Nutrition and health issues in the general Hong Kong population

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In Hong Kong, the chronic diseases that lead to mortality and morbidity, and contribute to disability include cardiovascular diseases, cancer, hypertension, osteoporosis, and diabetes mellitus. The role of nutrition as a risk factor for the development of these diseases has been described elsewhere. For the older population, adequate nutrition is important to maintain health, particularly with regard to the effect of nutrition on immunocompetence. Nutritional surveys of the general adult population show that although the intake pattern for cardiovascular health is good, follow-up surveys to monitor the pattern are needed. In the context of chronic disease prevention, decreasing salt consumption, increasing calcium intake, and increasing the awareness of the health value of fibre may all be beneficial actions. Educational efforts should be directed particularly at those with lower levels of education, since the poorly educated have been shown to have a less healthy diet and a greater prevalence of overweight individuals. Among the elderly, evidence of undernutrition has been documented in institutional settings and is associated with increased mortality. The diet of those residing in vegetarian homes has been shown to be deficient in many B vitamins, which results in a high frequency of nutritional anaemias. To help achieve an optimal nutritional status, nutrition screening programmes should become an integral part of the development of quality care programmes for institutions responsible for care of the elderly.

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Introduction

The three main causes of mortality in the Hong Kong Chinese population are cancer, ischaemic heart disease, and stroke.[1] Although there is no comprehensive data on the incidence or prevalence of chronic diseases, isolated studies have shown that between 1980 and 1989, the number of hospital admissions for acute myocardial infarction and ischaemic heart disease increased in spite of a slow decline in ischaemic heart disease mortality[2]; the age-related prevalence of diabetes mellitus from ages 30 to 64 years increased from 7.5%[3] to 8.7%[4] over a period of 5 years (1990-1995); and the age-specific hip fracture rates among subjects aged between 70 and 79 years (as an indicator of osteoporosis) increased from 224 per 100 000 in men and 173 per 100 000 in women in 1966, to 307 in men and 505 in women in 1989.[5] The overall prevalence of hypertension among the working population is 17% in men and 5% in women,[6] increasing with age to 48% for those aged 70 years and older.[7] The incidence of stroke is estimated to be 736 per 100 000 annually.[8] The prevalence of obesity (using a criterion of a body mass index [BMI] ≥30 kg/m^2) is 5.0% for men and 6.7% for women.[9] Some of these diseases in turn contribute to the overall burden of disability for society. It has been estimated that among Hong Kong Chinese people aged 70 years and more, the attributable fraction with severe functional limitation was highest for stroke, dementia, and fractures.[10]

The roles of dietary factors as risk factors for these chronic diseases have been described elsewhere. These include the association between: antioxidants and cancer and ischaemic heart disease[11-14]; dietary lipids and ischaemic heart disease[15]; intake of cations (sodium and potassium) and hypertension (ischaemic heart disease and stroke)[16,17]; calcium, sodium, and protein intake and osteoporosis[5]; and obesity and diabetes (with

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associated hypertension and ischaemic heart disease).[18] Adequate nutrition is a particularly important part of health maintenance in the older population, due to its direct effect on immunocompetence.[19] With the overall reduction of energy intake that occurs with ageing, the quantity of certain nutrients may not be sufficient, hence the need for nutrient supplements. Recent studies show that nutritional supplementation increases the number of helper and natural killer (NK) cells, increases the antibody response to vaccines and interleukin 2 levels, and reduces antibiotic use and the number of days of infection.[19]

Nutritional data for the Hong Kong population

Several surveys have been performed in Hong Kong that studied the nutrient intake, dietary habits, and other nutritional indices for the population as a whole and for the older population. The Hong Kong Adult Dietary Survey 1995 was performed between 1995 and 1996 as part of a cardiovascular risk factor study.[20] The study sample was randomised, age- and sex-stratified, and consisted of subjects from 34 years of age up to and including 55 years of age. Dietary assessment was made using a food frequency questionnaire that consisted of items in the following seven categories: bread/pasta/rice (16 items); vegetables (63 items); fruits (26 items); meat (39 items)/fish (31 items)/eggs (5 items); beverages (37 items); dim sums/snacks (39 items); soups (10 items); and oil/salt/sauces (7 items). Dietary lipids were quantified by using food tables for Hong Kong that had been compiled from McCance and Widdowson,[21] and two food tables used in China that were published by Zhongshan University (1991)[22]

Table 1. Daily nutrient intake in the Hong Kong Chinese population shown according to age group and sex

	Age group (years) Mean (SD)			
	≤34		35-44	
	M (n=103)	F (n=106)	M (n=132)	F (n=133)
Energy (kcal)	2557 (723)[a]	1891 (583)[a]	2532 (713)[a]	1870 (635)[a]
Protein (g)	120 (45)[a]	94 (37)[a]	118 (40)[a]	89 (36)[a]
Fat (g)	85 (32)[a]	67 (27)[ab]	86 (31)[a]	62 (25)[a]
Carbohydrate (g)	330 (95)	233 (66)	325 (94)	245 (84)
Vitamin A (μg)	1202 (899)[b]	1314 (714)	1302 (790)[b]	1433 (949)
Thiamine (mg)	1.2 (0.5)[a]	0.9 (0.4)[a]	1.2 (0.5)[a]	0.9 (0.5)[a]
Riboflavin (mg)	1.3 (0.5)[a]	1.1 (0.4)[a]	1.3 (0.5)[a]	1.1 (0.5)[a]
Niacin (mg)	21.6 (8.6)[a]	17.6 (7.6)[a]	21.2 (7.6)[a]	16.4 (7.5)[a]
Vitamin C (mg)	122 (70)[ab]	157 (86)	143 (86)	179 (112)
Vitamin D (μg)	20 (16)[a]	13 (12)	20 (17)[a]	15 (17)[a]
Vitamin E (mg)	10 (4)[b]	10 (4)	11 (5)	11 (6)
Sodium (mg)	4823 (6946)	3680 (2208)[c]	4301 (308)	4071 (2622)
Potassium (mg)	3115 (3485)	2782 (1482)[c]	3014 (1482)	3120 (1431)
Calcium (mg)	577 (221)	554 (213)	584 (247)	595 (281)
Iron (mg)	17 (6)	15 (5)	17 (6)	15 (7)
Zinc (mg)	15 (5)	11 (4)	15 (5)	13 (19)
Copper (mg)	14 (6)	12 (5)[d]	14 (6)[a]	13 (6)
SFA* (g)	25 (10)[ab]	19 (9)[abd]	25 (10)[ab]	17 (8)[a]
MUFA† (g)	31 (13)[ab]	24 (11)[ab]	31 (12)[ab]	22 (10)[a]
PUFA‡ (g)	18 (6)[a]	15 (5)[a]	18 (6)[a]	14 (6)[a]
Cholesterol (mg)	443 (198)[a]	329 (148)[a]	456 (189)[ab]	300 (154)[a]
Protein (%)	19 (3)	20 (3)[a]	19 (3)	19 (3)
Fat (%)	30 (6)[a]	32 (5)[abd]	30 (6)[a]	30 (5)[a]
Carbohydrate (%)	52 (7)[a]	50 (7)[abd]	52 (7)[a]	53 (7)[a]

* SFA saturated fatty acids
† MUFA monosaturated fatty acids
‡ PUFA polyunsaturated fatty acids

Between sex comparison, all subjects, one-way ANOVA:
[x] P<0.001
[y] P<0.05
[z] P<0.01

and the Institute of Health of the Chinese Medical Science Institute.[23] Sodium and potassium intakes were assessed from urinary output measurements, using estimates derived from spot urine sodium/creatinine and potassium/creatinine ratios. Estimates from urinary excretion were used, as the values calculated from the food tables were much lower for both sodium and potassium. Usual dietary practice was assessed using a questionnaire that queried the place where meals were eaten, the types of cooking oil used, types of fat spread on bread, avoidance of fat in meats or skin from poultry, types of milk used, and the frequency of consumption of eggs and deep-fried foods.

Men had greater intakes of energy and other nutrients than women, with the exception of vitamin C and the percentage of total calories from protein. There was an age-related decrease in energy intake and other nutrients except for vitamin C, sodium, potassium, and percentage of total calories from carbohydrate—intakes that all increased with age (Table 1).[20] Approximately 50% of the population had a cholesterol intake of ≤300 mg; 60% had a fat intake ≤30% of total energy; and 85% had a percentage of energy from saturated fats ≤10%—all criteria considered desirable for cardiovascular health (Table 2).[20,24] However, 78% of the population had sodium intake values in the range known to be associated with an age-related rise in blood pressure. Mean calcium intake was lower compared with the value found in an Australian survey. Awareness of the value of wholemeal bread and polyunsaturated fat spreads was lower in this population compared with the Australian results.[25]

45-54		≥55		Total	
M (n=127)	F (n=136)	M (n=138)	F (n=135)	M (n=500)	F (n=510)
2410 (586)[a]	1857 (565)[a]	2222 (604)	1653 (455)	2421 (667)[x]	1813 (567)
113 (40)[a]	89 (37)[a]	99 (34)	75 (26)	112 (40)[x]	86 (35)
78 (29)[a]	60 (24)[a]	67 (27)	50 (19)	78 (30)[x]	59 (25)
317 (74)	247 (75)	311 (87)	231 (62)	320 (88)[x]	239 (73)
1619 (965)	1548 (1145)	1437 (1105)	1346 (929)	1399 (96)	1416 (960)
1.2 (0.4)[a]	0.9 (0.4)[a]	1.0 (0.4)	0.8 (0.3)	1.2 (0.5)[x]	0.9 (0.4)
1.2 (0.4)[a]	1.0 (0.4)[a]	1.1 (0.4)	0.9 (0.4)	1.2 (0.5)[x]	1.0 (0.4)
20.4 (7.9)[a]	16.2 (7.2)[a]	17.9 (6.9)	13.8 (5.2)	20.2 (7.8)[x]	15.9 (7.0)
153 (82)	177 (82)	158 (95)	169 (106)	145 (85)[x]	171 (98)
21 (27)[a]	11 (10)	13 (19)	10 (13)	19 (21)[x]	12 (13)
12 (6)	11 (5)	12 (5)	10 (4)	11 (5)	11 (5)
4991 (5612)	5819 (7590)	5244 (1178)	4485 (2346)	4841 (7572)	4518 (4409)
3443 (3251)	3970 (3288)	4414 (1345)	3442 (1560)	3428 (7270)	3338 (2137)
641 (254)	590 (248)	612 (277)	537 (240)	605 (253)[y]	570 (249)
18 (6)	16 (6)	17 (6)	14 (5)	17 (6)[x]	15 (6)
15 (10)[a]	11 (6)	13 (6)	9 (4)	14 (7)[x]	11 (10)
14 (5)	12 (5)[a]	12 (5)	11 (5)	13 (5)[x]	12 (5)
21 (9)[a]	16 (8)[a]	18 (9)	13 (7)	22 (10)[x]	16 (8)
28 (11)[a]	20 (10)[a]	23 (11)	17 (7)	28 (12)[x]	20 (10)
17 (6)[a]	14 (5)[a]	15 (6)	12 (4)	17 (6)[x]	14 (5)
398 (182)[a]	289 (153)[a]	315 (164)	230 (114)	399 (191)[x]	285 (147)
19 (3)	19 (4)	18 (3)	18 (3)	18 (3)[z]	19 (3)
29 (5)[a]	29 (6)[a]	27 (7)	27 (5)	29 (6)	29 (5)
53 (8)[a]	54 (8)[a]	56 (8)	56 (7)	54 (8)	53 (8)

Within the same sex, comparison between different age groups by one-way ANOVA:
[a] compared with ≥55-years group, P<0.05
[b] compared with 45- to 54-years group, P<0.05
[c] increasing trend with increasing age, P<0.001
[d] compared with 35- to 44-years group, P<0.05

(1 kcal = 4.2 kJ)

Table 2. Proportion of individuals who satisfied recommended criteria for cardiovascular health

Daily nutrient intake	No. (%)		
	Men	Women	Total
Fat percentage of total daily calories ≤30%	294 (59)	304 (60)	598 (59)
SFA* as % of total energy ≤10%	419 (84)	439 (86)	858 (85)
Cholesterol ≤300 mg	165 (33)	326 (64)	491 (49)
Sodium ≤2300 mg	107 (21)	115 (23)	222 (22)

*SFA saturated fatty acids

After adjustment for age, a higher level of education is associated with intakes of higher nutrient density of fibre and calcium for both men and women, and higher nutrient density of protein fat, niacin, vitamin D, and polyunsaturated fatty acid for women. Consumption of fruits was also higher for women and that of dairy products higher for men, and this rose with an increasing level of education. Body mass index and waist to hip ratio were also lower. Single women had lower nutrient densities of vitamin D and iron, and lower consumption of vegetables and fish compared with married women. Body mass index was lower in both single men and single women compared with married individuals.

Surveys have shown that residents of long-term care institutions have poorer vitamin nutritional status,[26] particularly of the B and C vitamins, and lower 25-hydroxyvitamin D_3 levels. Protein calorie malnutrition also exists,[27] and these nutritional indices may be used to predict the short-term mortality for elderly residents of such institutions.[28] Elderly people living in private nursing homes and convalescent hospitals have the worst nutritional status compared with those living in other types of long-term care institutions and those in the community.[29] Those elderly in acute medical wards had the poorest protein energy and vitamin status of all the groups.[30] A significant number of long-term care institutions for the elderly are run by Buddhist organisations that provide vegetarian diets only. While the Chinese vegetarian diet may result in a favourable risk factor profile for ischaemic heart disease, it has been shown to be deficient in many B vitamins and to lead to a high frequency of nutritional anaemias.[31]

The public health implications of the local diet

A large proportion of the population have a diet regarded as optimal for cardiovascular health. Hong Kong has one of the lowest age-standardised mortality rates (per 100 000) for cardiovascular diseases in men and women aged 65 years and older,[32] which is approximately half the rate for Singapore and one third of the rate for Australia. Worries about a westernisation of the diet appear not to be reflected in mortality rates for ischaemic heart disease, which are declining.[2] However, hospital admissions for ischaemic heart disease are increasing. Factors other than diet may account for this observation, such as hypertension and the increasing prevalence of diabetes mellitus in the population.

There appears to be a discrepancy between dietary lipid intake and serum lipid profile in the Hong Kong Chinese population because despite the 'ideal' intake, the average serum lipid profile is similar to that found in some western populations.[33] The low incidence of coronary heart disease in spite of a lipid profile similar to populations with a much higher disease incidence suggests the presence of 'protective' factors, which may be genetic or environmental (including dietary factors). While a high cholesterol level predisposes to the formation of atherosclerotic plaques, factors affecting plaque stability and endothelial function are equally important.[34] Ethnic differences in endothelial function[35] or the dietary intake of folate, which affects homocysteine levels,[36] may be factors. It may not be appropriate to only concentrate on cholesterol in public health education programmes focused on coronary heart disease, but the importance of increasing the dietary intake of folate or folate-containing foods such as certain vegetables should also be included.

The relatively high sodium intake in the local population compared with the Australian data is undesirable, due to the known contribution of sodium to the development of hypertension and associated diseases (stroke, ischaemic heart disease); only 22% of those surveyed had a daily intake ≤2300 mg. In particular, the increasing intake seen with age may also partly contribute to the increasing prevalence of hypertension that occurs with age in this population. The increasing salt intake may be partly due to the increasing taste threshold that develops with age.[37] However, the effect of increased salt intake on blood

pressure may be partly countered by the increase in potassium intake.

The rising prevalence of diabetes mellitus is of concern and likely to be related to overnutrition—a result of energy intake in excess of the amount of physical activity performed in increasing numbers of the population. Nutritional factors have also been associated with increased bone loss with age—a low calcium, high sodium, and high protein intake are implicated.[5] The Hong Kong population has a high protein and sodium but low calcium intake—a pattern deleterious to bone health. Yet, the incidence of osteoporosis-related fractures is not greater when compared with western populations that have a higher calcium intake. Polymorphism of the vitamin D receptor gene may account for this difference, perhaps by increasing fractional calcium absorption or by retarding the rate of bone loss among certain ethnic groups that have a high prevalence of the 'protective' genotype.[38] Nevertheless, altering nutritional factors (raising the calcium intake and reducing the sodium intake) could help reduce the current incidence of osteoporosis. It has been shown in the local population that calcium supplementation, together with increased physical activity, increases bone mineral density in elderly women.[39]

The role of nutrition in the aetiology of cancer in the Hong Kong population is uncertain. Lung cancer is a leading cause of mortality for both men and women, despite the low smoking prevalence in women (5%).[40] Epidemiological studies have shown that a diet with greater intakes of fresh fruits, vegetables, and fish appear to ameliorate the risk of lung cancer developing in response to environmental smoke or air pollutants.[41]

With regard to the above diseases, dietary recommendations would include: advice to adjust total energy intake appropriate to the level of a person's physical activity; reinforcement of the benefits of a diet containing a low percentage of fat and saturated fatty acid (as a percentage of total energy), so that cholesterol is kept ≤300 mg; the value of increasing calcium intake (eg in the form of increasing consumption of leafy green vegetables and soy products); advice to increase fibre intake; and the suggestion that the intake of fruits and vegetables in general be raised to increase the level of antioxidants present and to counteract the effect of a high sodium intake on blood pressure. Salt consumption should be reduced—for example, by not adding salt at the table. In addition, the salt content of various prepared foods should be displayed to enable consumers to make an informed choice. More effective methods would include the food industry gradually reducing the salt content of manufactured foods. This measure could potentially influence the mean blood pressure of the population and could help prevent many chronic diseases. Educational efforts should be targeted particularly at those with lower educational levels; a practical way of achieving this is to concentrate on primary schools.

A decrease in energy intake occurs with age, which is a result of a reduction in the basal metabolic rate due to a loss of fat-free mass and reduction in physical activity,[42] and which may result in suboptimal intake of micronutrients. It is prudent to try to increase the nutrient density of micronutrients with increasing age.[43] Another approach is to promote increasing levels of physical activity in order to maintain the total energy and thus micronutrient intake. Physical activity has other benefits such as preventing functional decline and lowering the risk of cardiovascular disease. Nutrition screening programmes should become an integral part of the development of quality care programmes for institutions responsible for caring for the elderly. Doctors who provide primary health care will play an important role in health educational efforts aimed at improving the nutrition of the general population.

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