Internal Medicine

Preventive nutrition and health: an Asia-Pacific perspective*

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ABSTRACT The economics and sociodemography of the Asia-Pacific region are changing rapidly and with these changes are coming changes in the food supply, food intake and related health advantages and problems. The nexus between protein-energy malnutrition in the young is being replaced by a nexus between nutrient excess, with associated food component deficiencies, and non-communicable disease in an aging population. A food supply which is abundant, refined and fatty characterizes the present situation, and the early expressions of abdominal fatness with its attendant metabolism dysfunctions and health sequele are indicative of the transitional health problems. These include cardiovascular disease, diabetes, certain cancers, osteoporosis and immune deficiency. Urbanization and population pressures will be eased by innovations in food production and food technology, with attention to the full risk-benefit equation for individuals and the need for an environmentally sustainable food supply. Prevention will depend on how well the region manages each of these dimensions. *Intern Med 1995; 11 : 10-17*

KEY WORDS Food supply, food intake, health, disease, Asia Pacific

Health and changing socio-economic demography

The seven key factors changing health status in the AsiaPacific region at present are

1. rising affluence,
2. an aging population,
3. food cultural shifts,
4. sedentariness,
5. urbanization,
6. environmental degradation, and

7 health care system developments (availability, managerial, technological, educational and professional).

In reality none of these factors can be separated from each other, especially that of food cultural shifts and their impact on health. These shifts are occurring because of greater information exchange, education, travel, trade, fashion, cultural arrogance and pressure, cultural subservience, personal food need, local food supply, food preparative skill development (or lack of it) and more.

Generally, as *affluence* rises, the proportion of energy from fat increases. As the population ages energy requirement tends to decrease, lean mass decreases, and the need for nutrient dense food increases[1]. With *sedentariness* comes similar problems to those of aging. *Urbanization* cuts off certain traditional food supply lines and creates new ones, more food technologically dependent for storage and preparation; it adds to the difficulties of being physically active; and it contributes to problems of hygiene and pollution with attendant food contamination. *Environmental degradation* is beginning to affect food production and supply in the region. And health care systems are making major strides in availability, technology and quality at the primary, secondary and tertiary levels[2,3].

The changing health problems

The major shift in health status in the Asia-Pacific region has been in the nexus between protein-energy malnutrition (PEM) and infectious disease to one between nutrition and non-communicable disease. With each nexus, other factors, as already outlined, play a determining role. In transition, there may be an admixture of these problems, which are often characterized as those of undernutrition and overnutrition. Thus it is possible for a child to have protein and micronutrient deficiencies and also to be overfat. Again, the problems of nutritional excess may be expressed because of accompanying deficiency of food components, both nutrient and non-nutrient (see below).

Perhaps the most characteristic new health problem of the region is that of obesity and abdominal obesity in particular (**Table 1**)[4]. There may be a greater risk of the

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Table 1. Relationship between stature and BMI and WHR in Melbourne Chinese[3].

	BMI (kg/m^2)		Waist-to-hip ratio	
	Men (n = 268)	Women (n = 269)	Men (n = 268)	Women (n = 269)
Stature (cm)	-0.08	-0.09	-0.20*	-0.22*
Body weight (kg)	0.83†	0.86†	0.50†	0.43†

*P < 0.0001, †P < 0.0001

early development of abdominal obesity in traditional populations because of the combination of short stature and positive energy balance **(Table 2).**

The key health problems now in the Asia-Pacific Regions are[5-14]:

1. obesity,
2. cerebrovascular disease,
3. coronary heart disease,
4. a changing profile of neoplastic disease towards lung, breast, colorectal, pancreatic, prostatic and possibly skin, with ongoing problems of primary liver, nasopharyngeal and hematological,
5. non-insulin-dependent diabetes mellitus (NIDDM),
6. osteoporosis,
7. alcohol-related, and
8. road-accident related

But the problems of protein deficiency, nutritional anemia, iodine deficiency, vitamin A deficiency, trace-element deficiency, and water-soluble vitamin deficiency (B-1, B-2, B-6), remain to varying extents throughout the region[4,7].

The changing food supply

The most apparent changes in the Asia-Pacific food supply are its abundance, its increasing diversity, its use of more refined ingredients (like fat and sugar), new substitutes for old snacks and away-from home meals (e.g. Kentucky Fried Chicken instead of Hainanese chicken and rice) and for beverages (eg, Coke for Chinese tea, brandy or Cognac for Chinese tea) **(Table 3).**[15].

Probably the most important nutrient change is that of fat, up from 10-15% 20 years ago to 25-30% today in many parts of the region[7,8]. There are some enigmas here as far as the health consequences are concerned, however. For example, for the same order of magnitude of increase in fat intake in Singapore, there has been a much greater increase in coronary heart disease (CHD) than in Japan[11,16-18]. We, therefore, must be interested in what other lifestyle facilitators of our protection against the expression of CHD, including the nutritional, operate in the region. Candidate nutritional agents will include food habits and cooking techniques and the use of various

Table 2. Abdominal obesity-pathogenic hypotheses

A. Predisposing factors (major factors)
   1. Genetic
   2. Short stature
   3. Positive energy balnce

B. Expression dependent on modulators of fat distribution
   1. Factors with hormonal like properties (directly or indirectly)
      1.1 Endogenous
         sex hormones
         glucocorticoids
      1.2 Exogenous
         phytoestrogens
         substances of abuse
   2. Trophic or antitrophic factors for visceral (omental) fat
      2.1 Fatty acid unsaturation
         (saturated ↑, ω3 unsat ↓)
      2.2 Growth factors
      2.3 Environmental residues or other fat soluble substances
   3. Regulation of metabolically active fat
      3.1 Autonomic Nervous System and factors affecting its activity (eg, in central nervous system)
      3.2 Thermic factors in food

Table 3. Food related to the intake of tea in Melbourne Chinese[13].

Positive	Negative
Jelly fish	Water
Lotus seed	Coca-Cola
Bean syrup	Meat pie
"Dim Sim"	Cucumber
Homemade soup	Chinese radish
Chinese kale	Roast pork
Beancurd	
Boiled chicken	
Fresh plums	
Dried shrimps	
Shark's fin soup	
Abalone and scallops	
Duck	
Chinese cabbage	
"Moon cake"	

Table 4. Relationships between the prevalence of H.pylori : sero-positivity and chopstick use[22].

Ethnic	Birthplace	Subjects	*H.pylori*	Chopstick users
		n	%	
Chinese	China	71	70	93
	Vietnam	79	68	97
	Elsewhere	100	59	70
	Malaysia	91	44	47
Caucasian	Australia	101	31	0

Table 5. Non-nutrients of physiological importance defined chemically[24]

Ajoene	Capsaicins
Caffeine	Lectins
Coumestans	Trace Elements
Flavonoids	Peptides
Salicylates	Novel amino acids and fatty acids
Saponins	Peppermint oils
L-dopa	

Table 6. Non-nutrients defined physiologically[24]

Opioids or exorphins
Other neuroendocrine factors
Digestive enzyme inhibitors
Glycemia altering
Lipid lowering
Satiating
Thermogenic
Behavior modifying

plant food (fruits, nuts, seeds, cereal, vegetable), seafood, other animal-derived food like milk, dairy products and eggs, and quality of cooking oils. There are great opportunities and imperatives to understand these changes and their total health impact.

The nutritional factors

It is easy and simplistic to ascribe health consequences of nutritional change to food components alone. Food beliefs and habits are important[19-21]. An example of the importance of these is given by a study of Melbourne Chinese where it was found that chopsticks use accounted for a significant proportion of the unexplained difference in *Helicobacter Pylori* (an organism important in the pathogenesis of gastritis and peptic ulcer) positivity between individual Chinese, who do not all use chopsticks to the same extent depending largely on place of birth, but for which allowance has been made in the analysis **(Table 4)**[22]. To only have studied food or nutrient intake would have been to under-appreciate the role of food in this important health problem.

The food intake in its entirety also needs mathematical description. There may be advantageous offsets for the nutritional physiology of bone in an Asian diet low in calcium, not apparent unless the complete picture is seen. For example, phytoestrogen in soya products may make the use of available calcium to bone greater[23].

The interest in non-nutrient components of food of biological importance is growing **(Tables 5 and 6)**[24] as is that in the physico-chemistry of food[24,25].

The nutritional indicators

A region which is undergoing such rapid change in its food supply and health patterns needs nutritional as well as health indicators. These may be classified as food, body compositional, risk factors for non-communicable diseases and the disease processes themselves, and functional indices and reserve capacities. An index of *food variety* or food diversity can be particularly valuable in judging the progress or loss of a nutritionally sound food pattern[26-28].

Food

Food cultural or traditional indicators, including belief The assessment of food cultural change is usually made by socio-anthropological methods, but it is possible in the food area to develop and apply traditional food scores[16] or scores of food cculturation **(Table 7)**[29].

There is a general assumption that acculturation may be a health disadvantage, but whether it is or not can be tested with indices as predictors of outcomes. Whilst intact food culture may have within it checks and balances, acculturation which proceeds in an informed way can retain the best parts of traditional culture and replace those that are less satisfactory. Evidence we have amongst Chinese in Melbourne suggests that they engage in this process.

Meal indicators Conventionally, food data are handled ollectively for days, weeks, or longer periods and the role of particular meal snacking patterns is not examined. There is literature on breakfast as a meal and its health consequences, although little on other meals[30,31].

It is interesting that nutrient intake profiles can be quite distinctively related to time of day. Australian

Table 7. Relationship between plasma lipids and other parameters[29]

Plasma lipid	Regression coefficients					
by gender	Age	BMI	LOSA	CHAU	Age*CHAN	LOSA*CHAU
Men (N = 269)						
CHOL	0.021§	0.068§	0.0114*			
TRIG	0.013†	0.118§	NS	NS		
HDLC	0.0019	-0.044§	NS	0.14*	-0.0029*	
LDLC	0.14†	0.060	0.011*	NS		
LDLD/HDLC	0.011*	0.13§	NS	NS		
Women (N = 275)						
CHOL	0.017†	0.053*	NS	0.78‡	-0.016†	
TRIG	0.010†	0.078§	NS			
HDLC	NS	-0.033§	0.0078†	NS		
LDLC	0.014*	0.045*	-0.0029	0.47*	-0.012*	0.014*
LDLC/HDLC	0.018§	0.082§	-0.019*	-0.020		0.013*

CHAU : Food acculaturation towards Australian way of eating
LOSA : Length of stay in Australia
*P < 0.05, †P < 0.02, ‡P < 0.01, §P < 0.0001

children have most of their thiamin in the morning and most of their zinc in the evening[32]. What the biological significance of this is and what the significance of changing itmight be need to be researched.

There is evidence that low fat snacking minimizes cardiovascular risk[33] and it is worth remembering that Asian food patterns are generally characterized by snacking of such a kind. Therefore, it is conceivable that the increased prevalence of obesity and diabetes have as much to do with meals or snacking patterns as with intake of particular foods.

Cooking methods and styles may also change when ingredient use does not. There is a tendency, for example, for Chinese restaurants in Australia to serve more and more fried versions of Chinese foods now than a few years ago.

Food compositional indicators (macronutrients, micronutrients and non-nutrients) Tracking the macronutrient, micronutrient, non-nutrient and residue content of foods as nutritional indicators has value. Whilst methods of agricultural production may not change the micronutrient content of plant food greatly, livestock production methods are radically changing the fat content of meat. Non-nutrient components of milk may also vary depending on the pastur on which dairy catle are grazed, for example, in respect to to phytoestrogens or pesticide residues.

Food technological indicators There is little evaluation of the food supply in relation to food technology itself. So far food labeling has concentrated on ingredients, energy and nutrients. However, a change towards an extrusion methods for producing a cereal based food will alter its physico-chemical properties, and potentially, *small bowel handling and presentation to the large bowel* including its microflora; in turn this will change the way in which the colonic microflora services the colonocyte with substrates[34].

Body Composition

Fatness and its distribution There is general agreement that total body fatness in adults should be monitored by expressing weight in terms of height as a body mass index (kg/m^2) and this is helping greatly to focus attention on the changing prevalence of total fatness in the community. However, the appreciation of the early development of abdominal fatness depends on methods to assess it directly, whether this be by way of circumferences or skinfold thickness. Since abdominal fatness consists of abdominal subcutaneous fat, omental fat, and retroperitoneal fat, improved body compositional technology will allow for a more accurate localization of the fat tissue contributors to abdominal fatness. This is likely to be particularly important in terms of nutritional indicators for non-communicable diseases in the Asia-Pacific region[4]. We are not sure at present how transferable body compositional

indicators are from Caucasian populations to Asian populations isofar as measurement of amount to body fatness itself is concerned or of the long term prediction of health outcomes. Considerable attention needs to be given to long term studies in Asian populations. For the moment, we presume that an abdominal (midway between the lower aspect of the rib cage and the superior iliac crest) to hip (maximal gluteal protrusion) ratio greater than 0.85 is a fair index of increased risk of dysmetabolism and its sequelae of diabetes and coronary heart disease.

Lean mass Generally speaking, Asian populations are still more slim, or of lower body mass index, than their Caucasian counterparts. The data of James and Sette[35] indicate that a body mass index of less than 18.5 is associated with increased morbidity and mortality. It is clear that, from place to place in the Far East and South East Asia, populations may have similar prevalences of BMI less than 18.5, and yet different morbidity and life experiences, particularly amongst the aged[36] **(Table 8).** There may be factors protecting certain populations against an adverse outcome of BMI less than 18.5, or may be the reduction in amount of lean mass is not as great for some Asian populations as it is for others. These are important body compositional questions to address in the development of relevant body compositional indicators for the Asian region.

Risk factors for non-communicable diseases

There is general agreement on basic risk factor profiles for the major non-communicable diseases including cardiovascular disease, osteopenia, diabetes mellitus, and neoplastic disease as seen in developed countries. Presumptively, they are similar for the Asian region, but since their emergence is against a different food cultural background, one has to be cirumspect. In every case of non-communicable disease, however, food intake constitutes a risk factor or set of risk factors in its own right, as does body composition.

The impact of nutritionally-related risk factors for non-communicable disease, would depend on co-existent non-nutritional risk factors.

There is an increasing opportunity to monitor disease processes themselves which reflect the integrative effect of these various risk factors; for example, in atherosclerotic vascular disease, non-invasive indices using ultrasound; in the case of osteopenia, dual energy X-ray, absorptiometry (DEXA) with a degree of precision which can allow review of progress on a yearly if not 6 monthly basis; in diabetes, indices of early renal damage like the presence of

Table 8. Prevalence of CED, acceptable weight, overweight and obese in elderly communities of the IUNS study of *Food Habits in Later Life: Cross-Sectional Approaches*[37]

BMI	Men		Women	
	Young	Old	Young	Old
kg/m^2				
ACA	n = 41	n = 5	n = 36	n = 6
< 18.5	0	0	0	0
≥ 18.5-< 25	39	60	33	50
≥ 25-< 30	49	40	50	50
≥ 30	12	0	17	0
GRK-M	n = 64	n = 28	n = 59	n = 35
< 18.5	0	4	0	3
≥ 18.5-< 25	19	29	5	34
≥ 25-< 30	50	39	44	23
≥ 30	32	20	51	40
GRK-S	n = 26	n = 15	n = 20	n = 9
< 18.5	0	7	0	0
≥ 18.5-< 25	31	27	15	44
≥ 25-< 30	35	67	60	22
≥ 30	35	0	25	33
SWE	n = 51	n = 19	n = 75	n = 59
< 18.5	0	5	9	12
≥ 18.5-< 25	51	47	52	48
≥ 25-< 30	41	42	31	32
≥ 30	8	5	8	9
FIL	n = 33	n = 40	n = 105	n = 39
< 18.5	12	28	13	27
≥ 18.5-< 25	64	63	54	55
≥ 25-< 30	15	8	27	12
≥ 30	9	3	6	7
CBJ	n = 77	n = 42	n = 121	n = 53
< 18.5	1	2	3	9
≥ 18.5-< 25	48	57	41	66
≥ 25-< 30	40	36	43	19
≥ 30	10	5	12	6
CTJ-R	n = 73	n = 10	n = 79	n = 19
< 18.5	15	50	27	37
≥ 18.5-< 25	81	50	62	58
≥ 25-< 30	3	0	10	5
≥ 30	1	0	1	0
CTJ-U	n = 107	n = 19	n = 102	n = 32
< 18.5	6	16	14	19
≥ 18.5 < 25	60	68	57	59
≥ 25 < 30	31	11	24	16
≥ 30	3	5	6	6

microalbuminuria, allowing a more-aggressive approach to reduction of nephropathy, including protein restriction.

Functional Indices and reserve capacities

Without the evidence of development of a disease process, it may be possible to identify a reduction in biological function or, perhaps what is even more useful, a reduction in physiological reserve capacity. Opportunities to make such assessments are becoming available in the following areas: aging, strength and physical fitness, hematological (well established in respect to indices like hemoglobin concentration and hematinic nutrient levels in peripehral blood), and immune Function.

What is required here is that there be an epidemiological data base for these indices along side the nutrition epidemiological data base[8,38].

Future imperatives

Sustainability

In the long run, there is no point in encouraging or monitoring a particular dimension of nutritional status, unless it is sustainable. For example, in respect to food intake, the regular intake of fish in the human diet will not be possible with an expanding population, unless fish farming plays a greater and greater role. It will also not be possible to graze more and more animals at the expense of forest and woodland destruction. So there will be a limit to meat production and consumption for the human species. Genetic engineering will not fully resolve these dilemmas, because it generally focuses on a particular strain or species, and less overall biological diversity. It is a matter of judgment how much reduction in biodiversity will be possible, at some point here will be a limit. The theme of the 15th International Congress of Nutrition in Adelaide in 1993 was *Nutrition in a sustainable environment*[39].

Risk-benefit analysis

As the food supply changes and the health profile changes, there will be a required revision in the estimated risks and benefits of eating in a particular way, as well as the environmental consequences of doing so. This will incresingly be the case with new agricultural and food technology. With the quest for functional or designer foods to address particular health problems, a new era of human food toxicology will emerge. For example, we already have available high intensity sweeteners which provide the sweetness and palatability of sugar but without all the calories. One such high-intensity sweetener, aspartame (NutraSweet®), could help individuals, who are motivated to control their body weight. Blackburn and coworkers affiliated with harvard Medical School in the U.S., have demonstrated that aspartame as part of a multidisciplinary weight control program, can facilitate weight loss and promote long-term weight control[40]. More specifically they have done the following clinical research which I would like to briefly present to you, because of the extraordinary importance of that long term follow up study.

The study by Blackburn and coworkers investigated whether the use of foods and beverages containing the high-intensity sweetener aspartame as part of a multidisciplinary weight control program would improve weight loss and long-term control of body weight. The study was a prospective, randomized, stratified, two-arm parallel design. One hundred and sixty-three obese women aged 20 to 60 years were placed on a nutrient-balanced deficit diet (4186 ± 837 kJ kcal/day) and randomly assigned either to consume or abstain from aspartame-sweetened foods and beverages during 19 weeks of a multidisciplinary weight- reduction program. Both treatment diets were isocaloric, isonitrogenous, and isovolumic. Following active weight loss participants were encouraged to continue to consume or abstain from aspartame during a 2.6 year weight maintenance phase. During active weight loss, all participants attended weekly one-hour, closed group sessions led by a trained nutritionist. Groups consited of 10-15 individuals who had been randomized to the same intervention treatment. Participants were instructed on behavioral and lifetyle strategies, and their diet assign ments were reinforced by research staff. Groups met monthly during the maintenance phase. The primary outcome measures were aspartame consumption and body weight change. Secondary measures included level of physical activity and subjective reports of quality of life.

Women in both treatment groups lost a mean of 10% of body weight (10 kg) during 19 weeks of active weight loss. Among participants in the aspartame group, aspartame consumption was positively associated with weight loss ($p = 0.05$). During maintenance (week 71), participants in the aspartame group had a 3.1% weight regain, while those in the no-aspartame group had regained an average of 4.9%. By week 156, participants in the aspartame group had regained an additional 2.4% (net weight loss from baseline of 5.1%) compared with a gain of 5.4% (net weight loss from baseline of 0.3%) in the no-aspartame group. Using multivariate analysis, the aspartame group regained significantly less weight during maintenance week 156 ($p = 0.05$) than the no aspartame group **(Figure 1)**. Other factors that were predictive of a

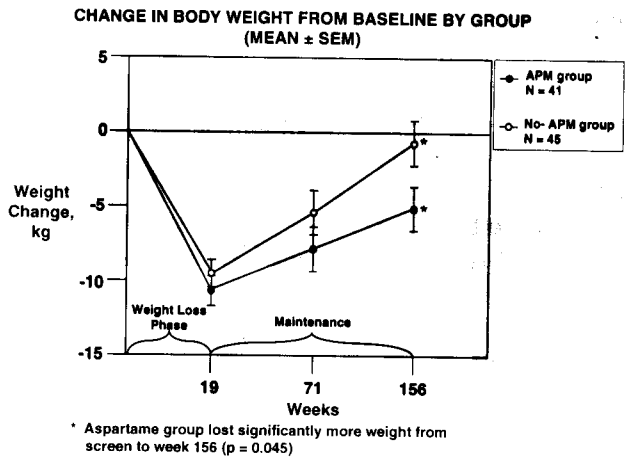

Fig. 1 Change in body weight from baseline by group (Mean ± SEM).

better three year weight maintenance were increased exercise and self-reported eating control.

In summary, among individuals consuming aspartame during a 19-week weight loss program, consuming more aspartame was associated with a greater weight loss. During maintenance (156 weeks), participants in a multidisciplinary maintenance program that incorporated aspartame-sweetened products had better long-term control of body weight. These results support the role of the high-intensity sweetener aspartame in aiding in the long-term control of body weight which should be considered by the Thailand population as a strategy for the treatment and prevention of obesity.

We live in an exciting and challenging period of human history, especially in the Asia-Pacific region, with its populations, more and more economically productive, living longer, with increasing health expectations, and wanting to be fed in a way that is not only interesting and enjoyable, but healthy. The Asia-Pacific food supply is unquestionably changing. We must be in a position to manage it well, minimizing the short and long term risks and optimizing the benefits[36].

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โภชนวิทยาป้องกัน มุมมองด้านเอเซียแปซิฟิก*

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บทย่อ ได้มีการเปลี่ยนแปลงด้านเศรษฐกิจและสังคมอย่างรวดเร็ว ในภาคพื้นเอเซียแปซิฟิก ซึ่งมีผลต่อการเปลี่ยนแปลงในด้านการได้รับอาหาร อาหารที่รับประทาน ตลอดจนประโยชน์และปัญหาที่สัมพันธ์กับสุขภาพ ความสัมพันธ์ระหว่างการได้รับสารอาหารเกินร่วมกับการขาดส่วนประกอบของอาหารและโรคไม่ติดต่อในประชากรสูงอายุได้เข้ามาแทนที่ความสัมพันธ์ระหว่างโรคขาดโปรตีนและพลังงานในเด็ก ปัจจุบันนี้ อาหารที่ได้รับมีปริมาณมาก อยู่ในสภาพผ่านการแปรรูปและเป็นไขมัน ตลอดจนการแสดงออกแต่เริ่มแรกของการมีไขมันมากในช่องท้องซึ่งก่อให้เกิดความผิดปกติของเมตาบอลิซึมและผลร้ายต่อสุขภาพ เป็นข้อบ่งชี้ของปัญหาสุขภาพที่เปลี่ยนแปลงไปจากเดิม ปัญหาสุขภาพเหล่านี้ได้แก่โรคหัวใจและหลอดเลือด โรคเบาหวาน โรคมะเร็งบางชนิด โรคกระดูกพรุน และโรคขาดภูมิต้านทาน วิธีการใหม่ในการผลิตอาหารและเทคโนโลยีทางอาหารโดยคำนึงถึงความเสี่ยงกับประโยชน์สำหรับบุคคล และความจำเป็นที่มีการได้รับอาหารอย่างต่อเนื่องจะช่วยบรรเทาความกดดันจากการวิวัฒนาการเป็นเขตเมืองและจากประชากร การป้องกันขึ้นกับด้านเอเซียแปซิฟิกจะจัดการกับปัญหาต่าง ๆ ได้ดีเพียงใด *อายุรศาสตร์ 2538;11:10-17*

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