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Developing a food exchange list for Middle Eastern appetizers and desserts commonly consumed in Jordan

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Abstract

Aim—This study was conducted to develop a meal-planning exchange list for Middle Eastern foods commonly included in the Jordanian cuisine. Forty types of appetizers and another 40 types of desserts were selected; with five different recipes for each item. Recipes were collected from different housewives and Arabic cookbooks. Ingredients' weight and dish net weight were recorded based on an average recipe, and dishes were prepared accordingly. Dishes were proximately analyzed following the AOAC procedures. Proximate analysis was compared to the WHO-food composition tables (FCT) for the use in the Middle East, and with food analysis software (ESHA).

Results—Significant correlations ($P < 0.001$) were found between macronutrient content obtained from proximate analysis and those obtained from ESHA. The correlation coefficients (r) were 0.92 for carbohydrate, 0.86 for protein, and 0.86 for fat. Strong correlations were also detected between proximate analysis FCT for carbohydrate ($r=0.91$, $P<0.001$) and protein ($r=0.81$; $P<0.001$) contents. However, this significant correlation was not found as strong, yet significant for fat ($r=0.62$, $P<0.001$).

Conclusion—A valid exchange system for traditional desserts and appetizers is now available and ready to be used by dietitians and health care providers in Jordan and Arab World.

Keywords

Middle Eastern foods; food exchange lists; Jordanian cuisine

INTRODUCTION

Jordan is an Arab country with a population of five million and is considered a part of the Middle East bordered by Syria, Saudi Arabia, Palestine and Iraq. Limited data are available about food pattern in Jordan; however, according to statistics, there is a substantial increase (25 %) in daily energy intake from 1962 to 2002. Carbohydrate contribution to daily energy intake decreased from 72% in 1962 to 62% in 2002, and fat contribution to daily energy intake increased from 18% in 1962 to 27 % in 2002.¹ No changes were documented regarding protein intake.² Cereals constituted the highest amount of food consumed, followed by fruits and vegetables.^{3,4}

Latest health surveys in Jordan reveal an alarming increase in diet-related, non-communicable diseases, particularly cardiovascular diseases, diabetes, obesity, and cancer.¹ About 64.4 Jordanians per 100,000 suffer from different types of cancers¹; about 32%, and 13.4% among Jordanian have hypertension^{5,6} and diabetes⁷, respectively; and about 60% of females and 33% of males have obesity.⁸

Lack of regional exchange lists that include traditional foods is a major limitation for adequate nutrition intervention for individuals in the Middle East. Exchange lists enable nutrition professionals to design meal plans that are convenient, affordable, culturally sensitive, and most importantly promote health. Chronic diseases that are nutrition-related have become epidemic not only in the Middle East, but worldwide.⁹ Diet plays a substantial role in maintaining a good health status, managing chronic conditions, and controlling body fat.¹⁰⁻¹² It is essential that user-friendly guides be developed to allow individuals monitor their daily food intake.¹³

The food exchange systems help individuals monitor food portion sizes, and thus energy intake. Exchange systems simply translate scientific nutrition knowledge into a practical form.¹⁴ Foods on the same list can be used interchangeably without changing approximate amounts of carbohydrate, protein, fat, and total energy supplied by a meal.¹⁵

Ethnic variations and traditions have tremendous influences on food choices. Consequently, a key point for enhancing individuals' commitment towards healthy eating is to incorporate culturally accepted foods in their meal plans.¹⁶ Currently, Jordanian dietitians use the exchange list published by the American Dietetic Association; and so, still facing the limitation of including cultural dishes consumed in Jordan in their meal plans. Despite the existence of regional food composition tables for Middle Eastern countries that include some dishes common in the Jordanian cuisine, ingredients and preparation methods differ substantially across countries. This research, therefore enables Jordanian practitioners to develop more practical and realistic meal plans that include traditional cuisine to facilitate higher compliance. The growth of cultural diversity in the developed world due to increased political and economic migration from places like Jordan makes it necessary for health care providers to pay attention to the cultural uniqueness of ethnic food habits. Practitioners outside Jordan working with Jordanian immigrants may also benefit from this research.

Middle Eastern main dishes common in the Jordanian cuisine has been previously reported¹³, the intention of the current study was to incorporate similar side dishes and desserts into exchange lists.

METHODS

The protocol of this study fulfills the requirements of the IRB committee in Jordan University of Science and Technology. A convenience sample of twenty housewives involved in food preparation was selected from different geographical regions in Jordan. These informants were asked to name 20 appetizers/desserts commonly prepared and were advised to refer to local cookbooks to enhance recall. Most frequently mentioned side dishes (N=80) were selected to be included in the exchange lists (list of the selected dishes and their description are provided in appendix 1). Analysis of the main dishes commonly used in Jordan has already been done and detailed description can be found elsewhere.¹³ To complement our previous work, the focus of this paper is on desserts and appetizers which will now be referred to as "side dishes" for the rest of this paper.

To minimize the variation in food preparation methods among individuals, five informants (representing different geographical regions in Jordan) out of the total 20 were asked to provide a detailed recipe for each item. The quantity of each ingredient was averaged

(summation of ingredients' quantities divided by 5). Every ingredient in the average recipe was documented in both kitchen (standard cups, spoons) and standard metric measurements (g, mg, L, mL, etc.). We expected that every informant would give us a recipe of different sizes according to their family size. In order to standardize the weights used to prepare side-dishes, individuals were asked to provide these recipes based on a prior chosen amount of the main ingredient of each recipe. For example, the main item in the cabbage salad is cabbage. Individuals were asked to provide a recipe for preparing cabbage salad from one kilogram of cabbage.

One batch of the average recipe was prepared. Preparation conditions were optimized in order to minimize bias; all the cooking was done by same researcher using same kitchen and facilities. The purpose of dishes' preparation was to get a precise weight of the ingredients and a net weight of the prepared item. Food proximate analysis procedures were conducted, according to the Association of Official Analytical Chemists procedures (AOAC), to determine the content of protein, fat, and carbohydrates.¹⁷ Analyses were conducted in the feed analysis laboratory in the Department of Animal Production at Jordan University of Science and Technology. Duplicate homogenized samples (300 grams) from each side dish were taken and coded. Samples were desiccated in the oven (Carbolite oven, NR 200F model, England) for 3 days, and were then ground. Moisture content was determined by calculating the difference between wet and dry sample weights. Ash was measured using a Carbolite furnace (Model CSF 11/7, Bamford, England), and the Kjeldahl method (Kjetelec system used: Model 1026 Tecator, Sweden) was used to determine nitrogen content. Protein was then estimated by multiplying the nitrogen content by 6.25. Total fat (ether extract) was analyzed using Soxtec system (Model HT 1043 Tecator, Sweden). Total carbohydrate content was estimated by difference in sample weight moisture, ash, protein, and ether extract.

Proximate analysis data were obtained per serving size of side dish. Decisions about the serving sizes were based on the amount that yielded the best fit in the exchange system. The following paragraph describes the process of dishes' fitting to the exchange system.

Side dishes were fitted according to their macronutrients' content based on the American Dietetic Association and the American Diabetes Association exchange system. Every 15 grams of carbohydrate was counted as one serving of starch, 7-8 grams of protein was considered a serving of meat or milk (depending on the carbohydrate and the fat content of the food), and 5 grams of fat was considered a serving of fat. In this study, we followed Wheeler et al.¹⁸ rounding-off method (described below) to fit items with macronutrients' content of more or less than the above-mentioned values. The rounding was as follows:

- * For carbohydrate exchange: if food portion had 1-5 grams of carbohydrates, it was not counted as a serving. If it had 6-10 grams of carbohydrates, it was counted as half serving. And if it had 11-20 grams of carbohydrates, it was counted as one serving.
- * For fat exchange: if food portion had 0-2 grams of fat, it was not counted as a serving. However, if it had 3 grams of fat, it was counted as half serving. And if it had 4-7 grams of fat, it was counted as one serving.
- * For protein exchange, if food portion had 0-3 grams of protein from the meat and meat substitutes list, it was not counted as a serving, and if it had 4-10 grams of protein, it was counted as one serving.

Dishes analysis and composition obtained in this study was compared to other food composition tables in the region, mainly The Food Composition Tables for the Use in the Middle East.¹⁹ Other food composition tables used for comparison were *Food Composition*

*Tables for Arab Gulf Countries*²⁰ and *Food Composition Tables for Egypt*.²¹ The Food Composition Tables for the Use in the Middle East prepared by Pellet and Shadervian tackled dishes most common in Lebanon. It is well known that Jordan is closer to Lebanon both geographically and culturally than it is to Gulf States or Egypt. For that reason, we found more common items between our list and Pellet and Shadervian's list.

Thirty-six side dishes out of 80 were found in the Pellet's and Shadervian's work. The composition of these 36 items was compared to that found in the proximate analysis conducted in this study. The Food Composition Tables for the Use in the Middle East did not comprehensively include all side dishes common in Jordan; so nutrient analysis software program was used (Food Processor, ESHA, City, State, V. 7.71) to estimate the combined ingredients of the food items.²² Amounts entered were edible parts used in cooking. The Food Processor database did not include all items used in the preparation of traditional side dishes such as knafeh dough; so these items were subjected to proximate analysis and were then added to the database for later use. With regard to comparing studied dishes with the *Food Composition Tables for Arab Gulf Countries*²⁰, and with the *Food Composition Tables for Egypt*²¹; common dishes in our study and these composition tables were 26 (8 desserts and 18 appetizers), and 18 (12 desserts and 6 appetizers) respectively.

Statistical Analysis

Pearson's correlation coefficients were used to study correlation between macronutrients contents obtained from the proximate analysis and the Food Processor. Linear regression analysis was performed to enable the best prediction of carbohydrate, protein, and fat when using the food analysis software. Data were analyzed using regression procedure of SAS Institute-version 6.0.²³ Significance was declared at $p < 0.05$

RESULTS AND DISCUSSION

The macronutrient contents and exchange list of the traditional side dishes are presented in Table 1. Very strong correlations ($P < 0.001$) were found between macronutrient content obtained from proximate analysis and those obtained from the Food Processor. Correlation coefficients (r) were 0.92 for carbohydrate, 0.86 for protein, and 0.86 for fat. Despite the fact that the Food Processor data were obtained from the summation of the analysis of all ingredients in their raw form, unlike proximate analysis which was performed on the cooked items, there were no significant differences in macronutrient content. These differences may be clearly seen in main dishes that require extensive cooking and heat treatment. This finding implies a very useful application of how one can obtain composition data of a combination food without going through an extensive laboratory analysis.

To further examine this application, a regression analysis was run to obtain prediction equations for macronutrient content for food items other than the ones included in this study. Using equations provided in Table 2, macronutrient composition of any food from the Jordanian cuisine can be predicted. Amounts of carbohydrates, protein, and fat can be obtained from food analysis software, and after fitting them into the equations, predicted composition can be obtained.

Similarly, strong correlations were found between proximate analysis and that published in FCT for carbohydrate ($r=0.91$, $P<0.001$) and protein ($r=0.81$; $P<0.001$) content. Significant correlation was found for fat ($r=0.62$, $P<0.001$), yet, it was not as strong as that found for carbohydrate and protein. When the average recipes from the present study were compared to similar ones published in FCT, considerable disparities were found in the types and amounts of oils.

*Food Composition Tables for Arab Gulf Countries*²⁰ included 26 items in common with our analyzed items. Controlling for weight, average percentages of error in carbohydrates, protein, and fat contents were 7.7%, 2.6%, and 5.5% respectively. Greater differences were found in the macronutrient contents between Jordanian dishes and the Egyptian ones.²¹ Controlling for weight, averages percentage of error in carbohydrates, protein, and fat contents were 14.4%, 3.3%, and 5.9 respectively.

A major limitation of this research is that it does not provide data about the type of fat (saturated, polyunsaturated, and monounsaturated) included in the side dishes. It was not possible to analyze the type of fat in the lab using the high pressure liquid chromatography (HPLC) technique. Another limitation of the study was the consideration of total carbohydrate rather than available carbohydrate. Fiber content should have been excluded to obtain available carbohydrate as an energy-yielding macronutrient. The findings of this study are limited due to the fact that our informants were not randomly selected.

CONCLUSIONS

In conclusion, food exchange lists for 80 Middle Eastern side dishes common in the Jordanian cuisine are now available. The Food Composition Tables for the Use in the Middle East¹⁹ appears to be a good source of information about carbohydrates and protein content of side dishes served in Jordan, however, this is not true in the case of fat content.

This work is important to consumers, dietitians, and researchers. Exchange lists such as these offer user-friendly guides that enables consumers to exchange foods and allows them to make healthier food selections. Dietitians can also use this tool to plan tailored meals for Jordanians' needs and health status. Dietitians who work with Jordanians living abroad may also find this information beneficial. Main Arab countries that can get maximum benefit from this work include Palestine, Syria and Lebanon. Practitioners in other Arab countries may also benefit from this work, but in less magnitude. Finally, providing nutritional information about traditional dishes in countries where culture has significant impact on eating habits is essential and should be a research priority. Research efforts like this one will set a solid base for nutrition science and practice in the region.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Table 1

Exchange list and macronutrients content (g) of appetizers and desserts common in Jordanian cuisine

Local name	g	CHO ^a	Protein	Fat	Kcal	Serving size	Exchanges per Serving
Dessert							
Asabe' zainab	30	15.3	2.4	4.5	111	3pieces	1starch, 0.5fat
Awamah	40	17.6	2.3	2.8	105	4pieces	1starch, 0.5fat
Bain narain	40	15.3	3.4	6.3	132	1piece	0.5starch, 0.5whole-milk, 0.5fat
Baqlawia	40	19.8	3.9	11.5	198	2pieces	1starch, 2fat
Barazeg	30	15.3	3.5	10.4	169	1piece	1starch, 2fat
Bbosh	60	29.3	2.7	4.4	168	1piece	2other-carbohydrates, 1fat
Gatayef ajwa	45	24.7	2.0	1.6	121	1piece	1.5other-carbohydrates
Gatayef asafery	60	16.8	3.5	4.3	120	2pieces	1starch, 0.5fat
Gatayef jibneh	40	14.6	3.5	3.1	100	1piece	1starch, 0.5fat
Gatayef jouz	45	22.7	2.8	3.4	133	1piece	1.5 starch, 0.5fat
Gharabeh	20	12.6	1.5	5.6	107	2pieces	1starch, 1fat
Godrit gader	65	30.2	6.2	4.8	189	1piece	2 starch, 0.5fat
Gras el eid	90	43.0	9.6	11.5	314	1piece	3starch, 2fat
Harressh	55	31.3	2.5	2.0	153	1piece	2starch
Helbeh	60	29.6	4.7	5.6	188	1piece	2starch, 1fat
Khaliet nahel	30	14.6	2.9	4.5	111	6piece	1starch, 1fat
Knafeh	50	16.5	5.1	10.8	184	1piece	0.5starch, 0.5whole-milk, 1.5fat
Knafeh maghshosheh	130	48.6	5.5	6.1	271	1piece	3starch, 1fat
Kollaj fozdog halabi	45	15.7	5.2	17.2	238	1piece	1starch, 3fat
Kollaj jibneh	50	14.6	4.9	12.9	194	1piece	1starch, 0.5lean-meat, 2fat
Kollaj jouz	45	17.1	4.3	16.1	231	1piece	1starch, 3fat
Kraizh	60	15.3	1.2	0.4	70	1piece	1other-carbohydrates
Lafet ilkateeb	70	29.9	6.4	11.6	250	1piece	2starch, 2fat
Layaly libnan	60	13.7	3.2	3.5	99	1piece	1starch, 0.5fat
Lazageat	50	21.0	4.7	1.8	119	1/4piece	1.5starch
Lazy cake	35	17.1	3.0	3.9	116	1piece	1starch, 0.5fat
Mabrosheh	50	30.9	3.7	5.9	192	1piece	2starch, 1fat

Local name	g	CHO ^a	Protein	Fat	Kcal	Serving size	Exchanges per Serving
Mamoul ajwa	30	17.3	2.4	4.9	123	1piece	1starch, 1fat
Mamoul fostoq	30	16.0	3.3	5.8	129	1piece	1starch, 1fat
Mamoul jouz	30	14.2	3.2	8.2	143	1piece	1starch, 1.5fat
Mraddad	65	36.0	5.2	10.8	262	1piece	2.5starch, 2fat
Muhlabiyeh	145	33.0	4.8	3.0	178	1/2cup	2other-carbohydrates
Nammourah	50	14.9	3.1	9.2	155	1piece	1starch, 1.5fat
Oshil saraya	60	15.2	4.6	3.7	113	1piece	0.5starch, 0.5whole-milk
Ruz bi halib	130	33.1	10.6	3.9	210	1/2cup	2starch, 0.5whole-milk
Sahlab	125	22.5	2.3	1.5	113	1/2cup	1.5other-carbohydrates
Smsmieh	30	17.1	3.9	7.4	151	1piece	1starch, 1.5fat
Zalabia	55	24.2	5.8	8.0	192	1/2piece	1.5starch, 1.5fat
Appetizer							
Baba gannuj	85	5.7	3.7	4.6	79	1/3cup	1vegetable, 1fat
Bagdonseeh	25	1.3	2.6	4.6	57	2Tbsp	1fat
Falafel	45	11.6	4.9	7.9	137	2pieces	1starch, 1.5fat
Fareem	80	38.6	5.8	7.4	244	1/4 cup	2.5starch, 1fat
Fatayer batata	70	24.9	4.7	2.3	139	1piece	1.5starch
Fatayer hummad	115	33.9	7.8	9.7	254	1piece	2starch, 0.5vegetable, 1.5fat
Fatayer jibneh	60	20.7	9.2	6.3	176	1piece	1.5starch, 0.5 medium-fat-meat, 0.5fat
Fatayer kishk ^b	75	27.2	9.3	8.5	223	1piece	1.5starch, 0.5low-fat-milk, 1fat
Fatayer lahm	60	22.7	8.2	5.8	176	1piece	1.5starch, 0.5lean meat, 0.5fat
Fatayer sabanek	90	27.3	5.8	6.9	195	1piece	2starch, 1fat
Fatayer zatar akhdar	55	22.5	4.7	6.1	164	1piece	1.5starch, 1fat
Fattoush	100	15.5	3.1	8.6	152	1cup	1vegetable, 0.5starch, 1.5fat
Foul moudamas	115	13.8	9.7	8.4	170	1/2cup	1starch, 1lean-meat, 1fat
Ijee	70	13.1	7.4	14.1	209	1piece	1starch, 1medium-fat-meat, 2fat
Jibneh bayda	35	0.8	6.7	6.2	86	1piece	1medium-fat-meat
Jibneh bayda makli	25	0.7	6.9	7.6	99	1piece	1high-fat-meat
Khubz abyad	30	15.4	2.8	0.1	74	1piece	1starch
Khubz shrak	30	14.6	3.0	0.2	72	1piece	1starch

Local name	g	CHO ^a	Protein	Fat	Kcal	Serving size	Exchanges per Serving
Labaneh	45	1.3	6.9	6.8	94	2balls	1medium-fat-meat
Magdoos	70	5.3	2.3	4.5	71	1piece	1vegetable, 1fat
Managish baid	140	37.9	16.1	8.8	295	1piece	2.5starch, 1medium-fat-meat, 0.5fat
Managish zait bi zatar	110	39.0	10.1	13.2	315	1piece	2.5starch, 2.5fat
Mshawasheh	105	13.3	8.8	10.1	179	1/2cup	1starch, 1medium-fat-meat, 1fat
Qudsieh	120	16.6	11.5	12.3	223	1/2cup	1starch, 1lean-meat, 2fat
Salatat banadoura bi basal	100	5.5	1.4	4.2	65	1/2cup	1vegetable, 1fat
Salatat banadoura bi laban	120	4.3	4.0	2.9	59	1/2cup	1vegetable, 0.5fat
Salatat banadoura bi tahini	105	6.7	4.3	4.7	86	1/2cup	1vegetable, 1fat
Salatat elit	85	4.9	1.5	5.4	74	1/2cup	1vegetable, 1fat
Salatat farfahina	105	3.9	3.0	1.6	42	1/2cup	1vegetable
Salatat il batata	140	19.4	5.1	1.2	109	1cup	1starch
Salatat il malfouf	95	6.0	1.2	12.5	141	1/2cup	1vegetable, 2.5fat
Salatat khass	150	5.4	1.6	8.4	104	1cup	1vegetable, 1.5fat
Salatat khiyar bi laban	110	5.0	2.6	0.9	39	1/2cup	1vegetable
Salatat kudat	180	5.5	2.2	3.1	59	1cup	1vegetable, 0.5fat
Sambousek jibneh	40	14.6	5.1	6.3	136	1piece	1starch, 0.5lean-meat, 1fat
Sambousek lahm	40	15.0	5.2	5.9	134	1piece	1starch, 0.5lean-meat, 1fat
Shawarma dajaj (1)	55	14.1	10.2	9.1	179	1/3piece	1starch, 1high-fat-meat
Shawarma dajaj (2)	55	14.7	11.4	6.9	167	1/3piece	1starch, 1medium-fat-meat
Shawarma lahm (1)	55	11.5	12.8	8.1	170	1/3piece	1starch, 1high-fat-meat
Shawarma lahm (2)	55	16.7	9.8	7.4	173	1/3piece	1starch, 1medium-fat-meat
Tabbouli	65	4.5	1.3	1.7	39	1/2cup	1vegetable
Zatar baladi	18	5.6	3.5	6.1	91	3Tbsp	1vegetable, 1fat

^aCHO= Carbohydrates

^bKishk is a dry mixture of wheat, bulgur, and whey

Table 2

Macronutrients' content prediction equations using explanatory variables obtained by the *food processor* software

Variable	Regression Equation
Carbohydrate (g)	CHOLAB= $3.70 + 0.8 \times \text{CHOESHA}$
Protein (g)	PROTLAB= $1.88 + 0.99 \times \text{PROTESHA}$
Fat (g)	FATLAB= $8.84 + 0.48 \times \text{FATESHA}$

CHOLAB= predicted carbohydrate content (g); CHOESHA= carbohydrate content obtained from *food processor* software; PROTLAB= predicted protein content (g); PROTESHA= protein content obtained from *food processor* software; FATLAB= predicted fat content (g); FATESHA= fat content obtained from *food processor* software