The five-point heart healthy lifestyle

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ABSTRACT

The "Lifestyle Big-Five" are, in order of importance, non-smoking, daily exercise for 30 min or more, a body mass index of 25 or less, the ideal diet and last and least, modest alcohol. This lifestyle is associated with a pattern of maximal freedom from cardiovascular disease, stroke and with improved longevity. The major data supporting the "Lifestyle Big-Five" chiefly come from the results of the Nurses' Health Study over 26 years and the Health Professionals Study over 20 years, both in the USA. Both these studies are supported by several large European studies including one that by computer randomly recruited a selected population. Apart from the evidence for non-smoking, which is already well-established and well-known, each of the other four components are evaluated in this review, with recommendations for application to patients. SAHeart 2011;8:154-163

"A major aim of health promotion and disease prevention is to maximise health during life rather than necessarily preventing the inevitable." (Gorelick 2008)[1]

Cardiologists, physicians and generalists often recommend lifestyle patterns and changes for their patients. But, how evidence-based are these recommendations? From the vast number of possible health promotion changes, varying from increased exercise to aspirin to green tea, and diets from Atkins to the vegetarian, only the study on USA Health Professionals reaches the scientific requirements for definitive information. In this study, five lifestyle changes are analysed and quantified (Figure 1). Medical professionals may, therefore, emphasise these points as simple steps that will promote long-term health benefits for their patients, as well as giving at least some protection from the inevitable cardiovascular diseases of aging such as hypertension and atheromatosis.

THE THREE CRITERIA REQUIRED FOR PROOF OF BENEFIT

To have strong and compelling evidence for any lifestyle change needs, I propose that there are three essentials (Table 1). First, examining the case for increased exercise, there has to be strong laboratory evidence favouring the prophylactic value of exercise. For example, hearts from exercised-trained rats were more

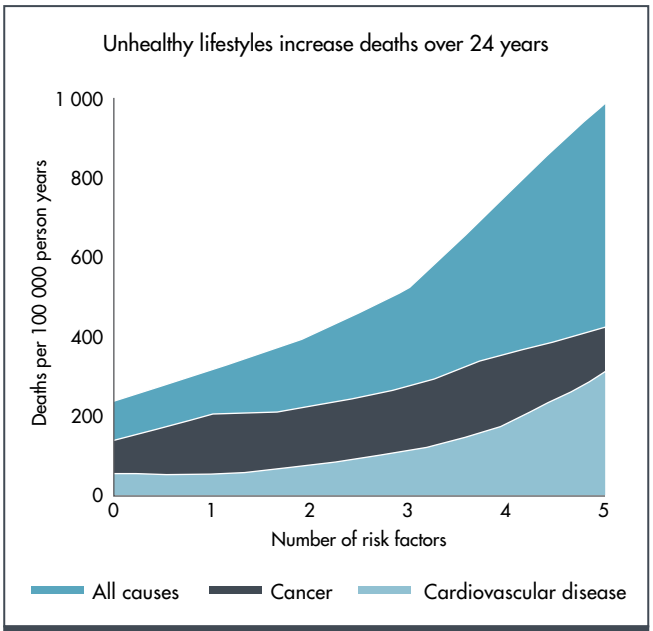

FIGURE 1: Deaths increase with the number of unhealthy lifestyle factors. A 24-year study on 77 782 American women. Note the increases in the number of deaths from heart and stroke (cardiovascular disease, dashed line), from cancer (dotted line) and deaths from all causes (top line). Thus, it is not only the heart that benefits from lifestyle change, but the body as a whole; there is an almost five-fold increase in all-cause deaths between those who have no abnormal lifestyle factors and those who have all five major factors. From van Dam RM, et al. Combined impact of lifestyle factors on mortality: prospective cohort study in US women. Open access in BMJ. 2008;337:a1440.

resistant to the adverse effects of coronary artery ligation.[2] Secondly, there should be population studies to show a significant association. These are observational studies because such studies record certain associations without proving cause and effect. Thus in the large Health Professionals Study,[3] those individuals who exercised more had fewer cardiovascular problems. Such studies support the proposed hypothesis but do not provide scientific proof of cause and effect.

Thirdly, there must be prospective trials. Ideally there should be large and well designed prospectively randomised studies to show that making the lifestyle change improves future cardiovascular health. For example, in the case of exercise and taking the example of persons with pre-diabetes,[4] increasing the intensity of exercise led to prevention of new diabetes, which is an established cause of coronary heart disease (CHD).

Laboratory data do not provide proof of efficacy, but point to the need for further human studies, first observational and then randomised.

THE "LIFESTYLE BIG-FIVE" FOR BEST CARE OF CARDIOVASCULAR HEALTH

Thus a high level of exercise is clearly cardioprotective, and one of the five key factors that determine whether any given individual will be free of CHD or stroke. The Lifestyle Big-Five are established as non-smoking, vigorous daily exercise for at least 30 minutes, ideal weight, ideal diet and modest alcohol by the long term studies which involved two very large groups of American health professionals.[3,5,6] In total, 114 090 persons were followed up for 16 years in men and up to 24 years for women, giving about two million person-years for analysis. The overall health message is that when the lifestyle is perfect, there is up to 80% protection from CHD and about 50 to 60% for ischaemic stroke, with fewer cancer deaths in women.[1,3,5,6] A similar combination of non-smoking, regular exercise, moderate alcohol and a Mediterranean style diet was associated with a markedly reduced 10-year mortality in elderly Europeans.[7] It is important to note that what these studies analysed was lifestyle, which fundamentally differs from the conventional cardiovascular risk factors such as increased blood pressure or cholesterol. However, even those men already taking medication for these two conditions and therefore having conventional risk factors, still had 78% less risk if they fully adhered to the ideal lifestyle.[3]

TABLE 1: Threefold criteria for proof of benefit of exercise

Essential criteria	Exercise
1. Laboratory evidence	Running rats have fewer complications of coronary ligation
2. Epidemiological evidence (Observational)	Highly trained athletes live longer
3. Prospective trial evidence (Randomised)	Intense exercise helps to prevent human diabetes with in turn is a major cause of cardiovascular disease

TABLE 2: The lifestyle "big five" in women

Lifestyle Big 5	% of protection from deaths	Mechanism
1. Non-smoking	28%	Protects arteries
2. Exercise, 30 min or more per day	17%	Slows the heart, drops BP
3. Ideal weight, BMI 25 or less chemicals released from fat cells	14%	Avoids toxic
4. Ideal diet	13%	High unsaturated fatty acids, high fruit and vegetables, low red meat
5. Modest alcohol	7%	Anti-stress; alcohol improves blood cholesterol patterns
All five	**79%**	

Data based on van Dam RM, et al. Combined impact of lifestyle factors on mortality: prospective cohort study in US women. Open access in BMJ. 2008;337:a1440.

The first study was only in men,[3] but later studies showed similar factors governing stroke prevention in both men and women,[7] and all causes of death (including cancer) in women.[6] The mortality data for women indicate the prime role of non-smoking and exercise (Table 2). Although the studies in men have not yet been continued long enough to give reliable mortality data, the principles even if not the detailed figures are likely to be the same for men as for women, as there were similar effects of lifestyle modification by the same five factors.

HOW FEASIBLE ARE THESE LIFESTYLE IDEALS?

To adhere to all five principles may seem a tough call for our patients. Indeed, in the men's study only 4% of this educated group could adhere to all five principles and receive the maximum possible benefit. To be practical, our advice to patients could if needed leave out the two aims which might be the most difficult to change in mid-life, namely achieving ideal weight and ideal diet. The three more feasible criteria, are non-smoking, daily physical exercise, and light to moderate alcohol. Combined, these three can give about two-thirds of the maximum benefit.

WHY FIVE, WHAT ABOUT THE "SIMPLE SEVEN"?

Another critical step takes into account the addition of three measurements, namely BP, total cholesterol, and fasting blood glucose. Adding these three items to the "Big Five" makes for "The Simple 7",[8] as recommended by the American Heart Association (AHA).[9] The AHA, however, has left out from its recommendation the last of the Big Five, namely moderate alcohol, presumably because of the inherent difficulty of keeping the dose moderate. However, I stress that for present purposes, only the issue of lifestyle and its modification is under evaluation.

PRACTICAL STEPS TO PERSUASION

The diseases of lifestyle may more accurately be called self-promoted diseases, because an unhealthy lifestyle increases the chances of contracting these dread diseases. To determine the chances that any given person at any given age will be the victim of CHD or stroke, risk factor charts such as the Framingham charts must be used. The higher the risk for a given patient, the more likely is it that the patient will be accept and act on lifestyle advice. A critical step is to persuade the partner, typically a wife in the case of a middle aged man, to understand in full the implications and necessity for the revised lifestyle. Furthermore, it is much more difficult to persuade the patient to stop smoking when the partner is puffing away. If any of the three basic measured criteria (BP, cholesterol, glucose) exceed AHA recommended levels,[9] then the consequences should be explained in detail to the patient and partner, after which lifestyle change is more likely.

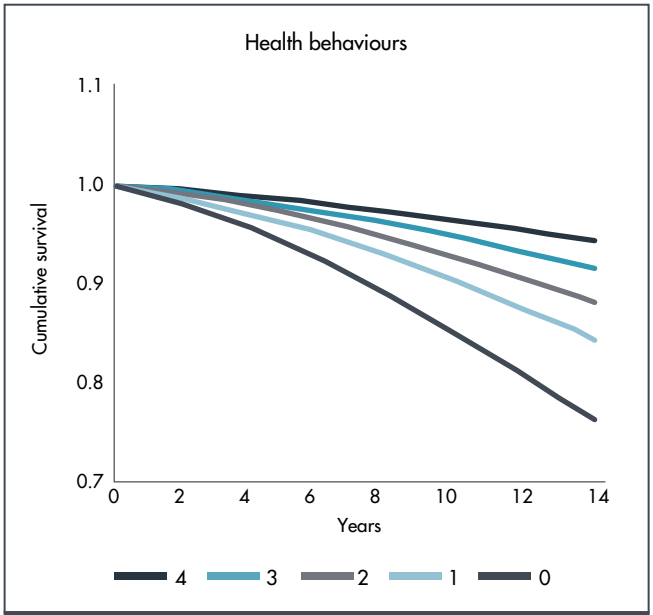

FIGURE 2: Survival in EPIC-Norfolk according to number of health behaviours in men and women aged 45 to 79 years without initially known cardiovascular disease or cancer, adjusted for age, sex, body mass index & social class. The top line reflects the maximal number of positive health behaviours. From Khaw KT, et al. Combined impact of health behaviours and mortality in men and women: the EPIC-Norfolk prospective population study. Open access in PLoS Med. 2008;5(1):e12.

WHAT ABOUT PROTECTION OF THE BRAIN?

The brain is a far more complex organ than the heart, with less well-defined criteria for damage prevention. However, we do know that stroke is a major threat to the health of the brain. In the study mentioned above, those few men and women (between 2 and 4% of the sample) who managed to stick to all five principles of the optimally healthy lifestyle had a very low risk of stroke – between 70 and 80% protection. Furthermore, physical exercise training is regarded as one of the best health steps to lessen the risk of development of Alzheimer's disease.[10] Also arguing for the benefits of the Mediterranean diet, higher blood concentrations of omega-3 fatty acids are associated with slower cognitive decline in the elderly,[11] without however, there being a proven cause-and-effect relationship.[12] Lifestyles that protect the heart also protect the brain.

ARE THE AMERICAN STUDIES REALLY RELEVANT TO NON-AMERICANS?

Because the Americans selected groups of health professionals for their studies, has the focus only been on younger, better educated and wealthier people? Similar studies have been carried out in Britain, where it is much easier to obtain a representative sample of the population as a whole.[13] In Norfolk County, over 20 000 people were randomly and electronically sampled from National Health Service lists (on which nearly all British residents are registered). Trained nurses checked selected individuals to confirm the replies to questionnaires. The study found that there were the same protective patterns of healthy living as in the American studies (Figure 2). The benefits were also found in older persons, and even in those who were overweight. The implication is that although obesity is adverse, even the obese can reap the benefits of modifying the other four factors. Physical activity could even counter an adverse genetic predisposition to obesity.[14]

In elderly Europeans, a similar combination of non-smoking, regular exercise, moderate alcohol and a Mediterranean-style diet (similar to the "healthy diet" in the American studies, but with olive oil added liberally) was associated with markedly reduced 10-year mortality.[7]

In the most recent British study, 4 886 persons throughout the United Kingdom were also randomly selected by computer, and followed for 20 years.[15] A health score was calculated in relation to four crucial factors characterising poor health behaviour: smoking, less than 3 fruits and vegetables per day, less than 2 hours of physical activity per week, and weekly alcohol intake more than 112g (about 1 to 2 drinks) for women and 168g (about 2 to 3 drinks) for men. These alcohol limits were similar to those found in another very large meta-analysis on over 1 million subjects.[16] In the British study, totally healthy behaviour could prolong life by 12 years compared with those who had all four self-inflicted health risks (Figure 2). A reservation is that this study missed one of the big five, namely weight. Thus their 12 year life-span difference between the healthy and the unhealthy could have been even longer.

WHAT ABOUT THE INDIAN SUBCONTINENT?

South Asian Indian women, a group of people who are consistently overweight or obese, have also been studied but purely from the metabolic point of view.[17] This group is at increased risk for cardiovascular disease associated with insulin resistance and a dyslipidaemia characterised by high triglyceride and low HDL-cholesterol concentrations. A calorie-restricted diet containing 40% carbohydrate for 3 months (thus moderately lower in carbohydrate) led to weight loss, decreased insulin resistance, and a reduction in diastolic blood pressure, plasma glucose and triglycerides in overweight, insulin resistant, but otherwise apparently healthy South Asian Indian women. This is clearly only a pointer in the direction of CV disease reduction. Proof would require a much longer and larger outcome study, but the principle of risk reduction is there, as has been found in every population thus far tested.

LIFESTYLE AND CANCER PREVENTION

Among the "Big-Five", the major protection against cancer is the benefit of not smoking, but the healthy diet is also important. In the Nurses' Health Study the healthy lifestyle was associated with a 25% reduction in cancer deaths (Figure 1), whereas the corresponding study in men is still ongoing. In the Nurses' Study, there was reduction of cancer deaths by each of the five beneficial lifestyle factors (Table 3). Of the five factors, by far the greatest population attributable risk (PAR) was for smoking with 26.8%. Next came exercise with a PAR of 8.3%. In Europe, it is estimated that between 9% and 19% of cancer cases could be attributed to lack of sufficient physical activity.[18] For cardiologists who are convinced by the links between increased exercise and decreased cardiovascular disease, it is more difficult to see how exercise could prevent lung cancer. Yet there are plausible mechanisms, namely decreased body fat with lower levels of adipokines and inflammatory markers; improved insulin resistance with increased glucose uptake by muscle and decreased fatty acid synthesis, and improved pulmonary function that lowers the concentration of carcinogens in the lungs.[18]

Which type of cancer is prevented? There is convincing or probable evidence for a beneficial effect of physical activity on the risk of colon, breast and endometrial cancers.[18] The evidence is weaker for ovarian, lung and prostate cancers and generally either null or insufficient for all remaining cancers. Thus physical activity reduces the risk of several of the major cancers. Based on cancer prevention data, 30 to 60 minutes of moderate or vigorous intensity activity is required for at least 5 days per week. In other words, the Lifestyle Big-5 should effectively help in cancer prevention.

TABLE 3: Relative risk and population attributable risk (PAR) (95% confidence intervals) of all cause, cardiovascular, and cancer mortality during 24 years of follow-up in Nurses' Health Study* (van Dam, et al. 2008)

	Women in high risk category	Deaths from any cause		Deaths from CV cause		Deaths from cancer	
	Variable (%)†	Relative risk	PAR (%)	Relative risk	PAR (%)	Relative risk	PAR (%)
Ever vs. never smoking	56	1.66	27.9	1.83	32.7	1.59	26.8
BMI ≥25 vs. 18.5-24.9	48	1.32	14.2	1.85	30.6	1.19	8.3
Physical activity <30 min/day vs. ≥30 min/day	75	1.25	16.5	1.47	27.7	1.13	9.3
Healthy diet score in lower 3/5 vs. upper 2/5	59	1.25	12.9	1.35	17.7	1.16	8.8
Heavier alcohol intake or none vs. light to moderate	34	1.18	7.4	1.31	11.3	1.06	3.1

*Relative risks and population attributable risks adjusted for age (5 year categories), time period (four periods), and other risk factors included in table.
†Based on prevalence in 1990. CV, cardiovascular. From Khaw KT, et al. Combined impact of health behaviours and mortality in men and women: the EPIC-Norfolk prospective population study. PLoS Med. 2008;5(1):e12. Open access.

PRACTICAL APPROACH TO EXERCISE

Thus exercise, the second most important lifestyle factor, can also benefit the obese, help to prevent the slide to diabetes in those with the metabolic syndrome, and even counter adverse effects of the genetic tendency to obesity. As sustained loss of weight is, for many, a nearly impossible task, it is helpful to stress that increased exercise helps to offset the adverse effects of obesity. Not surprisingly, Professor Richard Verrier, from the Harvard School of Public Health, during a visit to Cape Town said: "Exercise is the elixir of life." For many, exercise is best done in a group with a programme such as that organised in Newlands, Cape Town by the Sports Science Institute of South Africa (SSISA) under Professor Tim Noakes. To attain cardiorespiratory fitness (see the next section) is a different goal to losing weight, and psychologically often more feasible. The practical advice to give the patient is at least 30 minutes of moderate to vigorous exercise for at least five days per week. How much effort should be put into it? A simple criterion is: "You should be sweating by the end of your exercise". The emphasis should be on aerobic exercises, such as running or walking vigorously. Swimming lengths is a good alternative. The next communication point is when the patient asks: "How do I know if I am getting enough exercise?" The answer: "If you are, your resting heart-rate should be about 60 beats per minute or slower." An important message for the patient is that achieving high levels of fitness helps to delay death. Clearly, if dealing with a patient who has had a myocardial infarct or acute coronary syndrome, the approach is different and should be via a Rehabilitation Exercise Class.

EXERCISE AND OBESITY

Ideally increased exercise should be combined with weight loss in those with a BMI exceeding 25. This combination of interventions is possible in closely monitored groups over one year with increased physical function as the benefit even in those of average initial age of 70 years and a mean initial BMI of 37.[19] However, weight loss is often transient or not achieved. In that case increased exercise can still offset some of the health hazards of obesity.[20]

NEW RISK FACTORS

Degree of exercise fitness as a risk factor

To clinch the importance of exercise training and the associated cardiorespiratory fitness, the current proposal is that it should be added to the traditional Framingham risk factors for mortality in cardiovascular disease (CVD).[21] The addition of fitness to the traditional risk factor model resulted in reclassification of 10.7% of the men, with significant net reclassification improvement at both 10 years and 25 years (P<0.001 for both).

Sedentary life style as another new risk factor

More and more time in modern life is spent sitting, either at the television screen or at the computer screen. Three different population studies propose that sedentary time is as a new risk factor. In the US National Health and Nutrition Examination Survey (NHANES) on 4 757 participants (≥20 years) increased sedentary times were associated with adverse changes in waist circumference, HDL-cholesterol, C-reactive protein, triglycerides, insulin, and HOMA-index.[22] Conversely, breaks in sedentary time were beneficially associated with falls in waist circumference and C-reactive protein (P for trends <0.05). That there are serious consequences was shown in the Australian Diabetes, Obesity and Lifestyle Study (AusDiab) and in the Scottish Health Survey in which excess TV viewing was linked to increased mortality.[23,24] In the Scottish study the increased CVD risk persisted regardless of concurrent physical activity participation, and was explained collectively by C-reactive protein, body mass index, and high-density lipoprotein cholesterol.[24]

THREE HEART-HEALTHY DIETS

Diet is a word often linked to weight loss; but the word comes from the Greek diaita, which means a way of life. Thus, in its original sense, diet means the kinds of food that a person eats habitually. Currently there two separate issues: which diet best reduces weight (not considered here), and which diet gives overall optimal health and longevity.

The typical Western diet (with its high intake of fat, sugars and calories) damages the arterial endothelium and promotes obesity, diabetes, vascular disease, heart attacks and strokes. Three validated, health-promoting diets that counter the effects of the Western diet are:

- The **DASH BP-reducing diet**, with a pattern of high intake of fresh vegetables, fruit, legumes, whole grains, fish and poultry with the addition of salt restriction. Thus this is the ideal for the many people with hypertension or borderline hypertension but the extent of changes induced by this diet are wider. The DASH dietary pattern appears to be beneficial in the prevention and management of cardiovascular disease not only reducing blood pressure, in youths with diabetes mellitus helping to correct lipid abnormalities and the HbA1c pattern (The implication is that when applied to adults, this diet does

more than just reducing the blood pressure). This diet fulfils the three criteria given in the Introduction to this article, three criteria required for proof of benefit (Table 1).

- The **AHA diet** is based on the DASH diet, but gives precise values. It also emphasises a pattern of high intake of vegetables, fruit, legumes, whole grains, fish and poultry.[9] In detail: Fruits and vegetables: 4.5 cups per day; Fish: two 3.5oz servings per week (preferably oily fish); Fibre-rich whole grains (1.1g of fibre per 10g of carbohydrate): three 1oz equivalent servings per day; Sodium: <1 500mg per day; and Sugar-sweetened beverages: 450 kcal (36oz) per week.

  These goals are for a 2 000-kcal diet and should be scaled down accordingly for lower levels of caloric intake. Some would say that these recommendations are far too complex to transmit to the general population.

- The **Mediterranean diet** (Table 4) which is in some ways is similar to the others but features added olive oil and moderate alcohol; this diet has several strong points in its favour and needs a detailed discussion. Furthermore, like the DASH diet, it has all three criteria for proof of concept, laboratory data, population studies, and prospective outcome studies.

THE MEDITERRANEAN DIET

The more Mediterranean, the better. In the early 1950s, the great American epidemiologist Ancel Keys was struck by the very low incidence of coronary heart disease (CHD) in traditional Mediterranean communities and what he later came to call the Mediterranean diet.[25] In the first sentence of his book he summarises the message: "There is indeed a Mediterranean way to eat well and to stay well." Later, in 1958 Brian Bronte-Stewart from Cape Town stated that "ischaemic heart disease is no problem among the fish-eating Japanese, the maize-eating Bantu and the olive-oil-eating peoples along the Mediterranean littoral".[26]

Soon thereafter Ancel Keys researched the dietary differences in the famous seven geographically different countries, in which he showed that the major villain linking diet to health is the high saturated fat content of the Western diet.[27] In the traditional Mediterranean diet, fish replaces red meat, and there is an abundance of fresh vegetables, fruit, nuts and olive oil with moderate alcohol. The combination of fish and vegetable gives it the name that some prefer: "vegaquarian diet". Parenthetically, this diet is currently less and less practised in Mediterranean countries as fast fatty food takes over, so that even Greek teenagers are now getting tubby with blood values that suggest future obesity, diabetes and heart disease.

What are the health implications of the Mediterranean diet?

The Mediterranean diet first caught the eye of American and British doctors when Trichopoulou and colleagues[28] caused a sensation by claiming that greater adherence to the diet was associated with greater longevity. Although detailed definitions of the Mediterranean diet differ, there is strong evidence that the Mediterranean-style diet protects from heart attacks and stroke, lessens cancer, and decreases the death rate. In simple terms, the diet is rich in plant based foods (fresh vegetables, fruits, legumes) fish, nuts and olive oil, and low in fat and red meat (Table 4). In elderly European men, the combination of a Mediterranean diet, moderate alcohol use, non-smoking and increased physical activity gave lower death rates and, specifically, fewer deaths from coronary heart disease, cardiovascular diseases and cancer.[7] When combined, these factors decreased the death rate to 35% of the control. Conversely, totally missing the Mediterranean mark could account for 60% of all deaths in the population, 64% of deaths from coronary heart disease and 60% from cancer.[7]

Of note, this concept of the healthy Mediterranean diet, initially studied in a southern European population, overlaps with the five-point American healthy lifestyle guidelines which have a similar message but also add a low normal body weight. The Mediterranean diet is also similar to the American DASH diet (Dietary Approaches to Stop Hypertension) that reduces the blood pressure in those with hypertension. The only major difference is that the DASH diet also emphasises a low salt intake and leaves out the olive oil and moderate wine.

TABLE 4: The traditional Mediterranean diet

High percentage intake components	Vegetables, legumes, fruits, nuts, cereals, fish and olive oil each count for one point if the intake is above the mean. Note high monounsaturated to saturated fatty acid intake.
Modest alcohol	Earns a point (excess alcohol is harmful)
Low percentage intake components	Low intake of meat (or meat products) and fatty dairy products each count for one added point.
Evaluation	High adherence is 6 to 9 points, low adherence 0 to 3 points. For details see Trichopoulou A, et al. N Engl J Med. 2003;348:599-608.

Prevention of new diabetes by the Mediterranean diet

Higher adherence to a Mediterranean diet was inversely associated with incidence of type 2 diabetes among initially healthy participants. In 13 380 Spanish university graduates without diabetes at baseline followed up for a median of 4.4 years, participants who adhered closely to a Mediterranean diet had a much lower risk of new diabetes.[29] For those with the highest adherence to the diet (score 7 to 9) compared with those with low adherence (score <3), the incidence rate ratios of new diabetes was reduced to 0.17 (95% confidence interval 0.04 to 0.75), meaning an 83% reduction. Even for those with moderate adherence (score 3 to 6) the value was 0.41 (CI 0.19 to 0.87).

How does the Mediterranean diet reduce cardiovascular disease?

Heart diseases are reduced because of the low saturated animal fat content of the diet, by liberal use of olive oil and by the high omega-3 intake associated with fish eating. More specifically, the omega-3 polyunsaturated long chain fatty acids (C20 and C22 in chain length) experimentally protect heart cell membranes and are especially found in oily fish. In addition there are many potential but poorly understood micronutrients in the fresh fruit and vegetables that could theoretically contribute to the benefits of this diet.

Nuts

Adding nuts to the Mediterranean diet was more effective in preventing new diabetes in those with the metabolic syndrome than was increasing the content of virgin olive oil.[30]

Olive oil and the Glycaemic Index

The degree by which the blood sugar rises after any particular food is the Glycaemic Index. Olive oil, an important ingredient of the Mediterranean diet, has several benefits. It provides oleic acid that reduces the blood pressure,[31] and is the major fuel for the beating human heart. Olive oil itself when added to food delays the rate at which the stomach absorbs glucose thereby decreasing the normal postprandial surge in blood glucose. The lower the glucose surge, the lower the Glycaemic Index, which in turn means less risk of future diabetes. Whenever the blood glucose stays too high for too long, that also stimulates the diffuse inflammatory system which is a risk for increased cancer and a newly emphasised risk for heart attacks. Vinegar often goes with olive oil, and, besides enhancing taste also delays gastric emptying after a high carbohydrate meal.[23]

The Mediterranean diet and cancer

The more intensely the Mediterranean diet is adhered to, the greater is protection from cancer. In a large American population study on 380 296 individuals followed for 5 years, there were 5 985 cancer deaths.[34] In those whose diet conformed most to the Mediterranean pattern, cancer deaths were reduced by 17% in men and 12% in women when compared with those who adhered less well to this diet. This of course does not prove cause and effect, but shows association. The mechanism of cancer reduction remains a mystery. Perhaps there is less chronic inflammation associated with olive oil and the low Glycaemic Index. The Mediterranean diet might also deliver a variety of poorly understood anti-inflammatory components which could protect against cancer. It may be that the variety of fresh vegetables with abundant fruits and nuts somehow defeat the cancer cells. If the full secrets of the Mediterranean diet were uncovered, that would be an important advance in the fight against cancer.

WEIGHT LOSS BY ECO-ATKINS

For all its virtues the Mediterranean diet is not a weight loss diet, while most of our patients will have a body mass index (BMI) above the cut-off of point of 25 (Table 2). As the BMI rises, so does the blood pressure and cholesterol.[34] When the BMI exceeds 30 then weight loss is very clearly indicated. Here I am impressed by the rapid weight loss achieved by the modified Atkins diet, because the initial severe restriction of carbohydrate promotes ketosis which in turn suppresses the appetite. That means that one of the major obstacles to successful dieting, namely an excessive appetite, is removed at least for the time being.

In the definitive Israeli study the modified Atkins diet was applied with gradually increasing carbohydrate balanced by increasing exercise over time.[35] In this study, 322 moderately obese subjects with an initial mean BMI of 31 were given one of three diets for 2 years: Atkins type diet with low-carbohydrate, the Mediterranean-diet and the standard low-fat diet, the latter two being calorie-restricted. All the participants had their main meal in a cafeteria, and were told exactly what to eat. In these strict and closely monitored conditions, compliance at 2 years was 90% in the low-fat group, 85% in the Mediterranean and 78% in the group with the modified Atkins low-carbohydrate diet.[35] Among the 272 participants who completed the study after 2 years, the overall mean weight losses were only modest, being 5.5kg in the Atkins group, 4.6kg in the Mediterranean-diet, and 3.3kg in the low-fat diet.[35]

The metabolic results were surprising, in that low-carbohydrate diet depressed LDL-cholesterol more than did the low fat diet, and increased HDL-cholesterol more than the Mediterranean and

low fat diets. Furthermore the low-carbohydrate diet reduced triglycerides and the ratio of total cholesterol to HDL more than the other two diets.[35] Nonetheless all three diets moved all these parameters in the right direction.

Taking three diets together, all for 24 months, the modified Atkins, the Mediterranean and the low fat, the main predictor of both long-term compliance and success in weight loss was the initial reduction in weight reduction at 6 months, and the most irresistible restricted food item was cookies for 45% of dieters.[36]

What do patients think? One reason many like the Atkins diet, is its simplicity – "cut all the carbs". Another is that initial weight loss is rapid, facilitated by ketosis-induced loss of appetite. As shown in many studies, group therapy under supervision of a dietician with the use of food diaries helps adherence to the diet.

The obvious problem with the Atkins diet is that it is animal-based, being high in red meat and low in fruits, vegetables, and whole grains. There are also few proper long term population studies, so that having achieved weight loss with it, I then recommend a switch to the Mediterranean diet with restricted calories.

An important modification of the Atkins diet is the "Eco-Atkins" diet, in which vegetable sources of protein and fat replace animal sources. In a large and prolonged prospective cohort study of 129 716 subjects from the Nurses' Health Study and the Health Professionals' Follow-up Study (see Table 2 and Figure 1 of this paper), were followed for 26 years (women) and 20 years (men).[37] The low carbohydrate–high vegetable group had a lower all cause mortality (HR 0.80, CI 0.75-0.85) and CV mortality (HR 0.77, CI 0.68-0.87). Overall, the best combination is weight loss plus exercise.[19] which achieves more than weight loss. For example, muscle strength, balance and gait all improve.

MODERATE ALCOHOL FOR CARDIOPROTECTION

Alcohol, the fifth protective factor (and part of the Mediterranean diet), is a two-faced friend. A little helps, but more than that harms substantially. That modest alcohol consumption can decrease overall death rates is no longer in doubt, in the light of a giant study on about a million people proving the benefits of moderate alcohol consumption.[16] Thus the teetotaller deprives him- or herself of the protective cardiovascular effects of alcohol, while the heavy drinker is laid low by the direct toxic effects of excess alcohol on the liver and other organs and by increased car accidents and violence. Also of note is that it seems as if very little alcohol is needed to achieve this protection – especially in women, who have (on the whole) a lower liver capacity to break down alcohol; so that up to 2 to 3 drinks per day is protective in men, but women need only 1 to 2 drinks for similar protection.

PROOF THAT MODEST ALCOHOL INTAKE TRULY PROTECTS THE HEART

Modest alcohol intake may just reflect a relaxed lifestyle; certainly, modest alcohol decreases stress levels. Proof that alcohol really protects the heart comes from studying a group of people who have an uncommon genetic deficiency in the liver mechanism that breaks down the alcohol in the blood.[38] There are two main consequences of this condition: first, the rate of breakdown of alcohol by the liver is much slower, with higher than normal levels of alcohol in the blood, as we might expect. But second, this group suffers far fewer heart attacks than is considered normal. Thus alcohol stimulates the liver's production of protective high-density lipoprotein (HDL) cholesterol.

RESISTANCE TO LIFESTYLE CHANGES

Even after the assault of an ACS, human beings are reluctant to modify their behaviour. On the other hand, we know from current studies in the USA that there have been two key therapeutic trends events: more active therapy in treating hypertension and dyslipidaemias, and also that smoking has declined. The result is that in the USA, although much more needs to be done to achieve optimal CV health, the death rates for CVD and stroke are steadily going down.[9]

PRIMITIVE VALUES

In isolated and non-developed populations such as a small tribe of Indians in Brazil with a non-sedentary life-style, the total cholesterol is about 3.1mmol/L and the average systolic blood pressure is about 100mmHg.[39]

SOUTH AFRICAN BLACK POPULATIONS

In the classic South African study 1958 when the diet of rural Africans was traditional, beef-dripping, butter and beef muscle all substantially increased the serum cholesterol levels, with butter (40% rise) and beef (60% rise) having the greatest effect (Figure 3). The days of the traditional diet are now largely passed, and as discussed in an accompanying article by Pretorius and Sliwa, there are now many factors that make the Lifestyle Big-Five difficult to apply to peri-urban black communities. Yet, despite the stress and

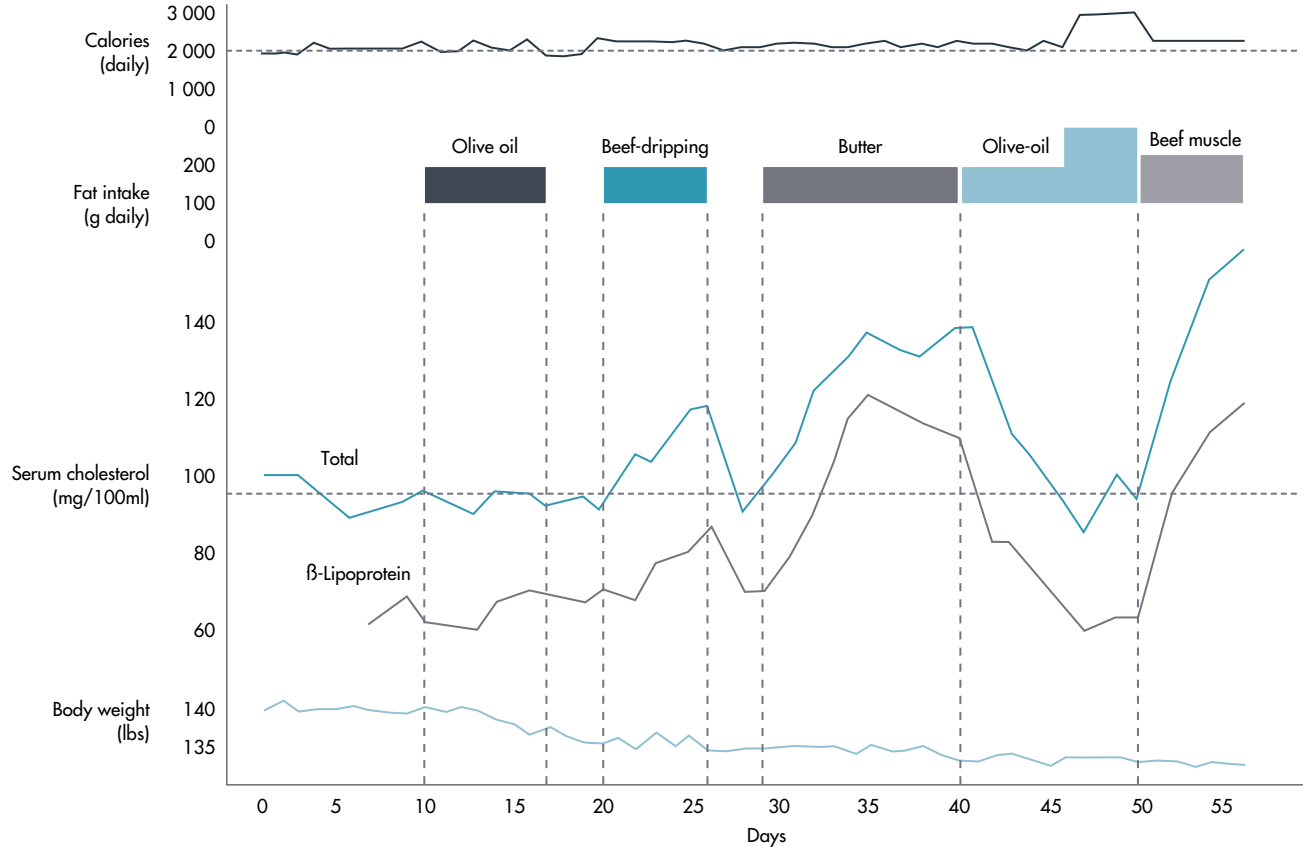

FIGURE 3: A classic South African study. Effect of olive oil, butter and beef on serum cholesterol levels at equal levels of fat intake. Note marked rise with beef dripping, beef muscle, and butter. Also note decline of butter values with replacement by olive oil. For details see Bronte-Stewart B. The effect of dietary fats on the blood lipids and their relation to ischaemic heart disease. Brit Med Bull, 1958;14:243-252.

pro- blems of urbanisation, the incidence of CHD has only modestly increased over the past years.[40] The relatively low total cholesterol may be the decisive protective factor.

Overall, a striking feature is the high incidence of obesity in African females. In one survey on black women in the North West Province; 29% had a BMI greater than 30. Physical activity index (derived from a subset of 530 subjects) correlated negatively with BMI and waist circumference.[41] Thus, in this population as in others, high levels of physical activity are associated with obesity. Subjects in the highest third of physical activity were less likely to be obese (odds ratio-0.38, 95% confidence interval-0.22-0.66). Regarding risk factors in a peri-urban black populations, smoking, obesity and hypertension should all be susceptible to the concept of major prevention by application of the Lifestyle Big-Five.

REFERENCES

1. Gorelick PB. Primary prevention of stroke: impact of healthy lifestyle. Circulation 2008;118:904-6.
2. Noakes TD, Higginson LM, Opie LH. Physical training increases ventricular fibrillation thresholds of isolated rat hearts during normoxia, hypoxia and regional ischaemia. Circulation, 67:24-30,1983.
3. Chiuve SE, McCullough ML, Sacks FM, et al. Healthy lifestyle factors in the primary prevention of coronary heart disease among men: benefits among users and nonusers of lipid-lowering and antihypertensive medications. Circulation. 2006; 114:160-7.
4. Knowler WC, Barrett-Connor E, Fowler SE, et al. Diabetes Prevention Program Research Group. Reduction in the incidence of type 2 diabetes with lifestyle intervention or metformin. N Engl J Med. 2002;346:393-403.
5. Chiuve SE, Rexrode KM, Spiegelman D, et al, Primary prevention of stroke by healthy lifestyle. Circulation 2008;118:947-954.
6. Van Dam RM, Li T, Spiegelman D, et al. Combined impact of lifestyle factors on mortality: prospective cohort study in US women. BMJ. 2008;337:a1440.
7. Knoops KT, de Groot LC, Kromhout D, et al. Mediterranean Diet, lifestyle factors and 10 year mortality in elderly European men and women, the HALE project. JAMA 2004; 292:1433-143.
8. Yancy CW. Is ideal cardiovascular health attainable? Circulation. 2011;123:835-7.
9. Lloyd-Jones DM, Hong Y, Labarthe D, et al. Defining and setting national goals for cardiovascular health promotion and disease reduction: the American Heart Association's strategic Impact Goal through 2020 and beyond. Circulation. 2010;121:586-613.
10. Ballard C, Gauthier S, Corbett A, et al. Alzheimer's disease. Lancet. 2011;377: 1019-31.
11. Dullemeijer C, Durga J, Brouwer IA, et al. n-3 fatty acid proportions in plasma and cognitive performance in older adults. Am J Clin Nutr. 2007;86:1479-85.
12. Van de Rest O, Geleijnse JM, Kok FJ, et al. Effect of fish oil on cognitive performance in older subjects: a randomised, controlled trial. Neurology. 2008;71:430-8.
13. Khaw KT, Wareham N, Bingham S, et al. Combined impact of health behaviours and mortality in men and women: the EPIC-Norfolk prospective population study. PLoS Med. 2008;5:e12.
14. Li S, Zhao JH, Luan Jet al. Physical activity attenuates the genetic predisposition to obesity in 20 000 men and women from EPIC-Norfolk prospective population study. PLoS Med. 2010;7. pii: e1000332.
15. Kvaavik E, Batty GD, Ursin G, et al. Influence of individual and combined health behaviours on total and cause-specific mortality in men and women: the United Kingdom health and lifestyle survey. Arch Intern Med 2010;170:711-718.
16. Di Castelnuovo A, Costanzo S, Bagnardi V, et al. Alcohol dosing and total mortality in men and women: an updated meta-analysis of 34 prospective studies. Arch Intern Med. 2006;166:2437-45.
17. Backes AC, Abbasi F, Lamendola C, et al. Clinical experience with a relatively low carbohydrate, calorie-restricted diet improves insulin sensitivity and associated metabolic abnormalities in overweight, insulin resistant South Asian Indian women. Asia Pac J Clin Nutr. 2008;17:669-71.
18. Friedenreich CM, Neilson HK, Lynch BM. State of the epidemiological evidence on physical activity and cancer prevention. Eur J Cancer. 2010;46:2593-604.
19. Villareal DT, Chode S, Parimi N, et al. Weight loss, exercise, or both and physical function in obese older adults. N Engl J Med. 2011;364:1218-29.
20. Goodpaster BH, Delany JP, Otto AD, et al. Effects of diet and physical activity interventions on weight loss and cardiometabolic risk factors in severely obese adults: a randomised trial. JAMA. 2010;304:1795-802.
21. Gupta S, Rohatgi A, Ayers CR. Cardiorespiratory Fitness and Classification of Risk of Cardiovascular Disease Mortality. Circulation 2011;123 1377-1383.
22. Healy GN, Matthews CE, Dunstan DW, et al. Sedentary time and cardio-metabolic biomarkers in US adults: NHANES 2003-06. Eur Heart J. 2011;32:590-597.
23. Dunstan DW, Barr EL, Healy GN, et al. Television viewing time and mortality: the Australian Diabetes, Obesity and Lifestyle Study (AusDiab). Circulation. 2010; 121:384-91.
24. Stamatakis E, Hamer M, Dunstan DW. Screen-based entertainment time, all-cause mortality, and cardiovascular events: population-based study with ongoing mortality and hospital events follow-up J Am Coll Cardiol. 2011;57:292-9.
25. Keys A, Keys N. How to eat well and to stay well. The Mediterranean way. Doubleday, New York, 1975.
26. Bronte-Stewart, B. The effect of dietary fats on the blood lipids and their relation to ischaemic heart disease. Brit Med Bull, 1958;14:243-252.
27. Keys A, Aravanis C, Blackburn HW, et al. Epidemiological studies related to coronary heart disease: characteristics of men aged 40-59 in seven countries. Acta Med Scand Suppl. 1966;460:1-392.
28. Trichopoulou A, Costacou T, Bamia C, et al. Adherence to a Mediterranean diet and survival in a Greek population. N Engl J Med. 2003;348:599-608.
29. Martínez-González MA, de la Fuente-Arrillaga C, Nunez-Cordoba JM, et al. Adherence to Mediterranean diet and risk of developing diabetes: prospective cohort study. BMJ. 2008;336:1348-51.
30. Salas-Salvadó J, Fernández-Ballart J, Ros E, et al. Effect of a Mediterranean diet supplemented with nuts on metabolic syndrome status: one-year results of the PREDIMED randomised trial. Arch Intern Med. 2008;168:2449-58.
31. Teres S, Barceló-Coblijn G, Benet M, et al. Oleic acid content is responsible for the reduction in blood pressure induced by olive oil. PNAS 2008;105:13811-16.
32. Ostman E, Granfeldt Y, Persson L, et al. Vinegar supplementation lowers glucose and insulin responses and increases satiety after a bread meal in healthy subjects. Eur J Clin Nutr. 2005;59:983-8.
33. Mitrou PN, Kipnis V, Thiébaut AC, et al. A Mediterranean dietary pattern and prediction of all-cause mortality in a US population: results from the NIH-AARP Diet and Health Study. Arch Intern Med. 2007;167:2461-8.
34. Gaziano TA, Opie LH. Body-mass index and mortality. Lancet. 2009;374:113-4.
35. Shai I, Schwarzfuchs D, Henkin Y, et al. Dietary Intervention Randomised Controlled Trial (DIRECT) Group. Weight loss with a low-carbohydrate, Mediterranean, or low-fat diet.N Engl J Med. 2008;359:229-41.
36. Greenberg I, Stampfer MJ, Schwarzfuchs D, et al. DIRECT Group. Adherence and success in long-term weight loss diets: the dietary intervention randomised controlled trial (DIRECT). J Am Coll Nutr. 2009;28:159-68.
37. Fung TT, van Dam RM, Hankinson SE, et al. Low-carbohydrate diets and all-cause and cause-specific mortality: two cohort studies. Ann Intern Med. 2010; 153:289-98.
38. Hines LM, Stampfer MJ, Ma J, et al. Genetic variation in alcohol dehydrogenase and the beneficial effect of moderate alcohol consumption on myocardial infarction. N Engl J Med. 2001;344:549-55.
39. Kivimäki M, Shipley MJ, Ferrie JE, et al. Best-practice interventions to reduce socio-economic inequalities of coronary heart disease mortality in UK: a prospective occupational cohort study. Lancet 2008;372:1648.
40. Mayosi BM, Flisher AJ, Lalloo UG, et al. The burden of non-communicable diseases in South Africa. Lancet. 2009;374:934-47.
41. Kruger HS, Venter CS, Vorster HH, et al. Physical inactivity is the major determinant of obesity in black women in the North West Province, South Africa: the THUSA study. Transition and health during urbanisation of South Africa. Nutrition. 2002;18:422-7.