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PROXIMATE AND MINERAL COMPOSITION OF INDIGENOUS QATARI DISHES: COMPARATIVE STUDY WITH SIMILAR MIDDLE EASTERN DISHES

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A B S T R A C T

Proximate composition and mineral content analysis of 10 traditional Qatari dishes revealed that protein contents ranged from 1.7 to 12.4%, while the fat content ranged from 0.13 to 1.0 %. The meat dishes contained higher levels of sodium ranging from 1276 to 1989 mg/100g while iron and zinc content varied from 0.3 to 7.4 and 0.03 to 4.5 mg/100g respectively. The level of potassium and calcium was found to be highest in Aseeda (sweet dish) with 375.7 and 403.6 mg/100g respectively. There is considerable difference in the nutrient composition of the Qatari dishes from that of the similar dishes from the Gulf States possibly due to variations in the raw materials and preparation processes. Data from this study will be helpful in calculating nutrient content of traditional dishes of Qatar for planning diet charts and also for developing a Qatar Food Database in the future.

Keywords: Food composition, Proximate analysis, Qatar; Traditional dishes; Mineral content.

INTRODUCTION

In Qatar, the nutrition and lifestyle changes have played a major role in the occurrence of diet-related chronic non-communicable diseases. It was reported that non-communicable diseases are predicted to account for 69% of all deaths in Qatar (WHO, 2011). Recent statistics show that diet related diseases like Type 2 diabetes and hypertension are on the rise. The prevalence of type 2 diabetes among Qatari population will escalate by 130% in the next three decades (Mushlin *et al*., 2012; WHO, 2011). The results from the Qatar STEP wise report for 2012 showed that 70.1% of the respondents were overweight, the prevalence of high blood sugar among the respondents was 16.7%; (Supreme Council of Health, 2013).

The nutritional paradox of the Arab countries is reflected in the two types of nutritional challenges that is currently being faced by these countries; problems related to deficiency in nutrients such as anemia and growth retardation and, problems that have resulted due to rapid changes in lifestyle and diet such as type 2 diabetes and hypertension (Musaiger, 2012). According to WHO (2013), 'Qatar is among the GCC countries in advanced nutritional transition stage**,** with large number of overweight and obese population as well as some population sub-group suffering from under-nutrition and micronutrient deficiencies. Nutrition transition is malnutrition, not from a need for food, but the need for high quality nourishment'. Qatar imports 90% of its food; the total food import is expected to rise 153% in the coming decade due to population growth (QNFSP, 2013). Both raw and processed food are imported in the country. Despite the rising popularity of fast food, traditional dishes that are either cooked at home or bought from restaurants and stores still form a large of the diet among the Qatari population.

In order to understand the effect of food on health, food composition chart is necessary. Food composition tables have been established in many countries around the world. The information provided in them is used by health professionals in creating diets for individuals with specific dietary requirements such as for those with diabetes, obesity, high blood pressure and high cholesterol. The key principle for food composition table is the description of foods and their components. Food

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composition table can also assist in the formulation of nutrition interventions to meet regulatory standards as well as in accurate food labeling, product formulation, studying food consumption pattern and in research related to diet and health (Dashti *et al*., 2001; Lewis & Lupien, 1996).

There is minimum data on the composition of traditional dishes that are consumed in Qatar. Most of the data is compiled from published articles on the Gulf Region with minimum reference to change of ingredients and recipes that are specific to the Qatari dishes. The framework of the food composition data should initially be data generation. In Qatar, this data is the compilation of all the foods that are consumed in the country which includes traditional composite dishes, adapted composite dishes and newly introduced foods. Raw materials and processed food may be extracted from existing data as most of these foods are imported to the country. The next steps would be analytical data generation, data compilation (in food composition database) and data dissemination (to users through internet or printed material).

Analysis of traditional dishes of Qatar is not well established. Only one study has been conducted so far. Al Nagdy *et al*. (1994) analyzed the chemical composition of 17 Qatari dishes. Qatar has more than 50 traditional dishes therefore the nutrient composition of a large number of Qatari dishes still need to be carried out. Although these dishes share same names in all the Gulf countries, there are variation in the nutrient composition due to differences in recipes. In this study, 10 traditional Qatari dishes were analyzed for their proximate composition and mineral content.

MATERIALS AND METHODS

Selection of Qatari Traditional Foods: Ten food (dishes) were carefully chosen from a list of 50 regularly consumed foods in Qatar. These composite dishes represent different food groups prepared from different vegetables, meats, fish, cereals and sweets. The recipes of these composite dishes were evaluated and revised by three different Qatari women to validate the accuracy of the ingredients and recipes. The selected dishes includes; ThareedLaham - Bedouin recipe, HareesDagag, MakboosDagag- Hamsa method, MashkoolRubian, MadrobatDagag, MargoogLaham, Barinoish, KobozRugag, Sago and Asseda. For each composite food three analytical samples were drawn. The ingredients of the 10 composite foods are illustrated in Table 1.

Table 1. Ingredients of traditional Qatari dishes.

Dishes	Ingredients (W/W %)
Sago	Sago 50, sugar 33, hot water 10, rose water with saffron 2, powdered cardamom 2, Margarine 1, and Nuts 2.
Asseda	Wheat flour 70 , sugar 10, hot water 10, powdered cardamom 2, oil 2, powdered cinnamon 2, saffron with rose water 2, margarine 2
HareesDagag	Harees (crushed wheat) 30 , chicken 27, hot water 39 , salt 2, margarine 2
MakboosDagag	Hot water 25, onions 3, rice 36, chicken 15, tomato 3, garlic 1, ginger 1, cinnamon 1, salt 2, turmeric 1, cardamom 1, black pepper 1, spicy green pepper 1, sunflower oil 3, margarine1.
MadrobatDagag	Chicken 10, rice 30, water, 38, parsley 5, dill 5, coriander 4, onions 2, garlic 2, tomatoes 2, tomato paste 2, turmeric 1, powder cardamom 1, cinnamon 1, salt 2, sunflower oil 2.
Barinoish	Rice 60, sugar 20, water 20
KobozRugag	Wheat flour 69 , water 20, salt 1, dates with water (supernatant only) 10
MashkoolRubian	Shrimp 47, rice 20, water 21, onions 2, garlic 1, tomatoes 1, turmeric 1, powdered cardamom 1, cinnamon 1, salt 2, sunflower oil 2, capsicum 1
ThareedLaham	Meat with bone and fat (lamb) 20, water 35, squash 5, carrots 5, onions 3, potato 5, spicy green pepper 3, garlic 5, tomatoes 3, tomato paste 3, turmeric 2, cardamom 2, salt 3, capsicum 2, KobozRugag 10
MargoogLahem	Meat with bone and fat (lamb) 25, water 35, potato 4, onions 3, capsicum 3, squash 3, parsley 3, coriander 2, tomato paste 2, Iranian bread 14, salt 2, spice 1

Preparation of the composite dishes for nutrient analysis: All the raw materials used in the preparation of the samples were purchased on the same day of preparation from the retail stores. Fresh produce was stored in the refrigerator for a few hours prior to cooking. Dishes were then cooked according to the

recipes provided and reviewed by three Qatari women. Final dishes were then stored at a temperature of 2°C for 12 hours prior to analysis and raw ingredients for recipes with their amounts were recorded (Table 1).

Proximate composition: Cooked samples were prepared and homogenized, the samples were then coded, and stored in zip-lock plastic bags at - 20°C. Analyses commenced within two days after every sampling for the proximate composition. For the mineral analysis, samples were analysed after 1 week during which they were stored at - 20°C. The analysis was carried out at the Central Laboratory Unit at Qatar University. All analyses for macro-nutrients (moisture, crude protein, crude fat, ash) and micro-nutrients were performed in triplicates. Fat, ash and moisture content were determined at the Human Nutrition Program at the College of Arts and Sciences, Qatar University. Moisture content of all the foods, was determined in triplicates within two days of food preparation according to the AOAC Official Method 931.15 (2011). Crude fat was determined in duplicate by extracting 5 g samples in a Soxhlet apparatus using petroleum ether with a boiling point range of 40–60 °C. Protein analysis was performed in triplicate by the Kjeldahl method AOAC Official Method 960.52 (2011) and a conversion factor of 6.25 was used.

Mineral Analysis: Inductively coupled plasma mass spectrometer (Agilent, 7500Ce) was used for trace element measurements. Clean Nickel cones were used for sample analysis to avoid memory effects. A microconcentric nebulizer with a desolvation introduction system (ARDIUS, CETAC, USA) was used in the measurements. The instrument was first optimized for a maximum ion intensity with a 10 pg mL^{-1} standard solution of ^{89}Y. After optimization of all the instrumental conditions, a multielement standard solution composed of W, Bi, Pb, Sr, La, Ce, and Ba was aspirated as a blank to estimate the background. Detection limit was then calculated from the calibration curve using multi-element standard solution.

RESULTS AND DISCUSSION

Proximate compositions: Proximate compositions of all dishes analysed are given in Table 2. The table also compares the moisture content of the same dishes reported in other gulf countries. Moisture content was moderately high (63.6 ± 0.3 to 83.6 ± 0.5%) in all the meat dishes analyzed in this study. Highest moisture content was found in MadrobatDagag (83.6 ±0.5%). Similar high moisture values in meat dishes have been reported by earlier studies (Table3). KobozRugag, the traditional bread from the Arabian gulf region had the lowest moisture content (29.1 ± 0.9%). However, moisture content of KobozRugag from Bahrain was reported to be lower (6.5%; Musaiger, 2011). For Sago the moisture content was 39.8 ± 0.4%. Previous studies reported higher levels of moisture content in sago (59.4% and 70.7% moisture content; Al-Nagdy *et al*., 1994 and Musaiger, 2011 respectively). The moisture is directly related to the water content in the dish and the cooking time.= therefore, the recipe and cooking method may have resulted in such differences. For Asseda, the moisture content was 69.44 ± 0.1%. This value is higher than that reported by Al-Nagdy *et al*. (1994); Musaiger *et al*. (1998) and Musaiger (2011), who found that the moisture content of Asseda was 50.1, 65.3 and 29.7% respectively.

Table 2. Moisture content (%) of ten traditional Qatari dishes analyzed in this study along with the result from other studies done in the Gulf region.

Dishes	Result of present study	Musaiger, 2011 (Bahrain)	Habib *et al*., 2011 (UAE)	Al-Amiri *et al*., 2009	Musaiger & D'Souza., 2008 (Arabian gulf)	Musaiger *et al*., 1998 (Oman)	Al-Nagdy *et al*., 1994
HareesDagag	82.2 ± 0.1	81	79.91±2.05	NA	NA	80.2	NA
MakboosDagag	68.9 ± 0.9	72.6	65.91±4.8	NA	NA	72.6	64.4
MadrobatDagag	83.6 ± 0.5	NA	NA	NA	NA	NA	NA
ThareedLaham	82.2 ± 0.2	75	NA	NA	NA	NA	NA
MargoogLaham	81.9 ± 0.8	65.6	NA	NA	NA	NA	72
MashkoolRubian	63.6 ± 0.3	NA	NA	NA	62.7	NA	NA
Barinoish	61 ± 0.2	42.9	NA	NA	NA	59.7	50.7
KobozRugag	29.1 ± 0.9	6.5	8.63±4.68	NA	NA	NA	NA
Sago	39.8 ± 0.4	70.7	NA	NA	NA	NA	59.4
Asseda	69.4 ± 0.1	29.7	NA	52.80±0.36	NA	65.3	50.1

NA= Not analyzed.

Protein content varied from 1.7 ± 0.06 % in Asseda to 12.5 ± 0.04 % in MashkoolRubian (Table 3). Protein content is generally high in shrimp. Musaiger and D'Souza (2008) reported higher protein content in tiger shrimp cooked in rice (29.2%) over curried variety (24.6%) due to loss of water. Shrimps are a good source of protein, beneficial minerals and vitamins. Due their nutritional value and taste, they are in high demand and are cooked in a variety of ways. In Qatar, the shrimps are often cooked with rice. In our study the protein content of KobozRugag was 5.3 ± 0.07%. However, protein content in KobozRugag from Bahrain was reported to be 12.5% (Musaiger, 2011). Additionally, Habib *et al*. (2011) reported that protein content in Ragag from UAE was 10.89 ± 1.18%. Asseda, a sweet dish also made of wheat flour, contained the least protein content (1.7 ± 0.06%). However Al-Nagdy *et al*. (1994) found that the protein content of Asseda was much higher (3.1%). Similarly it was reported to be 3.9% in Oman (Musaiger *et al*.,1998) and 3.5% in Bahrain (Musaiger, 2011). The difference in protein content may be due to the difference in the wheat flour used. Whole grain wheat flour contains more protein than processed wheat flour. Fat content in the dishes analyzed in this study ranged from 0.08 ± 0.004% in Asseda to 0.96 ± 0.02 % in MakbousDagag (Table 4). The fat content in our study was lower than those reported by earlier studies. Al-Nagdy *et al*. (1994) and Musaiger (2011) reported 14.4 and 6.0 % of fat content in MakbousDagag respectively. Very high fat content was reported in Barinoish (33.1%) by Al-Nagdy *et al*. (1994) whereas Musaiger (2011) reported comparatively lower fat content (4.0 %). Barinoish is a sweet rice also known as Muhammer. Oil was not used in our recipe, whereas in the study conducted by Al-Nagdy *et al*. (1994), corn oil was used for making the sweet rice. The presence of oil and the quantity used may have changed the fat content of the dish. Al-Nagdy *et al*. (1994) who reported ghee as one of the ingredients used for making Asseda showed very high fat content (29.2%). Ghee contains around 60% saturated fat and is commonly used in many Asian and Arab traditional food. It is now a known fact that high consumption of saturated fat increases the risk of cardiovascular disease, obesity and diabetes. Manickavasagan and Al-Sabahi (2013) studied possible differences in textural and sensorial attributes in halwa made with ghee and vegetable oils. They reported that the majority of their panelists accepted the non-ghee halwa over halwa made with ghee. They also reported that the modified halwa had acceptable sensory qualities. Substitution of ghee with vegetable oil would be a healthy choice for prevention of diet related diseases in the long run.

Table 3. Protein content (%) of ten traditional Qatari dishes analyzed in this study along with the result from other studies done in the Gulf region.

Dishes	Result of present study	Musaiger, 2011 (Bahrain)	Habib *et al*., 2011 (UAE)	Al-Amiri *et al*., 2009	Musaiger & D'Souza., 2008 (Arabian gulf)	Musaiger *et al*., 1998 (Oman)	Al-Nagdy *et al*., 1994
HareesDagag	4.8 ± 0.05	5.1	3.33±0.15	NA	NA	5.4	NA
MakboosDagag	4.1 ± 0.1	5.0	6.14±1.28	NA	NA	4.8	11
MadrobatDagag	2.8 ± 0.7	NA	NA	NA	NA	NA	NA
ThareedLaham	1.8 ± 0.05	6.8	NA	NA	NA	NA	NA
MargoogLaham	4.9 ± 0.92	5.6	NA	NA	NA	NA	2.7
MashkoolRubian	12.5 ± 0.04	NA	NA	NA	29.2	NA	NA
Barinoish	2 ± 0.28	2.9	NA	NA	NA	5.2	1.8
KobozRugag	5.3 ± 0.07	12.5	10.89±1.18	NA	NA	NA	NA
Sago	1.9 ± 0.06	1.0	NA	NA	NA	Na	0.1
Asseda	1.7±0.06	3.5	NA	1.39±0.21	NA	3.9	3.1

NA= Not analyzed.

Mineral content: Analysis of selected dishes for twenty five mineral contents revealed that there was marked variation in the overall composition of minerals (Table 5). Highest amount of total mineral content was found in MashkoolRubian (2626.45 mg/100g) and the lowest total mineral content was found in Sago (50.08 mg/100g). HareesDagag, a chicken and rice dish, had the highest sodium content (1989 mg/100 g) while the lowest sodium content was found in Asseda (1.24 mg/100g). Asseda is a sweet dish in which no salt is added. The sodium content of Sago, also a sweet dish, was 6.07 mg/100g. Although Sago contains no added

salt, the sodium content of sago starch itself is around 7 mg/100 g. The results of this study were not in agreement with Al-Nagdy *et al*. (1994) who reported the sodium content of Aseeda, MargoogDagag, Mashkool, MakboosDagag, Barinoish, and Sago to be 13, 300, 155, 16 and 28 mg/100g respectively. Musaiger *et al*. (2008) also reported lower sodium content in MakboosDagag, (190 mg/100 g) and higher sodium content in Barinoish and Aseeda (381, 324 mg/100g respectively). Additionally in Bahrain, Musaiger (2011) showed that the sodium content of Aseeda, MargoogDagag, Mashkool,MakboosDagag, Harees, Barinoish, Thareed and Sago were 170, 231, 672, 285, 390, 17, 422, and 5 mg/100g respectively. According to USDA (2013), the estimated daily dietary intake for sodium should be less than 2300 mg (for males and females between the age of 14-50). One of the side effects of high sodium diet is the risk of developing cardiovascular diseases. Sodium increases blood pressure since it retains excess fluid in the body, creating an added burden on the heart. Too much sodium in the diet may also have other harmful health effects, including increased risk for stroke, heart failure, osteoporosis, stomach cancer and kidney disease (American Heart Association, 2013). The prevalence of cardiovascular diseases is increasing in the Middle east. According to the 2006 Qatar World Health Survey, 28% of individuals in the Qatari population were found to be hypertensive (Chanpong, 2008). In our study, most of the meat dishes contained very high levels of sodium and it is necessary that steps should be taken to reduce the sodium intake in diets to prevent the risk of developing hypertension and related complications.

Table 4. Fat content (%) of ten traditional Qatari dishes analyzed in this study along with the result from other studies done in the Gulf region.

Dishes	Result of present study	Musaiger, 2011 (Bahrain)	Habib *et al*., 2011 (UAE)	Al-Amiri *et al*., 2009	Musaiger & D'Souza., 2008 (Arabian gulf)	Musaiger *et al*., 1998 (Oman)	Al-Nagdy *et al*., 1994
HareesDagag	0.26 ± 0.05	1.5	1.43 ±1.6	NA	NA	1.4	NA
MakboosDagag	0.96 ± 0.02	6.0	2.64 ±0.54	NA	NA	2.0	14.4
MadrobatDagag	0.13 ± 0.001	NA	NA	NA	NA	NA	NA
ThareedLaham	0.32 ± 0.01	3.5	NA	NA	NA	NA	NA
MargoogLaham	0.08 ± 0.006	4.1	NA	NA	NA	NA	6.2
MashkoolRubian	0.34 ± 0.009	NA	NA	NA	5.6	NA	NA
Barinoish	0.09 ± 0.002	4.0	NA	NA	NA	NA	33.1
KobozRugag	0.03 ± 0.001	0.4	1.19 ±0.8	NA	NA	NA	NA
Sago	0.17 ± 0.006	2.2	NA	NA	NA	NA	4.8
Asseda	0.08 ± 0.004	6.3	NA	3.44 ±0.38	NA	4.7	29.2

NA= Not analyzed.

The deficiency of iron is another major health problem in the middle east. According to Musaiger (2002) the prevalence of iron deficiency (anemia) among preschool children of the Arab gulf countries ranged from 20% to 67%, while that among school children ranged from 12.6% to 50%. The percentage of pregnant women who suffered from anemia ranged from 22.7% to 54%. The result from our study showed that the highest iron content was found in KobozRugag (7.36 mg/100g) and the lowest in Barinoish (0.30 mg/100g). This is probably due to date extracts used in the production of KobozRugag and the fortified wheat flour. The high content of iron in KobozRugag is therefore beneficial to health if incorporated as part of a daily diet. The result of the calcium content analysis showed that the highest calcium content was found in Asseda (375.7 mg/100g) and the lowest in Barinoish (13. 6 mg/100g). The high level of calcium in Asseda may be due to the wheat flour which contains 40 mg of calcium per cup. Numerous studies have clearly revealed the association between a decreased risk of osteoporosis and adequate intakes of calcium and vitamin D (Musaiger *et al*., 2011). Food high in calcium like Asseda would be beneficial especially to children and women. Zinc is also an important micronutrient for health, the deficiency of which causes developmental abnormalities. From our results, the highest Zinc content was found in MargoogLaham (4.52 mg/100g) and the lowest in Sago (0.03 mg/100g). The highest magnesium content was found in Asseda (71.67 mg per 100g) and the lowest magnesium content found in Sago (2.42 mg/100g). Al-Nagdy (1994), found that the magnesium content in Asseda was 44 mg/100 g whereas, Musaiger (2011) found that the magnesium content of Asseda was 32 mg/100 g. However, in Oman, Musaiger *et al*. (1998) found that the magnesium content of Asseda was only 5.9 mg/100g.

Table. 5. Means for the total mineral content of selected traditional Qatari dishes (mg/100g).

Element	Reference material (Tomato leaves)	Aseeda	Margoog Laham	Mashkool Rubian	Koboz Rugag	Makboos Dagag	Harees Dagag	Barinoish	Madrobat Dagag	Thareed Laham	Sago
B (Boron)	3.33	0.66	0.33	0.25	0.21	0.21	0.11	0.05	0.15	0.21	
Na (Sodium)	13.63	1.28	1751.00	1929.00	707.40	1810.00	1989	4.12	1276	1602	6.07
Mg (Magnesium)	1196.00	71.67	55.40	69.16	57.08	31.60	59.63	7.23	32.51	57.97	2.42
Al (Aluminum)	59.64	6.95	3.37	3.30	4.14	2.18	4.53	0.26	4.16	2.00	2.63
K (Potassium)	2697.00	403.60	662.20	454.80	287.90	363.40	265.60	27.40	370.90	652.30	18.03
Ca (Calcium)	5054	375.70	80.10	160.30	52.77	37.97	52.85	13.58	59.21	54.87	13.91
Ti (Titanium)	1.67	0.25	0.63	1.01	0.57	0.39	0.51	0.07	0.01	0.18	ND
Cr (Chromium)	0.21	ND	0.0005	0.01	0.01	ND	ND	ND	ND	ND	ND
Mn (Manganese)	24.56	1.26	0.71	0.77	1.74	0.63	1.67	0.27	0.50	0.87	0.04
Fe (Iron)	36.85	1.67	6.57	2.62	7.36	1.65	2.49	0.30	3.02	4.97	6.54
Ni (Nickel)	0.16	0.003	0.008	0.003	0.015	0.004	ND	ND	ND	ND	ND
Cu (Copper)	0.47	0.12	0.41	0.58	0.32	0.20	0.36	0.09	0.03	0.14	ND
Zn (Zinc)	3.08	0.43	4.52	2.80	1.83	1.14	1.82	0.77	1.21	1.71	0.03
Rb (Rubidium)	1.49	0.23	0.34	0.15	0.50	0.38	0.29	0.02	0.22	0.49	ND
Sr (Strontium)	8.49	0.62	0.43	1.52	0.35	0.23	0.40	0.02	0.34	0.29	ND
Mo (Molybdenum)	0.04	ND	0.02	0.02	0.01	0.06	0.01	0.04	ND	ND	ND
Sn (Tin)	0.00	ND	0.01	0.01	0.01	0.02	ND	ND	ND	ND	ND
Ba (Barium)	6.29	1.31	0.16	0.06	0.21	0.07	0.11	0.01	ND	0.05	ND
Hf (Hafnium)	0.002	0.002	0.0015	0.0014	0.001	0.0012	0.0013	0.0012	0.01	0.01	0.01
Ta (Tantalum)	0.01	0.01	0.01	0.01	0.01	0.005	0.01	0.01	0.05	0.06	0.05
W(Tungsten)	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.05	0.05	0.04
Au (Gold)	0.05	0.04	0.06	0.06	0.06	0.05	0.06	0.04	0.42	0.39	0.30
Hg (Mercury)	0.004	0.001	0.01	0.01	0.003	0.003	0.003	0.001	0.03	0.02	ND
Tl (Thallium)	0.01	0.004	0.003	0.0027	0.003	0.002	0.002	0.002	0.03	0.02	0.02
Pb (Lead)		0.012	0.0101	0.0083	0.013	0.0063	0.0052	0.0040	0.003	0.0026	ND

ND = Not detected.

The differences maybe because of different recipes (in Oman they do not add sugar) or the quality of wheat flour in each country. Copper content was found to be the highest found in MashkoolRubian (0.58 mg/100g) and the lowest in MadrobatDagag (0.03 mg/100 g). In the study done by Musaiger and D'Souza (2008), it was found that the copper content in shrimp cooked in rice was 0.6 mg/100g. Musaiger and D'Souza (2008) also found higher content of magnesium and calcium in shrimp cooked in rice and attributed it to the high content of these minerals found in shrimps with marginal contribution from the rice itself.

CONCLUSION

In recent years, due to changes in socio-economic conditions and subsequent changes in the diet habit of the people, health problems related to excessive consumption of calories and deficiency

of vital minerals are emerging as major problems. Preparation of traditional foods has also changed with an increased addition of fats, salt and white flour. The different methods of food preparation employed in Qatar have a marked influence on the nutrient and mineral composition of traditional dishes. A natural consequence of rise in food consumption and increase in the caloric density of Qatari foods has led to the increase of non-communicable diseases in Qatar and these include obesity, cardiovascular diseases, diabetes and micronutrient deficiencies. Data on the nutrient content of Qatar foods provided to health care workers, nutritionists and dietitians will assist them in addressing the major nutritional problems that are all associated with the diet of the community.

With reference to the food composition data in the Gulf, comprehensive analysis of foods is needed since most of the data compiled is based on calculations and not from direct analysis of foods. Most countries allow the use of compositional data taken from a regulatory compilation databases, such as a national food composition database as a substitute for direct analysis. This has added a quasi-regulatory role to food composition databases and strengthens the need for maintenance of data quality in terms of both the representativeness of the samples and the quality of the analytical data.

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AUTHORS CONTRIBUTIONS

Tahra ElObeid designed the research plan and worked with Ms. Zainb Megdad in the lab and in analysis of the results and discussion. Susanna Phoboo reviewed the paper and assisted in preparation of the manuscript.

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