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ABSTRACT This study aimed to evaluate the compliance of daily meals served to hypertensive and cardiac inpatients in Jordan according to WHO guidelines and the Therapeutic Lifestyle Changes (TLC) and Dietary Approach to Stop Hypertension (DASH) diets plans. Weekly cycle menus from the food service department of major hospitals in Jordan (n = 16) were analysed using ESHA Food Processor software to obtain data about macro- and micronutrient contents and food groups represented. The results showed inappropriate amounts of several nutrients in the menus provided, along with a general noncompliance with the DASH, TLC and WHO guidelines. Meals had higher than recommended sodium content coupled with low potassium content. Fatty acid profiles were often outside the recommended ranges. Meals provided to cardiac inpatients in Jordan need to be revised to meet the guidelines specified for the health

conditions of these patients.

Repas servis aux patients hospitalisés atteints d'hypertension et de cardiopathie en Jordanie : comparaison avec les recommendations alimentaires de l'Organisation mondiale de la santé et de l'Institut national de santé

RÉSUMÉ La présente étude visait à évaluer dans quelle mesure les repas quotidiens servis aux patients hospitalisés atteints d'hypertension ou de cardiopathie en Jordanie respectaient les recommendations de l'Organisation mondiale de la Santé (OMS) et les régimes alimentaires Therapeutic Lifestyle Changes (TLC) et Dietary Approach to Stop Hypertension (DASH). Les cycles hebdomadaires de menus du service de restauration des grands hôpitaux en Jordanie (n = 16) ont été analysés à l'aide du logiciel ESHA Food Processor pour obtenir des données sur la composition en macronutriments et en micronutriments ainsi que sur les groupes d'aliments représentés. Les résultats ont révélé des quantités inadaptées de plusieurs nutriments dans les menus servis, ainsi qu'un non-respect général des recommandations DASH, TLC et de l'OMS. Les repas avaient une composition en sodium trop élevée et un taux de potassium trop faible par rapport aux recommandations. Les profils des acides gras étaient souvent hors des plages recommandées. Les repas fournis aux patients hospitalisés atteints de cardiopathie en Jordanie doivent être revus pour répondre aux recommandations visant leurs pathologies.

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Introduction

Cardiovascular disease (CVD) is the number one cause of death worldwide (1). The World Health Organization (WHO) estimated that deaths from cardiovascular diseases and diabetes contribute to about 53% of all mortalities in Jordan (2). Hypertension is a major risk factor for CVD, affecting approximately 1 billion people globally and claiming the lives of more than 9 million annually (2). Hypertension is defined as a systolic blood pressure ≥ 140 mmHg and/or a

diastolic blood pressure ≥ 90 mmHg (3). In Jordan, hypertension affects about 32% of the adult population over age 25 years (4). Of those affected, only 56% are aware they have hypertension, 63% are being treated and only 39% are adequately controlled (4).

Diet is a major modifiable risk factor that underlies many chronic diseases (5). Two dietary strategies recommended by the United States National Institutes of Health—Therapeutic Lifestyle Changes (TLC) for lowering cholesterol and Dietary Approaches to Stop Hypertension (DASH) (6,7)—have been shown to reduce the risks of cardiovascular disease, high blood pressure and other related conditions. The World Health Organization (WHO) and the Food and Agriculture Organization have also set out guidelines in the Population nutrient intake goals for preventing diet-related chronic diseases (8).

Patients suffering from CVD and/or hypertension may experience long durations of hospital stay, with an average of 4.6 days for heart disease in general and 6.1 days for cerebrovascular disease (9). Nutritional status in most cases worsens during hospital stays, which further increases the risk of disease complications (10). Therefore hospital meals must be planned carefully, not only to meet the nutritional needs of patients but also to improve their future health status (10). Previous studies have found diets offered to hospitalized patients to be inadequate in macronutrient and micronutrients (11,12). For example, in Jordan, Hourani et al. looked at the adequacy of meals offered to patients with diabetes and found them to be lower in total carbohydrates and fibre, and higher in cholesterol and total fats, as compared with the guidelines set by the American Diabetes Association (12).

The aim of the current study was to investigate and evaluate the compliance of daily meals served to inpatients suffering from hypertension and/or CVD in comparison with the DASH and TLC diet guidelines (13–15) and the diet and nutrition recommendations of WHO (8). The rationale for carrying out this study lies in the importance of evaluating meals provided for inpatients suffering from hypertension and/or CVD against specified guidelines in order to improve patients' health and prognoses and reduce hospital stays, to promote models of ideal meals to be prepared after hospital discharge and to identify areas for improvements in hospital meals. Meals served to hypertensive and cardiac patients have not previously been evaluated in Jordan. The results of this study will therefore be useful for hospital administrators and health authorities wishing to improve patients' dietary intakes during their hospital stay.

Methods

This research was conducted in June 2012 and the study protocol was approved by the institutional review board at Jordan University of Science and Technology.

Sampling

Food service departments in major hospitals in Jordan were approached and asked to participate in the study. Out of 35 hospitals approached, only 16 hospitals agreed to participate. Hospital size varied from small to large, with the number of beds ranging from less than 100 to more than 300 beds.

Data collection

Food service departments were asked to provide their weekly menu served for hypertensive and cardiac patients; these are regularly referred to as “low salt” menus. All types of meals (breakfast, lunch, dinner) and snacks were included and all daily possible combinations were considered for analysis and evaluation.

The nutrient content of each food item was analysed using the Food Processor software, version 10.6.3 (ESHA Research; http://www.esha.com/products/food-processor/). Cultural items that were not available in the ESHA database were added manually using available cultural-specific food composition tables and tools (15–18). The criteria for evaluation of the diets included data about food groups, total energy, macronutrients, saturated fat, dietary cholesterol, simple and refined sugars, and mineral content.

Intakes/day for each nutrient and each food group were obtained by calculating the average of 7 days intakes (from the weekly menus). The degree to which average daily menus content of the hospitals met the relevant nutrition recommendation for patients with hypertension and CVD was evaluated against WHO, DASH and TLC guidelines (8,13,14), which were considered as the gold standards for comparisons of nutrient requirements in a cardiovascular context.

Statistical analysis

The data were analysed using SPSS software, version 17.0. Descriptive analysis was performed to obtain frequencies, means and standard deviations (SD). Student t-test was performed to analyse the differences between the nutrient and food group contents of the hospital meals and the gold standard guidelines. A P-value < 0.05 was considered the cut-off level for statistical significance.

Results

Nutrient contributions to total energy according to WHO guidelines

Table 1 shows the average daily nutrient and macronutrient contribution to total energy content in meals served in the 16 Jordanian hospitals and compares these with the recommended nutrient contents of the different guidelines for preventing diet-related chronic diseases.

The mean protein content of hospital meals (19.0%) was significantly higher than the WHO guidelines (10–15%), the mean sodium content (2831 mg) was significantly higher than recommended (< 2000 mg) and the potassium content (2411 mg) was significantly lower than the guideline (3150 mg) (all $P \leq 0.5$) (Table 1). No significant differences between the actual meal contents and the WHO guidelines were observed for calorie content, carbohydrates, total fats, saturated fats, cholesterol and trans-unsaturated fatty acids (trans fats) (Table 1).

Table 2 shows the number and percentage of hospitals whose meals complied with the nutrient recommendations of the 3 guidelines. This analysis confirmed that none of the hospitals met the protein guidelines of WHO, and only 37.5% met the sodium and potassium recommendations.

Nutrient contributions to total energy according to the DASH diet

Compared with the DASH diet, it was found that on average the hospital meals provided significantly higher amounts of saturated fats (12.1% versus 6%), dietary cholesterol (343 mg versus < 200 mg) and sodium (2831 mg versus 2300 mg) and lower amounts of dietary fibre (25.5 g versus 30 g), calcium (899 mg versus 1250 mg) and potassium (2411 mg versus 4700 mg) than those recommended ($P \leq 0.5$) (Table 1).

Nearly 44% of the hospitals met the sodium content guidelines of the DASH diet, 25.0% met the calcium guidelines, 18.8% met the fibre guidelines, 6.3% met guidelines on saturated fats and dietary cholesterol and 0% met the potassium recommendations (Table 2).

The average content of the meals were also analysed by food groups and compared with the TLC and DASH diets (Table 3). WHO recommendations were not defined for food groups in a similar way as our reported data and hence comparison was not applicable. It was found that daily meals offered in hospitals provided significantly fewer servings of vegetables (3.26), fruits (1.09) and milk (1.29) as compared with the DASH recommendations (4–5, 4–5 and 2–3 respectively) ($P \leq 0.5$).

Nutrient contributions to total energy according to the TLC diet

Compared with the TLC diet, the hospital meals on average had a significantly higher than recommended content of protein (19.0% versus 15%), saturated fatty acids (12.1% versus < 7%) and dietary cholesterol (343 mg versus 150 mg). The soluble fibre content was much lower than recommended by the TLC diet (1.21 g versus 10–25 g) (P ≤ 0.5) (Table 1).

Only one-quarter (25.0%) of the hospitals studied met the dietary cholesterol recommendations; 18.8% met the saturated fatty acids recommendations and 0% met the soluble fibre and protein recommendations (Table 2).

With regard to food groups, our study showed that the daily servings of vegetables (3.26), fruit (1.09) and milk (1.29) were significantly lower than those recommended by TLC (5, 4 and 2–3 respectively), whereas meat content was higher (6.17 versus < 5 servings) (P ≤ 0.5) (Table 3).

Discussion

The dietary factors that are most strongly implicated in hypertension include weight management and adequate dietary sodium and potassium intakes (7). To a lesser extent other factors also influence blood pressure and these include intake of saturated fats, trans fats, calcium and magnesium (7). Our study analysed the content of the primary dietary factors for cardiac patients, i.e. sodium and potassium, but also looked at all other factors associated with elevated blood pressure as presented by the DASH diet.

Our study showed that the sodium content of meals served to hypertensive and cardiac patients in our sample of Jordanian hospitals was high compared with the recommended level and the potassium level was low. Previous research has shown that sodium and potassium levels are of utmost importance for maintaining healthy blood pressure (19,20). Appel et al. suggested that increased potassium intakes have a stronger role in lowering blood pressure when combined with a high sodium diet; therefore increasing potassium, by increasing servings of fruits and vegetables, could consist of the first realistically achievable step toward meeting at least part of the guidelines (21).

Monitoring the types and amounts of dietary fat consumed by patients suffering from hypertension is a fundamental goal towards reducing the mortality and morbidity associated with hypertension (22). Saturated and trans fatty acids are the principal dietary determinants of plasma low-density-lipoprotein (LDL) cholesterol. Decreasing the level of LDL cholesterol may be achieved by an increase in the intake of energy derived from monounsaturated fatty acids and polyunsaturated fatty acids, which are recommended to be up to 20% and 10%

respectively. We found a meal content of monounsaturated fatty acids near 10% in our sampled hospitals and of polyunsaturated fatty acids about 5%. The amounts presented in Jordanian hospital menus were extremely low and combined with a high content of saturated fats (about 12% versus < 7% recommended menu content). A dietary cholesterol intake of < 200 mg daily is also recommended by the DASH guidelines and this too was violated by the actual average meal content of dietary cholesterol in our study hospitals of 343 mg per day.

Other dietary components including fibre and calcium have been shown to have an impact on the management of elevated blood pressure. It has been reported that an average increase of about 14 g of fibre per day may decrease systolic blood pressure and diastolic blood pressure by 1.6 and 2.0 mmHg respectively. Again, the menus analysed by our study contained insufficient amounts of fibre in comparison with the recommendations set by DASH. As for calcium, we also found inadequate intakes (about 900 mg compared with 1250 mg set by DASH), and although the evidence is inconclusive with regard to the role of calcium in the management of hypertension, it is essential to note that calcium metabolism is influenced by elevations in serum sodium and may play a role in the blood pressure response to salt in the diet (23).

Our results showed that there was no emphasis on fruit in the hospital menus and, whereas vegetables seemed to be offered more frequently, insufficient fruit servings were provided. A previous study showed that high consumption of fruits and vegetables was associated with a significantly lower risk for hypertension (24).

Hospitals should have an obligation to cater therapeutic meals that are planned to achieve targets set by guidelines as a tool to help control blood pressure. Some governmental institutions across the world have set clear guidelines for hospital meals and menus. For instance the Scottish government has established nutrient specifications for hospital meals, recommending a sodium intake below 2400 mg per day (25). Similarly, New York City Food Standards have explicitly requested that hospital menus achieve the nutrition goals set by the Dietary guidelines for Americans 2010, specifying a sodium content of 2300 mg for those aged less than 51 years and 1500 mg of sodium for those 51 years or older and/or suffering from hypertension (26). WHO also recommends that sodium consumption is kept below 2000 mg/day (8).

Clearly, the hospitals assessed in this study failed to meet the recommendations and furthermore they failed to do so in the so-called “low salt” diet, raising greater concerns about the sodium content of the “regular” diet menus.

Similar to our findings, a Brazilian study by Moreira et al. reported inadequate content of iron, zinc, copper, manganese and selenium in hospital meals (11). Additionally Hourani et al. looked at the adequacy of meals offered to patients with diabetes in Jordanian hospitals and found them to be lower in total carbohydrates and fibre, and higher in cholesterol and total fats, as compared with the guidelines set by the American Diabetes Association (12). Hospital meals offered to patients with chronic diseases should be considered as excellent educational tools to help patients implement lifestyle changes after discharge. Therefore the adequacy of the meals offered in the hospital may also influence the knowledge and eating habits of the patients after leaving the hospital, as well as that of their family members.

The results of this study may be limited due to the use of the ESHA Food Processor software as a tool to assess the nutrient content of the meals. Some researchers have questioned the validity of Food Processor in estimating the mineral content of foods. Sullivan et al. compared the phosphorus content of poultry in comparison to the content listed by Food Processor and found a significantly higher content in the analysed samples (27). Future studies should consider analysing the content of hospital meals.

In conclusion, our findings showed that Jordanian hospitals failed to meet some of the dietary recommendations set by WHO and the National Institutes of Health in their DASH and TLC guidelines. The findings of this study imply that the low-salt diet offered by this group of hospitals is providing an adversely high level of sodium and a deficient potassium content. An intensive re-evaluation of meals offered to hypertensive and cardiac inpatients in Jordanian hospitals is recommended. An easy start would be increasing servings of fruits and vegetables and considering greater provision of culturally acceptable vegetarian meals.

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