (M vs. F)	0.67 (0.55-0.81)	< 0.0001	0.60 (0.49-0.73)	< 0.0001
Marital status (Married vs. Un-married)	2.65 (1.96-3.61)	< 0.0001	1.81 (1.39-2.33)	< 0.0001
Physically active (Moderate Activity 150 min/wk. or more vs. No activity)*	0.95 (0.79-1.14)	0.58	0.72 (0.57-0.90)	0.006
Servings of fruit eaten in a day (≥ 2 vs. < 2)*	0.96 (0.88-1.05)	0.4	1.15 (0.93-1.42)	0.19
Servings of vegetables eaten in a day (≥ 3 vs. < 3)*	1.04 (0.96-1.12)	0.34	1.33 (0.99-1.78)	0.053
No. of meals per week not prepared at a home (≥ 4 vs. < 4)*	0.98 (0.94-1.02)	0.33	0.9 (0.70-1.15)	0.401
No. of days per week eating sweets (≥ 4 days vs. < 4)*	0.97 (0.94-1.01)	0.14	0.89 (0.73-1.08)	0.25
No. of days per week drinking sugar sweetened beverages (≥ 4 days vs. < 4)*	1.06 (1.02-1.10)	0.01	1.12 (0.87-1.40)	0.38
Fast Food consumption per week (≥ 1 days vs. 0)	0.98 (0.92-1.04)	0.52	0.84 (0.68-1.03)	0.102

* Based on Qatar dietary guidelines [39], *Divided into two equal categories, * > 600 MET-minute/week

among women (55.7 vs. 23.6 minutes per day) which indicates that men spend more time practicing total physical activity than women. The overall median time spent in sedentary activities was 179 minutes per day. The median value was longer for men (180 minutes per day) when compared with that of women (135 minutes per day). Median sedentary time was higher in age group ≥ 40 years (men 170 and women 180 minutes per day respectively) compared to age group < 40 years (men 150 and women 120 minutes per day respectively).

Obesity Versus Nutritional Factors & Physical Activity

The consumption of sweet beverages was significantly associated with obesity based on BMI in the overall study population. Physical activity was highly significantly associated with reduction in central obesity (OR = 0.72, CI = 0.57-0.90, P-value = 0.006). Also physical activity slightly affected the generalized obesity rates; however, this effect was not statistically significant (OR = 0.95, CI = 0.79-1.14, P-value = 0.58) (Table 4).

The number of fruit or vegetable servings consumed per day was not associated with obesity among Qatari adults. The number of meals consumed per week not prepared at a home and the number of days per week participants ate food from a fast-food restaurant were also not found associated with obesity. Men participants, never-married

participants, higher education and individuals of ages < 40 years old were less likely to be obese (based on BMI and WC) compared to their counterpart groups (Tables 4 and Table 5).

Discussion

The present study shows that the physical activity and nutritional behaviors may be impacting the prevalence of obesity and related morbidity in Qatar. It seems that the younger population (< 40 years old) is relatively at higher risk of obesity and related morbidities due to the nutritional factors compared to older adults who are possibly at higher risk of obesity and eventually chronic diseases because of lack of physical activity. In addition, female participants seem to be at more risk compared to men in both areas physical activity and nutritional factors. Overall, the mean BMI for the Qatari population aged between 18 and 64 was 29.2 (28.8 for men and 29.5 for women), and 70.1% of the studied population had a BMI equal to or above 25 kg/m². These results project that 70.1% of adult Qataris are at risk of developing coronary heart disease, ischemic stroke, and Type 2 diabetes mellitus [7,23]. Overall, obesity trends in Qatar are similar to Kuwait where 48% of population is obese with 74% of men and 77% of women are overweight or obese respectively [24]. The neighboring Saudi Arabia also faces similar trends (35.2% obese, 66% of men and

Table 5: Logistic regression of obesity (BMI > 30) on consumption of sugary beverages and the modifying effect of physical activity

Independent variable	Odds Ratio	p-value	Lower 95% CL	Upper 95% CL
Age (≥ 40 vs. < 40)	1.03	< 0.0001	1.02	1.04
Gender (M vs. F)	0.66	< 0.0001	0.55	0.79
Marital status (Married vs. Un-married)	1.47	< 0.0001	1.25	1.73
Highest level of education completed (University/Post-Graduate Education)	0.56	< 0.0001	0.44	0.71
No. of days per week drinking sugar sweetened beverages <u>when not physically active</u>	1.05	0.0092	1.01	1.08
No. of days per week drinking sugar sweetened beverages <u>when physically active</u>	1.02	0.2842	0.98	1.07

71% of women are overweight or obese respectively) [24].

In terms of physical activity, only 31.3% of the studied population was involved in a high level of physical activity, while 45.9% were involved in a low level of physical activity and 22.8% in moderate physical activity [19]. The proportion of women engaged in a low level of physical activity was higher than that among men (54.2% vs. 37%). The current levels of physical inactivity in Qatar and the rest of the world are associated with decreasing physical activity during leisure time and an increase in sedentary behavior during work-related activities. Furthermore, the increasing use of cars and other means of transportation also contribute to the low rates of physical activity. The trends of obesity and less physical activity in women in Qatar are similar to those in other Arab countries in the region [9,24]. The global proportion of adults with a BMI of 25 kg/m² or greater increased between 1980 and 2013 from 28.8% to 36.9% in men and from 29.8% to 38% in women [8].

Waist circumference was another physical parameter that was observed in this study. Increased WC is associated with an increased risk of CVD, according to a study done in Australia the risk of developing CVD among participants increased with increasing WC as well as age [25]. A WC above cut off points is associated with a higher risk of developing obesity-related conditions [25,26]. The results show that the average WC for Qatari men is 99.9 cm, very close to the higher limit of 102 cm, and that the average WC for Qatari women is 90.0 cm, slightly higher than the benchmark of 88 cm [19]. About 53% of participants (men and women) had their WC greater than the upper limit with women having higher WC compared to men similar to the results from another study done in Lebanon in which females (62%) had higher percentage of above benchmark WC compared to men (52%) [27]. These results adversely affect the health outcomes of the Qatari community as abnormal WC is considered to be a marker for increased risk for chronic disease throughout the adult BMI range including the normal [22].

Behavioral and biological factors together play an important role in the health status of an individual. Unhealthy dietary habits and physical inactivity are considered to be two of the critical lifestyle determinants. Lacks of physical activity and low fruit and/or vegetables consumption are associated with 3.2 and 1.7 million deaths worldwide each year, respectively [28,29]. There is evidence that the consumption of a diet rich in fiber, fruit, and vegetables can reduce cardiovascular-disease risk factors such as high blood pressure, high blood cholesterol, diabetes mellitus, and weight gain [30]. The consumption of at least five servings of fruit and vegetables per day is recommended to prevent diet-related chronic disease [31]; around 91% of Qatari citizens consume fewer than five servings of fruit and/or vegetables. Low fruit and vegetable intake is estimated to cause about 31% of the cases of ischemic heart disease, 11% of stroke cases, and 19% of cases of gastrointestinal cancer worldwide [32]. Furthermore, evidence from other studies show that there is a significant relationship between consuming sweet beverages and obesity [33,34].

The present study reveals that the dietary habits of 18-39 years old participants are unhealthier compared to their counterparts (≥40 year old) by reporting less fruit and vegetables consumption and higher sweets, sugar sweetened beverages and fast food consumption in both sexes. By gender, men tend to consume more sugar sweetened beverages compared to women while women consume more sweets compared to men in both age categories. Although the relationship of sweets and sugar sweetened beverages consumption and central

obesity was not statistically significant, there was a significant relationship found between sugar sweetened beverages consumption and generalized obesity in the current study. According to the Survey of Childhood and Adolescence Surveillance and Prevention of Adult Non-communicable Diseases (2011-2012) in Iran sweets and sugar sweetened beverages consumption showed a significant association with overall and abdominal obesity in participants [34]. Since a lack of or insufficient physical activity is also associated with an increased prevalence of cardiovascular disease and its associated risk factors, engagement in sufficient physical activity can reduce the risk of certain cancers and chronic diseases. (Figure 1) [28].

Recent statistics show that there has been an observed decline of 15% in crude death rates among Qataris from 2007 to 2011 [35]. This is due to a reduction in mortality related to certain diseases as well as to the high quality of health care delivery and provision in Qatar. Qatar has achieved significant progress in the field of preventive and curative health services, and free healthcare for residents and citizens. This is coupled with recent increase in the number of government and private health care facilities, and increase in physicians from 2.1 (per 1000 population) in 1998 to 3.3 in 2009 [36]. On the other hand according to STEP wise the prevalence of Qataris with five combined risk factors (currently smokers, less than 5 serving of fruits/vegetables per day, low level of activity, BMI ≥ 25 and raised BP), the overall prevalence of respondents with 3-5 risk factors (high risk category) is 50.6%, only 0.8% Qataris identified with zero risk factors [19]. These results are not favorable and indicate that obesity and obesity-related behavioral factors in Qatar are problems that require immediate attention. The obesity epidemic requires population-level risk reduction through public-awareness campaigns, improved access to healthy and affordable foods, increased and improved venues for physical activity, and healthy-lifestyle promotion programs at schools, worksites, and in other community locations. Studies show that the policy changes can also help in control of chronic diseases by targeting associated risk factors [37-39].

The present study had a number of strengths. The STEP wise survey has standardized questionnaire and protocols. The STEP wise survey population sample was supplied by the MDPS as a representative sample of the Qatari population between the ages of 18 and 64 [19]. Any data utilized from this survey can provide accurate estimates of population characteristics. These data are useful not only for monitoring chronic disease trends within the country, but also for comparing such trends with those in other countries.

The main limitation of this study was that the STEP wise survey data were collected through self-reported, face-to-face interviews. Respondents might have recalled inadequate information about their dietary habits, physical activity, duration of morbidity, or other components (some of which may not be in the scope of this study). The overall STEP wise survey response rate (88%) was excellent; however, there is a possibility that the individuals who did not agree to participate in the survey may be systematically different from those who did. Additionally, the scope of STEP wise and of this study was to investigate chronic-disease risk factors only in adult Qatari nationals aged between 18 and 64 years. Potential survey responses for children and adolescents (younger than 18 years) may differ from those of adults. Global trends show that, as with adults, overweight and obesity prevalence substantially increased in children and adolescents between 1980 and 2013 [8].

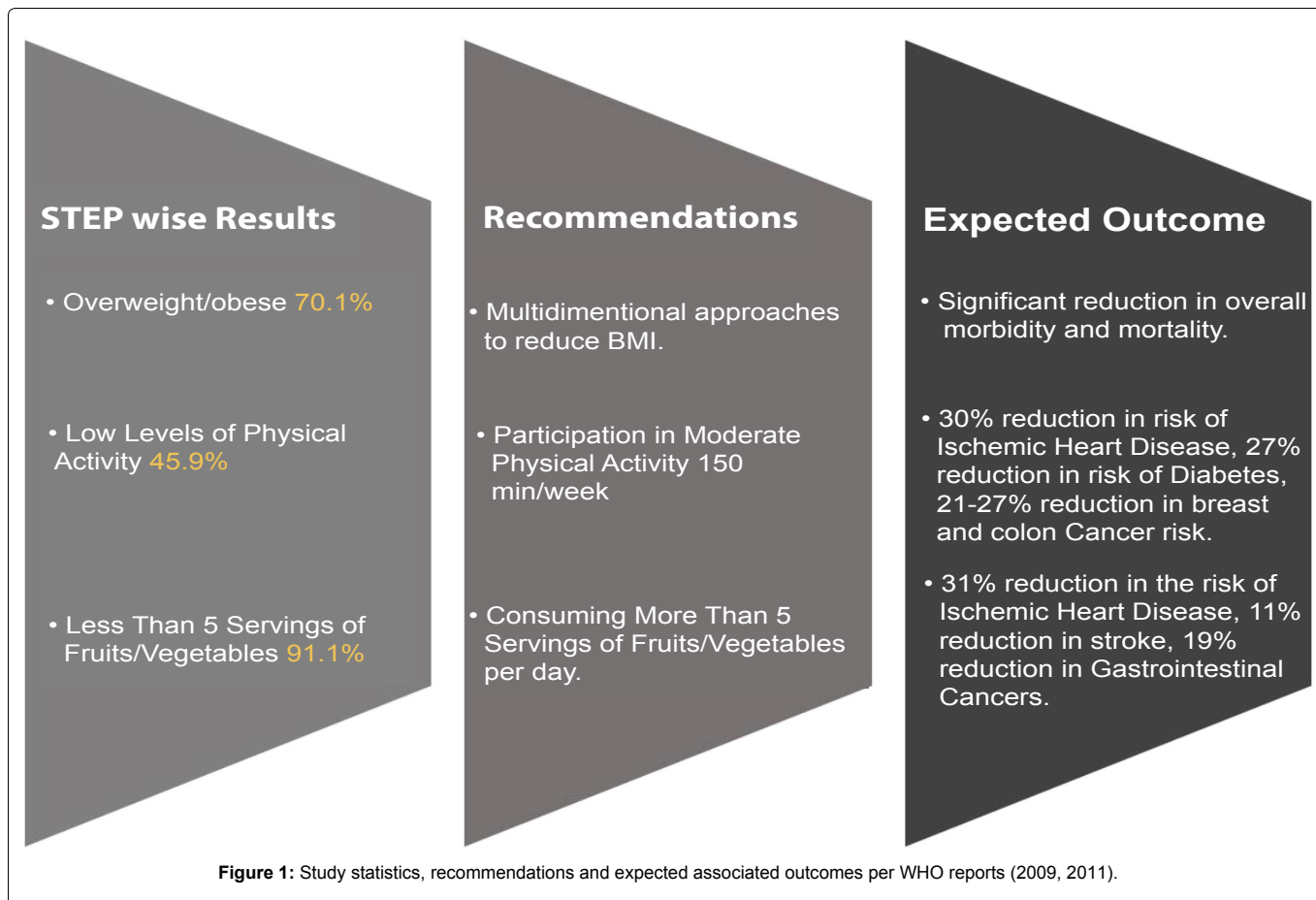


Figure 1: Study statistics, recommendations and expected associated outcomes per WHO reports (2009, 2011).

Conclusion

According to this study physical activity and dietary factors might have an impact on the obesity prevalence in Qatari adults. Young adults are at a relatively higher risk of obesity and related complications due to dietary characteristics, on the other hand elders seem to be predisposed to a higher risk of obesity and associated morbidity due to insufficient physical activity. By gender, Qatari women are more susceptible to obesity related complications compared to men. In general, obesity is a major problem in Qatari adults and requires extensive evidence-based strategies in order to reduce associated morbidity and premature death. The information from this study can be useful for public health and medical professionals in implementing interventions among the target population.

Conflict of Interest

The authors declare no conflict of interest.

Ethical Statement

Ethical procedures were followed throughout the implementation of the survey. A written consent was obtained from participants, and information regarding the study process and confidentiality was provided.

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