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NUTRIENT INTAKES OF DEPENDENT AND APPARENTLY INDEPENDENT NURSING HOME PATIENTS

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The nutrient intake of 20 independent and 18 dependent elderly persons is assessed in nursing home long-stay wards of a Melbourne geriatric teaching hospital. An assessment of the specific nutrient densities of the diet and comparison with recommended nutrient densities indicates that, not only is nutrient intake compromised because of low intakes of food energy, but also the quality of the diet is unsatisfactory. In institutional studies, those aged persons receiving supervision at meal times consume a more adequate diet than those able to feed themselves.

Introduction

Food intake by many older people tends to decrease due to a combination of factors including reduced activity, reduced budget, poor access to shops, inadequate cooking abilities and poor ideas about correct diet. Malnutrition is found among elderly people, particularly those living alone in the community. Diets are often inadequate in protein, vitamins and minerals (Gambert & Guansing, 1980; Flint *et al.*, 1979). Elderly patients in long-term care in nursing homes are relieved of many of the problems likely to cause malnutrition but are more dependent on meal time environment, time of meal, food presentation, nursing support in feeding, manual skills and intact mentality to determine the amount of food consumed (Davies & Smith, 1980). Patients physically incapable of feeding themselves have to be fed by nursing staff. Time for this may be inadequate, food spillage is often considerable and only parts of the meal may be eaten. Patients apparently able to feed themselves are encouraged in their independence, but are individually not monitored as well as those being fed by a nurse. Food supplies in nursing homes should be adequate but food wastage occurs, particularly if the meal is unpopular although nutritionally correct. An investigation was carried out to estimate food intake in nursing home patients by measuring actual food consumed by patients fed by nursing staff and patients apparently competent in feeding themselves.

Patients and methods

Thirty-eight patients were selected randomly for study in two nursing home wards of a geriatric teaching hospital. All had been assessed as needing long-term nursing home care and were in relatively stable medical condition. The two wards had a joint dining room and food was delivered in containers to

the ward serving kitchen. There were 18 patients in the group who were classed as dependent and required feeding by nurses and 20 patients were in the group who were capable of feeding themselves. Patient characteristics of the 2 groups studied are summarised in Table 1. Both groups were similar in age, sex distribution and weight. Three of the dependent group and 12 of the independent group were able to walk with assistance. The remainder were chair-bound. All were out of bed and dressed daily. The amount of exercise taken by the semi-ambulant patients, however, was very limited. Most of the dependent group (D), and many of the independent group (I) possessed neither dentures nor their own teeth, hence the preponderance of soft diets — 78 per cent in the dependent group and 50 per cent in the independent group (Table 1).

Table 1. *Patient characteristics of subjects studied*

	Independent (n = 20)	*Dependent* (n = 18)
Sex		
Females	13	10
Males	7	8
Type of diet		
Normal	9	3
Soft	10	14
Vitaminised	1	1
Dentition		
Own teeth	2	2
Dentures	14	6
Edentious	4	10
Mobility		
Mobile	5	1
Walk with assistance	7	2
Chair-bound	5	1
Chair-bound and bed-bound	3	14

Food intake was recorded for 3 consecutive days by the same dietitian, and quantified with household measures, which were previously calibrated. Food consumed was calculated by the difference between that served and that left. Nutrient analysis was based on the food composition tables of Paul & Southgate (1978). The more complete range of nutrients in the British Tables, rendered them more suitable for the questions raised in this study than the use of Australian Tables.

Allowance was made for known differences, and this approach provided close agreement between the use of British and Australian Tables (Bagu & Rutishauser, 1984).

Assessment of differences between apparently independent and dependent groups was made on the basis of Student's t-test.

Results

Nutrient intakes are shown in Table 2 together with the recommended dietary intakes (RDI) of the National Health and Medical Research Council of Australia or, where these are not available, from those of the United States National Academy of Sciences. In the case of dietary fibre, we have been guided by the Zutphen Study in the Netherlands (Kromhout, Bosschieter & de Lezemne Coulander, 1982), in arriving at a recommended intake of 40-50 g per day.

Twelve of the recognised vitamins were assessed, but vitamin K was not because of inadequate food composition data. Elements selected for assessment were iron, calcium and zinc.

Table 2. *Nutrient intake of nursing home patients* (mean ± s.e.m.)

Nutrients	*RDI (2/3)*	*Intake*		*Significance of difference in means*
		Group I (n = 20)	*Group D* (n = 18)	
Energy (kJ)	Males 6300[a] Females 5040[a]	4926 ± 201	6406 ± 654	$P < 0.5$
BMR (kJ/kg BW)	92.0[b]	95 ± 5	125 ± 3	$P < 0.05$
Protein (g/kg BW)	0.6[a]	0.9 ± 0.1	1.0 ± 0.1	n.s.
Fat (g)	—	52.1 ± 2.5	51.4 ± 5.9	n.s.
Absorbable carbohydrate (g)	—	136.3 ± 6.4	230.0 ± 23.7	$P < 0.001$
Simple sugars (g)	—	53.2 ± 4.3	91.4 ± 11.6	$P < 0.005$
Thiamin (mg)	0.53[a]	0.65 ± 0.04	2.16 ± 0.28	$P < 0.001$
Riboflavin (mg)	0.8[a]	1.37 ± 0.08	1.14 ± 0.13	n.s.
Niacin (mg niacin equiv.)	8.0-9.6[a]	17.7 ± 1.4	26.7 ± 3.0	$P < 0.05$
Vitamin B_2 (mg)	0.6-0.9[a]	0.65 ± 0.03	1.99 ± 0.27	$P < 0.001$
Vitamin B_{12} (μg)	1.4[a]	2.6 ± 0.2	2.0 ± 0.3	n.s.
Total folacin (μg)	132[a]	82.5 ± 4.3	116.4 ± 12.3	0.02
Pantothenic acid (mg)	2.6[b]	2.99 ± 0.17	2.18 ± 0.26	$P < 0.02$
Biotin (μg)	100-200[b]	21.6 ± 1.8	16.7 ± 4.1	$P < 0.05$
Vitamin C (mg)	20[a]	24.7 ± 4.9	27.1 ± 3.9	n.s.
Vitamin A (μg retinol equivalent)	495[a]	815.2 ± 63.9	545.0 ± 83.6	$P < 0.02$
Vitamin D (μg)	3.3[b]	2.7 ± 0.1	2.0 ± 0.6	n.s.
Vitamin E (mg)	6.0-8.0[b]	2.75 ± 0.76	2.27 ± 0.29	n.s.
Iron (mg)	6.6[a]	6.3 ± 0.4	7.3 ± 0.9	n.s.
Calcium (mg)	264-528[a]	619 ± 46	566 ± 62	n.s.
Zinc	8-10[a]	7.1 ± 0.5	11.1 ± 1.3	$P < 0.01$
Dietary fibre (g)	40-50[c]	7.9 ± 0.7	15.3 ± 1.8	$P < 0.001$

Footnotes: RDI is two-thirds of Recommendations (lower end of range where this applies) from the following references [a]National Health and Medical Research Council (1984). [b]Nation Academy of Sciences (U.S.A.) 1980. [c]Kromhout, D., Bosschieter, E.G. & deLezemne Coulander, C. (1982).

Energy intakes were at or about the basal metabolic rate (BMR). The relative contribution to energy intake of macronutrients, for independent and dependent patients respectively, were 16.4 ± 1.5 per cent and 13.5 ± 0.5 per cent for protein, 46.6 ± 1.4 per cent, and 61.1 ± 1.4 per cent for absorbable carbohydrate, and 39.9 ± 0.9 per cent and 29.6 ± 1.3 per cent for fat.

The RDIs expressed as mass per day were not met by either group for the following nutrients — total folacin, vitamin D, zinc and iron, and dietary fibre. Group I had lower intakes of energy, absorbable carbohydrate, simple sugars, thiamin, niacin, vitamin B_6, folacin, iron, zinc and dietary fibre than group D. However, group I had higher intakes of pantothenic acid, biotin and vitamin A than group D (Table 2).

Table 3. *Percentage of nursing home patients with food intake low in nutrient density*

	Recommended dietary intakes for energy and nutrient intake per total energy (MJ)		*Percentage of nursing home patients who fall below the recommended nutrient density*	
Energy and nutrient (per MJ)	*Males*	*Females*	*GroupI* (n = 20)	*GroupD* (n = 18)
Energy (MJ)	8.8[a]	6.4[a]	100	50
Protein (g)	7.9[a]	9.1[a]	15	72
Fat (g)	6.6[d]	6.6[d]	5	16
Thiamin (mg)	0.1[a]	0.1[a]	10	0
Riboflavin (mg)	0.15[a]	0.15[a]	0	0
Niacin (mg niacin equiv.)	1.6[a]	1.6[a]	0	0
Vitamin B_6 (mg)	0.11[a]	0.12[a]	20	0
Vitamin B_{12}	0.23[a]	0.31[a]	5	55
Total Folacin (μg)	22.73[a]	31.25[a]	100	100
Pantothenic acid (mg)	0.46[b]	0.59[b]	35	86
Biotin (μg)	11.36[b]	15.62[b]	0	50
Vitamin C (mg)	3.41[a]	4.68[a]	65	67
Vitamin A (retinol equiv. μg)	85[a]	117[a]	10	55
Vitamin D (μg)	0.58[b]	0.75[b]	85	94
Vitamin E (mg)	1.16[b]	1.19[b]	100	100
Iron (mg)	1.14[a]	1.87[a]	55	16
Calcium (mg)	45[a]	65[a]	5	0
Zinc (mg)	1.36[a]	1.87[a]	90	100
Dietary fibre (g)	4.65[c]	6.25[c]	100	100

Footnotes [a]National Health and Medical Research Council (1984). [b]National Academy of Sciences USA (1980). [c]Kromhout *et al.* (1982). [d]Bruce (1980)

This poses the question of whether low nutrient intake is due to a relative lack of foods containing specific nutrients or a general reduction of food energy intake, and with it some essential nutrients. This can be addressed by examining the nutrient density (nutrient content for a given amount of energy) of the diet. Nutrient density can be compared with RDIs also expressed as nutrient densities. Specific RDI nutrient densities are defined as the RDI for the specific nutrient per unit RDI for energy. When this was

done (Table 3), it was common to find subjects with specific nutrient densities below the recommended figures. This would suggest that not only was energy intake low but also that the quality of the diet was poor. Moreover, it would appear that food sources of certain nutrients, such as folacin, vitamin C, vitamin E, zinc and dietary fibre were particularly poorly represented.

Discussion

Several nutrients in both groups of patients were significantly lower than recommended intakes. This raises general questions about the appropriateness of RDIs for elderly people, vulnerability of patients in nursing homes from a nutritional point of view, perhaps related to medical condition, and the nature of nutrition care systems in institutions.

Our study showed that apparently independent nursing home patients receive a less nutritionally adequate diet than those who were supervised at meal times. Nutrients for which greater risks were present include thiamin, niacin, vitamin B_6, folacin, iron, zinc and dietary fibre. Independent patients actually had higher intakes of pantothenic acid and vitamin A than supervised patients. Although pantothenic acid is quite widely distributed in foodstuffs it is of interest that some of the good sources of pantothenic acid, such as liver and fish, are also good sources of vitamin A. It would appear that these foods are less often included in the diets of supervised patients.

In this study, a low specific nutrient intake reflected both a relative lack of foods containing these nutrients, a matter of dietary quality, and a general reduction in food energy intake.

It is possible that differences in presentation of meals to the 2 groups studied, explain differences in nutrient intake, since more of Group D had soft meals.

For both groups, the need often reflects a staff assessment of patient preference. This assessment may or may not take into account the nutrient needs of the patient. It is dependent on nutrition knowledge.

There are areas of potential nutritional problems which may remain inadequately addressed by the techniques of nutrient intake evaluation used in the study. The most important limitation is the presumption that dietary allowances established for adults apply equally to older age groups and especially to those with a particular disease state and on medication. Thus, for example, to minimise the risk of osteoporosis higher intakes of calcium may be preferred (Heaney *et al.*, 1982) yet intakes look adequate for both groups studied, by comparison with available RDIs. On the other hand, vitamin D intake might not be as inadequate as suggested if patients have access to sunlight. The patients in this study were rarely exposed to sunlight.

Recommendations about dietary fibre intake are still emerging. Most of the thinking about dietary fibre for elderly people relates to bowel function, but there are other areas of importance such as the progressive impairment of glucose tolerance. Not only the amount of dietary fibre, but the type and food source are likely to be important. In an Australian context with fruit as snacks in-between meals, a plentiful intake of vegetables and use of

wholegrain cereal, it is realistic to reach a dietary fibre intake of 40 g per day.

Nutrient intake alone is also a limited way of assessing nutritional problems. Other food factors and nutrient interactions may not have been taken into account. Nutrient losses in food preparation, storage and delivery may be greater than those allowed for in food tables. Bioavailability of nutrients may be different from that presumed.

This study emphasises the importance of meal time supervision of all patients in nursing homes (Davies & Smith, 1980). A clearer identification of groups at risk within nursing homes may increase effectiveness of nutritional support and thereby some improvement in quality of life.

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