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Full Length Research Paper

Prevalence and associated factors for obesity, abnormal waist circumference and diet composition among Arab adults in Israel

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Abstract

Obesity and overweight are an important adaptable risk factor for many chronic diseases and are the fifth leading risk for global deaths. Remarkably increased prevalence and escalating levels of overweight and obesity over the last 3 to 4 decades give it the character of modern pandemic phenomenon and the major public health crisis challenge worldwide, that is beginning to replace undernutrition, hunger and infectious diseases as the most significant contributor to chronic diseases. In Arab world the effects of overweight and obesity are widely recognized as one of Arab's leading health concerns, involving all ages and socioeconomic groups. To estimate the prevalence of obesity, covariates associated factors, diet composition and the eating habits among adults Arab population in Israel. A population-based cross-sectional study was performed with a total of 287 hospitalized patients at E.M.M.S hospital (Nazareth) from different departments (Internal, surgical and orthopedics words) aged 18 years and older (123 males and 164 females). Demographic data, anthropometric assessments, dietary assessment, socioeconomic and lifestyle characteristics, BP measurements, and biochemical assessment were collected using standard methods and techniques. Metabolic abnormalities were identified. The mean BMI results were compared between males and females (28.4±0.53) versus (30.31±0.46), respectively (P-value < 0.2). The measurement of WC among males and females was as follow: (104.3±1.67) versus (101.4±1.57) respectively, (P-value = 0.8). High and low risk for hypertension and type 2 diabetes by gender according to waist circumferences (high risk WC ≥ 88 cm for females and WC ≥ 94 males) was shown and illustrate that women with WC ≥ 88 cm had (74.7%) risk for hypertension and diabetes versus (64.9%) risk among males with WC ≥ 94; (P-value =0.03). Comparing the prevalence of type 2 diabetes among high risk group: WC ≥ 88 cm for females and WC ≥ 94 males and low risk group WC < 88 cm for females and WC < 94 for males was 35 (71.5%) vs. 13(26.5%) respectively, P-value = 0.002). Comparing the prevalence of hypertension among high risk group: WC ≥ 88 cm for females and WC ≥ 94 males and low risk group WC < 88 cm for females and WC < 94 for males was 45(70.3%) vs. 19(29.7%) respectively, P-value = 0.003). Median intake of refined grain and the whole grain intake (serving/day) in both genders was examined and showed that the median consumption of refined grain is significantly higher than the whole grain in both genders (P-value < 0.0001). In addition, we compared the median intake

of highly fat dairy products in both genders with low fat dairy (serving/day). We observed that the consumption of high fat dairy products is statistically higher than low fat dairy products (P-value <0.0001). Regarding diabetes and food consumptions: we observed that the consumption of refined bread by diabetics patients was significantly lower comparing with non diabetics subjects (P-value <0.001), and the consumption of whole bread by diabetics patients was significantly higher compared with non diabetics patients (P-value <0.024). The median consumption of low fat products (cheese 5%), by diabetics patients was significantly higher compared with the non diabetics subjects (P-value <0.023), in addition, the consumption of soft sweet drinks by diabetic patients was significantly lower than non diabetic subjects (P-value <0.008). The results of this study indicate that rates of abnormal waist circumference in all age groups are high, both in males and females. WC in females over the age 65 continues to increase while in men is decreased. Interestingly, we noticed that the Arab population eating regime is disorganized and usually without awareness and control. Indeed, we observed that unhealthy diet dominate in Arabic kitchens such as high carbohydrates, low fiber and high fat diet consumption. Cultural attitudes may partially underlie the high prevalence of obesity and changes in the economy, modernization, industrialization and socioeconomic status in addition to the influence effect of the surrounding western diet style consumed by the majority population in the country. "Dietary acculturation" or adapting the eating patterns of the majority resulted in rapid changes in diet and physical activity patterns. Adopting less healthy dietary patterns, and relinquishing healthy dietary prototypes, such as higher intake of fibre-rich products in form of legumes and whole grain products are both negative parts of the acculturation process. These results are in conflict with the famous known healthy diet in the Middle East known as "Mediterranean diet", rich in vegetables, fruits, high fiber and low fat diet.

Keywords: BMI, waist circumference, Obesity, Whole-wheat intake: Diet quality, Adult Arabs

INTRODUCTION

At the time that one third of the globe populations still suffers and lives under the oppression, poverty, deprivation, undernutrition and famine; two third of globe populations are struggling against overindulge foods which leads to overweight and obesity, where these observable facts kill more people than malnourished and underweight population.

Obesity and overweight are an important adaptable risk factor for many chronic diseases and are the fifth leading risk for global deaths (Poirier et al., 2006).

Remarkably increased prevalence and escalating levels of overweight and obesity over the last 3 to 4 decades give it the character of modern pandemic phenomenon and the major public health crisis challenge worldwide (Frumkin et al., 2004), that is beginning to replace undernutrition, hunger and infectious diseases as the most significant contributor to chronic diseases (Kopelman, 2000). The World Health Organization predicts there will be 2.3 billion overweight adults in the world by 2015 and more than 700 million of them will be obese (Brophy et al., 2009). Indeed, obesity is leading cause of disabilities and responsible for increase morbidity and mortality worldwide (Crimmins et al., 2011; Lavie et al., 2009).

Its pathophysiological link to cardiovascular atherosclerotic and metabolic diseases, including diabetes, hypertension, dyslipidemia, and coronary heart disease, certain forms of cancer, sleep-breathing disorders as well as on social functioning and quality of life are today of important health concerns (Bray, 2004).

Physiologically, the regulation of body weight is coordinated through a complicated system involving interactions between the various components of energy balance, together with feedback mechanisms that regulate appetite, energy intake and energy expenditure (Kevin et al., 2012). In obese individuals, the long imbalance between energy expenditure or the consumed energy and energy intake leads to weight gain and excess accumulation of body fat (Roberts et al., 1988). The disequilibrium in energy balance (increase accumulation of body fat and deficient in clearance or low expenditure of energy) is considered part of the

quandary. While the underlying mechanisms of overweight and obesity is multifaceted and multifactorial in their nature, diet and physical activity are central to energy balance and weight maintenance, but they are directly and indirectly influenced by a wide range of socioeconomical, environmental, behavioural, genetic and physiological factors (Cynthia et al., 2003). In fact, features that influence overweight and obesity are largely comparable across populations and are on the increase due to a trend in changes in the economical situation, urbanization, industrialization, globalization and socioeconomic status. The higher susceptibility of some individuals than others to dietary and lifestyle factors (dietary patterns and sedentary habits) that promote weight gain can be explained environmentally and partially by genetics factors (National Academies Press (US)., 2001). Genetic influence is currently estimated to account for 40–70% of the variance in human adiposity (Chung et al., 2008).

The dramatic increase in obesity frequency emphasizes the importance of prevention strategies for plummeting the consequent burden of chronic diseases (Who, Joint, and FAO Expert Consultation., 2003). Furthermore, the accurate characterization of obesity-related health risk has taken on new importance in efforts to generate targeted intervention strategies and appropriately allocate health care resources (Lobstein et al., 2004).

In adults, obesity and overweight are often determined using Anthropometric evaluation which involves measurement of body dimensions for the purpose of understanding human physical variation (Kain et al., 2002).

Indeed, the measures such as the body mass index (BMI) and waist circumference methods are used as convenient indices of adiposity and guidelines for classifying weight status. Men and women are classified as obese or overweight by a variety of cut-off values based on the mortality and morbidity associated with various levels of weight. Adults who have a BMI ≥30 kg/m^2 are considered obese and are generally at higher risk for adverse health events than are those who are considered overweight (BMI between 25.0 and 29.9 kg/m^2) or lean (BMI between 18.5 and 24.9 kg/m^2) (Vainio et al., 2002). Therefore, BMI is considered to be the most suitable, objective anthropometric indicator of nutritional status of the adult and has become the “gold standard” for identifying patients at increased risk of adiposity-related adverse health outcomes (Daniels, 2009).

Indeed, the evaluation of fatty mass and definitions of overweight and obesity use a range of approaches, some of which are sophisticated or expensive radiological imaging techniques such as magnetic resonance imaging or dual energy X-ray absorptiometry (Semiz, 2006), and are considered the gold-standard methods for determining the quantity of subcutaneous abdominal adipose tissue (SAAT) and intra-abdominal adipose tissue (IAAT) (Goran et al., 1998).

These methods are inapplicable outside of specialised clinical practice and used typically in research studies (Heymsfield et al., 1997).

Other practical and routinely used approaches in clinical practice are the Body Mass Index (BMI), which provides a proxy measure of total adiposity, and the simplest one which measure the central obesity: waist circumference (WC) – method or waist-to-hip ratio (WHR) (Wickramasinghe, 2011).

Waist circumference is the most common way to measure “abdominal obesity”, even independent of BMI (Okosun et al., 2000).

WC is actually a perimeter, which provides an estimate of body girth at the level of the abdomen and is frequently used as a surrogate marker of abdominal obesity, because WC correlates with abdominal fat mass and is linked with cardio-metabolic disease risk (Schunkert et al., 2012).

The current study comes to shed light on the prevalence of obesity and on the diet composition, quality and quantity among adult Arabs in Israel, and to evaluate the socioeconomic and lifestyle characteristics associated with it. We evaluated participants’ knowledge and behavior, and their reports on practices of health-care professionals with regard to body weight. Because the Arabs in Israel have high morbidity and mortality from diabetes and cardiovascular disease and obesity is a risk factor for both conditions. We hypothesized that the high prevalence of overweight and obesity among Israeli Arabs came from their relatively low socioeconomic and lifestyle characteristics compared to the rest of the population in the country, in addition we realized that a small proportion of Arabs are aware of the association between obesity and chronic diseases, and consequently their body weight is measured less often, and they are less frequently advised by health-care professionals to be physically active or to modify their diet.

SUBJECTS AND METHODS

A population-based cross-sectional study was performed with a total of 287 hospitalized patients at E.M.M.S hospital (Nazareth) from different departments (Internal, surgical and orthopedics words) aged 18 years and older (123 males and 164 females). Patients with history of eating disorders, Bariatric surgery, pregnancy, chronic/acute renal diseases, heart diseases, edema and anasacra were excluded. The study was approved by the institutional ethics committee. All participants provided a written informed consent. Data were collected between January 2012 and December 2012.

Complete medical history and data on demographic, socioeconomic and lifestyle characteristics; reports on height, current body weight and body weight were

Table 1. Characteristics of the study population.

	Men (43%) (n=123)	Women (57%) (n=164)	P value
Age(yrs)	53±2.3	51.16±1.48	0.34
Marital status Single Married Divorced	 33.8% 66.2% -	 29% 70% -	
Educational level Academic Non-academic	 29.3% 70.7%	 33.8% 66.2%	
Weekly exercise (hours)	0.95±0.13	0.9±0.09	
BMIkgm^{-2}	28.4±0.53	30.31±0.46	< 0.2
Waist circumference(cm)	104.3±1.67	101.4±1.57	0.8
Smoking status Current cigarette smoking (%)	 45.4%	 22%	

obtained from all patients 18 years and older. In addition, knowledge and behavior; and health-care professionals' practices with regard to body weight were obtained by interview. Anthropometric measurements, blood pressure measurements, and biochemical assessment were done and metabolic abnormalities were identified.

Anthropometric measurements

All measurements were conducted at hospital departments and performed twice by a trained team from January 2012 and December 2012. Body weight was measured using a digital electronic platform Scale with precision to 0.1 kg according to a standardized procedure (lightly dressed, without shoes). BMI was calculated by dividing weight in kg by height squared in meters. Patients were classified as follows: underweight (<20 kg/m2), normal (20–<25 kg/m2), overweight (25–<30 kg/m2), and obese (30+ kg/m2). Waist circumference (WC) was measured by trained interviewers using a nonelastic flexible tape at the smallest abdominal position in the narrowest zone between the lower costal rib and iliac crest, in the supine decubitus and horizontal positions. Abnormal waist circumference was defined as a value greater than 102 cm for men and 88 cm for women.

Assessment of dietary factors

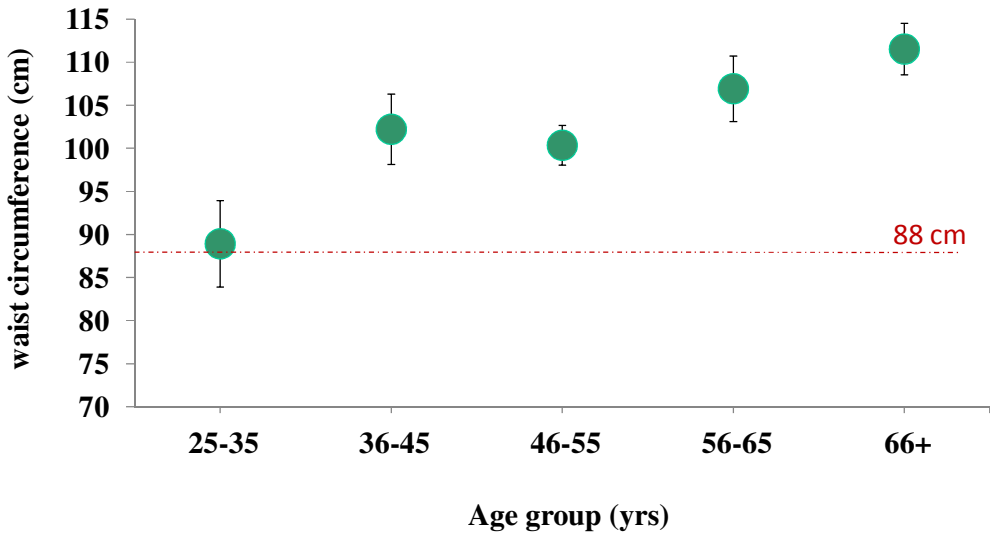
To assess the diet type and composition we used a semi-quantitative food frequency questionnaire (FFQ) which includes 74 items, each item in its role is subdivided to more specific questions. Questions about refined grain, whole grain, refined bread, whole bread, high and low fat dairy products, and intake of cheese and sweet soft drinks where our priority top questions and interest in addition to other questions. Trained dietarians data entry coders used our computer system to enter data into the database. The questionnaire was further adapted to capture the traditional dietary habits of the Arab population.

Data analysis

A statistical analysis was conducted using SPSS (Statistical Package for the Social Sciences) and for the quantitative data, Student's *t*-test was used to compare the sample means. Pearson's chi-squared test was used to compare the categorical data. Statistical significance was set at $P < 0.05$.

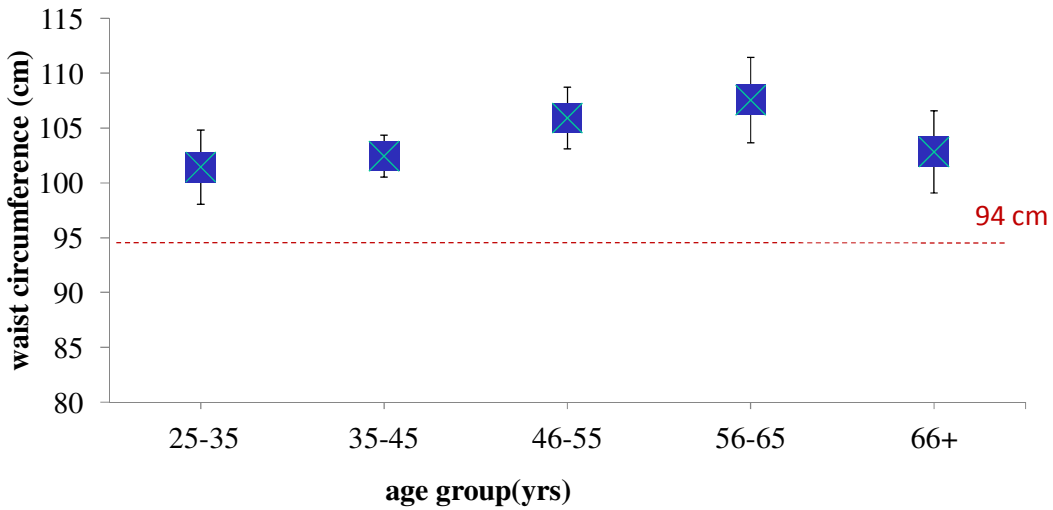
RESULTS

Characteristics of the study participants with the different variables are included in (Table 1). The study comprised a total of 287 participants, of whom (43%) were men and (57%) were women. The median age was (53±2.3) years for men and (51±1.4) for women. The marital status of both genders was as follow: (66.2%) of males were married, (33.8%) were single versus (70%) of females



Mean waist circumference ≥ 88cm by age group and gender (women). All age groups are up to the cut off point

Figure 1. Mean waist circumference in women

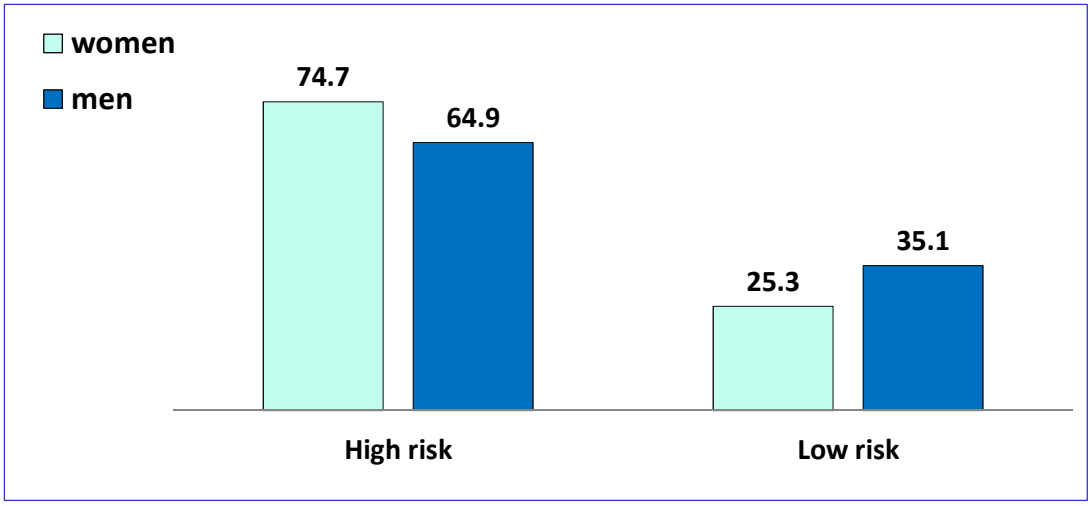


Mean waist circumference ≥ 94cm by age group and gender (Men). All age groups are up to the cut off point

Figure 2. Mean waist circumference in men

were married and (29%) were single. The smoking status was as follow: (45.4%) of males are smokers compared to (22%) of females. The proportion of males who had attained university level education was (29.3%) versus (33.8%) of females. The mean weekly hours exercise among males and females was (0.95±0.13) versus (0.9±0.09) respectively. A full response rate to the interviews and for the anthropometric measurements was observed.

Mean BMI was comparable amongst both males and females (28.4±0.53) versus (30.31±0.46) respectively (P-value < 0.2). This result indicated that all males suffered from overweight and almost all females suffered from obesity. The measurement of waist circumferences (cm) among males and females was as follow: (104.3±1.67) versus (101.4±1.57) respectively (Table 1). The mean waist circumference $\geq$ 88 cm and $\geq$ 94 was calculated by age group for female and males respectively (Figure 1 and 2). Both figures showed that all age groups are up to the cutoff points (88cm and 94cm). The interpretation of these results demonstrate abnormal and progressive increasing in waist circumference even after the age 65 in females and declining in waist circumference over the age 65. Figure 3. Showed the percentage of high and low



Percentage of high/low risk by gender. (High risk group definition; waist circumference ≥88, ≥94, in women and men respectively).

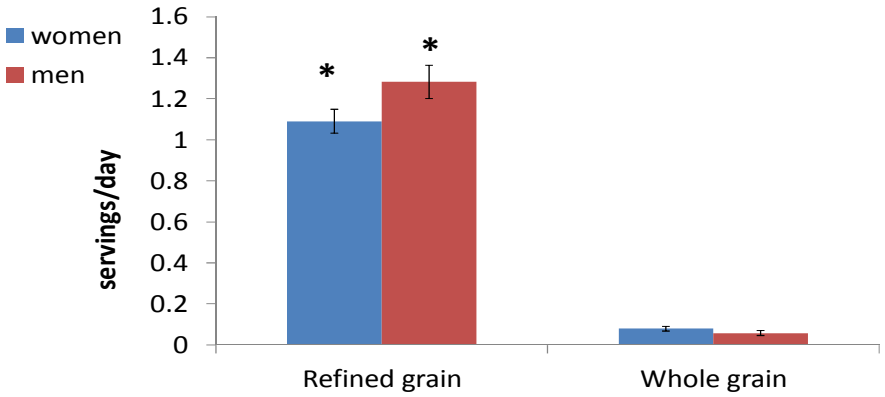
Figure 3. Percentage of high/low risk by gender

Table 2. Prevalence of type 2 diabetes and hypertension in high/low risk groups stratified according to waist circumference.

Subgroup	No. of cases of diabetes type 2 (%)	No. of cases of hypertension (%)
Low risk group	13 (26.53)	19 (29.68)
High risk group	35 (71.5)	45 (70.31)

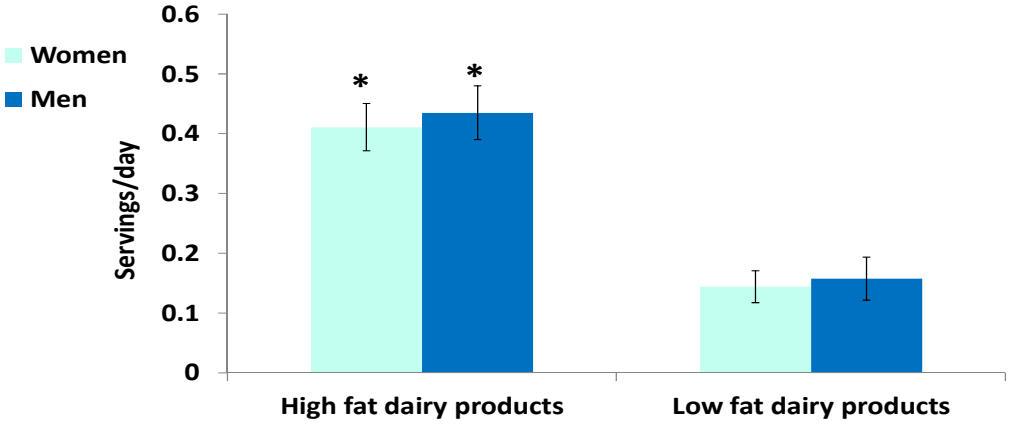
risk for hypertension and type 2 diabetes by gender according to waist circumferences (high risk WC ≥ 88 cm for females and WC ≥ 94 males). Figure 3. Showed that women with WC ≥ 88 cm had (74.7%) risk for hypertension and diabetes versus (64.9%) risk among males with WC ≥ 94; (P-value =0.03), we also observed that males and women with WC < 94 cm and WC < 88 had a lower risk for hypertension and diabetes (35% vs. 25.3%) respectively. Comparing the prevalence of type 2 diabetes among high risk group: WC ≥ 88 cm for females and WC ≥ 94 males and low risk group WC < 88 cm for females and WC < 94 for males was 35 (71.5%) vs. 13(26.5%) respectively, P-value = 0.002). Comparing the prevalence of hypertension among high risk group: WC ≥ 88 cm for females and WC ≥ 94 males and low risk group WC < 88 cm for females and WC < 94 for males was 45(70.3%) vs. 19(29.7%) respectively, P-value = 0.003) (Table 2).

In this study we also analyzed the eating habits among the Arab adults: we compared the median intake of refined grain and the whole grain intake (serving/day) in both genders. We observed that the median consumption of refined grain is significantly higher than the whole grain in both genders (P-value < 0.0001), (Figure 4). In addition, we compared the median intake of highly fat dairy products in both genders with low fat dairy (serving/day). We observed that the consumption of high fat dairy products is statistically higher than low fat dairy products (P-value <0.0001), (Figure 5). Regarding diabetes and food consumptions: we observed that the



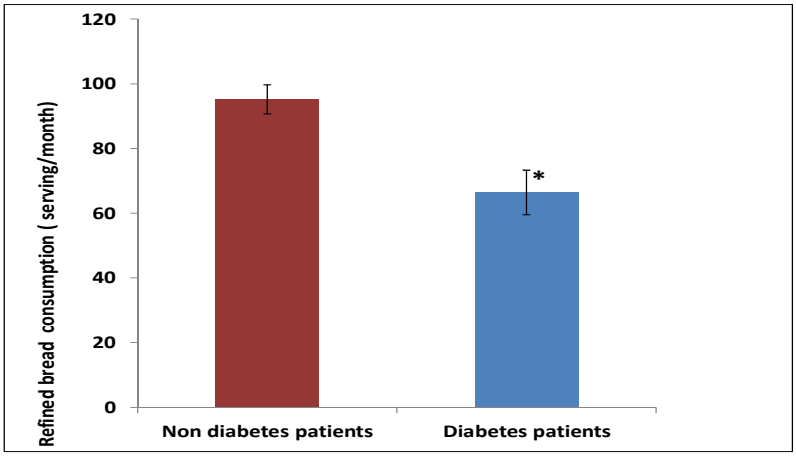
Median intake of refined grain/whole grain (servings/day) by gender. The consumption of refined grain higher significantly compared with whole grain, both in men and women (*; *P < 0.0001*).

Figure 4. Median intake of refined grain/whole grain (servings/day) by gender.



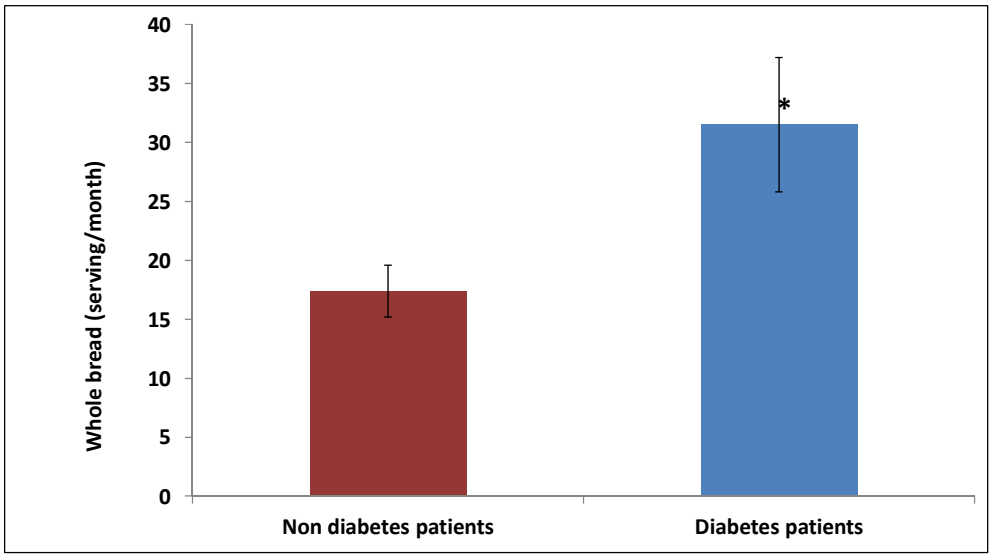
Median intake of high/low fat dairy products (servings/day) by gender. The consumption of high fat dairy products higher significantly than low fat (*; *P < 0.0001*)

Figure 5. Median intake of high/low fat dairy products (servings/day) by gender



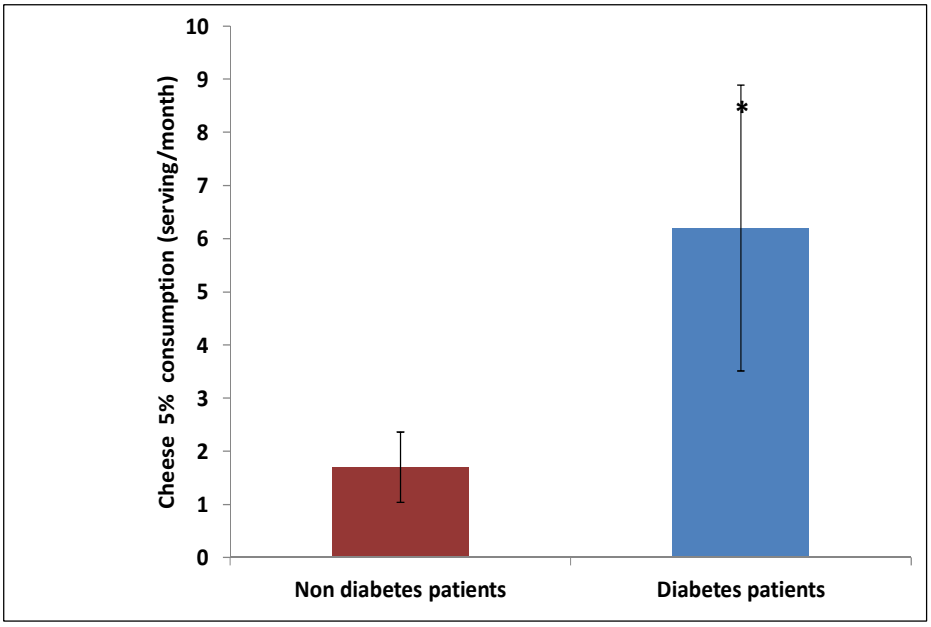
Median intake of refined bread (servings/month) by diabetes/non-diabetes patients. The consumption of refined bread by diabetes patients lower significantly compared with the non diabetes. *(*; P < 0.0001*)

Figure 6. Median intake of refined bread (servings/month) by diabetes/non-diabetes patients



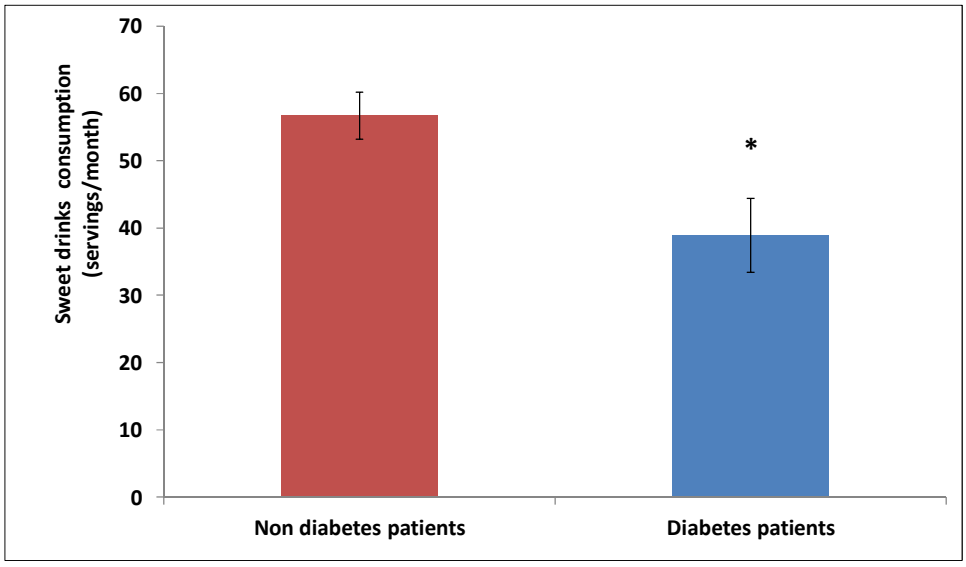
Median intake of whole bread (servings/month) by diabetes/non-diabetes patients. The consumption of whole bread by diabetes higher significantly compared with the non diabetes. (**; P < 0.024*)

Figure 7. Median intake of whole bread (servings/month) by diabetes/non-diabetes patients.



Median intake of cheese 5% (servings/month) by diabetes/non-diabetes patients. The consumption of cheese 5% by diabetes patients higher significantly compared with the non diabetes. *(*; P < 0.023)*

Figure 8. Median intake of low fat dairy products (servings/month) by diabetes/non-diabetes patients.



Median intake of soft drinks manufactured (servings/month) by diabetes/non-diabetes patients. The consumption of soft drinks manufactured by diabetes patients lower significantly compared with the non diabetes. *(*; P < 0,008)*

Figure 9. Median intake of soft drinks manufactured (servings/month) by diabetes/non-diabetes patients

consumption of refined bread by diabetics patients was significantly lower comparing with non diabetics subjects (P-value <0.001), (Figure 6), and the consumption of whole bread by diabetics patients was significantly higher compared with non diabetics patients (P-value <0.024), (Figure 7). The median consumption of low fat products (cheese 5%), by diabetics patients was significantly higher compared with the non diabetics subjects (P-value <0.023), (Figure 8), in addition, the consumption of soft sweet drinks by diabetic patients was significantly lower than non diabetic subjects (P-value <0.008), (Figure 9).

In summary, the results of our study indicate that rates of abnormal waist circumferences (WC) in both genders in all age groups are high, and WC surprisingly continue to increase progressively even after the age 65 in females. We also observed that increasing in WC as it was shown in our study is associated with increased risk for hypertension and diabetes. Interestingly, we noticed that the Arab population eating regime is disorganized and usually without awareness and control. Indeed, we observed that unhealthy diet dominate in Arabic kitchens such as high carbohydrates, low fiber and high fat diet consumption. These results are in conflict with the famous known healthy diet in the Middle East known as “Mediterranean diet”, rich in vegetables, fruits, high fiber and low fat diet.

DISCUSSION

Over the last few decades, the escalating prevalence rates of overweight and obesity have widely recognized globally as pandemic and have become a major public health challenge in developed countries that predisposes to a high risk of morbidity and premature mortality. Similar phenomenon is dramatically raising attention and emerging clearly in most developing countries and increasing progressively in the Arab world including the Arab community in Israel (Yumuk, 2005; Rennie et al., 2005; Ogden et al., 2007).

Overweight and obesity is considered one of the leading health concerns, involving all age and socioeconomic groups. Physiologically, body weight is coordinated through a complex system involving interactions between the various components of energy balance, together with feedback complex mechanisms that regulate appetite, energy intake and energy consumption. In humans, overload weight results from prolonged energy imbalance, with the overload energy stored as body fat which leads to an increase in adipose tissue mass. Being overweight or obese is powerfully linked with various chronic diseases including type 2 diabetes, cardiovascular disease, hypertension, some cancers, and with psychological health consequences and eating disorders (Carterson et al., 2004; Weinstein et al., 2006; Huang et al., 1998; Samanic et al., 2006). The underlying causes of overweight and obesity are multifactorial; result in a change in lifestyle (i.e. less physical activity) and inadequate eating habits. Indeed, Diet and physical activity are central to energy balance, but are directly and indirectly influenced by a wide range of variables such as socioeconomic, environmental,

behavioral, genetic and physiological factors. For many subjects, overweight is hard to avoid and very tough to overturn. Nevertheless, obesity is actually a complex disorder and, consequently, involves a multifaceted prevention ways and/or treatment strategies, which means that there is no universal treatment that would be beneficial for every obese patient; finding strategies to prevent the development of obesity are of critical importance to reduce the population burden of obesity and obesity related disorders. The findings of this study stressed that cultural attitudes may underlie the high prevalence of obesity among adult Arab population and confirm the data from earlier study reports of a high prevalence of overweight and obesity among Arab population in Israel (Kalter-Leibovici et al., 2007). However, we conducted this cross-sectional study of a population-based sample of hospitalized Arab patients, to examine the relationship between dietary composition, BMI and WC. To deeply examine the phenomenon of obesity among adult Arab population and to ascertained previous finding we used extended questionnaire which addressed several topics related to nutrition and dietary pattern especially by examining the intake of refined grain, whole grain, refined bread, whole bread and fat intake and their relationship to metabolic diseases. It is well known that bread is the main staple in the Arab's diet and consumed widely in every home. Decades ago bread was homemade by whole-wheat flour, as traditional unleavened bread, and today the consumed bread is almost store-bought or commercially produced white-flour bread, indeed, this one of many examples that describes the transition from traditional diet to the modern lifestyle characterized by low fibers and high fat dietary patterns. In fact, during the past five decades, Arab community in Israel, which represents more than fifth of the total population in the country, has undergone major transitions and changes in lifestyle – from agricultural to predominantly urban (Abramson et al., 1979). Many factors influenced the transition from the traditional diet style to the westernized lifestyle patterns in the Arab minority in Israel: First and foremost the changes in the economy, modernization, industrialization and socioeconomic status in addition to the influence effect of the surrounding western diet style consumed by the majority population in the country. "Dietary acculturation" or adapting the eating patterns of the majority resulted in rapid changes in diet and physical activity patterns. Adopting less healthy dietary patterns, and relinquishing healthy dietary prototypes, such as higher intake of fibre-rich products in form of legumes and whole grain products are both negative parts of the acculturation process.

Competing interests

The authors declare that they have no competing interests.

Authors' contributions

BB – Participated in the study design, and collection of data, performed part of the tables and figures.
AAN – Participated in the collections of data and study design, analyzed part of the data, and helped in making part of the tables and figures.
BA – Conceived the study, and participated in its design and coordination and wrote almost all manuscript (introduction and discussion) and helped to draft the manuscript.

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