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2

DEVELOPMENT OF A SEMI-QUANTITATIVE FOOD FREQUENCY

3

QUESTIONNAIRE FOR USE IN UNITED ARAB EMIRATES AND KUWAIT

4

BASED ON LOCAL FOODS

5

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1 **ABSTRACT**

2 **Background** The Food Frequency Questionnaire (FFQ) is one of the
3 most commonly used tools in epidemiologic studies to assess long-term
4 nutritional exposure. The purpose of this study is to describe the development of
5 culture specific FFQs for Arab populations in the United Arab Emirates (UAE)
6 and Kuwait.

7 **Methods** We interviewed samples of Arab populations over 18 years old in
8 UAE and Kuwait assessing their dietary intakes using 24-hour dietary recall.
9 Based on the most commonly reported foods and portion sizes, we constructed a
10 food list with the units of measurement. The food list was converted to a Semi-
11 Quantitative Food Frequency Questionnaire (SFFQ) format following the basic
12 pattern of the Harvard SFFQ using usual reported portions. The long SFFQ was
13 field-tested, shortened and developed into the final SFFQ.

14 In addition, to estimate the nutrients from mixed dishes we collected recipes of
15 those mixed dishes that were commonly eaten. We then estimated their
16 nutritional content by using nutrient values of the ingredients that took into
17 account method of preparation from the US Department of Agriculture's Food
18 Composition Database.

19 **Results** The SFFQs consist of 133 and **148** items for UAE and Kuwait,
20 respectively and will be validated in the subsequent year. The participants
21 reported average intakes over the past year. On average the participants
22 reported eating 3.4 servings/d of fruits and 3.1 servings/d of vegetables in UAE
23 versus 2.8 servings/d of fruits and 3.2 servings/d of vegetables in Kuwait.

1 Participants reported eating cereal 4.8 times/d in UAE and 5.3 times/d in Kuwaiti.

2 The mean intake of dairy products was 2.2/day in UAE and 3.4 among Kuwaiti.

3

4 **Conclusion:** We have developed SFFQs to measure diet in Kuwait and
5 UAE that will serve the needs of public health researchers and clinicians and are
6 currently validating those instruments.

7

1 **BACKGROUND**

2 The lifestyle of residents of the Arab countries in the Persian Gulf region has
3 changed dramatically over the last two decades. The people consume more fat,
4 meat, sugar, rice and wheat flour than before (1-4). At the same time there has
5 been a decline in physical activity with increased use of cars, mechanization of
6 household chores, and the availability of domestic help. It has been reported that
7 Kuwait has probably one of the most obese citizens in the world (5). In a
8 representative sample of 2999 adult females showed that 52.5% were overweight
9 and 42% were obese (Al-awadi, 1989). The prevalence of obesity is even higher
10 in UAE while 71% and 56% of married women and men respectively were obese
11 (6). There is a need to study diet in this population in relation to obesity and
12 chronic diseases but there is no customized instrument to do so. Among the
13 different methods of dietary assessment (e.g. food records, 24hr DR, etc.), the
14 Food Frequency Questionnaire (FFQ) is becoming the most commonly used
15 method in nutritional epidemiologic studies (7). An FFQ needs to be tailored to
16 the typical food consumption of the population under study and the study
17 objectives. Based on a complete search of the literature (using Medline medical
18 subject heading and text words) and personal communication with nutritionists in
19 Kuwait and United Arab Emirate Universities), we could not find a validated FFQ
20 for use in these countries. Hence, we decided to develop a SFFQ for UAE and
21 Kuwait. To be able to convert foods to nutrients it is necessary to use a
22 nutritional database. Because people from different regions prepare their foods
23 using traditional recipes, no nutritional database can be applied globally unless a

1 careful local adaptation is applied. We constructed a nutrient database for both
2 countries based on the USDA food composition table.
3 We will use the validated SFFQ for the Prospective Urban and Rural
4 Epidemiologic (PURE) study. PURE study will eventually involve about 140,000
5 individuals (40,000 households) from 14 developing countries (including UAE)
6 and will provide a global overview of how societal transitions affect health
7 behaviours and lead to obesity, diabetes and CVD.

8

9

SUBJECTS AND METHODS

10

11 **Population.** We collected 24-hour dietary recalls (24hr DR) from 126 apparently
12 healthy men and women aged 18-65 years from different areas of UAE in
13 November 2003 and different areas of Kuwait in September 2004. The UAE data
14 were collected from Mamzar (Urban) and Hatta (Semi Urban). The Kuwaiti
15 sample was collected from the Capital, Hawally and Farwania governorates,
16 which represent 3 out of 6 governorates. During September-December 2004,
17 we pilot tested the developed FFQ on 200 participants from the same
18 communities.

19

20 **I. Development of the semi-quantitative food frequency questionnaire** We
21 followed the following steps in the development of a SFFQ: constructing a food
22 list, defining portion sizes and assigning frequency of consumption to each line

1 item, pilot testing and shortening the long FFQ. Finally, the shortened version of
2 FFQ needs to be validated, which we are currently doing.

3

4 **1. Constructing the food list** Creation of a food list is the first step in
5 compiling SFFQ. This list contains commonly consumed foods with the usual
6 reported portion sizes. We used three approaches to create the food list: 24-hour
7 dietary recalls, popular cookbooks and consultation with local experts in Kuwait
8 and UAE.

9 **Collection of 24 hours Dietary Recall (DR)** Qualified nutritionists interviewed
10 participants to prevent measurement errors and ensure completeness and
11 accuracy of collection of 24hr DR data. Interviews were conducted to take the
12 respondents through the recall process in direct chronological order from the first
13 foods in the morning to the last foods and drinks consumed on the day before.
14 To standardize the method of data collection, all procedures were described in a
15 manual for the nutritionists who were interviewing. To aid the respondents to
16 assess portions consumed and to quantify the portion sizes, a picture book
17 including the country's specific dishes with additional household measurements
18 were used. We used parts of "Food portion sizes: A photographic Atlas"
19 developed by Nelson (8) supplemented with country specific pictures for locally
20 eaten dishes and their portion sizes. The food atlas contained six photographs of
21 different portion sizes for each food items.

22 **Computing food items** In the next step of food list creation, one person
23 entered all the recorded 24hr DRs data into one column of an excel spreadsheet

1 and in the adjacent column each reported food the portion or serving size. Then
2 all the like foods recorded in the 24-hour diet recall were combined together; for
3 example all servings of bread for each person were combined and summed, but
4 composite foods were kept as they were reported. Subsequently, a new list of
5 the frequencies of the foods consumed and a description of the serving or portion
6 sizes was prepared. We grouped like foods together based on the similarity of
7 nutrient or cooking usage. The resulting list was a record of all foods and
8 beverages reported by all respondents. Frequency tables were prepared using
9 the Statistical Packages for Social Sciences software (SPSS) to identify the most
10 commonly consumed food items.

11 **Input from nutritionist** We sent the food list to the nutritionists in
12 Kuwait and UAE to help the selection of foods that should be included in the long
13 SFFQ. They added any nutrient rich foods that may be eaten frequently at
14 another time of the year or on special occasions that may have been missed in
15 the 24-hour DR.

16

17 **2. Formatting the long FFQ**

18 We used the basic pattern of the Harvard FFQ to format our long FFQs. We
19 organized the main foods into seven main food categories: Milk, milk product and
20 fats (including milk with different amount of fat, Labnah, Ghee...), vegetables
21 (fresh or cooked), fruit, fruit juice and their products, meat, eggs and meat
22 products (including meat organs), cereal and cereal product, beverages, herbs
23 and spices, processed food and mixed dishes. We also asked about

1 consumption of sweet and baked goods (faaloodah, betheeth, baklava, etc.) and
2 nuts like almond, pistachio and hamoose. To distinguish the fibre content of the
3 diet and the quality of carbohydrates, we differentiated between the types of
4 consumed cereal and cereal product (white or wholemeal bread, white rice,
5 whole grain). In the last section of the FFQ we asked about type of cooking oils
6 and fats and also, minerals including calcium, iron and zinc and multivitamins
7 including the B vitamins, vitamin C, and vitamin A, D, E.

8 **Portion sizes** To obtain the local specific food portion sizes, we
9 examined all reported portions manually and took the most frequently reported
10 portions size as unit of measurement. For example most participants reported
11 consumption of vegetable marag based on “cup”. For items such as eggs we
12 considered one of those items as a portion. For fruits such as banana or orange,
13 a medium size was considered to be as a “unit” of the fruit. The method of
14 asking portion sizes for non-unitary foods, such as grapes was based on ½ cup.
15 For other foods one unit of utensil that mostly reported by respondents was
16 assumed as one portion size.

17 **Frequency of consumption** Most investigators have reported using
18 of a multiple choice response format, with the number of options usually ranging
19 from 5 to 10. We divided the number of options to 9 categories; Never/ less than
20 once/month, 1-3/month, 1/week, 2-4/week, 5-6/week, 1/day, 2-3/day, 4-5/day,
21 >6/day. For each food item, participants indicate their average frequency of
22 consumption over the past year of a specified serving size by checking 1 of the 9
23 frequency categories ranging from “almost never” to “≥6 times/d.” For foods that

1 contain an extremely high amount of a particular nutrient but are used
2 infrequently, such as liver, we re-categorized the options for frequency of intake.
3 For instance, we used eliminated options of higher intake (6 or more times per
4 day) but distinguished between never and less than once a month at the lower
5 end. We will compute the daily intake based on the midpoint of the reported
6 frequency category for each food item; for example we will take a response of “2-
7 4/week” to be 3/7 or 0.43 serving/day.

8 **Seasonality** Although like most Western countries the availability and
9 cost of fruits and vegetables do not vary dramatically throughout the year in UAE
10 and Kuwait, people’s preferences of consumption during hot summer might be
11 different from winter. Hence, we designed specific questions for fruits and
12 vegetables that may be consumed more in a specific period of year and asked
13 participants about the intake of those fruits or vegetables at that time of the year.
14 We only asked the frequency of consumption for one month during the season.
15 We determined the length of the season from local experts who used their
16 experience and consulted with fruit and vegetable vendors.

17 **3. Pilot testing of SFFQ**

18 We pilot tested the long SFFQ among 200 participants from the same
19 populations (but not those who participated in the 24hr DR). The objectives were
20 to determine the completeness of the list and to shorten the SFFQ by deleting
21 foods that were not commonly consumed. Based on the analysis of the pilot
22 SFFQ we deleted some food items. The shortened SFFQ is known as SFFQ1.

23

1 **II. Food Composition Database**

2 The food composition database will be used to convert intakes of foods into
3 nutrients. The nutritional database is developed based on the logic of Health
4 Professional Study (Harvard School of Public Health). We constructed one
5 nutrient database for UAE and Kuwait, as most foods are nearly the same in both
6 countries. We extracted the nutrient contents of the food items from Table SR17
7 of the USDA food database which is available online as the starting point to
8 establish database
9 (<http://www.nal.usda.gov/fnic/foodcomp/Data/SR17/sr17.html>). From SR17 we
10 chose those varieties of food items which are not very specific to a region and
11 are more representative, for example; for apple we chose “apples, raw, with skin
12 (NDB No:09003)” or for orange, we chose “oranges, raw all commercial varieties
13 (NDB No: 09200)”. But for mixed dishes we ought to create a new nutrient
14 database appropriate for local foods (a sample is given in Table 7).

15 **Recipe gathering** To create a representative recipe for each existing mixed
16 dish, we collected two recipes from each of the low, middle and high-income
17 families. The local nutritionist collected recipes from the person who prepared
18 the foods and knew about the ingredients and portion sizes. We assessed
19 quality and quantity of each ingredient. For example we distinguished between
20 fatty and lean meat. We recorded the quantity of food in different ways such as
21 weight (g), volume (fluid ounce, cup, tbs., tsp.), food specific unit (small, medium,
22 large) or dimension (cm) depending on its nature. Also, we used the “Food
23 composition: Kuwaiti composite dishes” (9) and other popular cookbooks. The

1 average of ingredients from those recipes was used to create a base recipe for
2 the nutrient database. Then we matched ingredients used for each recipe to
3 similar food items in the USDA database and imported the nutrient contents into
4 an Excel-spread sheet. We considered the change in nutrient contents by the
5 cooking method. The yield factor was also considered for those food items that
6 cooked items not available in USDA table. Then we analysed each mixed dish
7 using Excel-spread sheet and calculated the nutrient values of recipes. Finally,
8 the calculated nutrient content of 100 grams of the chosen recipe added it to the
9 main database in SAS (release, SAS Institute, Cary, NC). A sample of nutrient
10 database is given in Table 7.

11

12 **III. Reproducibility and Validity**

13 Over the next year, we will invite a random sample of 400 cohort members to
14 participate in a dietary assessment validation study. To minimize within person
15 and seasonal variations, we will collect four 24hrDRs in different seasons from
16 them. Then, we will compare food and nutrient intakes estimated from the SFFQ
17 with the mean intake estimated from these four 24-hour diet recalls. To assess
18 reproducibility we will repeat the SFFQ a year later.

19

20 **Statistical analysis**

21 Statistical analyses were performed using computerized statistical software of
22 SPSS 10.1 for windows (SPSS Inc, Chicago IL). The frequency of food
23 consumption and some basic demographic characteristic were calculated.

1

2 **Results**

3 We administered FFQs to 200 participants with different occupations in Kuwait
4 and UAE. The mean age was 34.7 ± 11 yr in UAE and 31.3 ± 10 yr in Kuwait. Of
5 the UAE participants, 76% were female and 24% were male. Similarly in Kuwait
6 78% of participants were female and 22% male. Overall 45% of UAE and 69% of
7 Kuwaiti participants had university education. There was no illiterate person
8 among Kuwaiti participants and only 13% of UAE participants were illiterate.
9 About 38% of Kuwaiti and 37% of UAE participants did not respond to income
10 question. In UAE 60% of respondents had income in the range of 5000-10000
11 Dirham/month (equal to 1700-3000 US\$) and 60% of Kuwaiti participants had
12 income of less than 500 Dinar/month (equal to 1500 US\$). Heights, weights and
13 BMIs of the participants are provided in Tables 1 and 2. No significant
14 differences were noted between female and male respondents with respect to
15 BMI ($P=0.4$, 0.5 for UAE and Kuwait, respectively). However, in UAE women
16 had a higher mean of BMI than men while in Kuwait men were heavier than
17 women.

18

19 **Frequency of consumed food**

20 Tables 4 and 5 show the frequency of consumption of some foods in Kuwait and
21 UAE. About 30% of respondents in UAE and 26% of Kuwaiti reported that they
22 had at least one glass of milk daily on average in the past year, but only 6% of
23 UAE participants and 8% of Kuwaiti participants reported daily intake of butter.

1 Sixty-eight percent of the UAE and 48% of Kuwaiti participants reported
2 consuming rice once per day. 67% and 51% of people (UAE and Kuwaiti
3 respectively) ate an egg at least 2 times/week and no one consumed more than
4 one egg per day in UAE while 5% of Kuwaiti participants consumed eggs more
5 than once daily. Overall in UAE, 86% of participants did not eat chicken with skin
6 although 47% had eaten chicken at least twice /week. On the other hand only
7 42% of Kuwaitis did not consume chicken with skin and 43% ate chicken at least
8 twice per week. Dates were more popular in UAE than in Kuwait and only 9% of
9 UAE participants ate dates less than once a month and nearly 59% reported daily
10 intake. In Kuwait 27% of the participants reported eating dates never or less than
11 once per month, and 38% consumed dates at least daily. Among other fruits,
12 apple, oranges and bananas were consumed very frequently. About half of
13 participants never drank colas or consumed them less than once per month.

14

15 **Daily food intake**

16 The FFQ-estimated daily intakes of seven major food groups among Kuwaiti and
17 UAE men and women are shown in Tables 5 and 6. On average the participants
18 reported eating 3.4 servings/d of fruits and 3.1 servings/d of vegetables in UAE
19 versus 2.8 servings/d of fruits and 3.2 servings/d of vegetables in Kuwait.
20 Cereals are important staples in the diet of both countries and the participants
21 reported eating cereal 4.8 times/d in UAE and 5.3 times/d in Kuwait. All
22 participants reported consuming cereals at least once per day. Meat was
23 consumed nearly two times/day in both countries and among the meat group
24 poultry was consumed more often than red meat or fish. The mean intake of

1 dairy products was 2.2/day in UAE and 3.4/day Kuwait. The participants on
2 average drank 3.5 cups/day of tea or coffee in UAE and 1.9 cups/day in Kuwait;
3 men reported drinking more tea and coffee than women (4.6 vs. 3.2 and 2.5
4 vs.1.7 cups/day in UAE and Kuwait respectively). Nuts seem to be popular
5 among Arab people, which consumed 0.5 servings/day in UAE and 0.7
6 servings/day in Kuwait.

7

8 **Discussion**

9 In this paper we have described the development of a semi-quantitative FFQ and
10 food composition database for the Arab population in Kuwait and UAE. The goal
11 of diet assessment in epidemiologic studies differs slightly from that in a clinical
12 setting. In epidemiologic studies the goals are obtain a measure of usual rather
13 than current diet, and rank people by intake. The FFQ has been developed with
14 these purposes in mind and has become the standard method to collect dietary
15 data in studies of chronic disease all over the world. We opted to use a semi-
16 quantitative FFQ, which estimated food intake in categories rather than the exact
17 frequency, because it has been shown that there is minimal loss of information in
18 estimating nutrient intakes using food intake categories (10). We also asked the
19 participants about intakes of pre-specified portion sizes rather than asking them
20 to estimate their regular portion size. Correlations for nutrient intake calculated
21 using the FFQ with and without taking portion sizes into account were over 0.9
22 (7;7). The advantage of using categories to estimate food intake, and pre-
23 specified portion sizes are that the FFQ becomes easier to administer, and likely

1 more reliable. We did not attempt to make a comprehensive list of foods to
2 include in the FFQ. Rather, we kept items in the FFQ if they were nutrient rich,
3 consumed frequently and discriminated intake between individuals. The other
4 criterion we considered together with the nutrient content (including caloric value)
5 was the presence of other substances of interest, for instance caffeine. Most
6 FFQs have between 100-150 items (11) and our FFQ has 133 (UAE) and 146
7 (Kuwait) items. Increasing the number of items in the FFQ has been shown to
8 increase over-reporting (12).

9 To estimate nutrient intake from FFQs, there is a need for a food composition
10 table listing the average nutrient content of foods contained in the FFQ. To
11 obtain nutrient intake we multiply the average nutrient content of a specified
12 portion of food listed in the food composition table by the average frequency of
13 intake reported in the FFQ. The food composition table can be a substantial
14 source of variation in the estimation of nutrients using the FFQ. As no nutritional
15 database has ever been gathered in Kuwait or UAE, we used the US Department
16 of Agriculture nutrient database as our standard to estimate nutrient content. The
17 advantages of this approach are: First, the USDA food composition database is
18 probably the most comprehensive in the world. For example, there are 26
19 categories of spinach including different types of spinach, raw spinach, and
20 spinach cooked in a variety of ways (13), allowing us to choose the most
21 appropriate one. Second, the nutrient estimation assays have been done in a
22 standardized manner. Third, it has the largest number of nutrients reported.
23 Fourth, the USDA food composition database is continually updated. Last,

1 Kuwait and UAE import foods from all around the world and mixture of food items
2 from different region are available in the market. For mixed dishes that were not
3 listed in the USDA database we calculated nutrient intake by analyzing recipes.
4 Moreover, there are nearly 150 food composition tables in use around the world
5 and their values are primarily based on USDA (14-16), and even European
6 countries include nutrient information from USDA to their food composition table
7 (17;18). Finally, similar approaches have been taken by other investigators in
8 Israel, (19) and Costa Rica (20).

9 **Limitations:** A limitation of this study is that we are using 24-hour dietary recall
10 instead of food diaries to validate the FFQ. However, the 24-hour dietary recall
11 has been used in such circumstances for validation.

12 The age group represented in Kuwait and UAE sample are <36 years for both
13 males and females, thus the overall impression in the dietary habits is biased
14 towards the younger group. For example the consumption of rice as well as
15 dates might be underestimated. The way to make it more accurate is of course to
16 repeat it (validate). Another limitation of is that most participants from both
17 countries were women (76 and 78 compare to men=24 and 22) and some foods
18 which men may eat may be underestimated. However, nutritionist with
19 experience in those countries reviewed the food lists to ensure the competence.
20 According to the report in Kuwait more chicken is consumed than meat; generally
21 males consume more meat than females.

1 **Conclusion:** The validated questionnaire and food composition database will
2 not only be useful tools for our own study, but they will also be assets that other
3 researchers in the region can use or adapt to suit their needs.
4 We have enclosed two SFFQs in this article so other researchers in the field of
5 public health can use this comprehensive FFQ. We are evaluating SFFQs and
6 the validated SFFQ will be available online for all public health researcher in the
7 region.
8

1

2 **Table1** Demographic characteristics of UAE participants

	Men (N=24)	Women (N=76)	Overall (N=100)
Age	40.5±13	33.0±10	34.7±11
Weight (kg)	78.6±12	71.1±18	72.9±17
Height (cm)	169.5±6	157.5±6	160.3±8
BMI (kg/m ²)	27.4±4	28.7±7	28.3±7
Education			
None	22.7%	10%	13%
Primary school	9.0%	8%	9%
Secondary school	23%	30%	31%
Trade School	32%	3%	2%
University	23%	49%	45%
Income (Dirham)			
<5000	12.5%	9%	11%
5001-10000	12.5%	63%	60%
10001-15000	19%	24%	22%
>15000	12.5%	4%	6%

3

4 Conversion rate for US \$

5 1 Dirham = 0.3 US\$

6

7

8 **Table2** Demographic characteristics of Kuwaiti participants

	Men (N=22)	Women (N=78)	Overall (N=100)
Age	35.9±13	30.0±9	31.3±10
Weight (kg)	78.5±19	66.1±13	68.8±16
Height (cm)	172.1±8	159.7±5	162.4±8
BMI (kg/m ²)	26.6±7	25.9±5	26.0±6
Education			
None	0%	0%	0%
Primary school	0%	5%	4%
Secondary school	32%	18%	21%
Trade School	5%	4%	4%
University	64%	72%	70%
Income			
<500	68%	31%	61%
501-1000	32%	54%	36%
>1000	0%	15%	3%

9

10 Conversion rate for \$US

11 1 Dinar = 3 US\$

12

- 1 **Table 3** Frequency of Food Consumption reported by UAE
- 2 Participants (Men=24, women=76) reported on the FFQ (values
- 3 are in percent)

Foods	Frequency of Consumption					
	Never/ <1/mo	1-3/mo	1/wk	2-4/wk	1/d	>1/d
Dairy Products						
Whole milk						
Men	26	4	0	22	44	4
Women	48	7	5	13	26	1
Overall	43	6	4	15	30	2
White Cheese						
Men	17	9	13	44	17	0
Women	21	14	12	25	27	1
Overall	20	13	12	29	25	1
Butter						
Men	78	9	9	4	0	0
Women	64	12	8	9	8	0
Overall	67	11	8	8	6	0
Cereal and cereal Products						
White bread						
Men	9	9	17	48	17	0
Women	13	25	26	13	21	3
Overall	12	21	24	21	20	2
Rice						
Men	0	0	4	9	74	13
Women	3	1	8	21	66	1
Overall	2	1	7	18	68	4
Meat, eggs						
Eggs						
Men	0	4	4	44	48	0
Women	7	14	20	33	27	0
Overall	5	12	16	35	32	0
Chicken with skin						
Men	74	0	0	13	13	0
Women	90	4	3	4	3	0
Overall	86	1	2	6	5	0
Chicken without skin						
Men	17	0	0	52	30	0
Women	3	3	3	71	20	1
Overall	6	2	2	67	22	1
Liver						
Men	22	52	8.7	17	0	0
Women	30	44	17	9	0	0
Overall	28	46	15	11	0	0

- 1 **Table 3 con't** Frequency of Food Consumption reported by UAE
- 2 Participants (Men=24, women=76) reported on the FFQ (values are
- 3 in percent)

Foods	Frequency of Consumption					
	Never/ <1/mo	1-3/mo	1/wk	2-4/wk	1/d	>1/d
Beef as main dish						
Men	0	13	26	61	0	0
Women	20	33	22	26	0	0
Overall	15	28	23	34	0	0
Fruits						
Dates						
Men	9	9	9	4	57	17
Women	9	7	16	2	50	7
Overall	9	9	7	16	52	7
Apple						
Men	0	4	13	39	35	9
Women	14	14	20	33	20	0
Overall	11	12	18	34	23	2
Bananas						
Men	4	4	17	44	17	13
Women	14	23	38	18	7	0
Overall	12	19	33	24	9	3
Orange						
Men	5	9	9	32	41	4.5
Women	8	8	17	39	29	0
Overall	7	8	15	37	31	1
Vegetables						
Spinach						
Men	61	17	9	13	0	0
Women	43	29	18	8	3	0
Overall	47	26	16	9	2	0
Potatoes						
Men	35	17	13	30	4	0
Women	48	17	12	12	12	0
Overall	45	17	12	16	10	0
Coke						
Men	52	13	13	13	9	0
Women	40	18	20	12	10	0
Overall	43	17	15	12	11	2

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- 6

1 **Table 4** Frequency of Food Consumption reported by Kuwaiti
 2 participants (Men=22, women=78) reported on the FFQ (values are
 3 in percent)

Foods	Frequency of Consumption					
	Never/ <1/mo	1-3/mo	1/wk	2-4/wk	1/d	>1/d
Dairy Products						
Whole milk						
Men	51	13	4	6	22	4
Women	41	5	9	18	9	18
Overall	49	11	5	9	19	7
White Cheese						
Men	9	14	14	32	23	9
Women	18	17	15	24	21	5
Overall	16	16	15	26	21	6
Butter						
Men	50	23	5	14	9	0
Women	44	28	14	5	8	1
Overall	45	27	12	7	8	1
Cereal and cereal Products						
White bread						
Men	36	9	5	18	18	14
Women	31	18	13	12	22	5
Overall						
Rice						
Men	0	0	0	18	68	14
Women	6	6	12	27	42	6
Overall						
Meat, eggs						
Eggs						
Men	18	14	9	32	18	9
Women	8	22	22	26	19	4
Overall	10	20	19	27	19	5
Chicken with skin						
Men	59	0	5	27	9	0
Women	37	13	5	27	17	1
Overall	42	10	5	27	15	1
Chicken without skin						
Men	23	5	14	41	18	0
Women	28	8	10	40	13	1
Overall	27	7	11	40	14	1
Liver						
Men	73	18	5	5	0	0
Women	59	36	1	1	3	0
Overall	62	32	2	1	3	0

- 1 **Table 4 con't** Frequency of Food Consumption reported by Kuwaiti
- 2 Participants (Men=22, women=78) reported on the FFQ (values are
- 3 In percent)

Foods	Frequency of Consumption					
	Never/ <1/mo	1-3/mo	1/wk	2-4/wk	1/d	>1/d
Beef as main dish						
Men	27	23	18	27	5	0
Women	37	26	17	17	4	0
Overall	35	25	17	19	4	0
Fruits						
Dates						
Men	46	0	14	5	18	18
Women	22	13	4	23	37	1
Overall	27	10	6	19	33	5
Apple						
Men	0	41	23	18	14	5
Women	15	24	18	18	22	3
Overall	12	28	19	18	20	3
Bananas						
Men	5	9	18	41	27	0
Women	18	32	14	17	14	5
Overall	15	27	15	22	17	4
Orange						
Men	14	14	18	18	27	9
Women	8	22	17	18	35	1
Overall	9	20	17	18	33	3
Vegetables						
Spinach						
Men	64	27	9	0	0	0
Women	51	33	5	9	1	0
Overall	54	32	6	7	1	0
Potatoes						
Men	55	9	14	23	0	0
Women	37	22	19	15	6	0
Overall	41	19	18	17	5	0
Diet Coke						
Men	59	9	23	5	5	0
Women	67	6	8	12	8	0
Overall	65	5	8	14	7	1

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Table 5 Average daily intake of main foods estimated by SFFQ reported by UAE participants (Men=24, Women=76)

Sex	Foods	Min	Max	Mean	Std. Deviation
Women	Fruits	0.2	8.5	3.0	1.7
	Vegetables	0.4	7.9	3.0	1.5
	Dairy products	0.0	5.2	2.1	1.0
	Meat	0.6	4.2	1.7	0.7
	Cereals and cereal products	0.7	10.7	4.7	2.2
	Nuts	0.0	2.6	0.4	0.47
	Beverages	0.0	9.1	3.2	2.2
	Men	Fruits	1.8	8.8	4.8
Vegetables		0.3	6.6	3.7	1.6
Dairy products		0.4	7.0	2.5	1.3
Meat		0.6	4.4	2.3	0.9
Cereals and cereal products		1.5	6.6	5.0	1.2
Nuts		0.0	3.0	0.8	0.9
Beverages		0.9	8.5	4.6	2.0
Overall		Fruits	0.2	8.8	3.4
	Vegetables	0.2	7.9	3.1	1.6
	Dairy products	0.2	7.1	2.2	1.1
	Meat	0.6	4.4	1.9	0.8
	Cereals and cereal products	0.7	10.8	4.8	2.0
	Nuts	0.0	3.0	0.5	0.6
	Beverages	0.0	9.1	3.5	2.3

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Table 6 Average daily intake of main foods estimated by SFFQ reported by Kuwaiti participants (Men=22, Women=78)

Sex	Foods	Min	Max	Mean	Std. Deviation
Women	Fruits	0.4	8.1	2.8	1.7
	Vegetables	0.0	10.5	3.3	2.2
	Dairy products	0.0	9.7	3.3	2.3
	Meat	0.2	9.9	1.8	1.3
	Cereals and cereal products	0.7	20.1	4.9	3.2
	Nuts	0.0	7.0	0.6	1.1
	Soft drink	0.0	4.5	0.5	0.7
	Men	Fruits	0.5	7.3	3.1
Vegetables		0.3	6.5	3.0	1.9
Dairy products		0.4	6.6	3.5	1.7
Meat		0.4	6.6	2.5	1.6
Cereals and cereal products		2.3	12.8	6.5	2.4
Nuts		0.0	7.0	1.2	1.8
Soft drink		0.0	4.5	0.7	1.0
Overall		Fruits	0.4	8	2.8
	Vegetables	0.00	10.5	3.2	2.1
	Dairy products	0.00	9.7	3.4	2.3
	Meat	0.2	9.9	1.9	1.4
	Cereals and cereal products	0.7	20.1	5.3	3.1
	Nuts	0.0	7.0	0.7	1.3
	Soft drink	0.0	4.5	0.5	0.8

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Table 7: Nutrient composition per serving (100g) of some commonly eaten foods in UAE and Kuwait

Food	Total calories (Kcal)	CHO (g)	Fat (g)	Protein (g)	Fiber (g)	Vitamins (mg)							Ca (mg)	Phosp hours (mg)	Iron (mg)
						A (RE, μ)	Folate(μ)	B1	B6	B12	C	E (α)			
<u>Mixed dish</u>															
Kofta	173	3.1	11.1	15.0	0.6	63.1	14.1	0.09	0.26	1.7	12.6	0.1	23.7	128	1.6
Qouzi	206	15.0	11.2	10.5	0.6	5.1	36.7	0.1	0.1	0.9	2.3	0.3	18.0	90.3	1.4
Marga Laham	95	7.1	4.0	7.5	0.8	19.0	4.6	0.07	0.2	0.7	7.0	0.04	7.1	65.4	0.8
Jereesh	226	29.7	7.0	12.9	5.2	13.9	22.7	0.2	0.2	0.7	3.5	0.4	21.1	252	2.1
<u>Sweets</u>															
Balalett	210	35	4.7	6.6	0.1	Trace	10	0.01	0.06	Trace	Trace	0.5	28.5	105	1.5
Elba	264	30.6	12.6	11.3	Trace	206	25	0.1	0.1	1.3	1.1	0.6	522	356	2.1

LIST OF ABBREVIATIONS

SFFQ	Semi-Quantitative Food Frequency Questionnaire
24hr DR	24 hour Dietary Recall
UAE	United Arab Emirates
PURE	Prospective Urban and Rural Epidemiologic
SPSS	Statistical Packages for Social Sciences

AUTHORS CONTRIBUTIONS

- MD Participate in design of study, coordinate and performed statistical analysis, drafted the manuscript
- AM Participate in design of study, performed statistical analysis, helped to draft the manuscript
- NH Coordinate study in Kuwait, helped to draft the manuscript
- AY Facilitated data collection in UAE, helped to draft the manuscript
- FN Coordinate study in UAE
- SY Participate in design of study, helped to draft the manuscript

All authors read and approved the final manuscript.

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