Letter to the Editor

The Strength of No Association between Diet Quality Indices and Simple Indices of Overweight/Obesity

Dear Editor

In a recent issue of AIM, I read an article written by Asghari, et al. which tried to explain if diet quality is associated to simple indices of overweight/obesity. It is not necessary to emphasize that both childhood and adulthood obesity are of growing concern in the whole world. Reilly and Dorosty in 1999 explained an epidemic of childhood obesity in UK[1] and several other studies i.e. Kelishadi, et al. (2003), Dorosty, et al. (2002), and Maddah (2008) suggest an increasing prevalence of childhood obesity in Iranian children[2–4] too. Many other studies confirm that obesity prevalence in adults is increasing very quickly. Ayatollahi and Ghoreshizadeh (2010) have shown that obesity prevalence in Shirazi men has doubled (from 4.7% to 10.5%) and in women increased more than four times (from 5.1 to 22.5%) during last 14 years.[5] WHO European Region Office now warns a tripling in obesity prevalence in the whole world in the 21st century.[6]

Obesity is a multifactorial syndrome involving genetic, environmental, and behavioural alterations. In theory, energy intake should be higher than that of the energy expenditure, to cause the body to increase fat storage and, hence, gradually make the person obese.[7] Many different studies worldwide have shown association between food intake and obesity in both children and adults.[8] The same results have been presented in Iranian studies too. Hojjat and Dorosty (2005) shown that daily energy and macronutrient intake as well as frequency of consuming fast foods and fizzy drinks were higher in obese children, compared to non-obese ones.[9] In the same study, parental obesity was very much influencing the probability of being an obese child. This indicates the importance of the role of genetic in obesity of next generation. On the other hand, their study showed that less active children who used to watch TV and/or play with electronic devices are at higher risk of obesity.

Due to the role of dietary intake and physical activity in this era, many activities are conducted to reduce obesity prevalence in different parts of the world. Authors and experts used to suggest those who are obese or at risk of obesity to eat more fruits and vegetables; reduce the time watching TV or playing video games; and eliminating as much fast foods as possible, from their diets.[10]

It has been said that the obesity epidemic has developed over time and there's no quick fix for it; but schools, parents, physicians, nutritionists, and psychologists need to get involved before a new generation develops that has multiple health problems, which could have been avoided by early behaviour modifications.[6] As an example of acting to combat obesity, two years ago the United States President has signed the Healthy, Hunger-Free Kids Act of 2010, which affected 31 million children in the United States who used to eat lunch through school programs by reducing salt, sugar, and fat in lunches.[11]

Asghari, et al. (2012) have analysed a cohort data from the Tehran Lipid and Glucose Study (a population lab, which were followed up about 7 years by now), to find out how diet quality of an Iranian population is associated with simple indices of overweight/obesity. Their results showed no association between diet quality and obesity. This finding is not in agreement with Esmailzadeh and Azadbakht's study (2008), which suggests an association between dietary pattern and general obesity as well as central adiposity among Iranian women.[12] At the same time, the results of the study by Asghari, et al. are in contradiction with those of Bazhan, et al. (2011)[13] too. In that study, obese girls had a significantly higher energy intake from carbohydrates and fats than their normal- weight counterparts.

Asghari, et al. (2012) sample size (192 subjects remained from originally 283 people in a 6.7 years cohort study) was reasonable and their methodology was proper too. On the other hand, Esmailzadeh and Azadbakht have studied 486 women aged 40 – 60 years in their cross-sectional study, which is acceptable. The cross- sectional study of Bazhan, et al. (2011) had a sample size of 400 adolescent females aged 14 – 17 years as well.

Table 1 shows the results of the study by Azadbakht in which women who used to follow a western diet, had the highest possibility to be generally and centrally obese, compared to other dietary patterns. In addition, the results of the study by Bazhan (Table 2) indicate that obese adolescents used to take more carbohydrate and fat via their diets. A part of the results of the study by Asghari is shown in Table 3. The original table (which can be found in this issue of AIM) is slightly hard to interpret, since there are plenty of information shown in a single table.

However, it is very difficult to criticise any of these studies and hence, it is logical to suggest repeating similar studies in different Iranian populations i.e. in several parts of Tehran and other Iranian cities before a definite judgement can be made. Meanwhile, the previous suggestions regarding the avoidance of non-healthy diets should be continued.

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Table 1. Results of the study by Esmailzadeh and Azadbakht ; multivariate adjusted odds ratios for general obesity and central adiposity across quintiles of dietary pattern scores in women.

	Quintiles of healthy pattern score				Quintiles of western pattern score				Quintiles of Iranian pattern score			
	1	3	5	*P*-trend[7]	1	3	5	*P*-trend	1	3	5	*P*-trend
General obesity[2]												
Crude	1.00	0.62 (0.34–1.10)	0.28 (0.14–0.53)	<0.01	1.00	2.01 (1.07–3.76)	2.73 (1.46–5.08)	<0.01	1.00	0.87 (0.47–1.58)	0.83 (0.45–1.51)	0.29
Model I[3]	1.00	0.64 (0.36–1.09)	0.29 (0.14–0.55)	<0.01	1.00	1.98 (1.03–3.68)	2.70 (1.41–5.01)	<0.01	1.00	0.83 (0.45–1.62)	0.81 (0.47–1.50)	0.37
Model II[4]	1.00	0.69 (0.36–1.15)	0.34 (0.17–0.63)	<0.05	1.00	1.91 (1.00–3.55)	2.61 (1.33–4.85)	<0.01	1.00	0.84 (0.49–1.57)	0.84 (0.44–1.48)	0.55
Model III[5]	1.00	0.76 (0.38–1.29)	0.41 (0.20–0.75)	<0.05	1.00	1.85 (0.94–3.41)	2.48 (1.20–4.61)	<0.01	1.00	0.81 (0.54–1.59)	0.88 (0.49–1.45)	0.74
Central adiposity[6]												
Crude	1.00	0.53 (0.28–0.98)	0.30 (0.16–0.55)	<0.01	1.00	2.79 (1.55–5.01)	5.74 (2.99,10.9)	<0.01	1.00	2.15 (1.18–3.90)	1.54 (0.86–2.74)	0.11
Model I	1.00	0.55 (0.30–0.97)	0.33 (0.19–0.55)	<0.01	1.00	2.74 (1.51–4.97)	5.70 (2.97–10.9)	<0.01	1.00	2.09 (1.14–3.82)	1.50 (0.86–2.71)	0.18
Model II	1.00	0.58 (0.37–1.02)	0.39 (0.21–0.60)	<0.01	1.00	2.66 (1.43–4.81)	5.57 (2.91–10.8)	<0.01	1.00	2.10 (1.12–3.74)	1.56 (0.89–2.68)	0.29
Model III	1.00	0.66 (0.37–1.11)	0.48 (0.27–0.67)	<0.05	1.00	2.42 (1.34–4.59)	5.33 (2.85–10.6)	<0.01	1.00	2.08 (1.09–3.65)	1.61 (0.94–2.61)	0.41

Table 2. Results of the study by Bazhan et al. (2011) on types of food consumed (g/d) by overweight/obese and normal- weight subjects.

Food	Overweight/obese *n* = 80	Normal *n* = 320
Cereals (rice, bread, pasta)	576.7 ± 211.2*	429.5 ± 131.1
Meat and meat products (red meat, sausages, hamburgers)	48.4 ± 22.3*	29.6 ± 19.3
Poultry and fish	22.8 ± 16.3	24.5 ± 21.1
Eggs	34.9 ± 24.4	29.3 ± 30.5
Dairy products (milk, yogurt, cheese)	226.9 ± 197.5	215.2 ± 180.2
Vegetables (dark green leafy vegetables, cruciferous vegetables, tomatoes, cucumbers, onion)	168.5 ± 116.6	174.2 ± 131.8
Fruits (citrus, banana, apple)	376.4 ± 256.4*	309.5 ± 207.3
Legumes (lentil, bean, pea)	84.3 ± 59.8	79.4 ± 52.2
Fats (vegetable fats, animal fats, butter)	45.4 ± 15.2*	27.1 ± 10.1
Cooking oils (corn oil, sunflower oil, soybean oil)	3.1 ± 8.3	1.9 ± 5.9
Sugar	35.4 ± 24.1	29.2 ± 21.6
Soft drinks	73.7 ± 126.7*	9.5 ± 51.1

Table 3. Part of the results of the study by Asghari et al. which show no difference between different diet groups and nutrient intake.

Components	MDS			HEI-2005			DQI-I		
	Criteria	Point	Score Range	Criteria	Point	Score Range	Criteria	Point	Score Range
Overall food group variety	—	—	—	—	—	—	Consumption of ≥ 1 serving from each food group/d	3	0–15
Within-group variety from protein source	—	—	—	—	—	—	≥ 3 different sources/d	5	0–5
							2 different sources/d	3	
							From 1 source/d	1	
							None	0	
Total vegetables	≥ Median	1	0 or 1	≥ 1.1 cup equiv /1000 kcal	5	0–5	≥ 100% recommendations*	5	0–5
	< Median	0		Otherwise	P		Otherwise	P	
Total fruits	≥ Median	1	0 or 1	≥ 0.8 cup equiv/1000 kcal	5	0–5	≥ 100% recommendations*	5	0–5
	< Median	0		Otherwise	P		Otherwise	P	
Total grains	—	—	—	≥ 3.0 oz equiv/1000 kcal	5	0–5	≥ 100% recommendations*	5	0–5
				Otherwise	P		Otherwise	P	
Protein	—	—	—	—	—	—	≥ 100% recommendations†	5	0–5
							Otherwise	P	
Calcium	—	—	—	—	—	—	≥ 100% recommendations†	5	0–5
							Otherwise	P	
Vitamin C	—	—	—	—	—	—	≥ 100% recommendations†	5	0–5
							Otherwise	P	
Iron	—	—	—	—	—	—	≥ 100% recommendations†	5	0–5
							Otherwise	P	
Fiber	—	—	—	—	—	—	≥ 100% recommendations‡	5	0–5
							Otherwise	P	
Total fat	—	—	—	—	—	—	≤ 30% of energy/d	6	0–6
							> 30–35% of energy/d	3	
							> 35% of energy/d	0	
Saturated fat	—	—	—	≤ 7% of energy/d	10	0–10	≤ 7% of energy/d	6	0–6
				≥ 15% of energy/d	0		> 7–10% of energy/d	3	
				Otherwise	P		> 10% of energy/d	0	
Cholesterol	—	—	—	—	—	—	≤ 300 mg/d	6	0–6
							> 300–400 mg/d	3	
							> 400 mg/d	0	
Sodium¶	—	—	—	1st decile	10	0–10	<15th percentile	6	0–6
				10th decile	0		≥85th percentile	0	
				Otherwise	P		Otherwise	P	
Empty calorie foods	—	—	—	—	—	—	≤3% energy/d	6	0–6
							>3–10% energy/d	3	
							>10% energy/d	0	
SoFAAS	—	—	—	≤ 20% of energy	20	0–20	—	—	—
				≥ 50% of energy	0				
				Otherwise	P				
Macronutrient ratio (CHO: protein:fat)	—	—	—	—	—	—	55–65:10–15:15–30	6	0–6
							65–68:9–16:13–32	4	
							50–70:8–17:12–35	2	
							Otherwise	0	
Fatty acid ratio	≥ Median PUFA/SFA	1	0 or 1	—	—	—	PUFA/SFA = 1–1·5; MUFA/SFA = 1–1·5	4	0–4
	< Median PUFA/SFA	0					PUFA/SFA = 0·8–1·7; MUFA/SFA = 0·8–1·7	2	
							Otherwise	0	

MDS = mediterranean diet scale, HEI-2005 = healthy eating index-2005, DQI-I = diet quality index-international, P = proportionately, SoFAAS = total calories from solid fat and added sugar, CHO = carbohydrate, PUFA = poly unsaturated fatty acid, SFA = saturated fatty acid, MUFA: mono unsaturated fatty acid. *Based on three energy levels introduced in Food Guide Pyramid 1992, †According to dietary reference intake recommendations, ‡> 20, 25 and 30 g for the three energy levels introduced in Food Guide Pyramid 1992, respectively, ¶Based on the distribution of sodium content of foods consumed by the study subjects.

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Authors' Reply

We appreciate the informative comments by Dorosty regarding our recently published article, entitled "the association between diet quality indices and obesity: Tehran Lipid and Glucose Study".[1] The studied target group was adults, which is not the same focused group raised by Dorosty in evaluating the association of diet and obesity.[2] Also, he has compared findings of our article with Esmailzadeh[3] and Bazhan's[4] studies. Esmailzadeh studied the association of the posteriori dietary pattern with adiposity in

a cross-sectional design among middle-aged women residents of Tehran.[3] Bazhan evaluated the macronutrient distribution and obesity among adolescent girls.[4] These cited papers have different study design, target group, and dietary intake assessment methods. In recent years, both posteriori and the priori dietary patterns have been used in the evaluation of diet and chronic diseases.[5,6] The posteriori dietary pattern is based on statistical modelling of dietary data, and the priori dietary pattern is the theoretical dietary pattern known as diet quality indices. Esmailzadeh focused on the dietary pattern in terms of posteriori method and Bazhan used neither of the priori and posteriori method in her study.

In our recently published article, in the Tehran Lipid and Glucose population-based cohort study, the performances of the priori dietary pattern including Mediterranean Diet Scale (MDS), Healthy Eating Index-2005 (HEI-2005), and Diet Quality Index-International (DQI-I) were compared in prediction of simple indices of overweight or obesity. No significant relationship between diet quality indices and obesity and abdominal obesity were found, indicating that the ability of diet quality indices to predict obesity and abdominal obesity depends on how well these indices correlate with changes in energy balance as the primary focus in obesity. The structure of indices is the determining factor in this area. More to the point is the fact that the indices do not allocate negative scores to energy intakes that were above energy requirements. Regarding MDS, as dietary pattern used in our study did not conform to the Mediterranean diet, it did not show the beneficial effect. The median intakes of fish, nuts, and whole grain were zero, indicating the low- frequency consumption of these foods. The energy density approach in HEI-2005 focuses on food and nutrient intakes in proportion to energy intake. Although this approach results in balance among food group intakes, it does not consider extra energy consumption. According to the scoring systems of the HEI-2005 and DQI-I, persons consuming over the recommended amounts for food groups receive full points. Therefore, these scores do not show the extent to which a person deviates from the recommended values, which can be considered a limitation for these indices. Therefore, it seems reasonable to people that the structure of the diet quality indices is crucial factor in determining their association with chronic diseases.

Considering the differences in genetic predisposition, environmental factors, and disease pattern in the different ethnicities, it seemed necessary to develop and promote country-based dietary indices to address the specific characteristics of dietary patterns in relation to disease.[7]

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