

# Macro and micronutrients content of regular diet meals served at Governmental Jordanian Hospitals

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**Summary.** *Backgrounds and Objective:* Meals of regular diet were evaluated, in seven hospitals located in three cities in the middle region of Jordan. *Methods:* The diets were evaluated by calculating their mean content of energy, fiber, macronutrients and some micronutrients, then compared with standards. *Results:* Our results revealed that energy content was less than 2000 Kcal in all hospitals and fiber content was less than 28 g in most hospitals. Carbohydrate (CHO), protein and fat contribution of the total energy in all hospitals were within the acceptable macronutrients distribution range (AMDR) and ranges between 47.1% and 58.1% for CHO, 14.8% and 22.6% for protein and 21.8% and 32.1% for fat. On average, all hospital meals provided a diet low in the following minerals (Ca, K) and vitamins (A, C, D, E, K) and did not meet the nutritional standards. Regular diet contain excessive levels of sodium which exceeded the AI of 1500 mg of sodium and exceeded the UL of 2300 mg. Based on "Choose My Plate" recommendations, out of seven hospitals, 5 met the recommendations for vegetables, and 4 met the recommendations for grains but only 1, 2 and 3 hospitals met the recommendations for protein, dairy and fruits, respectively. *Conclusion:* On the basis of this study, we conclude that many hospitals do not design regular diets to meet dietary recommendations. Careful menu planning should be emphasized and followed. Menus should be evaluated and updated continuously to reflect the changes of the patients' preferences and requirement.

**Key Words:** inpatients, regular diet, hospital diets, meals, Jordan

## Introduction

Food in Hospitals is one important part of an integrated programme for improving nutritional care in hospitals. It is well known that nutrition plays an important role for every patient who is admitted to a hospital(1). It is fundamental that hospitals provide appropriate food and nutritional care to manage any nutritional risk, to improve nutritional health and well-being and optimise the wider clinical management of all patients(2).

Evaluating food intake among hospitalized patients has a great importance in decreasing malnutrition and health problems. Over the last years, multiple studies have been conducted worldwide showing that

the prevalence of hospital malnutrition ranges from 20 to 50% (3-7), depending on the population studied, the geographic area and the method and criteria used for the diagnosis. The situation in Jordan is not much more encouraging, and different studies have found that the prevalence of hospital malnutrition also varies between 56.2 and 62 % (8,9).

Nutritional therapy is an essential component of the management of disease and has an important role in helping achieve and maintain optimal control(10). Regular diets, also called house or normal diets, are used to maintain or achieve the highest level of nutrition in patients who do not have special needs related to illness or injury considered the largest diet use in hospital. Generally, all hospital diets should meet the

nutritional requirements of the assisted patient. Studies suggest that dietary recommendations are not met among hospitalized patients (11-13).

In Jordan, Understanding dietetics and hospital food service seems to progress very slowly but steadily during the last four decades (14-16). There are few published data describing hospital patient menus and determining whether the content levels of nutrients fall within recommended guidelines (17-19). In our literature search, we found some reports describing the regular and therapeutic diets in Jordanian hospitals (20-22). Thus, the current work was conducted to evaluate the regular diet meals content of macronutrients, some micronutrients and energy in seven governmental, teaching and military hospitals and number of food groups based on my plate guide of meals served at those Hospitals in the middle region of Jordan.

## Methods

Meals of regular diet were evaluated, in seven hospitals, chosen randomly, located in three cities (Amman, Al-Salt and Madaba), in the middle region of Jordan, namely: One Teaching hospital (Hospital A), One military hospital (Hospital E) and five Governmental hospitals (B, C, D, F and G). This study was conducted between September, 2014 and January 2015. Approval to implement the study protocol was obtained from the committee of scientific research of Al-Balqa Applied University. Prior to data collection, Approvals for collecting data were obtained from hospital administrators.

We visited nutrition department in each hospital for interviewing the dieticians in charge. A copy of three days menu of three regular diet is taken. Quantities are determined either by observation or by asking the dieticians and the technicians in charge. Amounts of ingredients for recipes for every item served in the prescribed meal plans in each hospital were recorded in a comprehensive database that allowed precise nutritional analyses by weight of food serving. Nutritional information supplied by the manufacturer of prepackaged foods was used when available.

To analyze these meals, three days of breakfast, lunch, and dinner meals made up of standardized por-

tion sizes for each prescribed diet were analyzed for daily nutrient content using the United States Department of Agriculture Database, super tracker (23). The mean of three day nutrient contents of meals (2 weekdays and 1 weekend day) was calculated.

Energy, macro nutrients (carbohydrates, protein, fat) dietary fiber & certain micronutrients (Minerals: Ca, K, Na, Fe, P) and Vitamins (A, B12, C, D, E, K) are recorded for each food item. The total values of each nutrient/day are summed & then an average is made upon the three days nutrient sums. The food items of each day are entered separately to the food trackers, divided according to the menu meals & the intake of food groups the meals provide.

Nutrient levels in regular menus were compared with standards based on the USDA's *2010 Dietary Guidelines for Americans* (requirements for adult populations): the adequate intake (AI) level, or Recommended Dietary Allowances (RDA), the tolerable upper level (UL) and the acceptable macronutrients distribution range (AMDR) (24-27). Recommended total daily amounts of food groups of the Choose My Plate guidelines were used for assessment of contents of these meals in each hospital.

## Statistical analysis

Statistical analysis was performed using SPSS, version 15.0. Descriptive statistics were used and data were presented as means, medians frequencies and percentages.

## Results

Table (1) contains nutrition standards that are based on the USDA's 2010 Dietary Guidelines for Americans. These standards are requirements for adult populations.

As seen in Table (2), CHO, protein and fat contribution of the total energy in all hospitals were within the AMDR and ranges between 47.1% in hospital (D) and 58.1% in hospital (F) for CHO, 14.8% in hospital (G) and 22.6% in hospital (A) for protein and 21.8% in hospital (A) and 32.1% in hospital (G) for fat. Energy content was less than 2000 Kcal in all hospitals

**Table 1.** Recommended standards (DRI ) for nutrients per day

Nutrients Standards:	AMDR	RDA	AI	UL
Energy(Kcal)		2000 **		
CHO (g)	45–65% of energy	130		
Protein (g)	10–35% of energy	56M;46F		
Fat (g)	20–35% of energy	; ≤ 30% of total calories **		
Fiber (g)		≥ 28 grams		
Ca(mg)			1000	2500
K(g)			4.7	ND
Na(mg)		≤ 2300 mg ; Na (> 50 years): ≤ 1,500 mg **		
Fe(mg)		> 8 (18 F; 8 M)		45
P(mg)		700		4000
VitaminA(μg)		900M;700F		3000
Vitamin B12(μg)		2.4		ND
Vitamin C(mg)		90M;75F		2000
Vitamin D (μg)			5	50
Vitamin E(mg)		15		1000
Vitamin K(μg)			120M;90F	ND

\* Daily limit, regardless of total calorie intake ; ND = Not determinable

\*\* Ref. (26) : New York City Food Standards : Patient Meals , 2012 The City of New York, Department of Health and Mental Hygiene. Available at :<http://www.nyc.gov/html/doh/downloads/pdf/cardio/patient-meals-standards.pdf>

**Table 2.** Mean content of energy, macronutrients and dietary fiber of Regular diet, served in seven Hospitals \*

Hospital	Energy(Kcal)	CHO (g)	Protein (g)	Fat (g)	Fiber (g)
A	1575.3	218.9	88.9	38.2	20.6
B	1766.2	252.2	69	53.5	17.1
C	1596.2	226.9	73.6	43.8	27.2
D	1482.8	174.5	78.7	52.2	12.7
E	1774.6	223.9	81.7	61.4	58.2
F	1677.3	243.6	68.2	47.8	49.6
G	1757	233.3	65	62.6	7.7

\*Daily average calculated from 3-day data including 3 meals each day (2 weekdays and 1 weekend day)

and fiber content was less than 28 g in all hospitals except hospital E and F.

On average, all hospital meals provided a diet low in ca and K levels and did not meet the nutrient standards (table 3), while the levels of P, Fe and Na were higher than the standards (Except for P in hospital G), but they did not exceed the UL for those nutrients. As shown in table 4, the vitamins of the planned menus in all Hospitals, did not meet the nutritional standards (Except for vitamin B12).

Based on “Choose My Plate” recommendations, Mean contents of food groups were ranged as follow: grains, 3-7 serving/d; vegetables, 1.2-3.1 serving/d; fruits, 0.6-2.1 serving/d; dairy, 1.3-3.3 serving/d and protein, 3.7-5 serving/d (Table 5). Out of seven hospitals, 5 met the recommendations for vegetables, and 4 met the recommendations for grains but only 1,2 and 3 hospitals met the recommendations for protein, dairy and fruits, respectively.

**Table 3.** Mean content of minerals of Regular diet, served in seven Hospitals \*

Hospital	Ca (mg)	K (g)	Na (mg)	Fe (mg)	P (mg)
A	926	3.37	3923	11.3	1267
B	785	1.84	3638	16	884
C	924	2.31	3102	10.2	1189
D	805	1.94	2691	13.3	1195
E	849	2.44	3113	25.9	1191
F	836	2.24	3087	27.5	1030
G	950	1.89	2757	13.7	206

\*Daily average calculated from 3-day data including 3 meals each day (2 weekdays and 1 weekend day)

**Table 4.** Mean content of vitamins of Regular diet, served in seven Hospitals\*

Hospital	Vitamin A(µg)	Vitamin B12 (µg)	Vitamin C (µg)	Vitamin D (µg)	Vitamin E (mg)	Vitamin K (µg)
A	892	8.3	61.3	2.7	4.3	72.9
B	603	3	48	0.3	3.6	42.9
C	412	2.5	49.6	0.3	5.6	36.5
D	534	4.4	54.3	3	1.9	31.7
E	852	3.3	81.6	4.4	1.6	86.5
F	418	4.02	53.5	4.3	1.4	85.1
G	735	2.7	30	2.3	2.02	73.2

\*Daily average calculated from 3-day data including 3 meals each day (2 weekdays and 1 weekend day)

**Table 5.** Mean content of number of serving of food groups of Regular diet, served in seven Hospitals \*

Hospital	Reference/ Goal(serving/d)	6(oz)	2.5cups	2 cups	3 cups	5(oz)	allowance is 6 teaspoons
	Content	Grains (oz)	Vegetables (cups)	Fruits (cups)	Dairy (cups)	Protein Foods(oz)	Oils(tsp) teaspoons
A		6.2	2	1.3	3.3	4.7	2.7
B		7	3.1	0.6	1.3	5	6
C		4.6	2.3	2.1	2.3	4.8	1.6
D		5.3	1.2	0.9	3.1	4.7	2
E		6.3	2	2	1.8	4	2.6
F		6.1	1.8	2	1.7	4.2	2.8
G		3	2	0.8	2.5	3.7	1.3

\*Daily average calculated from 3-day data including 3 meals each day (2 weekdays and 1 weekend day)

## Discussion

Our results revealed that CHO, protein and fat contribution of the total energy in all hospitals were within the AMDR and ranges between 47.1% and 58.1% for CHO, 14.8% and 22.6% for protein and

21.8% and 32.1% for fat and this finding is supported by the results of other studies. In Jordan, the contribution of carbohydrate and fat to daily energy intake were 62% and 27% in 2002, respectively. The protein intake has been fluctuating around 10% of daily energy intake from 1962 to 2002 (16). In a study from Korea(13), the

researchers found that the content of planned menus of regular diet served in three hospitals, A,B and C were as follows: In Hospital A, the levels of energy (Kcal), Carbohydrate (g), protein (g), and fat (g) were 2131.2, 309.2, 103 and 53.6, respectively. In Hospital B, 1890.6, 288, 83.4 and 45, respectively and in Hospital C, 1930.2, 305, 80.8 and 43, respectively.

We demonstrated that hospital patient menus contain excessive levels of sodium which exceeded the AI of 1500 mg of sodium and exceeded the UL of 2300 mg, and this finding is supported by the results of other studies. This observation could have important clinical implications given the therapeutic necessity of sodium restriction in conditions such as decompensated heart failure (17). One study from Switzerland found an average of 3760 mg of sodium in a standard menu<sup>28</sup>. In another, 86% of regular menus exceeded the UL of 2300 mg of sodium, and 100% of these menus exceeded the AI of 1500 mg. Among patient-selected regular menus, 97% and 79% exceeded the AI and the UL, respectively (17). In another, The amount of Na in the regular diet was 203.3% above the UL (29). In a study conducted in Jordan, the content of sodium has been assessed in regular diet served in three hospitals in Amman, and has been found to exceed the upper limit of the daily recommended intake for adults by an average of 78% (30).

The results showed that all hospital meals provided a diet low in the following minerals (Ca, K) and vitamins (A, C, D, E, K) and did not meet the nutritional standards. Similar results were obtained by other studies (30).

Our results showed that the mean contents of food groups were ranged as follows: grains, 3-7 serving/d; vegetables, 1.2-3.1 serving/d; fruits, 0.6-2.1 serving/d; dairy, 1.3-3.3 serving/d and protein, 3.7-5 serving/d and this finding is supported by the results of other studies. Regular diet has been evaluated in two main hospitals in Amman for nutrient adequacy (21). It has been shown that the diet was inadequate in milk and fruit groups with great variations in the contents of calories and macronutrients (21).

Inadequate nutrition has a strong influence on the health of an individual. It is estimated that 20 to 60% of diseases result from the insufficient intake of nutrients (31). Nutrient deficits in hospital meals could

have serious consequences for patients, especially those hospitalized for extended periods. Older patients frequently present with advanced nutritional deficiencies and, when hospitalized, rarely eat everything they are served. Moreover, age-, disease-, or treatment-related changes in digestion, absorption, and metabolism further increase demand and decrease utilization of critical nutrients (12).

## Conclusions

On the basis of this study, we conclude that many hospitals do not design regular diets to meet dietary recommendations. Although regular diet in most studied hospitals supply adequate carbohydrate, protein, and fat, they are generally deficient in terms of a number of fiber and some vitamins and minerals. Menus contain excessive levels of sodium which exceeded the UL of 2300 mg of sodium in all hospitals. Hospital-prescribed regular diets, may often lack important nutrients. Nutrient deficits in hospital meals could have serious consequences for hospitalized patients. Since the planned menus play in evaluating meals served to in-patients, careful menu planning should be emphasized and followed. Once dietitians set goals and standards by planning menus, they should manage and control the processes to a point where the goals are met.

## Study limitations

The results should be interpreted with caution given that we did not analyze meals directly. While we used USDA database to analyze macro/micro nutrients content of foods.

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