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Nutrition and common health problems

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Clin Med 2004;4:400-4

In the past fifty years, the UK diet has changed substantially¹ while physical activity has decreased, resulting in a rapid increase in overweight and obesity. These changes have coincided with increases in the incidence of many chronic diseases

such as non-insulin dependent diabetes mellitus (NIDDM), some cancers, osteoporosis and bowel disease. Many dietary components have a role in both prevention and management of these diseases (Table 1). Evidence for the role of diet and physical activity in the aetiology of chronic disease relies principally on the consistency of epidemiological data supported by evidence of mechanisms and some intervention studies. The World Health Organization recently summarised the evidence for relationships between diet and physical activity and the development of chronic diseases (Table 2).²

Cardiovascular disease

Fats

High serum concentrations of cholesterol, particularly low-density lipoprotein (LDL) cholesterol and low levels of high-density lipoprotein (HDL) cholesterol, predict coronary heart disease mortality. The use of statins to lower LDL

Table 1. Food sources of nutrients associated with chronic disease risk in the UK diet.

• Nutrients associated with increased risk of chronic disease	
Nutrient	Food sources
Fat	Fried foods, pastries, cakes, crisps, rich sauces
Saturated fatty acids	High fat dairy foods, processed meats
Trans fatty acids	Biscuits, cakes, pastries, hard margarines
Sugar	Sweetened drinks, confectionery, biscuits
Sodium	Processed foods, savoury snacks
• Nutrients associated with decreased risk of chronic disease	
Nutrient	Food sources
Mono-unsaturated fatty acids	Olive oil, rape seed oil, nuts, avocados
n-6 polyunsaturated fatty acids	Sunflower and corn oils, margarines
n-3 polyunsaturated fatty acids	Oily fish,* rape seed oil, leafy vegetables
Fibre	Wholegrain cereals, vegetables, beans, pulses
Vitamin C	Citrus fruits and juices, potatoes
Folic acid	Fortified cereals, leafy vegetables, orange juice, liver
Vitamin E	Wholegrain cereals, fortified margarines, vegetable oils
Vitamin D	Fish oils, fortified margarines, liver
Calcium	Milk, cheese, yogurt, wholegrain cereals, soya
Potassium	Fruits, vegetables

* Mackerel, herring, salmon, sardines, pilchards, trout and fresh (but not canned) tuna.

cholesterol reduces cardiovascular events in subjects with and without preceding cardiovascular disease.³ Dietary fat composition is more important than dietary cholesterol in influencing serum cholesterol levels. Saturated fatty acids increase and n-6 polyunsaturates reduce both blood cholesterol levels and cardiovascular risk. Monounsaturates appear neutral; substituting them for saturates reduces blood cholesterol. Long-chain n-3 polyunsaturated fatty acids in fish oils have a protective effect, probably related to antithrombotic and anti-arrhythmic properties. Trans fatty acids increase LDL cholesterol and decrease HDL cholesterol, increasing cardiovascular risk.⁴

Advice to change dietary fat and cholesterol intake in healthy subjects produces a small but potentially important reduction in cardiovascular risk in trials lasting longer than two years⁵ even though compliance may be poor. In secondary prevention, advice to increase oily fish intake reduced case fatality from second heart attacks,⁶ and a diet high in alpha-linolenic acid (a medium chain n-3 polyunsaturated fatty acid), fruit and

vegetables reduced second cardiac events compared with a conventional low fat diet after four years.⁷

Fruits, vegetables, cereals and fibre

There is an inverse association between fruit and vegetable or wholegrain cereal consumption and cardiovascular risk. Heart disease risk is about 15% lower at the 90th centile than at the 10th centile of fruit and vegetable consumption.⁸ Several secondary prevention trials found no effect of antioxidant supplements (vitamins E and C and beta-carotene) on coronary events or overall mortality.⁹ Vegetables are also good sources of folic acid – elevated plasma homocysteine levels (a marker of low folate intake) independently predict cardiovascular risk. A meta-analysis of prospective studies found lower cardiovascular disease risk with lower homocysteine levels¹⁰ while treatment with folate and other B vitamins was found to reduce restenosis after coronary angioplasty.¹¹ Dietary fibre from fruit and vegetables could also contribute to

the effect. There is insufficient evidence that other plant constituents such as flavonoids in soy products and fruits and vegetables have protective effects.

Salt and alcohol

Both decreasing dietary sodium intake and increasing fruit and vegetable consumption, together with less high fat dairy products, independently and additively decrease blood pressure by up to 11 mmHg.¹² Dietary salt is mostly derived from processed foods such as bread, ready meals and savoury snacks. Moderate alcohol consumption probably confers some protection against cardiovascular disease, though high alcohol intake increases the risk of stroke as well as liver disease and social problems.

Physical activity

Physical activity increases HDL cholesterol, lowers blood pressure, improves glucose tolerance and reduces blood coagulation and platelet aggregation. It has a major role to play in primary and

Table 2. Associations between diet and physical activity and chronic diseases (adapted from Ref 2).

Nutritional factor	Cardiovascular disease	Obesity and NIDDM	Cancers	Osteoporosis
Energy-dense foods		Convincing increase		
Saturated fats	Convincing increase	Probable increase		
Monounsaturated fats	Probable decrease			
Trans fats	Convincing increase			
n-6 fatty acids	Convincing decrease			
Fish oils	Convincing decrease			
Other n-3 fatty acids	Probable decrease			
Fibre	Convincing decrease	Probable decrease		
Whole-grain cereals	Probable decrease			
Sweetened drinks		Probable increase		
Preserved meat			Probable increase ¹	
Vitamin D				Convincing decrease
Sodium	Convincing increase			
Potassium	Convincing decrease			
Calcium				Convincing decrease
Fruits and vegetables	Convincing decrease	Probable decrease	Probable decrease ²	
Alcohol:				
high intake	Convincing increase ³		Convincing increase ⁴	
low to moderate intake	Convincing decrease			
Physical activity	Convincing decrease	Convincing decrease	Convincing decrease ³	Convincing decrease

¹colorectal cancer, ²oesophageal, stomach and colorectal cancer, ³stroke, ⁴oropharyngeal, oesophageal, liver and breast cancer. NIDDM = non-insulin dependent diabetes mellitus.

secondary prevention of cardiovascular disease.⁴

Obesity and NIDDM

Ready access to 'energy dense' foods (high in fat and added sugar and low in starch and fibre) can contribute to higher energy intake, particularly with a sedentary lifestyle. The risk of NIDDM increases rapidly with increasing overweight above body mass index (BMI) of 30 kg/m². Weight loss and physical activity in overweight subjects with impaired glucose tolerance markedly reduced incidence of type 2 diabetes after three years.¹³

Managing weight loss

Weight management programmes should aim for slow weight loss through changes in diet which can be maintained for years. Weight loss of 10 kg or around 10% of initial body weight leads to substantial improvements in risk factors.¹⁴ A reduction in energy intake of 20–25% or about 2.5 MJ (600 kcal), per day by reducing intake of high saturated fat, high added sugar foods and drinks and increasing intake of wholegrain cereals, fruits and vegetables should lead to weight loss of about 0.5 kg per week. Many patients find it easier to adhere to dietary advice if it is delivered with behaviour therapy and/or group support. A gradual increase in physical activity improves risk factors as well as helping to maintain weight loss.

Cancer

Nutritional factors influence risk of several cancers.^{1,15} Overweight increases risk of hormone-sensitive cancers such as postmenopausal breast cancer and endometrial cancer. By contrast, physical activity lowers risk of breast¹⁶ and colorectal cancers.¹⁷ High consumption of preserved meats and low consumption of fruits and vegetables are associated with greater risk of colorectal cancer, while high alcohol intake increases risk of liver and breast cancers and, especially in combination with smoking, cancers of the upper gastrointestinal tract.

The possibility that antioxidant vitamins could reduce cancer risk has not been supported by two major intervention studies of supplements of vitamin E, beta-carotene and retinol. These studies either failed to show clear-cut benefits in prevention of lung cancer or other cancers in smokers or demonstrated an adverse effect.^{18,19} The Medical Research Council Heart Protection trial also found no effect of antioxidant vitamin supplementation on cancer incidence.⁹

Osteoporosis

Osteoporotic fractures are a major cause of morbidity in older people, particularly women. Many factors contribute to the risk of fracture: smoking and alcohol consumption increase the risk while weight-bearing physical activity has a protective effect.²⁰ Populations with low

calcium intake typically have low fracture rates. Calcium supplementation in Western populations can help to prevent postmenopausal bone loss, though there is limited evidence that this reduces risk of fracture.²¹

Vitamin D increases calcium absorption from the gut. In younger adults most vitamin D is derived from the action of sunlight on the skin, but dietary sources are important in those who have low sunlight exposure, such as the housebound elderly, in whom supplements (10 µg daily) may be beneficial in preventing fracture.²²

Bowel diseases (Table 3)

Acute diarrhoea

Food poisoning, other infection or antibiotic use can result in considerable

Table 3. Diet and bowel health.

Condition	Aetiology	Management
Acute diarrhoea	Food poisoning Gut infection Antibiotics	Oral rehydration solutions Probiotics
Dysphagia	Neuromuscular Stricture	Maintain weight PEG tube
GORD	Obesity Increased intra-abdominal pressure Reduced lower oesophageal sphincter pressure	Avoid overweight Avoid constipation
Peptic ulcer	<i>Helicobacter pylori</i> NSAIDs	Antibiotics Avoid NSAIDs
Coeliac	Genetically-determined immune-mediated reaction to gluten	Avoid wheat, barley, rye Correct iron and folate deficiencies Observe bone health
IBD (UC & Crohn's)	Abnormal mucosal response to commensal flora Unknown mechanisms	UC: no role for diet Crohn's: maintain appetite and weight Correct micronutrient deficiency Pouchitis: probiotics
Constipation	Multiple causes	High NSP (fibre) diet
Diverticular disease	'Western' style diet and other factors	Wheat bran or bulk laxatives
Irritable bowel	Probably several disorders Abnormal motor sensitivity of gut	If constipation predominant, try high NSP/bulk laxatives
Food intolerance	Immune-mediated response to dietary antigens or deficient enzymes	Avoidance of specific food (after PCDBFC)

GORD = gastro-oesophageal reflux disease, IBD = inflammatory bowel disease, NSAID = non-steroidal anti-inflammatory drug NSP = non-starch polysaccharide, PCDBFC = placebo-controlled, double-blind food challenge, PEG = polyethylene glycol, UC = ulcerative colitis.

salt and water losses.²³ Oral rehydration solutions are the mainstay of treatment. Probiotics may reduce both the duration and severity of acute attacks of diarrhoea in children²⁴ and help prevent antibiotic associated diarrhoea in adults.²⁵

Gastro-oesophageal reflux disease

Obesity is a major contributor to gastro-oesophageal reflux disease; weight reduction is essential for effective management. Other dietary measures have not been subject to good clinical trials.

Gallstones

Obesity increases risk of gallstones.

Celiac disease

Celiac disease can be entirely relieved by diet. Jejunal biopsy is essential to confirm the diagnosis since dietary change must be lifelong – a skilled dietitian is necessary to supervise this. The key to management is a gluten-free diet which excludes wheat, barley and rye. Oats, rice, maize, buckwheat, millet, sorghum and quinoa are tolerated. A gluten-free diet with around 1 g calcium daily reduces the likelihood of complications (iron and folate deficiency, osteomalacia/osteoporosis,

dermatitis herpetiformis, non-Hodgkin's lymphoma).^{26,27}

Food intolerance

Food intolerance encompasses food allergy (an acute immunoglobulin E mediated response to allergens in foods such as peanuts) as well as physiological intolerances, for example lactose deficiency, and ill defined non-immune mediated symptoms in conditions such as intolerance to dairy products, fish etc. Using double-blind, placebo-controlled food challenge, the prevalence of food intolerance is 1-2% of the population, although 20% say they are intolerant of a particular food. Management, by dietary exclusion should not be undertaken without good evidence, especially in the young.²⁸

Constipation

Increasing intake of non-starch polysaccharides (NSP) or dietary fibre can be helpful. An increase of 6–7 g/day (average NSP intake in the UK is 12–14 g/day) can be achieved by increasing bread intake and changing to wholemeal, eating a whole-wheat breakfast cereal, increasing fruit and vegetable intake or by bulk laxatives.

Diverticular disease

Lack of dietary fibre may contribute to the aetiology. Wheat bran may aggravate flatus production, feelings of abdominal distension and incomplete rectal emptying, but dietary change should always be tried first to manage the less severe and uncomplicated forms of the condition.

Inflammatory bowel disease (ulcerative colitis and Crohn's disease)

Diet is not thought to play any part in the aetiology of inflammatory bowel disease but has an important role in management of Crohn's disease. Anorexia, malabsorption and bleeding can lead to weight loss and anaemia due to iron, folate or vitamin B12 deficiency, osteomalacia and micronutrient deficiency. Probiotics may be helpful in pouchitis.²⁹

Conclusions

Nutrition plays a major role in the causation and progression of many common medical conditions and is an important part of the strategies for both prevention and management. Physicians should be aware of the potential for non-pharmacological interventions in the therapeutic armoury.

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Key Points

Lifelong exposure to environmental influences, including diet and physical activity, is an important determinant with genetic background of susceptibility to common medical conditions in the UK

Diet, nutrition and physical activity are modifiable factors influencing the development and progression of cardiovascular disease, cancer and other common health problems

The diet, nutrition and physical activity goals for prevention of different diseases are essentially the same

Diets that are not energy dense, with plenty of vegetables, fruit and wholegrains, regular fish, modest amounts of meat and dairy and little salt, combined with regular physical activity are likely to reduce risk of cardiovascular disease, obesity and related conditions, some cancers, bone disease and some common bowel complaints

Diet and nutrition should contribute to secondary prevention and management of cardiovascular disease, osteoporosis and fracture

KEY WORDS: bowel disease, cancer, cardiovascular disease, diet, osteoporosis, physical activity

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