

# Pattern of dietary behaviour and obesity in Ahwaz, Islamic Republic of Iran

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## نمط السلوكيات الغذائية والسمنة في منطقة الأهواز، بجمهورية إيران الإسلامية

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خلاصة: من أجل دراسة العوامل السلوكية المصاحبة للنظام الغذائي، ولبحث تورُّع منسب كتلة الجسم، أجرينا مسحاً مقطوعياً في منطقة الأهواز بجمهورية إيران الإسلامية. وقد استعملنا مقياساً مركباً للسلوكيات الغذائية بُني على أساس الإجابات الشخصية على استبيان يشمل 24 بنداً حول وتيرة استعمال الأغذية، وذلك لتصنيف العادات الغذائية باعتبارها أفضل أو أقل ملاءمة من الوجهة الصحية. وكان عدد المجيبين على الاستبيان 1600 من أرباب العائلات من بين 150 000 مسكن احتضرت عشوائياً. وظهر أن الأغذية التي هي أقل ملاءمة من الوجهة الصحية كانت مرتبطة بالعمر والحالة الاقتصادية، وكانت السمنة المفرطة مرتبطة بالجنس الأنثوي وبالعمر (ويعكس ما عليه الحال في الأعمار التي تزيد على 65 سنة). إن التدخلات التي تستهدف من يأكلون أغذية أقل ملاءمة من الوجهة الصحية يجب أن تكون مستندة إلى البيانات. ويتطلب الأمر إجراء المزيد من البحوث حول العوامل التي تحدّد إمكانية الحصول على الأغذية الصحية في المجتمعات النامية.

**ABSTRACT** To study behavioural factors associated with diet and to investigate body mass index distribution, a cross-sectional survey was carried out in Ahwaz. A composite dietary behaviour score obtained from self-reported responses to a 24-item food-frequency questionnaire was used to categorize eating habits as more/less healthy. Responders were 1600 heads of households from 150 000 randomly selected residences. Less healthy diets were shown to be associated with age and economic status, and greater obesity with women and age (reversed after ages > 65 years). Interventions targeted at less healthy eaters need to be evidence-based, and further research into factors determining access to healthy diets in developing communities is required.

### Caractéristiques du comportement alimentaire et obésité à Ahwaz (République islamique d'Iran)

**RESUME** Une enquête transversale a été réalisée à Ahwaz afin d'étudier les facteurs comportementaux associés à l'alimentation et d'examiner la distribution de l'indice de masse corporelle. Un score composite pour le comportement alimentaire obtenu à partir de réponses à un questionnaire direct sur la fréquence de consommation des aliments comportant 24 produits alimentaires a été utilisé pour classer les habitudes de consommation comme plus/moins saines. Les personnes interrogées étaient 1600 chefs de famille pris dans 150 000 foyers choisis au hasard. Il a été montré que les régimes alimentaires les moins sains étaient associés avec l'âge et la situation socio-économique et l'obésité la plus importante avec les femmes et l'âge (inversé après les âges > 65 ans). Les interventions ciblées sur les consommateurs ayant le moins bon état de santé doivent être fondées sur des données scientifiques probantes et l'avantage de recherche est nécessaire sur les facteurs qui déterminent l'accès aux régimes alimentaires sains dans les communautés en développement.

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## Introduction

Diet and obesity are important in the etiology of many diseases, including coronary heart diseases, hypertension, cancers, diabetes, gallstones and orthopaedic impairment [1,2]. They have become a focus of attention in health strategies in some countries, with targets for improvement being set in relation to consumption of total and saturated fats [3,4]. Recommendations on healthy diets have also been made in relation to consumption of fibre-rich carbohydrates and total energy [4,5]. Many factors are associated with dietary behaviour at the family level, such as occupation, wealth and family size [6,7]. At an individual level, diet is associated with appetite, physiological factors and other factors, such as age, body weight, stress and the presence of specific diseases [7,8].

Understanding the complex interaction of different factors is crucial to the development of successful health promotion interventions. In this study, the behavioural factors associated with dietary patterns in the city of Ahwaz, the capital of Khuzestan, in the south-western corner of the Islamic Republic of Iran, are identified. The distribution of categories of body mass index (BMI) is also investigated and variations in dietary behaviour relating to age, sex, economic status and educational attainment are presented.

## Methods

A cross-sectional study, part of a wider lifestyle survey, was carried out to collect data on dietary patterns from heads of households (age range: 18–84 years) living in Ahwaz. A self-reporting questionnaire was administered face-to-face by trained interviewers. The survey was citywide,

with 1600 people randomly sampled from 75 wards in Ahwaz, containing in total approximately 150 000 native-Iranian households. A random cluster sampling technique was used.

Completed questionnaires were received from 1540 participants, a response rate of 96.3%. The questionnaire included information about the health status of the participants, their diet, leisure-time activities, employment, smoking and use of health services. Questions for the survey were derived from different sources, including the Oxford Healthy Life Survey [9] and Newcastle Health and Lifestyle Survey [10]. The questionnaire was piloted on 100 people and modified accordingly for the Iranian population.

Diet was assessed using a 24-item food-frequency questionnaire. A composite dietary behaviour score was obtained, and respondents were categorized into 2 groups — those scoring above and below the median value of 86 (range: 24–120) — indicating less and more healthy eaters respectively. Participants were asked how often they ate specific foods (e.g. red meat, milk, fish) known to be frequently consumed by Iranian households in their daily diets. All 24 food items were scored on a scale of 1 to 5 according to their health-giving properties and how often they were eaten, with a higher score indicating a healthier diet. Thus, foods with high fats scored 1 for most days and 5 for rarely or never, whereas foods with high fibre scored 5 for most days and 1 for rarely or never. In computing these scores, it was important to ensure that each participant had a value for each item in order to obtain the composite score. Non-respondents to dietary questions were excluded.

BMI was calculated from the weight and height reported by the participants

[weight (kg)/height<sup>2</sup> (m<sup>2</sup>)]. Using established criteria [11], BMI was categorized into five groups: underweight (< 20 kg/m<sup>2</sup> for both sexes), acceptable weight (20–24 kg/m<sup>2</sup> for men; 20–23 kg/m<sup>2</sup> for women), overweight (25–29 kg/m<sup>2</sup> for men; 24–27 kg/m<sup>2</sup> for women), and obese (> 30 kg/m<sup>2</sup> for men; > 28 kg/m<sup>2</sup> for women).

Economic status was assessed by reference to car and home ownership. Families with both a car and home counted as less deprived, and without both a car and home, as more deprived. Deprivation status was assessed for 738 participants. Data were analysed using *SPSS*, version 7.0. The chi-squared test was applied to test for the association between categorized variables. The Mann–Whitney test was used to identify differences between dietary patterns and population groups.

## Results

Table 1 shows the frequency of consumption of the main food items. Many participants consumed foods known to be less healthy several days a week. For example, solid fats, red meat and aerated (fizzy) soft drinks were consumed by a large proportion of respondents, 2 or more days a week. However, a substantial proportion of people also consumed healthier foods (e.g. vegetables, fish, fruits) many days a week.

Table 2 shows the distribution of daily consumption of food groups by deprivation status. Cereals were the most popular food, consumed by 98.6% of the population daily. Less deprived groups were more likely to consume cereals, vegetables, fruits, meats and milk/diary products ( $P < 0.005$ ). However, there was no significant difference between the consumption of different food groups by age, sex or educational attainment.

Table 3 shows more/less healthy eating behaviours scored above and below the median value by age group, educational attainment and degree of deprivation. Being older and of lower economic status were associated with less healthy diets ( $P < 0.001$ ). However, there was no significant difference between more/less healthy eating by educational attainment.

Table 4 shows the distribution of BMI by age group, sex and deprivation status. The overall prevalence of obesity was 13.9% (95% CI: 11.8–16.1). The mean BMI in males was 25.5 kg/m<sup>2</sup> (standard deviation = 4.2) and in females 26.9 kg/m<sup>2</sup> (standard deviation = 4.7). There was a significant pattern of greater obesity in females compared to males (36.6% versus 11.9%) ( $P < 0.001$ ) and in older generations ( $P < 0.001$ ), although this trend appeared to reverse at ages > 65 years.

## Discussion

This study was the first to be conducted on patterns of dietary behaviour in this society. It shows that many people consume unhealthy foods during their daily food intake, and less healthy diets tend to be consumed in deprived groups and older generations. The results confirm that women and older people tend to be more obese than men and younger people.

As the study was cross-sectional and self-reported, we were unable to draw any conclusions about causation. However, it may be hypothesized that lower economic status is importantly related to a less healthy diet in this community. Another limitation of the study that should be considered when interpreting the findings is the validity of the measurements. In addition, the allocation of some food items (e.g. red

Table 1 Frequency of consumption of main food groups by the participants, Ahwaz, Islamic Republic of Iran

Food group	Most days		2-3 times/ week		Once/week		1-2 times/ month		Rarely or never	
	No.	%	No.	%	No.	%	No.	%	No.	%
<i>Less healthy foods</i>										
Solid fat	1024	68.6	156	10.4	81	5.4	232	15.5	0	0.0
Red meat	524	35.4	644	43.5	166	11.2	144	9.7	2	0.1
Aerated soft drinks	334	22.7	455	30.5	280	18.8	420	28.2	3	0.2
Cakes/pastries	334	22.7	394	26.7	266	18.1	477	32.4	2	0.1
Butter	319	21.6	311	21.1	211	14.3	622	41.3	11	0.7
Chocolates	218	14.7	341	23.1	319	21.6	593	40.1	7	0.5
Ice cream	189	12.9	285	19.5	405	27.7	577	39.5	6	0.4
Cream	123	22.4	178	12.2	237	16.2	908	62.1	15	1.0
Sausages	88	6.0	221	15.1	392	26.8	751	51.4	9	0.6
Processed meat	87	5.9	236	16.1	393	26.8	739	50.4	12	0.8
<i>More healthy foods</i>										
Bread	1497	98.4	17	1.1	1	0.1	6	0.4	0	0.0
Tea/coffee	1474	96.7	15	1.0	5	0.3	0	0.0	29	1.9
Vegetables	1156	76.7	213	14.1	72	4.8	66	4.4	1	0.1
Fruits	1097	72.9	307	20.4	55	3.7	46	3.1	0	0.0
Rice	1072	70.8	337	22.3	70	4.6	35	2.3	0	0.0
Cheese	1035	69.2	256	17.1	72	4.8	132	8.8	1	0.1
Yoghurt	1010	67.0	367	24.4	75	5.0	55	3.6	0	0.0
Eggs	687	45.5	545	36.1	112	7.4	165	10.9	1	0.1
Peas/beans	657	43.5	513	34.0	220	14.6	120	7.9	1	0.1
Liquid oil	622	42.1	142	9.6	159	10.8	544	36.8	12	0.8
Chicken	398	26.3	756	49.9	278	18.4	82	5.4	0	0.0
Milk	353	35.8	415	27.7	226	15.1	316	21.7	4	0.3
Fish	272	18.0	533	35.3	497	32.9	204	13.5	4	0.3
Fruit juice	82	5.7	110	7.6	135	9.4	1096	76.0	19	1.3

Table 2 Daily consumption of food groups by deprivation status

Food group	More deprived		Less deprived		Total		P-value
	No.	%	No.	%	No.	%	
Cereals	404	97.0	324	100.0	728	98.6	0.013
Vegetables	302	69.4	274	82.8	576	75.2	<0.001
Fruits	294	68.1	281	85.7	575	75.7	<0.001
Meats	318	79.5	271	87.7	589	83.1	0.004
Milk/diary products	331	83.2	299	94.6	630	88.2	0.004
Total <sup>a</sup>	414		324		738		

<sup>a</sup>The total figures less than the sum of observations (738) are missing responses.

**Table 3 More and less healthy eating by age group, deprivation status and educational attainment**

Variable	More healthy eaters		Less healthy eaters		P-value
	No.	%	No.	%	
<i>Age group (years)</i>					
≤ 24	12	63.2	7	26.8	< 0.001
25-34	167	66.5	84	33.5	
35-44	239	55.3	193	44.7	
45-54	137	44.6	170	55.4	
55-64	54	37.0	92	63.0	
≥ 65	29	31.2	64	68.8	
<i>Deprivation status</i>					
More deprived	133	38.2	215	61.8	< 0.001
Less deprived	145	52.5	131	47.5	
<i>Educational attainment</i>					
Uneducated	81	45.8	96	54.2	NS
Primary school	170	49.7	172	50.3	
Middle school	108	55.4	87	44.6	
High school	183	52.3	167	47.7	
University	106	53.3	93	46.7	

NS = not significant at 5% level.

**Table 4 Distribution of body mass index by age, deprivation status and sex**

Variable	Underweight		Acceptable weight		Overweight		Obese		Total No.
	No.	%	No.	%	No.	%	No.	%	
<i>Age group (years)<sup>a</sup></i>									
≤ 24	5	38.4	4	30.8	3	23.1	1	7.7	13
25-34	30	13.4	90	40.2	81	36.2	23	10.3	224
35-44	22	6.1	127	35.0	158	43.5	56	15.4	363
45-54	13	5.5	103	43.6	85	36.1	35	14.8	236
55-64	4	4.6	40	47.1	27	31.8	14	16.5	85
≥ 65	5	8.6	27	46.6	18	31.0	8	13.8	58
<i>Deprivation status</i>									
More deprived	26	9.1	115	40.2	111	38.8	34	11.9	286
Less deprived	16	7.0	80	34.9	104	45.4	29	12.7	229
<i>Sex<sup>a</sup></i>									
Male	73	8.1	374	41.6	345	38.4	107	11.9	899
Female	6	7.3	18	22.0	28	34.1	30	36.6	82
<i>Total</i>	79	8.0	396	39.9	379	38.2	138	13.9	992

<sup>a</sup>P < 0.001 (analyses standardized for age and sex).

Total figures less than the sum of observations are missing responses.

meat, coffee) in less or more healthy diets is open to question.

The findings of the study concur with the findings of others. Anderson and Hunts [6] and White et al. [10] explored eating patterns of populations in Glasgow (Scotland) and Newcastle-upon-Tyne (England) using similar methods. With similar findings, they concluded that nutritional health promotion interventions should be targeted more at lower-income groups. Nutritional health promotion has traditionally been presented in hospitals or community settings, aimed at individuals with identified nutritional problems [10,12]. However, newer approaches aimed at achieving a healthy diet within households, and other specifically targeted interventions, are based on epidemiological patterns of nutrition in the population [13]. Such approaches are designed to counter socioeconomic barriers and to focus on the more deprived members of the community.

There have been great changes in the dietary habits of Middle Eastern populations in the past decades [2]. A wide range of epidemiological studies has implicated obesity as a significant predisposing risk factor in a variety of disabling and life-threatening medical conditions [12]. The higher prevalence of obesity in this study compared to other studies [14,15] points to the need for more effective interventions to decrease the problem in this community.

Obesity has been reported to affect 15% of men and 16.5% of women in the United Kingdom [5]. Some studies have shown that rates of obesity are higher in industrialized than developing countries [15]. However, there are some notable exceptions, such as in parts of India [16], and as shown in the present study. The prevalence of obesity (BMI  $\geq 30$  kg/m<sup>2</sup> for both sexes) for 19–70-year-olds in Isfahan,

Islamic Republic of Iran has been reported at 27.0% for women and 24.8% for men [17]. A study to determine the prevalence of obesity in Saudi Arabia found 28% of Saudi males in the Riyadh region were obese (BMI  $> 30$  kg/m<sup>2</sup>) [18].

The rising prevalence of obesity in developing countries is now a major public health issue. Population-based prevention strategies aimed at effecting a downward shift in BMI distribution seem to be the most appropriate strategy for tackling the problem [19]. In countries that have undergone or are undergoing economic transition, obesity is more likely to be linked to cohorts of lower, rather than higher socioeconomic status. The reasons for this are multifactorial and not well documented. They may be due to, among other things, the long-term trend for the price of food relative to other goods and services to decline (thereby increasing the affordability and accessibility of foodstuffs as incomes rise); over-eating as a compensatory response to a perceived lack of fulfilment in other areas of life; the impulse of undernourished populations to seek out high-fat foods; the reduced opportunity for exercise in increasingly sedentary modern lifestyles; and the habitual tendency to eat in order to alleviate stress.

Obesity has previously been significantly associated with age [20]. This association was clearly seen in this study. With regard to sex, significant differences in both BMI and obesity prevalence were found. Previous studies have also confirmed a higher prevalence of obesity among women than men [14,21,22]. It appears to be mainly due to the lower physical activity levels of women, which are generally culturally endorsed in our community.

In conclusion, education policy and economic interventions to promote healthi-

er eating and to encourage exercise should be targeted at the poor, the less well educated, the older generations and women. The relationships between the availability and price of food and its consumption in a healthy diet need to be explored further, using different methods and appropriate intervention studies. Such interventions should be based on a thorough assessment of need, and should undergo precise evaluation to determine their effectiveness and efficiency. Further research is needed to

explore the factors that determine access to a healthy diet.

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