Nutrient intakes in long-stay mentally handicapped persons

BY KAY CUNNINGHAM[1], M. J. GIBNEY[2]*, A. KELLY[3], J. KEVANY[4] AND M. MULCAHY[1]

[1] *Stewarts Hospital, Palmerstown, Dublin, and Departments of* [2] *Clinical Medicine,* [3] *Statistics and* [4] *Community Medicine, Trinity College Dublin, Irish Republic*

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A study of the dietary intake of 115 male and 217 female mentally handicapped persons aged 15–64 years in five long-stay institutions was carried out using a semi-weighed technique over 4 d. Nineteen per cent of males and 5% of females were classified as being underweight and 15% of males and 27% of females were classified as being obese. The average daily intakes of nutrients were: energy 8·8 MJ, protein 92 g, carbohydrate 218 g, fat 101 g, dietary fibre 18 g, calcium 1024 mg, iron 12·5 mg, vitamin B_6 1·4 mg, vitamin B_{12} 10·8 μg, ascorbic acid 68 mg. The distribution of energy between protein, carbohydrate and fat was 18, 39 and 43% respectively. Energy intakes were not related to ambulatory status, degree of mental handicap, the level of drug usage or body mass index. Energy intakes varied significantly between hospitals and between the sexes.

Nutrient intake: Mental handicap

Individuals in the care of long-stay institutions may encounter nutritional problems more frequently and of a different variety compared with free-living individuals. Such groups are, in general, wholly dependent on their institution for their nutrient intakes. As such their food selection may be limited to that provided by the caterer and the types of meals presented are often as much dictated by financial and managerial constraints as by the nutritional needs of the people in care. Long-stay mentally handicapped people have the added burden that communication with the nursing and paramedical staff may be limited. Whilst the special nutritional problems of the mentally handicapped are recognized (Hollins, 1985), only limited quantitative information on their nutrient intakes is presently available (Culley & Middleton, 1969; Laidler, 1976; Litchford & Wakefield, 1985; Litchford, 1986). Accordingly, the present study set out to examine indices of adiposity and nutrient intakes in long-stay mentally handicapped persons and to determine whether these variables were related to such factors as age, sex, mobility and degree of mental handicap.

METHODS

Subjects

A random sample of 1000 institutionalized persons was drawn from the Mental Handicap Index System of the Medico-Social Research Board, Dublin. Of these, eighty-three were untraceable having either died or moved outside the care of the Eastern Health Board within whose authority the study was conducted. Also, 353 were excluded because of lack of co-operation from hospital boards. The remaining 564 were included in a preliminary

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survey of medico-social factors. Of these, 217 were excluded because of inadequate, incomplete or late returns of the questionnaire by the hospital authorities. The final sample was 332 which excluded fifteen patients, ten in the age range 11–14 years and five in the age range > 75 years because of inadequate numbers.

Medico-social factors

Background medico-social information on all subjects was obtained. Mobility was defined as ambulant even with the aid of a frame and non-ambulant as wholly dependent on a wheel chair. The causes of mental handicap were grouped into unknown cause or either pre-conceptual, pre-natal or post-natal causes. The degree of mental handicap was classified according to IQ range: moderate (35–49), severe (20–34) and profound (< 20) as proposed in the 9th revision of the international classification of diseases (World Health Organization, 1977). Individuals were classified into social groupings according to their father's occupation. Whilst the number of drugs prescribed daily was obtained, satisfactory qualitative information on the nature of drugs prescribed was not made available by physicians.

Anthropometric and dietary measurements

Body-weight was recorded in underclothing, without shoes. Those who could not stand unaided were measured for height in the supine position. Dietary intakes were carried out using a semi-weighed technique over four consecutive days by the senior ward staff following a preliminary training period. One nurse remained responsible for each ward throughout the study. Servings and plate waste were recorded in household and catering measures and were subsequently quantified on diet-weighing scales (0–500 g × 5 g; Salter's). This method minimized the interruption of normal ward routine and promoted excellent co-operation by the nursing staff. Weights of foods consumed were converted into daily intakes of nutrients using computerized food composition tables (Paul & Southgate, 1978).

Statistical analysis

The values were analysed by one-way analysis of variance. Where the F statistic proved significant, the individual means were contrasted using Scheffe's technique with a 95% confidence interval. In order to determine whether or not energy intake differed across handicap status after controlling for a variety of socio-medico factors, it was decided to explore energy dependence by means of regression analysis. A wide variety of models were tested, the best of which are shown in Table 1.

RESULTS

Because of the multiplicity of factors which might influence energy intake, the independent effects of these factors (hospital, sex, body mass index, handicap status, ambulatory status, frequency of drug prescription and age) on energy intake were examined by multiple regression analysis. Our final model did not include such factors as handicap status, ambulatory status and whether drugs were being taken or not. Only terms for hospital, sex, body mass index and a number of interaction terms remained significant. As both hospital and sex are categorical variables, these have been replaced by $(n-1)$ dummy variables, where n is the number of the groups. Constants for the final regression equation relating energy intake to hospital and sex are given in Table 1.

Table 1. *Constants from the regression equation linking energy intake (MJ/d) to hospital and sex*

Variable	Coefficient	SE	Statistical significance: *P*
Constant	9·33	1·27	< 0·001
Hospital no. 2*	1·98	2·97	= 0·505
Hospital no. 3	−1·48	1·85	= 0·427
Hospital no. 4	11·7	3·18	< 0·001
Hospital no. 5	1·07	1·61	= 0·507
Sex†	3·06	0·38	< 0·001
BMI	0·10	0·05	< 0·063
Interaction terms‡: 1. Sex by hospital 2. BMI by hospital			
F ratio 13·3, df 13 and 336 ($P < 0·001$), coefficient of determination 0·341			

BMI, body mass index (wt (kg)/height (m)^2).

* Four dummy variables for hospital effect. Each is expressed relative to hospital 1. The mean intakes (MJ/d) for males were 10·1, 11·1, 5·2 and 9·1 for hospitals 1–4 respectively. Hospital 5 was all females. The respective values for females were 7·0, 11·6, 7·1, 7·7 and 9·0.

† Dummy variable for sex. This is the effect for sex = male, relative to sex = female.

‡ Two sets of interaction terms were required. Within each set, at least one effect was statistically significant with $P < 0·01$.

Table 2. *Age and sex distribution of 332 randomly chosen long-stay mentally handicapped patients*

Age range (years)	Males	Females
15–18	23	14
19–34	63	189
35–64	29	14
Total	115	217

Table 3. *Distribution of body mass index (BMI) in male and female long-stay mentally handicapped patients*

	Males		Females	
	BMI	%	BMI	%
Underweight	< 20	19	< 18	5
Acceptable wt	> 20 < 25	64	> 18 < 23	53
Overweight	> 25 < 30	15	> 23 < 28	27
Obese	> 30	2	> 28	15

BMI, wt (kg)/height (m)^2.

The age and sex distributions of the patients are given in Table 2. The majority of patients were in the age range 20–40 years. The distribution of body mass index is given in Table 3. There was a tendency for more men to be underweight and for fewer men to be overweight or obese compared with women. The distribution of sexes within grades of mental handicap is given in Table 4, together with findings on body mass index, energy

Table 4. *Sex distribution, body mass index*, energy intake and cause of mental retardation in patients with moderate, severe or profound mental handicap*

(Mean values and standard deviations)

	Degree of handicap					
	Moderate		Severe		Profound	
IQ range	35–49		20–34		< 20	
Male (%)	32		33		35	
Female (%)	39		37		24	
Cause of handicap (%)						
Unknown	40		25		11	
Pre-conceptual	26		27		24	
Pre-natal	11		20		26	
Post-natal	23		28		39	
	Mean	SD	Mean	SD	Mean	SD
Body mass index	24	3·3	22	5·0	21	3·8
Energy intake (MJ/d)	8·7	2·26	9·2	2·24	8·3	0·24

* Wt (kg)/height $(m)^2$.

Table 5. *Body mass index* and energy intake of ambulant and non-ambulant patients*

(Mean values and standard deviations)

	Ambulant		Non-ambulant	
Percentage of study group (*n* 332)	83		17	
	Mean	SD	Mean	SD
Energy intake (MJ/d)	8·8	2·7	8·4	2·5
Body mass index	23·1	3·3	21·6	6·0

* Wt (kg)/height $(m)^2$.

intake and the distribution of causes of mental handicap. Significant differences were found in the mean values for both energy intakes and body mass index for different grades of mental handicap. However, subsequent adjustment of those means by regression analysis found no significant independent effect of handicap status or body mass index on energy intake. The proportion of patients with unknown causes of handicap decreased as the severity of mental handicap increased, while an opposite trend was found for pre- and post-natal causes. The most common diagnoses of the causes of mental handicap were Down's syndrome (pre-conceptual), 'birth-injury' (pre-natal) and epilepsy (post-natal). The energy intakes and body mass indexes of ambulatory and non-ambulatory patients are given in Table 5. The majority of patients (83 %) were ambulatory and whilst their unadjusted mean energy intake was significantly greater ($P < 0{\cdot}05$) than the non-ambulant patients (Table 5), no significant independent effect of ambulatory status on energy intake was found by regression analysis. The nutrient intakes of different age groups for men and women are given in Table 6 and the food sources of energy, protein, fat and carbohydrate are given in Table 7. Cereals, milk and meat were the main sources of energy (67 %) and protein (78 %). Milk, fats and oils and meat were the major sources of dietary fat (77 %), and cereals and vegetables were the major sources of dietary carbohydrate (68 %). The distribution of nutrient intakes is given in Table 8. In the case of men, relatively few had

Table 6. *Daily intakes of nutrients of male and female long-stay mentally handicapped patients in different age groups*

(Mean values and standard deviations)

Age (years)...	15–18		19–34		35–64	
	Mean	SD	Mean	SD	Mean	SD
			Males			
n	23		63		29	
Energy (MJ)	10·2	2·7	10·6	3·0	9·4	2·3
Protein (g)	102	22	113	23	107	24
Carbohydrate (g)	253	79	254	58	215	56
Fat (g)	119	26	126	42	112	32
Dietary fibre (g)	20·9	6·5	20·3	5·2	19·4	6·5
Calcium (mg)	1176	242	1136	323	1080	324
Iron (mg)	13	3	15	3	14	4
Ascorbic acid (mg)	64	22	77	26	72	21
Vitamin B_6 (mg)	1·6	0·3	1·7	0·3	1·5	0·4
Vitamin B_{12} (μg)	10·1	9·9	15·2	11·8	15·0	13·2
			Females			
n	14		189		14	
Energy (MJ)	8·6	3·4	8·0	2·2	7·8	2·4
Protein (g)	96	27	83	21	79	24
Carbohydrate (g)	212	114	205	71	197	70
Fat (g)	95	35	89	26	88	30
Dietary fibre (g)	20·1	7·9	16·4	6·7	15·6	4·9
Calcium (mg)	1060	434	945	383	954	430
Iron (mg)	13	4	12	4	11	3
Ascorbic acid (mg)	99	54	64	29	62	28
Vitamin B_6 (mg)	1·5	0·4	1·3	0·4	1·3	0·3
Vitamin B_{12} (μg)	11·8	15·6	8·5	8·7	9·2	10·0

Table 7. *Sources* (%) *of energy, protein, fat and carbohydrate in the diet of long-stay mentally handicapped patients*

(Mean values and standard deviations)

	Energy		Protein		Fat		Carbohydrate	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Cereals	27·0	7·4	18·6	6·5	11·1	4·9	49·3	12·0
Milk	19·1	7·6	19·2	7·8	27·6	14·9	10·9	4·7
Eggs	6·6	4·0	9·5	5·6	11·3	7·1	–	
Fats and oils	9·0	4·0	–		19·9	8·4	–	
Meat	20·8	2·9	41·0	10·1	29·2	11·6	1·6	1·6
Fish	2·1	1·1	6·4	3·8	1·3	1·5	0·7	1·1
Vegetables	11·8	4·2	7·4	2·4	8·3	5·5	18·3	6·2
Fruit	2·4	2·3	0·6	0·6	0·1	0·3	6·2	5·8
Nuts	4·9	1·0	0·1	0·2	8·6	0·9	0·7	0·3
Sugars	4·5	4·1	0·1	0·2	0·2	0·3	10·4	9·0
Confectionary	6·5	5·3	2·2	2·9	6·1	5·7	8·4	6·3
Beverages	3·4	3·1	1·9	2·3	1·3	1·4	6·2	5·3
Soft drinks	3·1	3·3	0·4	0·6	–		7·7	6·9
Alcohol	0·5	0·4	0·1	0·1	–		0·6	0·6
Others	2·2	2·1	2·9	5·5	2·1	2·1	1·8	1·5

Table 8. *Mean daily intakes (g/d) of selected nutrients for groups consuming varying proportions of the recommended daily allowance (RDA) (Department of Health, 1983) for each nutrient*

(Mean values and standard deviations)

RDA...	> 50 < 75			> 75 < 100			> 100		
	Mean	SD	*n*	Mean	SD	*n*	Mean	SD	*n*
					Males				
Energy (MJ/d)	7·7	1·0	12	10·0	0·9	49	13·7	2·2	24
Protein	0	0	0	61	5	6	115	19	85
Calcium	527	29	5	624	229	5	1184	270	82
Iron	6·7	1·2	3	9·0	0·9	7	15·5	3·0	82
Vitamin C	35	4·7	7	53	4·6	11	83	21	74
Vitamin B_6	1·2	0·4	7	1·4	0·2	11	1·8	0·3	24
Vitamin B_{12}	1·5	0	1	2·9	0	1	15·4	12·2	90
					Females				
Energy (MJ/d)	5·4	0·6	51	7·6	0·6	67	10·3	1·7	79
Protein	36	0	1	45	5	4	83	22	197
Calcium	505	58	29	705	54	67	1234	385	107
Iron	9·3	6·9	69	12·0	1·1	88	15·9	4·3	35
Vitamin C	37	6·1	40	45	12·2	61	85	24	102
Vitamin B_6	1·1	0·3	40	1·2	0·4	61	1·4	0·3	102
Vitamin B_{12}	1·8	0·7	4	2·5	0·6	10	9·3	9·4	189

intakes in the region of 50–75% of the recommended daily allowance (RDA) (Department of Health, 1983). About 25% of women had low intakes of energy, iron, vitamin C and vitamin B_6.

DISCUSSION

Persons suffering from mental handicap encounter specific problems which may have a bearing on their nutritional well-being. Abnormal masticatory problems have been associated with feeding difficulties such as choking or vomiting, particularly in young infants with mental handicap (Gouge & Ectvall, 1975; Webb, 1980). The incidence of obesity among patients with Down's syndrome is higher than among normal healthy individuals (Coffey & Crawford, 1971) while in contrast, inadequate energy intakes, relative to requirements, have been reported for athetoids with a resultant low weight-for-age (Leamy, 1953). The incidence of obesity in the present study (males 2%, females 15%) was considerably lower than that reported for the Kilkenny Health Project (males 8%, females 27%) in a sample size of 953 free-living adults (E. Shelley, unpublished results). The incidence of constipation was found to be no different between institutionalized people with or without mental handicap (Webb, 1980). The problem of drug–nutrient interactions has been well-recognized among the mentally disabled (Reynolds, 1974; Crosley *et al.* 1975; Tolman *et al.* 1975) as has the problem of ruminating or regurgitation (Rast & Johnston, 1986).

Given these unique features which may predispose the mentally handicapped to nutritional problems, it is surprising how little information has been gathered in this area (Hollins, 1985). The results of the present study show that energy intake is related to individual hospitals and to sex but is not related to either ambulatory status, body mass index or the degree of mental handicap. The design of the present study did not allow an evaluation of the reasons underlying inter-hospital variation in energy intake. Estimates of

Table 9. *A comparison of selected nutrient intakes in the present study for 19- to 34-year olds with recent studies for healthy adult Irish*

(Mean values and standard deviations)

Source...	Connolly *et al.* (1980)		Gibney *et al.* (1989)		Lee & Gibney (1988)		Barker *et al.* (1988)		Present study	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
					Males					
n	36		30		42		258		63	
Age (years)	> 19		39		34		35		19–34	
Energy (MJ/d)	11·8	2·7	12·5	2·6	13·1	3·0	10·6	2·4	10·6	3·0
Protein (g/d)	113	–	107	22	100	25	85	19	113	23
Fat (g/d)	131	–	119	35	128	33	109	30	126	42
Carbohydrate (g/d)	316	–	344	88	409	128	292	82	254	58
Fibre (g/d)	23	7	24	6	22	6	21	8	20	5
Calcium (mg/d)	1383	571	1026	364	1233	434		–	1136	323
Iron (mg/d)	14·8	12·1	15·8	6·5	13·5	3·2	13·6	5·6	15	3
Vitamin C (mg/d)	96	52	89	26	60	21		–	77	26
Fat energy (%)	42	–	39	6	38	7	39	–	44	8
					Females					
n	35		30		55		334		189	
Age (years)	> 19		39		33		37		19–34	
Energy (MJ/d)	9·2	2·3	8·4	2·2	8·5	2·8	7·1	1·9	8·0	2·2
Protein (g/d)	83	–	7·7	22	64	18	60	15	83	21
Fat (g/d)	104	–	87	28	81	24	76	24	87	26
Carbohydrate (g/d)	248	–	232	67	275	131	199	57	205	71
Fibre (g/d)	19	8	20	9	14	5	16	6	16	7
Calcium (mg/d)	984	329	761	252	905	355		–	945	383
Iron (mg/d)	12·1	3·7	11·8	4·2	8	2	10	5	12	4
Vitamin C (mg/d)	72	34	93	114	45	18		–	64	29
Fat energy (%)	43	–	40	6	37	8	41	–	41	7

the energy intakes in the UK as part of the hospital meal survey (Department of Health and Social Security, 1978) have also revealed a wide disparity of mean energy intakes among different hospitals, which would indicate the value of a regular monitoring system to ensure good nutritional standards. The range of energy intakes recorded in that study was 10·7–17·3 MJ/d for mentally handicapped patients.

Other studies have shown that physiological and psychological factors, feeding practices and weight status did not influence the nutrient intakes of mentally retarded patients, while the intakes of Fe, calcium and riboflavin varied between the sexes (Litchford, 1986). Table 9 allows a comparison of the intakes of selected nutrients recorded in the present study for the biggest age group, 19–34 years, with four studies of free living adults in Ireland. These four studies provide for a wide range of geographical locations and socio-economic backgrounds and use a variety of methodologies. Connolly *et al.* (1980) studied thirty-five semi-rural families in Cork using a 3-d weighed intake method. Gibney *et al.* (1989) studied sixty adults from a semi-rural background in Kilkenny using the 7-d weighed intake method. Lee & Gibney (1988) studied fifty families in a Dublin suburb with chronically high unemployment using a diet history method, while Barker *et al.* (1988) studied a random sample of adults in Northern Ireland using the 7-d weighed intake method. Clearly, the values reported for the present study are generally comparable with those of free-living subjects and the similarity of the coefficients of variation (standard deviation as

a percentage of the mean) indicate that the extremes of high- and low-nutrient intakes of institutionalized mentally handicapped persons are no different than those for free-living subjects. The subjects in the present study showed a lower intake of carbohydrate and a higher intake of protein compared with the other studies. Fibre intake was low compared with the two semi-rural groups studied (Connolly *et al.* 1980; Gibney *et al.* 1989). Fat, as a percentage of energy, was generally high compared with the other groups, especially for men. It is clear from Table 8 that up to one-quarter of female subjects had energy intakes between 50 and 75% of the RDA, and that equally-poor values followed for Fe, vitamin C and vitamin B_6. Whilst care must be taken to ensure adequate intakes of nutrients by all institutionalized people, especially the mentally handicapped, it is clear from Table 9 that the scale of the problem is no different from that faced by free-living subjects capable of individual food selection. In the absence of any possible confounding effects of drug–nutrient interactions, it would therefore seem that most patients, irrespective of the degree of mental or physical handicap, receive adequate intakes of nutrients. Greater patient care and increased nutrition awareness among the ward staff in mental hospitals have been shown to improve the nutritional quality of otherwise marginally-deficient diets (Cimino *et al.* 1985; Litchford & Wakefield, 1985). However, a debate exists as to whether current RDAs are applicable to patients with mental retardation (Ponder & Bergman, 1980). In general, RDAs are not intended to be applied to those who are physically ill. Whether they can be applied to the mentally retarded who are physically healthy is uncertain.

As is frequently observed among the general population of developed countries, the diets of the institutionalized mentally handicapped have been found in the present study to fall short of those nutritional guidelines aimed at reducing the risk of such diseases as coronary heart disease (Department of Health and Social Security, 1984). Dietary fat provided 43% of energy intake in contrast to the estimated prevailing national intake of 38% (Upton & Gibney, 1987) and the dietary standards set for Ireland of 35% of energy from fat (Food Advisory Committee, 1984). This higher than average intake of fat is largely due to a higher consumption of milk and meat. In the present study these two food sources provided 19 and 20% respectively of dietary energy, which contrast with the respective national averages of 11 and 16% (Upton & Gibney, 1987). Intakes of fibre and carbohydrate observed in the present study, particularly among older females, were considerably lower than previous values reported for free-living people in Ireland (Upton & Gibney, 1987; Gibney *et al.* 1989). These findings show that the diets of the mentally handicapped are no different from those of the rest of the population.

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