

Macronutrients Imbalance and Micronutrient Deficiencies among Healthy Saudi Physicians in Al Madina, Saudi Arabia

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ABSTRACT

Context: Diet and nutrition are important factors in the promotion and maintenance of good health. Physicians are involved in medical nutrition therapy of their patients; however, little is known on how physicians are personally adherent to good nutrition. The aim of the study was to assess the nutritional practices of Saudi physicians.

Subjects and Methods: This is a pilot study that included 48 healthy Saudi physicians, of both genders, randomly selected from King Fahad Hospital, Madina, Saudi Arabia from June 2013 to December 2013. Self-reported dietary intake over 24 h was assessed. The adequacy of nutrient intake was evaluated by comparing the physicians' intake to the dietary reference intakes (DRI).

Results: The mean age of physicians was 41.6 ± 10 years, weight was 78 ± 20.2 kg, and body mass index was 27.76 ± 5.37 kg/m². They reported adequate daily consumption of food energy with high intake of carbohydrate ($178.5 \pm 46.4\%$) of DRI and high fat and protein intake from animal sources with low fiber intake ($34.9 \pm 25.1\%$) of DRI. Daily intakes for most of the micronutrients were lower than recommended with the exception of phosphorus, Vitamin E, and Vitamin B12 with no significant difference between males and females, except for lower intake of iron and Vitamin D by females. Vitamin D was the most severe deficient vitamin; $46.1 \pm 53.9\%$ of DRI.

Conclusions: Nutritional practices of the sampled group of Saudi Physicians were not optimal. They have a high prevalence of micronutrients deficiencies. In addition, they tend to consume less fiber, more carbohydrate, and food from animal sources. Actions are needed to control nutrition status in Saudi Arabia, including the adoption of healthy eating pattern early in life, extensive nutrition and health education, and intervention strategies.

Key words: 24 h dietary intake, physicians, recommended daily intake, Saudi Arabia

ملخص البحث:

تهدف هذه الدراسة إلى تقصي الممارسات الغذائية للأطباء السعوديين في المدينة المنورة من خلال الاستبانة لكل ماتم تناوله من أكل أو شرب خلال اربع وعشرين ساعة ثم تم تقييم مدى كفاية العناصر الغذائية من خلال المقارنة مع مرجع الكميات الغذائية الموصى بها للبالغين. شملت الدراسة 48 طبيباً من كلا الجنسين. و أوضحت الدراسة أن الممارسات الغذائية لمجموعة الأطباء السعوديين ليست بالمتألية حيث كان هناك زيادة في تناول النشويات والغذاء من مصادر حيوانية مع إستهلاك أقل للألياف، كذلك كان هناك نقص في تناول العديد من الفيتامينات و المعادن الضرورية.

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INTRODUCTION

Consuming a good, nutritious diet is crucial in maintaining health and preventing disease. A healthy diet needs to have a balance of macronutrients (fats, proteins, and carbohydrates), micronutrients, and calories to support energy needs without inducing excessive weight gain. Changes in the world food economy along with a sedentary life style significantly increase the risk of chronic diseases and premature death. Physicians are involved in the medical nutrition therapy of their patients. Therefore, this study was undertaken to ascertain the extent to which Saudi physicians are personally adherent to good nutrition.

SUBJECTS AND METHODS

This was a pilot study aimed at screening 100 Saudi male and female physicians working at King Fahad Hospital in Madinah, Saudi Arabia, from June to December 2013. Participants were all involved in direct patient care and were selected randomly. After approval from local authorities, physicians were given a questionnaire that was constructed by a qualified dietitian and asked to self-record their diet for 1 day. The participants were instructed to report everything eaten or drunk at meals, snacks, and coffee breaks over a 24 h period. The questionnaire required details of the exact portions of consumed food (serving size), type of food (fortified, skimmed, low fat, and full fat), form purchased (fresh/frozen/canned/dry), method of preparation (boiled/baked/fried/breaded), parts eaten (whole item/half), ingredients (if mixed dish), and addition to foods (dressing, cream, or sugar). The questionnaire also asked whether the food consumed during this 24 h period represented a typical diet, and if not, the participant had to detail the differences. The participants were also asked if they had been taking any nutritional supplements. Food records were analyzed using The World Food Dietary Assessment System, which facilitates rapid dietary assessment using an IBM-compatible personal computer.^[1] The adequacy of nutrient intake was evaluated by quantifying the percentage of nutrient intake out of the dietary reference intakes (DRI).^[2] Anthropometric measurements were taken from all individuals including weight in kg and height in cm. Body mass index (BMI) was subsequently calculated as weight (kg)/height (m²).

Statistical analysis

Statistical evaluation of all the data was undertaken on IBM-PC microprocessor computer using Statistical

Package for Social Sciences (SPSS) software for windows (version 18.0; SPSS Inc., Chicago, IL, USA) for data management and analysis. Microsoft Office Excel 2007 was used for figure. Quantitative data were presented as mean \pm standard deviation and for the comparison of the male and female groups' means, independent samples *t*-test was used. All tests were two-tailed and considered significant when $P < 0.05$.

RESULTS

Of the 100 distributed questionnaires, 81 (81%) responses were returned. The following participants were excluded from the study; those with an underlying chronic illness that necessitated dietary restriction ($n = 6$), on a special diet for any reason ($n = 7$), pregnancy during the study ($n = 4$), and those who could not recall their diet in sufficient detail ($n = 16$). After these exclusions, the study sample comprised 48 physicians (21 males and 27 females) with a mean age of 41.6 ± 10 years (26–53), mean weight of 78 ± 20.2 kg, and mean BMI of 27.76 ± 5.37 kg/m². Both males and females were matched for age (43.7 ± 9.8 years vs. 39.5 ± 10 , respectively) and BMI (27.3 ± 4.3 vs. and 28.3 ± 6.3 , respectively). Table 1 shows the daily nutrient intake and the percentage of DRI of the 48 healthy Saudi physicians. There were no statistical significant differences in the nutritional practices between those with normal weight versus those who were overweight or obese.

On average, the mean daily calorific intake of the physicians was adequate (2357.8 ± 585.4 kcal), which represents $101.9 \pm 27.9\%$ of DRI. Carbohydrate intake was high (396.4 ± 75.6 g) which exceeded recommendations ($178.5 \pm 46.4\%$ of DRI). Protein intake met the recommendations, but with a relative high animal source of 34 ± 18.2 g (60.18% of total proteins), particularly among males, which was 39.5 ± 20.1 g versus 28.5 ± 14.7 g in females ($P = 0.035$). The total daily fat intake was 52.4 g ($80.6 \pm 65.0\%$ of DRI), however, the origin of fat was more from animal sources, 33.98 ± 35 g (60.8% of the total fat). Cholesterol daily intake was acceptable. Their fiber intake was significantly low at $34.9 \pm 25.1\%$ DRI. Approximately, 70% of the mean daily energy intake was from carbohydrates, 18.5% from fat, and 9.5% from protein [Figure 1].

The daily intakes for the majority of minerals were lower than recommended, with the exception of phosphorus. There were no significant differences between males and females except for a lower intake of iron in females,

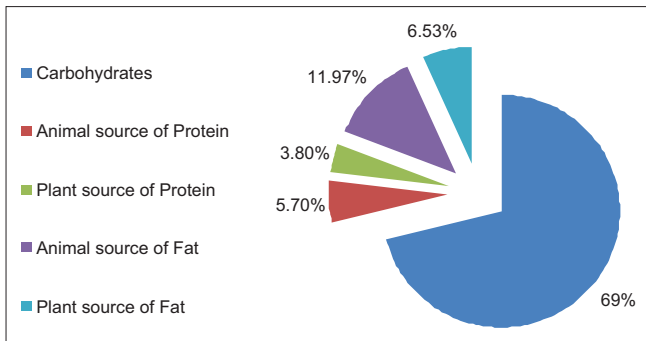


Figure 1: Distribution of calories intake in apparently healthy Saudi physicians

63.5 ± 25.4% of DRI versus 103.8 ± 45.2% in males, *P* = 0.000 [Tables 1 and 2].

The daily intakes of most vitamins were not adequate, except for Vitamin E and Vitamin B12, with no significant difference between males and females except for Vitamin D [Table 1]. Vitamin D was the most severe deficient vitamin, at 1.7 ± 2.1 mg (46.1 ± 53.9% of DRI), which was significantly lower in females than in males (31.0 ± 34.6 vs. 61.2 ± 65.1, *P* = 0.05) [Table 2].

DISCUSSION

Reports have indicated that physicians’ personal health habits are important predictors of their patients counseling practices.^[5-7] We hypothesized that physicians who themselves engage in dietary counseling are more likely have good dietary habits. In contrary to our hypothesis, we found a high prevalence of micronutrient deficiencies in the sampled group of Saudi physicians. They tend to consume a diet with less fiber and higher carbohydrate content and more food from animal sources. This suboptimal dietary habit in healthy Saudi physicians parallels the nutritional habits in the general population of Saudi Arabia.^[8-15]

Macronutrient imbalance with low fiber intake is a common practice in Saudi Arabia.^[8,9] This might be due to an inadequate intake of fruit and vegetables. Alissa *et al.* reported a higher saturated fat and cholesterol intake among Saudi males.^[8] Although foods from animal source might be considered an unhealthy diet that is high in saturated fat and cholesterol and low in fiber, recent studies revealed animal source foods are rich sources for micronutrients. Both macronutrients and micronutrients may be present in suboptimal levels in vegetarian diets and relatively small amounts of animal source foods, added to a vegetarian diet, can substantially increase nutrient adequacy.^[16,17]

Table 1: 24 hours nutrients intake by 48 apparently healthy Saudi physicians

	Mean±SD	
	Daily intake	% of DRI
Energy (Kcal)	2357±585.4	101.9±27.9
Carbohydrates (g)	396.4±75.6	178.5±46.4
Protein (g)	56.5±22.9	100.0±37.7
Fat (g)	52.4±42.2	80.6±65.0
Sat. Fat (g)	33.98±35.2	169.9±176.13
Cholesterol (mg)	220.5±146.3	73.5±48.8
Fiber (g)	8.7±6.3	34.9±25.1%
Minerals		
Sodium (mg)	1948.1±630.7	83.7±41.6%
Potassium (mg)	1712.3±597.9	36.4±12.7
Calcium (mg)	458.3±262.4	45.8±26.2
Phosphorus (mg)	966.4±282.7	138.1±40.4
Mg (mg)	225.4±96.9	62.0±27.4
Iron (mg)	10±4.2	83.7±41.6
Zinc (mg)	8.3±3.1	62.0±22.1
Vitamins		
Thiamin (B1) (mg)	0.76±0.5	59.6±32.8
Riboflavin (B2) (mg)	1.3±0.7	86.2±44.8
Niacin (B3) (mg)	11.8±6.8	69.0±37.4
Pyridoxine (B6) (mg)	0.98±0.6	62.3±36.8
Vitamin B12 (µg)	2.3±1.5	116.5±73.2
Folate (µg)	164.2±59.3	86.7±31.6%
Vitamin A (µg)	513.9±1310.9	59.6±163.8%
Vitamin C (mg)	40.2±43.1	67.0±71.8
Vitamin D (mg)	1.7±2.1	46.1±53.9
Vitamin E (mg)	10.1±11.4	113.0±124.7

DRI – Daily recommended intake

Table 2: Differences in the nutrients intake between males and females

% of DRI Mean±SD	Males	Females	<i>P</i> value
Calories	91.2±20.2	112.6±30.7	0.007
CHO	146.3±26.2	210.7±39.3	0.00
Protein	126.3±52.1	99.8±34.4	0.043
Iron	103.8±45.2	63.5±25.4	0.000
Vitamin D	61.2±65.1	31.0±34.6	0.05

DRI – Daily recommended intake; CHO – Carbohydrates

Vitamin D was the most severe deficient vitamin among this group. Despite the abundant sunshine throughout the year in Saudi Arabia, Vitamin D deficiency is prevalent and affects all ages and both sexes (15–20).^[10-15] The prevalence of Vitamin D insufficiency; 25 hydroxyvitamin D (25(OH)D) 50–75 nmol/L, and Vitamin D deficiency; 25(OH)D < 50 nmol/L, in Saudi Arabia have been reported to be as high as 100% and 90%, respectively.^[10,11] The etiology of Vitamin D deficiency

in Saudi Arabia is multifactorial, including avoidance of sun exposure because of the extremely hot climate; covering most of the body parts particularly for women as a religious custom; inadequate intake of Vitamin D in the diet; and skin pigmentation. Interventions should be taken to tackle Vitamin D deficiency in Saudi Arabia, including increasing awareness of Vitamin D deficiency and the importance of Vitamin D and its health impacts. Sun exposure during the early morning and before sunset when weather is cooler and a change of dietary habits to include a higher intake of foods rich in Vitamin D should be encouraged. Local authorities should focus on increasing food fortification with a higher quantity of Vitamin D. The Saudi population should be encouraged to enrich their diet with Vitamin D in the form of vitamin supplements.

The study showed that Saudi females have a lower intake of iron than Saudi males, which is in agreement with previous reports.^[14] Al-Assaf found that iron intake of Saudi males was adequate but that of Saudi females was inadequate leading to a higher prevalence of iron deficiency anemia.^[14] In addition to low iron intake; menstrual bleeding, pregnancy, lactation, are other factors contributing to iron deficiency in females. Therefore, Saudi females should be encouraged to increase their iron and Vitamin D intake as they are predisposed to these micronutrient deficiencies more than males.

This study demonstrated that despite physicians having a good theoretical understanding of the role of diet in optimizing health some of them do not translate this information into their daily habit of choosing healthy foods.^[18] Possible explanations for the sub-optimal dietary habits in this group with good medical knowledge and good socioeconomic status include lingering of poor dietary habits that were acquired during childhood; inadequacy of a micronutrient rich diet in Saudi meals which typically depend on a high carbohydrate content, for example rice and bread and adoption of western-type diets that are high in “fast foods.” A constrain of the physicians’ time may also affect their ability to consume balanced and healthful meals.

This study had several limitations. First, the data on dietary/nutrition intake of physicians were based on self-reporting for a 24 h period only. Due to day-to-day variations in nutrient intakes, assessment of the adequacy of the nutrient intake over 1 day may not be sufficient. Nevertheless, a 24 h recall method is simple and more convenient. In addition, in one study, the means reported intake values from 24 h recall were not significantly

different from actual weighed amounts values.^[19] On the same study, when the internal validity of a 24 h dietary recall and a 7-day dietary record was investigated, the validity declined by the fifth record days and the demographic nature of the sample became biased as the record progressed to the 7th day due to drop-outs and decreased usability of the records.^[19] Future researchers may wish to use alternate methods that offer a more accurate and precise way of data collection on nutrition intake over a longer period. Another limitation is that the findings of this study cannot be generalized to all Saudi physicians due to the small sample size. However, this study gives some insight on the nutrition practices of some physicians. Finally, this study was designed to be descriptive, and thus no causal implication can be made. Further studies with a large sample size are needed to confirm our results and to explore the reasons for suboptimal dietary habits in this population group.

CONCLUSIONS

Nutritional practices of the sampled group of Saudi Physicians were not optimal. Their diets were deficient in micronutrients and fiber with excess carbohydrate and animal food sources. This mirrors the nutritional habits of the general population of Saudi Arabia. Actions are needed to control the nutrition status in Saudi Arabia, including intervention strategies and extensive nutrition and health education.

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Conflicts of interest

There are no conflicts of interest.

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