

The importance of diet and physical activity in the treatment of conditions managed in general practice

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SUMMARY. Evidence from meta-analyses, physiological data and individual studies suggests that diet and exercise are important in the aetiology and treatment of many of the conditions that are managed predominantly in primary care (hypercholesterolaemia, hypertension, diabetes, obesity and excess alcohol intake). However, much of the evidence comes from outside primary care, and it is doubtful whether those studies done in primary care used optimal intervention strategies. A priority for future research should be to demonstrate the feasibility, efficacy and efficiency of lifestyle interventions in a general practice setting.

Keywords: health status; patient attitude to health; health promotion; lifestyle; diet; exercise.

Introduction

THE government has argued for increased health promotion in its *Health of the nation* white paper.¹ The primary health care team is now rewarded for collecting information in adults on smoking, blood pressure, body mass index, exercise and diet, and for giving appropriate advice.² However, the health promotion remuneration 'banding' system ignores the practicalities of lifestyle intervention for the large numbers of high-risk individuals identified, and doubts have been expressed about lifestyle intervention and health promotion.³ If we are to argue for better quality lifestyle assessment and intervention in primary care, the arguments in favour of this must be credible to working primary health care teams.

This paper reviews the evidence for intervention in diet and physical activity among high-risk adult groups in general practice. While a definitive review of this area is not possible in a single paper, evidence is drawn from many areas (including meta-analyses) to promote discussion. Meta-analyses have potential problems; particularly, heterogeneity, publication bias and poor description of methodology.³ However, they summarize studies statistically and reduce the bias of quoting individual published studies. To identify as many relevant meta-analyses as possible, a *Medline* search for the 2 years 1985 and 1994 was performed for articles which had both 'meta-analysis' and any of the following terms in the title or abstract: diet, exercise, cholesterol, alcohol, obesity or diabetes. For numerous and controversial meta-analyses (e.g. cholesterol), we have used more recent and sophisticated analyses, discussed controversies, and given physiological evidence. Where meta-analyses were not available,

recent reviews were sought and experts were asked to identify any important omissions (see Acknowledgements).

Coronary heart disease and diet

The importance of diet, acting via serum cholesterol level, in affecting the risk of coronary heart disease is highlighted in a recent meta-analysis of the 10 largest cohort studies, and 28 randomized dietary and drug intervention trials (both primary and secondary prevention).⁵ This meta-analysis was more sophisticated than previous meta-analyses since it incorporated the effects of extent and duration of cholesterol reduction using logistic regression.⁶ In the cohort studies, a 0.6 mmol l⁻¹ reduction in serum cholesterol level was associated with a 27% reduction in the incidence of coronary heart disease by the age of 60 years, and similarly, in the randomized trials, a 25% reduction in incidence was found when subjects were followed up for more than 5 years. Similar estimates come from a meta-analysis of dietary trials only.⁷ A meta-analysis of the possible hazards of cholesterol reduction demonstrated no convincing harmful effect of cholesterol reduction, except possibly an increased risk of haemorrhagic stroke.⁸

Meta-analyses of metabolic data provide strong evidence that reducing the ratio of saturated to unsaturated fatty acids in the diet will reduce the serum cholesterol level.^{9,10} A 10% reduction in the percentage of energy obtained from saturated fat has been achieved both in community studies^{11,12} and in the studies with high-risk individuals,⁵ and this is sufficient to reduce the serum cholesterol concentration by 0.5 mmol l⁻¹,⁹ although there is debate about the intensity of the diet required in practice.¹³ A useful complement to dietary advice in high-risk individuals could be the use of garlic supplements: a recent meta-analysis of five randomized placebo controlled trials demonstrated that garlic supplementation equivalent to between half and one clove per day decreased the cholesterol level by almost 10% (0.6 mmol l⁻¹),¹² with similar results from a meta-analysis which included open trials.¹⁵ However, possible publication bias and recent negative trial (Garlic and Cholesterol, South West AUDGP meeting, Bristol 1996, Neil *et al*) warrant caution interpreting these 'garlic' meta-analyses. A further small reduction in cholesterol level (0.1 mmol l⁻¹) has been demonstrated in a 10-trial meta-analysis of the effects of oat products, independently of any effects of fat-substitution.¹⁶

Debate continues about the importance of the excess of non-cardiovascular deaths found in some drug intervention studies.^{17,18} Another meta-analysis of cohort studies¹⁹ and the recent report of the Whitehall study²⁰ have demonstrated an increase in non-cardiovascular mortality and in total mortality at very low cholesterol concentrations. The cause of this is unclear, but it may be caused by confounding variables: in the British study, possible confounding factors were the lower socio-economic class and poorer health status of those with low cholesterol concentrations. Although it is possible that some drugs increase non-cardiovascular mortality and that there is increased mortality in populations associated with very low cholesterol concentrations, meta-analyses have demonstrated no harmful effect in dietary intervention studies,^{7,21,22} and the adverse population effect is

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only seen at cholesterol concentrations below 4 mmol l⁻¹. Thus, concerns about non-cardiovascular mortality should not prevent dietary advice to reduce serum cholesterol level being given to high-risk individuals who meta-analyses suggests are the most likely to benefit from intervention.²³ Another area of current debate is the importance of triglyceride concentration.²⁴ However, at present, it has not been shown consistently that the effects of triglyceride concentration are independent of high-density lipoprotein cholesterol concentration (they are strongly inversely related).

The epidemiological evidence relating to cholesterol concentration is supported by physiological data which suggest that low-density lipoprotein cholesterol peroxidation is important in the development of atherosclerosis.²⁵⁻²⁷ Antioxidant vitamins and flavonoids inhibit the likely physiological processes in atherosclerosis^{28,29} and probably offer protection at the population level.^{30,31} Further support for the role of oxidized low-density lipoprotein cholesterol in atherosclerosis is found in the association between susceptibility to oxidation and the severity of coronary atherosclerosis,³² and the fact that antibodies to oxidized low-density lipoprotein cholesterol are a marker for progression of atherosclerosis.^{33,34} These studies provide consistent evidence that individuals at high risk of coronary heart disease are likely to benefit from dietary advice aimed at lowering their serum cholesterol levels.

What has been shown to work in primary care? Two recent trials in general practice in the United Kingdom, the OXCHECK study and the family heart study (both involving population invitation to health checks and lifestyle counselling by practice nurses), showed modest benefits in reducing cholesterol concentration and blood pressure level,^{35,36} but there is doubt as to whether the most effective behavioural intervention was used.³⁷ Until more optimal behavioural strategies can be proven, the results of the DINE trial suggest that giving a leaflet to patients with hypercholesterolaemia may be as effective as more intensive counselling by a nurse or dietician, and may be more cost-effective.³⁸

Obesity

Obesity is one of the most common and potentially preventable health risk factors in primary care throughout the industrialized world. Approximately 13% of 40–59-year-old men and women are obese (body mass index >30)³⁹ and the prevalence has increased dramatically — in men aged 35–65 years, the prevalence of obesity more than doubled between 1980 and 1991.⁴⁰ Overweight people (body mass index 25) are twice as likely as those with a normal body mass index to suffer a major coronary heart disease event,⁴¹ and the mortality rate from all causes rises steeply when the body mass index is over 30; for example, non-smokers with a body mass index of 34 have more than twice the long-term total mortality rate of those with an index of 24.⁴²

Obesity is associated with increased morbidity from musculoskeletal, psychosocial and other causes,⁴³ and is one of the best predictors of developing hypertension.⁴⁴ Obese individuals also have a high risk of developing non-insulin dependent diabetes.^{43,45} A recent study estimates that those with a body mass index of greater than 35 have a 42-fold increase in risk of developing non-insulin dependent diabetes compared with those with an index of less than 23.⁴⁶

Meta-analyses of the effects of obesity on blood pressure suggest a fall in systolic blood pressure of 1.2 mmHg for every kilogram lost, which is consistent with evidence supporting the role of insulin in the pathogenesis of hypertension.⁴⁷⁻⁴⁹ Another meta-analysis of 70 studies suggests significant correlations between weight loss and cholesterol reduction in overweight individuals.⁵⁰

An overview of the use of very low calorie diets in obesity (800 kcal per day) has found that they achieve a weight loss of 1.5–2.5 kg per week compared with 0.4–0.5 kg per week for 1200 kcal diets; no increased weight loss was found for diets of below 800 kcal per day.⁵¹ Thus, to achieve the 'ideal' weight loss of 0.5–1.0 kg per week (more lean tissue is likely to be lost at faster rates of weight loss),^{43,52} an 800–1200 kcal per day diet is required. Although the long-term maintenance of low or very low calorie diets is not very satisfactory, maintenance can be improved by the addition of physical activity (which also reduces lean tissue loss) and behavioural techniques.⁵¹ Group settings with expert guidance can also be effective.⁵³

Thus, there is great potential for treating obesity and possibly reducing associated pathology, particularly for patients with a body mass index of greater than 30. However, the evidence for the efficacy of intervention in general practice is limited.

Hypertension

Hypertension is one of the most common problems managed by the primary health care team.³⁹ There is evidence from a number of epidemiological studies that dietary salt is important in the aetiology of hypertension,^{54,56} and from a meta-analysis of 78 intervention studies, evidence that dietary salt reduction is important as a non-pharmacological treatment of hypertension.⁵⁷ It has been estimated that a reduction in intake of 50 mmol sodium per day (equivalent to reducing mean intake by about a third) would reduce the mean systolic blood pressure of the population by 5 mmHg, and reduce the incidence of stroke by 26% and of coronary heart disease by 15%.^{55,57} The meta-analysis of salt intervention studies by Law and colleagues⁵⁸ included unrandomized studies: another meta-analysis of 23 randomized controlled trials demonstrates that a 76 mmol reduction in sodium per day is associated with a reduction in systolic blood pressure of 4.9 and 1.7 mmHg in hypertensive and normotensive subjects, respectively.⁵⁸ Although meta-analysis suggests calcium supplements are not likely to reduce blood pressure,⁵⁹ potassium is likely to help (except in cases of renal failure, and in those taking ACE inhibitors, potassium-sparing diuretics or beta-blockers): meta-analysis of 19 controlled studies demonstrated systolic blood pressure reduced by 5.9 mmHg and diastolic blood pressure reduced by 3.4 mmHg with potassium supplements.⁶⁰ A high potassium and magnesium salt has been found to reduce blood pressure in elderly people.⁶¹

Weight reduction in the obese, reduction in alcohol intake and increased exercise are also likely to be important in treating essential hypertension. High doses of fish oil (more than 3 g per day) were found to reduce systolic and diastolic blood pressure by 5.5 and 3.5 mmHg, respectively, in a meta-analysis of six controlled studies using untreated hypertensive patients,⁶² although the evidence for a general relationship between fat and blood pressure is lacking.⁶³ A meta-analysis of seven placebo-controlled studies covering a mixture of hypertensive and normal subjects found that 600–900 mg of garlic per day reduces systolic and diastolic blood pressure by 10 and 5 mmHg, respectively, but see reservation above.⁶⁴ A low-salt, low-alcohol diet, and calorie reduction where appropriate can limit the requirement for antihypertensive medication,^{65,66} as can increasing dietary potassium.⁶⁷

Thus, the scope for lifestyle intervention to treat and probably prevent hypertension is large. However, few trials of non-pharmacological management have been carried out in primary care.

Diabetes

Diabetes is one of the commonest chronic diseases managed by

primary health care teams.³⁹ The diabetes control and complications trial has demonstrated that improved blood glucose control can reduce complications in patients — although it may probably increase hypoglycaemic attacks — with insulin dependent diabetes (American Diabetic Association meeting, July 1993), and this has been confirmed by a meta-analysis of studies of late complications in insulin-dependent diabetes.⁶⁸ Several studies and two meta-analyses provide further indirect evidence for diet, since strategies to support dietary change could improve blood glucose control and even survival among diabetic patients,⁶⁹⁻⁷² and access to a dietician is associated with good blood glucose control in general practice.⁷³ Obesity and the ability to achieve weight reduction are important determinants of prognosis in diabetes.⁷⁴ Diabetic patients are at high risk of cardiovascular disease, and thus, are likely to benefit from advice to exercise^{75,76} and follow diets which probably reduce the risk of cardiovascular disease (those rich in complex carbohydrates, fruit and vegetables, low in fat, and low in salt where appropriate).⁷⁶⁻⁷⁸ Thus, good lifestyle assessment and intervention should improve the management of diabetic patients in general practice.

Alcohol

Alcohol has been implicated in numerous problems which commonly present in general practice, in particular accidents, antisocial behaviour and depression,^{79,81} obesity,^{52,82} and raised blood pressure and stroke (more than six units daily are associated with 7–8 and 5 mmHg increases in systolic and diastolic blood pressure, respectively, which are largely reversible).^{83,84} Alcohol is also implicated in cirrhosis of the liver, hepatitis, gastritis, pancreatitis, cancers (of the liver, mouth, oesophagus and larynx), myopathy, neuropathy, cardiomyopathy, and the fetal alcohol syndrome.⁸² Two recent meta-analyses suggest there may be a modest association between alcohol and both breast and colon cancers,^{85,86} although the large variation between studies and the small size of the effect make it difficult to be sure of a causal association.

There is also debate as to safe limits of alcohol consumption. Two large British studies have found that the minimum mortality rate from all causes for men occurs at a consumption of approximately 26 units per week with mortality rates rising above 28 units per week.⁸⁷⁻⁸⁹ In the British civil servants study, more than 28 units per week for men and between seven and 28 units per week were associated with 10 and 6% 10-year all-cause mortality rates, respectively.⁸⁷ The doctors cohort study, although less representative of the UK population, showed a minimum all-cause mortality rate at 21 units per week for male doctors but with a shallow gradient of risk until above 30 units per week.⁹⁰ Thus, the minimum mortality rate on the U-shaped curve of alcohol consumption is likely to be between 21 and 26 units per week in the UK population, that is moderate drinking is likely to be beneficial, chiefly owing to reduced cardiovascular disease. Consistent with this finding is the reduced incidence of diabetes with moderate alcohol consumption.^{91,92} Independent of weekly limits for an individual, the social morbidity and mortality resulting from alcohol consumption can occur at much lower levels if consumption is in bouts. For example, 10 units of alcohol in one session causes a 10-fold increase in the risk of a road accident despite being well under the 'safe' weekly limit.⁵¹

A randomized study in primary care found that simple advice to heavy drinkers (more than 35 units per week in men and more than 21 units in women) reduced the numbers of heavy drinkers by 20% and this was associated with a parallel reduction in gamma-glutamyl transferase levels,⁹³ and from a recent meta-analysis of six trials of brief interventions.⁹⁴ Similar findings

have been reported in other studies in primary care.⁹⁵ The key elements of effective brief interventions for reducing alcohol consumption have been summarized in FRAMES: Feedback, personal Responsibility for change, Advice, a Menu of recommendations from which to choose, the ability of the counsellor to Empathize, and the development of Self-efficacy (belief in the ability to change).⁹⁶

Other areas

There is emerging evidence for the importance of early life events (intrauterine and in the first year of life) in the development of cardiovascular disease, respiratory disease and diabetes in adults.⁹⁷ Other than encouraging breast feeding,⁹⁸ what interventions are appropriate in early life or before pregnancy are not yet clear.

Nutrition in the elderly is clearly important as a determinant of health, given that supplements of micronutrients dramatically affect the predisposition to illness,⁹⁹ and that there is evidence that between 8 and 12% of people over 80 years of age suffer frank malnutrition.¹⁰⁰ Diet and cancer are also linked: many cancers are related to low fruit and vegetable consumption and poor antioxidant status,¹⁰¹ and there is debate about the role of fat and caloric intake in breast and colon cancers.¹⁰²

Exercise

Energy balance is determined by both intake and expenditure, and thus, physical activity should form part of the assessment of nutritional status. A meta-analysis of 27 cohort studies examining the relationship between physical activity and coronary heart disease demonstrates a relative risk of death for secondary groups (compared with high-activity groups) of 1.9 for occupational activity and 1.7 for leisure time activity.¹⁰³ Overviews of diet and exercise rehabilitation programmes after myocardial infarction also demonstrate a reduction in subsequent cardiovascular mortality.^{104,105} It is possible that fitness is more important than reported physical activity since fitness (or more precisely functional work capacity) was a better predictor of subsequent mortality than reported physical activity in several primary prevention cohort studies.¹⁰⁶

Exercise is a useful treatment for hypertension: meta-analysis of 36 aerobic training studies demonstrated reductions of 10 mmHg in systolic blood pressure and 8 mmHg in diastolic blood pressure for patients with essential hypertension.¹⁰⁷ It appears that blood pressure reduction is maximal at aerobic exercise of moderate intensity and frequency (50–65% of maximum intensity for 30 minutes three times a week), with less (or no) effect at higher intensity levels.¹⁰⁸ Meta-analyses demonstrate that exercise results in modest reductions in serum total cholesterol level with an additional effect if weight reduction occurs;¹⁰⁹ reduction in high-density lipoprotein concentration appears to require greater frequency of training than for blood pressure changes.¹⁰⁸ For overweight individuals, exercise training is useful during dieting since it increases energy output and reduces the weight lost as fat-free mass.^{110,111} Exercise reduces serum fibrinogen levels,^{112,113} may limit or prevent the onset of non-insulin dependent diabetes,^{91,114} and may improve glycaemic control.⁷⁵ Meta-analyses suggests no significant adverse effects of exercise in pregnancy.¹⁵ Furthermore, exercise has useful psychological effects: meta-analysis suggests that aerobic training session (20 minutes per session) for 10 weeks reduce both state and trait anxiety.¹¹⁶ Exercise appears to be an important factor preventing cardiovascular disease, osteoporosis and hip fracture, maintaining functional capacity, and possibly reducing mortality in elderly people.¹¹⁷⁻¹²⁰

Given the low levels of activity and fitness revealed in the recent national survey of activity and fitness, with 50–80% of the population over the age of 24 years unable to walk 3 mph up a 5% gradient without exceeding 70% of maximal heart rate,¹²¹ the scope for intervention in primary care is great. However, excluding cardiac rehabilitation, there has been only one (non-randomized) trial of exercise intervention in a UK primary care setting,¹²² highlighting the need for further research in this area.

Conclusion

The evidence presented here suggests that diet and physical activity are important in the aetiology and treatment of many common conditions that are currently managed in general practice. However, much of this evidence comes from outside primary care. Furthermore, it is not clear whether the expertise, time and facilities exist in primary care for the assessment, intervention and follow-up required to translate these findings into routine clinical care. A priority for future research should be demonstrate the feasibility, efficacy, and efficiency of lifestyle interventions in a general practice setting.

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