Obesity among Arabs and Jews in Israel: A Population-Based Study

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Abstract

Background: Arabs in Israel have high morbidity and mortality from diabetes and cardiovascular disease. Obesity is a risk factor for both conditions.

Objectives: To investigate the prevalence of obesity (body mass index > 30 kg/m^2), subjects' knowledge and behaviors, and their reports on practices of health-care professionals regarding body weight among Arabs and Jews.

Methods: The study participants (n=880) were randomly sampled from the urban population of the Hadera district in Israel. Data on demographic, socioeconomic and lifestyle characteristics; reports on height, current body weight and body weight at the age of 18 years; knowledge and behavior; and health-care professionals' practices with regard to body weight were obtained by interview. Anthropometric measurements were performed subsequently.

Results: Information on BMI was available on 868 participants (49% Arabs, 49% women, median age 46 years). Although the median BMI did not differ significantly between Arabs and Jews at age 18, the prevalence of current obesity was 52% in Arab women compared to 31% in Jewish women ($P < 0.001$), and 25% in Arab men compared to 23% in Jewish men ($P = 0.6$). On multivariate analysis, obesity was significantly associated with age, BMI at the age of 18 years, leisure time physical activity and cigarette smoking, but not with ethnicity. Fewer Arabs reported measuring their body weight and Arab women were less frequently advised to maintain an active lifestyle.

Conclusions: The high prevalence of obesity among Arab women may be explained by lifestyle characteristics. Prevention of obesity in Arabs should be directed at women and should start preferably before adulthood.

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Arabs are the largest ethnic minority in Israel, comprising almost one-fifth of the total population. More than 80% of the Arabs in Israel are Muslim [1]. During the past five decades, Arab society in Israel has undergone major changes in lifestyle – from agricultural to predominantly urban [2].

Compared to the Jewish population Arabs in Israel are disadvantaged. They have a far higher unemployment rate and an inferior level of education [1]. Until 1995, 26% of the Arab population were not covered by comprehensive health insurance, compared to only 2% of the Jewish population [3]. Since 1995, with implementation of the National Health Insurance law, *all* Israeli citizens are covered by comprehensive health insurance and have access to primary, secondary and tertiary health care. Nevertheless, there are marked health disparities within the population of Israel. The Muslim Arab minority has a higher infant mortality rate and a shorter lifespan compared to the Jewish population [4].

Cardiovascular and diabetes-related morbidity and mortality rates are significantly higher among Muslim Arabs than among Jews in Israel, especially in women [4-8]. While mortality from ischemic heart disease and stroke declined significantly in Israel during the past few decades, the decline was more modest among Arabs [8]. Obesity, an established risk factor for diabetes [9,10] and cardiovascular disease [11], may be one of the causes of these health disparities. A high prevalence of obesity has been reported in native and immigrant Arab populations, and was attributed to rapid urbanization leading to a sedentary lifestyle, together with increasing availability of food [12-14].

The current study examined the prevalence of obesity among Muslim Arabs and Jews in Israel, and the socioeconomic and lifestyle characteristics associated with it. We also evaluated participants' knowledge and behavior, and their reports on practices of health-care professionals with regard to body weight. Our hypothesis was that Arabs have a higher prevalence of obesity compared to Jews due to differences in socioeconomic and lifestyle characteristics. We also hypothesized that compared to Jews, a smaller proportion of Arabs are aware of the association between obesity and heart disease, that their body weight is measured less often, and that they are less frequently advised by health-care professionals to be physically active or to modify their diet.

Subjects and Methods

This is a population-based cross-sectional study. The study participants (n=880) were derived from a random sample of the urban population of the Hadera district in Israel, and divided equally according to ethnicity (Arab or Jewish), gender, and four 10 year age strata. Non-responders (people who could not be

BMI = body mass index

traced or refused to participate) were substituted by other individuals drawn from a random sample and matched for gender, age, ethnicity and town. Since no data have been published on the prevalence of obesity among Arabs and Jews at that time (2001), the sample size calculation was undertaken to allow the detection of an odds ratio of 2 between Arabs and Jews for self-reported diabetes [4], with a two-sided significance level of 5% and 90% statistical power, using a Mantel-Haenzel procedure stratified for age and gender [15]. The study was approved by the institutional ethics committee. All participants provided a written informed consent. Data were collected between January 2002 and December 2005.

Interviews and measurement

The study questionnaire was translated into Hebrew and Arabic. A process of translation and back-translation ensured the reliability of the questionnaire across languages. The interviews were conducted by trained interviewers in Arabic or Hebrew in the participants' homes. Participants were asked what their height and current body weight was, as well as their body weight at the age of 18 – when axial growth is usually completed. Weight gained after this age is usually attributed to an increase in fat tissue mass.

Study participants were asked if they knew what factors were associated with greater risk for heart disease, and to name these factors in an open-ended question. To evaluate behavior related to body weight, we asked them whether they have a bathroom scale and if they use it to measure their body weight periodically. They were asked whether their body weight was measured during visits to the primary care clinic within the last 5 years, whether they had ever been informed by a physician that they were overweight, and whether they had ever been advised to maintain an active lifestyle or given dietary advice for weight control, diabetes, hypertension, and/or hyperlipidemia. Dietary intake was assessed using a quantified food frequency questionnaire that included over 240 different food items. The questionnaire was developed for the Jewish population and further modified to include local Arab foods [16]. We obtained detailed information on social and demographic characteristics, self-defined religious attitudes, cigarette smoking habits, and the type and duration of leisure and non-leisure physical activity. Measurements of height and weight and waist circumference were performed by trained study nurses.

Medical record abstraction

To compare between participants and non-responders, we obtained information on the prevalence of obesity from the primary care medical records in 501 of the original 880 sampled individuals.

Statistical analyses

Data entry and analyses were performed using the 8.2 release of SAS PC and the 12.0 release of SPSS computer software. The housing density was calculated as the number of persons living in the household divided by the number of rooms. Using the information on self-reported and measured height and current body weight, and reported body weight at age 18, we calculated the current body mass index (reported and measured) and BMI at the age of 18, by dividing body weight (in kilograms) with the squared value of height (in meters). Based on self-reported BMI, we further calculated the expected BMI using gender-specific regression models [see Appendix]. We used the expected BMI where actual measurements were not available. Obesity was defined as having a BMI $\geq$ 30 kg/m^2. Abnormal waist circumference was defined as a value greater than 102 cm for men and 88 cm for women [17].

We employed the principal component analysis for data reduction of the socioeconomic variables. Two new variables were produced; the first variable was the number of years of schooling completed by the participant and the occupation with the highest prestige level of either the participant or his/her spouse. The second variable referred to housing density. Together, the two variables explained almost 90% of the total variance.

Since some of the continuous variables did not exhibit a normal distribution, information on the distribution of continuous variables is presented as median and range. Associations of contingency tables were tested using the chi-square statistic, while the associations between obesity and continuous variables were tested using the unpaired *t*-test and the Mann-Whitney test, as appropriate. We used multivariate logistic regression to test for variables that are significantly and independently associated with obesity. The independent variables entered into the multivariate model were those associated with obesity on univariate analysis, with a P value $\leq$ 0.1. We used multivariate logistic regression to test for variables that are significantly associated with participants' knowledge and behavior, and their reports on practices of health-care professionals. The independent variables entered into these models were participants' age, gender, ethnicity, and status of obesity. All analyses were two-tailed and α was set at 0.05.

Results

The study comprised a total of 880 participants, of whom 439 (50%) were Arabs and 440 (50%) were men. The median age was 46 years (range 26–67). The overall response rate to the interviews in the original sample was 79%. Twelve percent of the people in the original sample refused to participate and 9% could not be traced. Anthropometric measurements were performed in 612 of the 880 participants (69%), of whom 48% were Arabs. The Pearson's correlation coefficients for the correlation between the natural logarithm (Ln) of calculated BMI based on self-reported body height and weight, and that based on actual measurements, were 0.93 in Jewish men, 0.83 in Arab men, 0.91 in Jewish women and 0.87 in Arab women.

Characteristics associated with obesity

Information on current BMI was available for 868 participants (99%). Of these, 284 (32%) were obese. Arab women had a higher BMI (median 30.4 kg/m^2, range 17.1–56.1) compared to Jewish women (median 26.5 kg/m^2, range 17.6–52.0) (P < 0.001). Likewise, the prevalence of obesity was significantly higher among

Arab women compared to Jewish women (52.2 vs. 31.4%, respectively, $P < 0.001$). The BMI values among Arab men (median 27.4 kg/m^2, range 16.7–43.8) and Jewish men (median 27.1 kg/m^2, range 18.0–45.5) did not differ significantly ($P = 0.23$). The prevalence of obesity was 25.1% among Arab men and 23.2% among Jewish men ($P = 0.6$) [Figure 1]. BMI at the age of 18 was similar in the two ethnic groups in both men and women; the median BMI (kg/m^2) values at the age of 18 were 22.1 (range 14.7–31.5) among Arab men vs. 22.5 (range 13.8–36.3) among Jewish men ($P = 0.46$). The corresponding median BMI values at the age of 18 among Arab and Jewish women were 20.3 (13.7–31.1) and 20.6 (14.5–35.4), respectively ($P = 0.32$). Waist circumference measurements were obtained in 612 participants (69%). While the prevalence of abnormal waist circumference was similar among Arab and Jewish men (38.1% and 37%, respectively, $P = 0.9$), it was significantly higher among Arab women compared to Jewish women (67.7% vs. 42%, $P < 0.001$).

On univariate analysis, obesity was associated with Arab ethnicity [Table 1], but the association was no longer statistically significant on multivariate analysis (adjusted odds ratio 1.16, 95% confidence interval 0.72–1.87). Ethnicity was not found to be significantly associated with obesity after further adjustment for parity on multivariate analysis that included women participants only (data not shown).

The following variables were significantly associated with obesity on multivariate analysis: age (adjusted OR for 10 year increment: 1.38, 95%CI 1.10–1.74); BMI at the age of 18 years (adjusted OR for 1 unit increment: 1.25, 95%CI 1.17–1.33); current cigarette smoking (adjusted OR 0.51, 95%CI 0.32–0.79); and being engaged in any leisure time sports activity (adjusted OR 0.65, 95%CI 0.45–0.95). We also found a significant interaction between age and gender (OR 1.51, 95%CI 1.08–2.10), meaning that the association between age and BMI was more pronounced among women [Figure 1].

Table 1. Demographic, social and lifestyle characteristics by status of obesity

	Non-obese (n=584)	Obese (n=284)	P
Age (yrs)*	43 (26–67)	51 (26–66)	< 0.001
Gender (% male)	57.0	37.3	< 0.001
Ethnicity (% Arabs)	45.2	57.7	0.001
BMI at 18 (kg/m2)*	21.0 (13.8–33.8)	22.7 (13.7–36.3)	< 0.001
Years of education*	12 (0–23)	10 (0–28)	< 0.001
Employed (%)	62.3	41.8	< 0.001
Housing density (persons/room)*	1.0 (0.33–7.0)	1.0 (0.25–6.0)	0.16
Self-defined religious attitudes (%)			< 0.001
Secular	40.2	23.4	
Observant	39.2	40.8	
Religious	20.6	35.8	
Current cigarette smoking (%)	36.5	19.7	< 0.001
Any leisure time physical activity (%)	43.1	30.7	< 0.001
Work-related physical activity* (hrs/day)	0.3 (0-15)	0.3 (0-9)	0.35
Total daily energy intake (kcal/day)*	2,230 (560–7,510)	2,000 (640–6,530)	< 0.001
Percent of daily calories derived from carbohydrates (%)*	52.0 (26.9–84.1)	51.2 (27.2–76.6)	0.15
Percent of daily calories derived from protein*	16.6 (6.1–29.5)	18.0 (8.3–28.5)	< 0.001
Percent of daily calories derived from fat*	34.0 (15.0–55.9)	34.0 (15.4–56.3)	0.76

* Median (range)

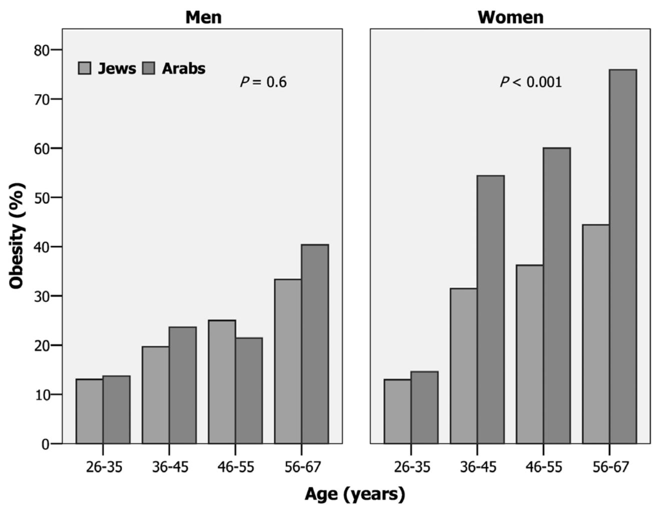

Figure 1. Prevalence of obesity by age, ethnicity and gender

Knowledge and behavior related to body weight

Arabs and Jews named obesity as a risk factor for heart disease with a similar frequency. Arab participants reported less frequently having a bathroom scale. Fewer Arabs, women especially, reported measuring their body weight periodically [Table 2].

Practices of health-care professionals in relation to body weight

The proportion of Arabs, women especially, reporting that their body weight had been measured during visits to the primary care clinic within the last 5 years was higher than among Jews [Table 3]. This finding persists after further adjustment for diabetes, total number of chronic diseases, and number of visits to the primary care clinic within the last year (data not shown). Altogether, the proportion of participants measuring their body weight either at home or at the primary care clinic was similar among Arabs and Jews (74% vs. 76%, respectively, $P = 0.5$).

While Arab men reported more frequently than Jewish men that they had been advised by a physician and/or a nurse to maintain an active lifestyle, the opposite was true for Arab women. Among obese people, less than half reported ever having been informed by a physician that they were overweight and only one-fifth reported ever receiving dietary advice for weight control [Table 3].

A diagnosis of obesity was recorded in 32 of the 150 medical records of obese participants (21%). This proportion did not differ

OR = odds ratio
CI = confidence interval

Table 2. Knowledge and behaviors related to body weight by status of obesity

	Men				Women				
	Jews		Arabs		Jews		Arabs		
	Non-obese (n=169)	Obese (n=51)	Non-obese (n=164)	Obese (n=55)	Non-obese (n=151)	Obese (n=69)	Non-obese (n=100)	Obese (n=109)	OR Arabs vs. Jews (95% CI)*
Naming obesity as a factor associated with greater risk for heart disease (%)	13.0	15.7	14.6	27.3	16.6	20.6	30.0	16.7	1.32 (0.93–1.88)
Reporting having a bathroom scale (%)	61.9	66.7	53.0	50.9	65.3	66.2	54.0	45.8	0.59 (0.45–0.78)
Reporting measuring their body weight periodically (%)	65.1	62.7	56.1	47.3	74.7	76.5	51.0	52.3	0.64 (0.44–0.94)**

* Comparisons between Arabs and Jews, adjusted for age, gender and obesity (main effect only).

** The interaction term of gender by ethnicity was statistically significant: OR 0.55 (95%CI 0.32–0.98), $P = 0.041$.

Table 3. Self-reports on practices of health-care professionals in relation to body weight

	Men				Women				
	Jews		Arabs		Jews		Arabs		
	Non-obese (n=169)	Obese (n=51)	Non-obese (n=164)	Obese (n=55)	Non-obese (n=151)	Obese (n=69)	Non-obese (n=100)	Obese (n=109)	OR Arabs vs. Jews (95% CI)*
Body weight was measured in the clinic within the last 5 years (%)	26.8	25.5	32.3	35.2	20.3	35.8	39.4	55.1	1.39 (0.91– 2.10)**
Advised by a physician/nurse to maintain an active lifestyle (%)	19.5	29.4	25.6	47.3	15.2	29.0	11.1	24.3	1.62 (1.05– 2.51)†
Received dietary advice for cardiovascular risk factor managementr (%)‡	17.2	42.0	16.5	34.5	15.2	47.8	12.0	32.1	0.78 (0.55– 1.12)
Informed by a physician on being overweight (%)	–	41.2	–	49.1	–	31.3	–	47.2	1.56 (0.96–2.53)§
Received dietary advice for weight control (%)	–	19.6	–	21.1	–	22.4	–	22.4	0.98 (0.55– 1.74)§

* Comparisons between Arabs and Jews, adjusted for age, gender and obesity (main effect only).

** The interaction term of gender by ethnicity was statistically significant: OR 1.87 (95%CI 1.04–3.38), $P = 0.037$.

† The interaction term of gender by ethnicity was statistically significant: OR 0.47 (95%CI 0.24–0.92), $P = 0.027$.

‡ Including obesity, hypertension, diabetes and/or hyperlipidemia.

§ Comparisons between Arabs and Jews in obese people only, adjusted for gender and age

significantly by ethnicity (21% in Arabs and 34% in Jews, P = 0.3).

Comparisons between responders and non-responders

The response rate to the interviews in the original sample was 90% among Arabs and 68% among Jews ($P < 0.001$). Non-responders were on average 3 years younger than participants (P = 0.07). The proportion of men among non-responders was 44% compared to 51% among participants ($P = 0.08$). According to the medical records, the prevalence of obesity was 9% in both participants and non-responders (age-adjusted OR 1.08, 95%CI 0.46–2.54).

Discussion

Our findings show a high prevalence of obesity and central obesity among Arab women. One of every two Arab woman was obese by the fourth decade of life, and three of four women were obese by the sixth decade of life. We found that the excess rate of obesity among Arabs is related to weight gained through adult life, since Arabs and Jews had similar gender-specific median BMI values at the age of 18. On multivariate analysis, obesity was associated with age, (especially among women), BMI at the age of 18 years, leisure time physical activity and cigarette smoking, but not with ethnicity.

Obesity was not significantly associated with current daily energy and macronutrient intakes on multivariate analysis. Interestingly enough, obese participants reported lower daily energy intake compared to non-obese individuals. Under-reporting of energy intake is common to most dietary studies, is unrelated to the dietary assessment tool, and is more frequent among overweight and obese individuals compared to lean persons [18].

Cultural attitudes may underlie the high prevalence of obesity among Arab women. Studies in Saudi Arabian women suggest that about one-third of overweight and obese women consider themselves to be of normal weight, and that awareness of body size is related to education [19,20]. Reports on ethnicity or race-related differences in body size preferences and perception in the western population are equivocal [21,22].

Participants' knowledge on the health consequence of obesity did not differ by ethnicity. Arab women were less frequently advised to maintain an active lifestyle. This may be due to perceived cultural barriers and lower access of Arab women to public sports facilities.

Lifestyle interventions aiming to lose weight and increase physical activity are effective and prevent diabetes [23]. Yet, we found that the performance of health professionals in promoting prevention of obesity through practices such as weight measurement and advice to exercise or diet was inadequate. Overall, the proportion of people reporting such practices rarely exceeded 50% in any given gender, ethnic or body weight-specific subgroup. Furthermore, information confirming the presence of obesity was available in the medical records of only one-fifth of obese participants.

Study limitations and strengths

This study has limitations. The response rate among Jews was lower than among Arabs. However, we found a similar age-adjusted rate of obesity among participants and non-responders. To reduce selection bias, non-responders were substituted by other individuals matched for age, gender, ethnicity and place of residence.

The association between current obesity and BMI at age 18 is based on recalled past body weight. Recalled information on body weight may be biased. Nevertheless, the association between measured childhood BMI and adult adiposity was previously reported [24]. Studies have found a strong correlation between recalled and previously measured weight when recalled 4–40 years later (correlation coefficients range between 0.73 and 0.94) [25]. In some studies, men and women with high current BMI underestimate their past weight to a greater degree than others. Thus, we assume that the association between BMI at the age of 18 and current obesity is not spurious.

The current study provides comprehensive investigation of the prevalence and associated risk factors of obesity, people's knowledge and attitudes, and the practices of health-care professionals for prevention of obesity in two distinct ethnic populations.

Conclusions

Efforts to promote an active lifestyle and maintaining a normal body weight should be targeted at Arab women where the need is greatest. Prevention should start early, preferably before adulthood. The association between Arab ethnicity and obesity can most probably be explained by lifestyle characteristics.

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Appendix

Linear regression models for prediction of measured BMI using BMI values based self-reported body weight and height

Formula for men:

$\text{Ln BMI}_{\text{predicted}} = 0.433 + 0.866 * \text{Ln BMI}_{\text{reported}} + 0.001 * \text{Age} - 0.007 * \text{ethnicity}$

Formula for women:

$\text{Ln BMI}_{\text{predicted}} = 0.201 + 0.949 * \text{Ln BMI}_{\text{reported}} + 0.001 * \text{Age} + 0.021 * \text{ethnicity}$

Where ethnicity is 1 in Arabs and 0 in Jews