A B S T R A C T

Nutrient intakes based on six days of food intake were collected from 52 elderly Nova Scotian women. Mean reported energy intake was 1600 kilocalories, of which fat contributed 31%. Mean intakes of zinc and Vitamin D were below recommendations. Other nutrients of concern were protein, calcium, folate, and vitamins B₆ and B₁₂. Nutrition education efforts should be directed at assisting older people to maintain the generally recommended low fat intake, while stressing the desirability of a balanced food intake of sufficient quantity, which includes low-fat milk and dairy products, lean meats and legumes as sources of nutrients in low supply.

A B R É G É

Les données relatives aux apports en éléments nutritifs, basés sur une période de six jours, ont été recueillies auprès de 52 femmes âgées de la Nouvelle-Écosse. La moyenne de l'apport énergétique déclaré était de 1 600 kilocalories dont 31 % provenant de matières grasses. Les moyennes d'apport en zinc et en vitamine D étaient inférieures aux recommandations. Parmi les autres apports en éléments nutritifs faisant problème, on a noté les protéines, le calcium, les folates, ainsi que les vitamines B₆ et B₁₂. Les initiatives d'éducation à la nutrition doivent avoir pour objet d'aider les personnes âgées à maintenir une alimentation dont l'apport nutritif soit faible en gras et corresponde aux recommandations, tout en soulignant l'importance d'un régime équilibré en quantité suffisante, qui comprenne des produits laitiers et du lait allégé, des viandes maigres et des légumes comme sources d'éléments nutritifs en faible quantité.

Nutrient Intakes of Senior Women: Balancing the Low-Fat Message

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Older people may be at increased risk nutritionally because of chronic medical conditions, disability and/or physiological changes that interfere with consumption, absorption or metabolism of nutrients.¹ A number of Canadian dietary studies have identified low intakes of energy, zinc, calcium, Vitamin D and folate as potential problems in elderly women living independently.²⁻⁹ Reduced consumption of red meat and dairy products—excellent sources of protein, zinc, calcium, and Vitamin D—in response to nutrition messages directed at reducing total and saturated fat may exacerbate the problem.¹⁰⁻¹³ This study examines the nutrient intakes of 52 senior Nova Scotian women based on six days of food intake data collected during summer and winter.

METHODS

Subjects

The subjects were a convenience sample recruited by word of mouth referral. Signed informed consent forms were obtained from all subjects. The study protocol was approved by the Ethics Committee of Acadia University. Seven subjects failed to complete the study because of death (1), serious illness (2), extended vacation (2), and unwillingness to continue (2).

Data collection

During an initial home visit, the women provided background information, self-

reported height and weight, and a 24-hour dietary recall. Food models, and graduated bowls and cups aided estimation of portion size. The women were asked to record their dietary intake for the next two consecutive days. The two-day records were picked up by the interviewer and checked for clarity. Another 24-hour recall and two-day record was obtained six months later. One or two weekend days were included. The food intakes were coded by the interviewers, checked by the author, and analyzed by a program that used the 1988 Canadian Nutrient File. Data were statistically analyzed using SPSS/PC+.¹⁴

RESULTS

Characteristics of the 52 participants are reported in Table I. The mean age was 73.4 years. The socioeconomic status was estimated using the Blishen scale and was based on the former occupation of the subject.¹⁵ Only two subjects estimated that they spent less than \$21 on food per person per week, an amount approximately equivalent to the Agriculture Canada Nutritious Food Basket minimum at the time of the survey.

The mean Body Mass Index (BMI) for the group as a whole was 23.4; for the 65-74 year olds it was 24.0 and for the 75+ group, 22.6. The mean BMI was within the range of 19 to 31 associated with lowest relative risk of functional impairment of elderly women.¹⁶ The percentages of women reporting BMIs in different categories were as follows: less than 19, 6%; 19 to 31, 90% and greater than 31, 4%. Rowland¹⁷ reported a tendency for overweight women to under-report weight and for older women to over-report height, so the actual BMIs may have been higher.

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The mean intakes of nutrients from food alone for the 65 to 74 year age group ($n=31$), for those over 75 years ($n=21$) and for the group as a whole ($n=52$) are shown in Table II. These two age categories correspond to the groupings used in the Nutrition Recommendations, the source of the Recommended Nutrient Intakes or RNIs.¹⁸ For vitamins A and B₁₂, the mean values are also reported excluding three outliers, who had consumed organ meats on one of the days reported. There were no significant differences between the mean intakes of the two age groups as tested by a t test ($p=0.05$) for any of the nutrients.¹⁴ Subjects obtained an average of 16% of energy from protein, 31% from fat and the remainder from carbohydrate and alcohol. Although mean energy derived from protein was within the range of 15 to 20% recommended for female seniors,¹⁸ 19 individuals derived less than 15% of energy from protein (range 12.5% to 14.9%).

The percentage of subjects whose nutrient intake from food was less than the RNI is seen in Table III.¹⁸ Protein, zinc, calcium, Vitamin D, folate and Vitamin B₁₂ were the nutrients for which the highest percentage of individuals were at risk of inadequate intakes as compared with the RNI.

There is evidence that the RNI for seniors for protein, folate, vitamins B₆ and D, and calcium may underestimate optimal intakes.¹⁹⁻²³ Using Campbell's¹⁹ suggested protein intakes of 1.0 g/kg body weight, 50% of seniors in this study were at risk of inadequate intake. Selhub²⁰ found that intakes of 280 mcg/day of folate and 1.9 mg/day of Vitamin B₆ were associated with lower plasma homocysteine levels in elderly people. Elevated homocysteine is associated with increased risk of cardiovascular disease.²¹ In this sample, 60 and 62% of women had intakes of folate and Vitamin B₆ respectively below these protective levels. Dawson-Hughes²² concluded that intakes of Vitamin D at the RNI of 5 mcg were not sufficient to minimize bone loss from the hip of older women residing in northern latitudes. Only one woman reported a dietary Vitamin D intake greater than 10 mcg. The Osteoporosis Society of Canada recommends calcium intakes of 1000 to 1500 mg for ages 50+, the greater amount

advised if the risk of osteoporosis is high.²³ Only one subject reported a dietary calcium intake exceeding 1500 mg, and 29% averaged 1000 mg or more.

Thirty-one women (60%) seldom or never took nutrient supplements (0 to 3 times a week), and 21 (40%) took them regularly (4 to 7 times a week). Thirteen per cent of the total group regularly used multivitamin mineral products, 15% took Vitamin C, 13% Vitamin E, and 6 to 10% took Vitamin B complex, Vitamin A, calcium, lecithin or cod/halibut liver oil. Nutritional supplement intake was not noted in the food intake data collection. Assuming that the women who mentioned using supplements regularly did so on the days of food recording/recall, an estimate of the impact on percentage achieving 100% of the RNI is seen in Table IV. Use of supplements did not enable any women to achieve calcium intakes of 1500 mg but did raise the intakes of an additional six (12%) to above 1000 mg and raised Vitamin D intakes of an additional eight (15%) to above 10 mcg.

DISCUSSION

This was a well educated, economically advantaged group that would be expected to have a higher nutrient intake than less

TABLE I
Characteristics of Participants

Characteristic	Number
Age (years)	
65-74	31
75-91	21
Marital status	
Married	14
Widowed	23
Single/divorced	15
Living Arrangements	
Lived alone	35
Lived with another	17
Lived in own home	23
Lived in apartment	29
Education	
Elementary school	2
High school	11
Vocational*	16
University	16
Postgraduate	7
Socioeconomic status (Blisshen)	
1-39.9	5
40.0-69.9	26
70.0+	21
Health status (self-evaluation)	
Very good to excellent	18
Good	29
Fair to poor	5
Activity level (self-evaluation)	
Moderate activity	26
Light activity	19
Sedentary	9

* Teachers, nurses and secretaries

TABLE II
Means and Standard Deviations of Nutrients from Food

Nutrient	Age Category, years		
	65-74 (n=31)	75+ (n=21)	All (n=52)
Energy (kcal)	1651 ± 278	1547 ± 345	1609 ± 308
Protein (g)	67 ± 12	61 ± 11	65 ± 12
Fat (g)	59 ± 13	56 ± 17	57 ± 15
Carbohydrate (g)	221 ± 46	208 ± 56	215 ± 50
Dietary fibre (g)	17 ± 5	17 ± 5	17 ± 5
Cholesterol (g)	252 ± 118	239 ± 81	247 ± 104
Calcium (mg)	878 ± 264	834 ± 283	860 ± 270
Phosphorus (mg)	1223 ± 302	1139 ± 303	1189 ± 302
Potassium (mg)	3002 ± 621	2776 ± 656	2911 ± 639
Iron (mg)	12.1 ± 3.0	11.8 ± 3.7	12.0 ± 3.3
Zinc (mg)	7.7 ± 1.8	7.5 ± 2.0	7.6 ± 1.9
Vitamin A (RE)	1292 ± 815	1593 ± 1062	1413 ± 925
Vitamin A (RE)*	1112 ± 334	1396 ± 563	1128 ± 468
Vitamin D (mcg)	4.7 ± 1.9	4.4 ± 2.9	4.6 ± 2.3
Vitamin E (mg)	8.4 ± 3.5	7.8 ± 4.8	8.2 ± 4.0
Vitamin C (mg)	153 ± 55	132 ± 44	144 ± 52
Thiamin (mg)	1.3 ± 0.4	1.3 ± 0.4	1.3 ± 0.4
Riboflavin (mg)	1.7 ± 0.7	1.5 ± 0.6	1.6 ± 0.6
Niacin (NE)	28 ± 5	26 ± 5	28 ± 5
Vitamin B ₆ (mg)	1.6 ± 0.4	1.5 ± 0.3	1.5 ± 0.4
Folate (mcg)	245 ± 61	228 ± 68	238 ± 64
Vitamin B ₁₂ (mcg)	5.7 ± 8.0	5.6 ± 9.5	5.7 ± 8.6
Vitamin B ₁₂ (mcg)*	4.0 ± 1.7	3.6 ± 1.4	3.8 ± 1.7

* Outliers removed, $n=49$

TABLE III
Percentage of Subjects Whose
Nutrient Intakes from Food were
Less than 100% of the RNI

Nutrient	Age Category, years		All
	65-74	75+	
Protein	13	29	19
Calcium	45	57	50
Iron	0	14	6
Zinc	74	86	79
Vitamin A	13	5	10
Vitamin D	65	67	65
Vitamin C	0	0	0
Thiamin	6	5	6
Riboflavin	0	0	0
Niacin	0	0	0
Vitamin B ₆	3	0	2
Folate	29	33	31
Vitamin B ₁₂	16	19	17

TABLE IV
Percentage of Subjects for Whom
Supplement Use Increased Nutrient
Intakes to Above 100% of the RNI

Nutrient	Percentage
Zinc	6
Vitamin D	13
Calcium	8
Folate	4
Vitamin A	2
Vitamin B ₁₂	2

advantaged women. Holcomb²⁴ reported that more educated elderly women consumed a greater variety of fruits, vegetables and meats. The moderate BMIs in the group described here may reflect health consciousness and efforts to maintain a personally acceptable body weight. Although there was a trend of lower intake of nutrients in the more senior women, differences between the two age groups were not statistically significant. This could reflect the relatively small sample or the fact that there was little change in the amount or type of food consumed with advancing age.

Macronutrient intake

The mean energy intake reported here was 150 kilocalories below the generalized RNI, but this deficit must be interpreted cautiously. Both the 24 hour recall and food record methodologies used in this study have been reported to produce significantly lower estimates of energy intake in elderly women as compared with actual energy requirements measured by the doubly labelled water method.²⁵ Mean energy

intake for the 65 to 74 year olds in this group was 250 kilocalories higher than that reported for the same age group in the Nova Scotia Nutrition Survey (NSNS), which may indicate less under-reporting and conscious modification of food intake.⁹ An energy intake of at least 1800 kilocalories minimizes the risk of insufficient intake of other nutrients,¹⁸ and corresponds to mean energy requirements measured in a small group of elderly women.²⁶ Although 71% of this group reported energy intakes of less than 1800 kcal, only for zinc and Vitamin D did the percentage of individuals with intakes less than the RNI approach the 70% levels, implying selection of nutrient-dense foods. The NSNS reported that in the 65 to 74 year group the mean intake of eight nutrients, expressed per 1000 kilocalories, was either equal to or greater than that of the 18 to 34 year group, confirming careful selection of food by seniors.⁹

A high percentage of individuals failed to meet the RNI for protein and the higher amount suggested by Campbell¹⁹ as well as the suggested minimum of 15% of energy from protein. Grey-Donald has pointed out the serious consequences of extended periods of suboptimal protein and energy intakes, especially in the frail elderly.²⁷ The RNI is based on body weight and may overestimate the protein needs of obese persons.²⁸ The two persons identified as being at greatest risk had BMIs of more than 33. The mean intake of fat was close to the accepted recommendation of 30% of energy from fat and consistent with the results of the NSNS, which reported 32% of energy from fat. This group is heeding the message to moderate fat intake. There is no RNI for dietary fibre; however, the American Dietetic Association stated that an intake of 20 to 35 grams per day may provide health benefits and reduce the risk of certain diseases.²⁹ The mean intake of 17 g reported here is low, but the Canadian Nutrient File data on dietary fibre are incomplete, so intakes were underestimated.³⁰ Fibre density was 10.6 g/1000 kcal, greater than the 9.5 g/1000 kcal reported in the NSNS.⁹

Minerals

With the exception of zinc, the mean dietary intake of all the minerals studied

was above the RNI. Zinc deficiency is associated with lessened immune response in elders.³¹ Few of the supplements used contained zinc. Both Donald⁷ and Gibson³² reported higher mean intakes of zinc than the RNI, of 9.4 mg and 10.1 mg respectively. Despite a mean intake that exceeded the RNI, Donald found that 9.5% of her group had subnormal plasma zinc levels.⁷ None of the women in Gibson's group had low serum zinc levels.³² Increased consumption of foods such as lean red meats, legumes and low-fat milk would provide zinc without increasing fat.

The mean calcium intake of this group was above the RNI and greater than that reported in other Canadian studies.⁵⁻⁹ However, half the women consumed less than the RNI of 800 mg. Achievement of intakes of 1000 to 1500 mg, as suggested by the Osteoporosis Society,²³ would require a determined effort to increase consumption of calcium rich foods or the use of calcium supplements.

Vitamins

With the exception of Vitamin D, the mean intake of all vitamins exceeded the RNI. The RNI for Vitamin D has been raised to 5 mcg per day for persons over 50 years of age to compensate for lower absorption and reduced exposure to sunlight in older adults,¹⁸ and even this level may be inadequate.²² Impaired skin synthesis of precholecalciferol with age increases the urgent need for adequate dietary intakes.³³ Half the women consumed less than the RNI, and only 17% consumed more than 10 mcg, from dietary and supplemental sources combined. Guidance on ways of incorporating low-fat milk into diets could improve both Vitamin D and calcium intake.

When individual intakes of the water soluble vitamins were examined, there was a risk of inadequate intakes of Vitamin B₁₂ and folate. Martinez³⁴ found 21% of a group of 59 to 88 year old women had subnormal serum B₁₂ levels. Absorption of the protein-bound Vitamin B₁₂ as found in food declines with age, and Vitamin B₁₂ is malabsorbed in cases of atrophic gastritis, which affects an estimated 30% of elders.³³ Basu³⁵ and Donald⁷ reported subnormal plasma levels of Vitamin B₁₂ in 10 to 11%

and of folate in 12 to 14% in a group of 65 to 74 year old women who, as with the group reported here, had mean dietary intakes of B₁₂ and folate above the RNI. Levels of intake of folate and Vitamin B₆ above the RNI may decrease risk of cardiovascular disease,²¹ and Vitamin B₆ status is known to decrease with age.¹⁸ Increased consumption of foods of animal origin as sources of Vitamin B₁₂, and fruits and vegetables high in folate and Vitamin B₆ could be beneficial.

CONCLUSION

The mean intakes of energy, zinc and Vitamin D of these advantaged older women were below the RNI. Additionally, a large number of women reported intakes of protein, calcium, Vitamin B₁₂, folate and Vitamin B₆ that were below either the RNI or the higher amounts suggested as protective against chronic conditions. Mean intake of fat was close to the recommended 30% of energy, and mean intake of other vitamins and minerals was satisfactory. Red meat and dairy products, which are good to excellent sources of many nutrients in short supply, are also well publicized sources of saturated fat. Nutrition educators must take care to present a balanced message that reinforces the value of eating fruits, vegetables and grain products while acknowledging the potential contribution of lean red meat and low-fat dairy products as sources of needed nutrients.

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