

**DIET AND LIFESTYLE MANAGEMENT OF DEGENERATIVE DISEASES**  
**With Special Reference to Weight Management**

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**Key Words:** nutrition, degenerative diseases, metabolic syndrome, obesity, hypertension, cardiovascular diseases, diabetes.

### **INTRODUCTION:**

There are over one billion overweight and obese individuals globally. Overweight and obesity are associated with elevated blood pressure (BP)/cholesterol levels and an increased risk of developing diabetes (insulin resistance). These are often referred to as 'degenerative diseases'; a term which is closely associated with metabolic syndrome/Syndrome X/ Asian Paradox. Several studies have clearly indicated that malnutrition is a double edged sword with under-nutrition on one side and over-nutrition on the other and that both are associated with adult obesity and metabolic syndrome. Excess body fat (generalized/abdominal) accounts for about 60% and 20% of the global burden of diabetes and cardiovascular (CVD) diseases respectively. Elevated cholesterol levels alone are responsible for nearly 60% of CVD morbidity globally. Major modifiable determinants of overweight and obesity are unhealthy diet and physical inactivity. Thus, a population wide approach needs to be developed that targets the whole community and aims to shift the entire population distribution of risk-factors in a favorable direction. These strategies should aim at creating a conducive environment by making policy changes and raising awareness, motivation and skills for behaviour change through health education and promoting population wide strategies.

Improving diet and lifestyle is a critical component to curb and prevent the present epidemic of Non-Communicable diseases (NCD's) particularly the degenerative diseases the leading cause of morbidity and mortality in all developed and developing nations. While developing a policy decision/framing and implementing a programme we need to keep the following most critical features in mind:

- (1) Recognizing that diet is part of an overall healthy lifestyle, *Lifestyle* also includes activity and behavior.
- (2) Identifying the influence of environmental factors on the prevalence of under/overweight, hypertension and hence also CVD/diabetes related health behaviors.
- (3) Formulating practical guidelines on how to achieve diet and lifestyle changes which need to be provided to the general and 'at-risk' population.
- (4) The importance of following the recommendations when eating at home and away from home needs to be emphasized.
- (5) The vital roles of healthcare professionals, restaurants, the food industry, schools, and local policies need to be highlighted, along with specific recommendations to these groups.

## **PUBLIC HEALTH AND CLINICAL RECOMMENDATIONS** **ON DIET AND LIFESTYLE**

### **I Public Health Recommendations:**

The American Heart Association/International Heart Federation/ National Heart Institute and World Health Organization Committees have time and again been providing dietary and healthy lifestyle recommendations for the populations of developed and developing nations with the goal of reducing risk for obesity and its complications which is the No. 1 killer among all NCD's. Maintaining a healthy diet and lifestyle offers the greatest potential of all known approaches for reducing the risk for degenerative diseases in the general public. This is still true in spite of major advances in clinical medicine. The recommendations provide a foundation for a public health approach to degenerative disease risk reduction through healthy eating habits and other lifestyle factors. In recent years, obesity has emerged as a major nutritional problem around the globe and there is a long way to go in developing nations such as India with limited resources.

### **Goals**

The Diet and Lifestyle Goals as suggested by several International organizations are intended to reduce risk and complications of overweight/obesity. Those formulated by AHA provide guidance for adults and children over the age of 2 years.

**Specific goals** for prevention include:

- to consume an overall healthy diet;
- aim for a healthy body weight;
- aim for recommended levels of low-density lipoprotein cholesterol, high-density lipoprotein cholesterol, and triglycerides;
- aim for normal blood pressure and a normal blood glucose level;
- be physically active; and
- avoid use of and exposure to tobacco products.

### **Objectives of Dietary Management:**

The recommendations (primarily of AHA/WHO) are to balance (calorie) intake and physical activity to achieve and maintain a healthy body weight; consume a diet rich in vegetables and fruits; choose whole-grain, high-fiber foods; consume fish, especially oily fish, at least twice a week; limit intake of saturated fat to <7% of energy, *trans* fat to <1% of energy, and cholesterol to <300 mg/day by choosing lean meats and vegetable alternatives, fat-free (skim) or low-fat (1% fat) dairy products and minimize intake of partially hydrogenated fats; minimize intake of beverages and foods with added sugars; choose and prepare foods with little or no salt; if you

consume alcohol, do so in moderation; and when you eat food prepared outside of the home, follow these Diet and Lifestyle Recommendations. By adhering to these diet and lifestyle recommendations we can substantially reduce the risk of developing cardiovascular disease and other complications of excess body weight, which remains the leading cause of morbidity and mortality in both developed and developing nations.

### **Recommendations on Dietary Intake**

Although the vast majority of research studies have focused on individual nutrients and foods, it is well recognized that multiple dietary factors influence the risk of developing degenerative diseases and its major risk factors (obesity/hypertension). To a much lesser extent, research has examined the health effects of the whole diet; both observational studies and clinical trials. These data have documented that healthy dietary patterns are associated with a substantially reduced risk of developing NCD's particularly obesity and CVD, their risk factors,<sup>4,5,6</sup> and other non-cardiovascular diseases.<sup>7</sup> An emphasis on balanced/prudent diet is also appropriate to ensure nutrient adequacy and energy balance.<sup>2</sup> Hence, rather than focusing on a single nutrient or food, individuals should aim to improve their whole or overall diet. Consistent with this principle, the AHA recommends that individuals consume a variety of fruits, vegetables, and grain products, especially whole grains; choose fat-free and low-fat dairy products, legumes, poultry, and lean meats; and eat fish, preferably oily fish, at least twice a week.

Although the recommendations present guidance about specific nutrients and types of foods, the importance of an overall healthy diet and lifestyle cannot be overemphasized. Multiple dietary factors influence risk of developing metabolic syndrome particularly CVD, and not all do so via changes in the risk factors described above. Hence, CVD benefit is likely to accrue by adherence to a healthy diet and lifestyle even if these risk factors are not markedly altered. The salient features include:

#### **(i) Consume a Diet Rich in Vegetables and Fruits**

Most vegetables and fruits are rich in nutrients, low in calories, and high in fiber. Therefore, diets high in vegetables and fruits meet micronutrient, macronutrient, and fiber requirements without adding substantially to overall energy consumption. Whether it is the vegetables and fruits themselves or the absence of other foods displaced from the diet that is associated with CVD risk reduction has yet to be determined. Regardless, diets rich in vegetables and fruits have been shown to lower BP and improve other CVD risk factors in short-term randomized trials.<sup>5,6,29</sup> In longitudinal observation studies, persons who regularly consume such diets are at a lower risk of developing CVD, particularly stroke.<sup>30,31,32</sup>

Consumption of a variety of vegetables and fruits has been recommended. Vegetables and fruits that are deeply colored throughout (eg, spinach, carrots, peaches, berries) should be emphasized because they tend to be higher in micronutrient content than are other

vegetables and fruits such as potatoes and corn. Fruit juice is not equivalent to the whole fruit in fiber content and perhaps satiety value and should not be emphasized. A diet rich in vegetables and fruits is a strategy for lowering the energy density of the diet to control energy intake. High calorie fruits and vegetables are suggested for weight gain and vice versa. Equally important is the method of preparation. Techniques that preserve nutrient and fiber content without adding unnecessary calories, saturated or *trans* fat, sugar, and salt are recommended.

### **(ii) Choose Whole-Grain, High-Fiber Foods**

Dietary patterns that are high in whole-grain products and fiber have been associated with increased diet quality and decreased risk of CVD.<sup>34</sup> Soluble or viscous fibers (notably  $\beta$ -glucan and pectin) modestly reduce LDL cholesterol levels beyond those achieved by a diet low in saturated and *trans* fatty acids and cholesterol alone.<sup>35</sup> Insoluble fiber has been associated with decreased CVD risk<sup>34,35,36</sup> and slower progression of CVD in high-risk individuals.<sup>39</sup> Dietary fiber may promote satiety by slowing gastric emptying, leading to an overall decrease in calorie intake.<sup>37,38</sup> Soluble fiber may increase short-chain fatty acid synthesis, thereby reducing endogenous cholesterol production.<sup>36</sup> The AHA recommends that at least half of grain intake must include whole grains and this is particularly important in case of cereal-based diet as consumed in India.

### **(iii) Consume Fish, Especially Oily Fish, at Least Twice a Week**

Fish, especially oily fish, is rich in very long-chain omega-3 polyunsaturated fatty acids: eicosapentaenoic acid, C20:5n-3 (EPA) and docosahexaenoic acid, C22:6n-3 (DHA). The consumption of 2 servings per week of fish high in EPA and DHA is associated with a reduced risk of both sudden death and death from coronary artery disease in adults.<sup>40,41</sup> In addition to providing EPA and DHA, regular fish consumption may facilitate the displacement of other foods higher in saturated and *trans* fatty acids from the diet, such as fatty meats and full-fat dairy products. Methods used to prepare fish should minimize the addition of saturated and *trans* fatty acids, as occurs with the use of cream sauces or hydrogenated fat during frying.

Contamination of certain fish with methyl mercury, polychlorinated biphenyls, and other organic compounds is a potential concern.<sup>41</sup> Subgroups of the population, primarily children and pregnant women, must avoid eating those fish with the potential for the highest level of mercury contamination (eg, shark, swordfish, king mackerel, or tilefish), eat up to 12 ounces (2 average meals) per week of a variety of fish and shellfish that are lower in mercury (eg, canned light tuna, salmon, pollock, catfish), and check local advisories about the safety of fish caught by family and friends in local lakes, rivers, and coastal areas.<sup>45</sup>

### **(iv) Limit Your Intake of Saturated and *Trans* Fat and Cholesterol**

As a set of goals, the AHA/WHO recommends intakes of <7% of energy as saturated fat, <1% of energy as *trans* fat, and <300 mg cholesterol per day. These goals can be

achieved by (1) choosing lean meats and vegetable alternatives; (2) selecting fat-free (skim), 1%-fat, and low-fat dairy products; and (3) minimizing intake of partially hydrogenated fats.<sup>2</sup>

Diets low in saturated and *trans* fatty acids and cholesterol reduce the risk of CVD, in large part through their effects on LDL cholesterol levels. In the current diets, the major sources of saturated fatty acids are animal fats (meat and dairy), and the primary sources of *trans* fatty acids are partially hydrogenated fats used to prepare commercially fried and baked products. Major sources of dietary cholesterol are foods of animal origin (eggs, dairy, and meat). Saturated and *trans* fatty acid intakes are directly related to LDL cholesterol levels.<sup>44,45,46</sup> Increased dietary cholesterol intake also raises LDL cholesterol concentrations.

Efforts to reduce saturated fat and cholesterol typically rely on replacement of animal fats with unsaturated fats (polyunsaturated and monounsaturated fats) and on selection of lower-fat versions of foods (eg, replacing full-fat dairy products with non-fat or low-fat versions). Replacing meats with vegetable alternatives (eg, beans) or fish is one strategy to replace saturated fats with unsaturated fats and reduce the cholesterol content. In view of the positive linear relationship among dietary saturated fat, LDL cholesterol, and CVD risk, and current intakes, the AHA now recommends a population-wide goal of <7% of energy. Efforts to reduce *trans* fatty acids typically rely on the substitution of partially hydrogenated fats with those made with liquid vegetable oils (with the exception of tropical fats). While mandatory *trans* fat labeling has been successful in the US since January 1, 2006, making it easier for consumers to identify and limit their *trans* fatty acid intake, it may presently not be feasible in the Indian scenario. It has been estimated that even if partially hydrogenated fats were removed from the food supply, the *trans* fats still would represent about 1% of the calories because some *trans* fatty acids are produced from deodorization of vegetable oils and because meat and dairy products contain naturally occurring *trans* fatty acids.<sup>48,49,50</sup>

The relative health effects of polyunsaturated and monounsaturated fats have actively been debated. A few clinical outcome trials have documented that replacement of saturated fat with polyunsaturated fats reduces the risk of developing CHD, whereas prospective observational studies have documented that diets rich in monounsaturated fats are associated with a reduced risk of CHD. The AHA supports the recommendations of the Institute of Medicine and the National Cholesterol Education Program for total fat. A range of 25% to 35% for total fat has been considered to be an appropriate level of intake in a healthy dietary pattern. However, the amount of fat to be included in Indian Diets still need to be studied at length.

#### **(v) Minimize Your Intake of Beverages and Foods With Added Sugars**

Over the past few decades, the consumption of beverages and foods with added sugars has risen markedly. The intake of added sugars (sucrose, corn syrup, and high-fructose corn syrup) increased from 13.1% of energy during the period 1977 to 1978 to 16.6% of

energy during 1999 to 2002 in the US population.<sup>50,51</sup> With the introduction of a variety of fruit drinks and soft drinks, the same can be anticipated in India too.

The primary reasons for reducing the intake of beverages and foods with added sugars are to lower total calorie intake and promote nutrient adequacy.<sup>54</sup> Individuals who consume large amounts of beverages with added sugars tend to consume more calories and gain weight.<sup>53-55</sup> Some evidence suggests that calories consumed as liquid are not as satiating as calories consumed as solid food.<sup>56</sup> This factor may negatively affect attempts to achieve and maintain a healthy body weight.

#### **(vi) Choose and Prepare Foods With Little or No Salt**

On average, as salt (sodium chloride) intake increases, so does BP.<sup>59,60</sup> A reduced sodium intake can prevent hypertension in non-hypertensive individuals, can lower BP in the setting of antihypertensive medication, and can facilitate hypertension control. A reduced sodium intake is associated with a blunted age-related rise in systolic BP and a reduced risk of atherosclerotic cardiovascular events and congestive heart failure. In general, the effects of sodium reduction on BP tend to be greater in blacks; middle-aged and older-aged persons; and individuals with hypertension, diabetes, or chronic kidney disease (CKD). Diets rich in potassium lower BP and also blunt the BP-raising effects of an increased sodium intake.<sup>59</sup>

In view of the progressive dose-response relationship between sodium intake and BP, it is difficult to set a recommended upper level of sodium intake, which could be as low as 1.5 g/d (65 mmol/d). However, in view of the available high-sodium food supply and the currently high levels of sodium consumption, a reduction in sodium intake to 1.5 g/d (65 mmol/d) is not easily achievable at present. In the interim, an achievable recommendation is 2.3 g/d (100 mmol/d).

#### **(vii) If You Consume Alcohol, Do So in Moderation**

Moderate alcohol intake has been associated with reduced incidence of degenerative diseases particularly cardiovascular events in many populations.<sup>2</sup> This association is not only found with wine but also with other alcoholic beverages.<sup>56,58</sup> Unlike other potentially beneficial dietary components, the consumption of alcohol cannot be recommended solely for CVD risk reduction. Alcohol can be addictive, and high intake can be associated with serious adverse health and social consequences, including hypertriglyceridemia, hypertension, liver damage,<sup>5</sup> physical abuse, vehicular and work accidents, and increased risk of breast cancer.<sup>2</sup>

Thus, AHA recommends that if alcoholic beverages are consumed, they should be limited to no more than 2 drinks per day for men and 1 drink per day for women, and ideally should be consumed with meals. In general, a 12-ounce bottle of beer, a 4-ounce glass of wine, and a 1½-ounce shot of 80-proof spirits all contain the same amount of alcohol (one half ounce). Each of these is considered a "drink equivalent."<sup>57,58,59</sup>

Individuals who choose to consume alcoholic beverages should also be aware that alcohol has a higher caloric density than protein and carbohydrate and is a source of additional "empty" calories.

### **(viii) Other Dietary Factors**

#### **(a) Antioxidant Supplements**

Antioxidant vitamin supplements or other supplements such as selenium to prevent degenerative diseases are not recommended.<sup>66,67</sup> Although observational studies have suggested that high intakes of antioxidant vitamins from food and supplements are associated with a lower risk of degenerative diseases, clinical trials of antioxidant vitamin supplements have not confirmed benefit. Some trials, in fact, have documented potential harm, including an increased risk of lung cancer from beta-carotene supplements in smokers and an increased risk of heart failure and the possibility of increased total mortality<sup>71</sup> from high-dose vitamin E supplements. Although antioxidant supplements are not recommended, food sources rich in antioxidants, principally from a variety of plant-derived foods such as fruits, vegetables, whole grains, and vegetable oils have been recommended.<sup>2</sup>

#### **(b) Soy Protein**

Evidence of a direct cardiovascular health benefit from consuming soy protein products instead of dairy or other proteins or isoflavone supplements is minimal.<sup>69,70</sup> Although earlier research has suggested that soy protein has clinically important favorable effects on LDL cholesterol levels and other CVD risk factors, studies reported during the past 5 years have not confirmed those results.<sup>70</sup> A very large amount of soy protein, comprising more than half of daily protein intake, may lower LDL cholesterol levels by a few percentage points when it replaces dairy protein or a mixture of animal proteins, but data are mainly from hypercholesterolemic individuals. The evidence favors soy protein rather than soy isoflavones as the responsible nutrient.<sup>70,71</sup> No meaningful benefit of soy consumption is evident with regard to HDL cholesterol, triglycerides, or lipoprotein(a). Nevertheless, consumption of soy protein-rich foods may indirectly reduce CVD risk if they replace animal and dairy products that contain saturated fat and cholesterol.

#### **(c) Folate and Other B Vitamins**

Available evidence is inadequate to recommend folate and other B vitamin supplements as a means to reduce CVD risk at this time. Folate intake and to a lesser extent intake of vitamins B6 and B12 are inversely associated with blood homocysteine levels. In observational studies, increased blood levels of homocysteine are associated with an increased risk of CVD. Trials of homocysteine-reducing vitamin therapy have not indicated promising results<sup>73,74,75,76,77</sup>

#### **(d) Phytochemicals**

Flavonoids and sulfur-containing compounds are classes of compounds found in fruits and vegetables that may be important in reducing the risk of atherosclerosis. Within these categories are multiple possible compounds, most of which are not well characterized and whose modes of action are not established.<sup>78</sup>

#### **(e) Fish Oil Supplements**

Fish intake has been associated with decreased risk of CVD. On the basis of the available data, the AHA recommends that patients without documented CHD eat a variety of fish, preferably oily fish, at least twice a week.<sup>40</sup> Patients with documented CHD are advised to consume EPA+DHA supplements could be in consultation with their physician.<sup>79,83</sup> This recommendation would particularly be suitable for coastal parts of India.

#### **(f) Plant Stanols/Sterols**

Plant stanols/sterols lower LDL cholesterol levels by up to 15%<sup>85</sup> and therefore are seen as a therapeutic option, in addition to diet and lifestyle modification, for individuals with elevated LDL cholesterol levels. Maximum effects are observed at plant stanol/sterol intakes of 2 g per day. Plant stanol/sterols are currently available in a wide variety of foods, drinks, and soft gel capsules in the international market. The choice of vehicle should be determined by availability and by other considerations, including caloric content. To sustain LDL cholesterol reductions from these products, individuals need to consume them daily, just as they would use lipid-lowering medication.

#### **(ix) Diet and Lifestyle Recommendations While Eating Away From Home**

As a consequence to urbanization and modernization, we are increasingly consuming food that is prepared outside the home. Such types of "away" food include food prepared at restaurants and grocery stores, quick-serve food-service units, schools and daycare centers, and other non-home locations. Large portion sizes and high energy density are common features of away food.<sup>60,61</sup> Many types of away foods, particularly traditional quick-serve, are also high in saturated fat, *trans* fatty acids, cholesterol, added sugars, and sodium and low in fiber and micronutrients (*suji halwa, poories, tikkis, samosas* etc). Adverse health consequences have emerged. There is a positive association between frequency of meal consumption at quick-serve restaurants and total energy intake, weight gain, and insulin resistance.<sup>62</sup> Attainment of a healthy diet will require individuals to make wise choices when they eat food prepared outside of the home.

#### **(x) Avoid Use of and Exposure to Tobacco Products**

On the basis of the overwhelming evidence for the adverse effects of tobacco products and secondary exposure to tobacco smoke on CVD, as well as cancer and other serious illness, efforts to eliminate the use of tobacco products and minimize exposure to second-

hand smoke (passive smoking)<sup>25,26</sup> have been endorsed strongly and unequivocally. Nearly 23% of US adults smoke, with the highest rates in American Indian/Alaskan Native women (37%) and the lowest rates in Asian women (7%).<sup>2</sup> Because cessation of smoking in habitual smokers can be associated with weight gain, particular attention should be given to preventing this outcome.<sup>26</sup> Concern about weight gain should not be a reason for continued use of tobacco products.

## **LIFESTYLE RECOMMENDATIONS:**

### **Adopting a Physically Active Lifestyle**

Regular physical activity is essential for maintaining physical and cardiovascular fitness, maintaining healthy weight, and sustaining weight loss/gain once achieved.<sup>23</sup> A sedentary lifestyle is associated with older age and is more common among Hispanic or Latino and black adults than among white adults. Regular physical activity improves cardiovascular risk factors (BP, lipid profiles, and blood glucose) and lowers the risk of developing other chronic diseases, including type 2 diabetes, osteoporosis, obesity, depression, and cancer of the breast and colon.<sup>20</sup>

The AHA 2006 Diet and Lifestyle Recommendations<sup>2</sup> are in line with those of NCEP and DASH and are intended to reduce risk of developing degenerative diseases. These recommendations allow maximal flexibility in their implementation among a group of individuals with a wide range of dietary preferences and to meet the unique needs for growth, development, and aging.

## **II Clinical Recommendations**

Clinical management of patients with or at risk for developing degenerative diseases particularly diabetes/CVD is particularly important in order to attenuate further progression of the disease. For certain patients at higher risk, the recommendations may have to be intensified. We need to adhere to the lipid and blood glucose levels recommended by NCEP and WHO respectively. Although great advances have been made in prevention and treatment of these diseases through drug therapies and procedures, diet and lifestyle therapies remain the foundation of clinical intervention for prevention. The clinical approach is an extension of the public health approach, with some modifications depending on the type of patient.

### **(i) Ideal or Desirable Body Weight**

A healthy body weight is currently defined as a body mass index (BMI) of 18.5 to 24.9 kg/m<sup>2</sup>. Overweight is a BMI between 25 and 29.9 kg/m<sup>2</sup>, and obesity is a BMI  $\geq$ 30 kg/m<sup>2</sup>. The prevalence of overweight and obesity has increased dramatically over the past 20 years, and the problem has now reached epidemic proportions.<sup>8,9</sup> Of particular concern is that this trend has shown no signs of abating. Obesity is an independent risk factor for

CVD.<sup>9</sup> Excess body weight adversely affects CVD risk factors (eg, increasing low-density lipoprotein [LDL] cholesterol levels, triglyceride levels, blood pressure [BP], and blood glucose levels, and reducing high-density lipoprotein [HDL] cholesterol levels) and increases the risk of developing coronary heart disease (CHD), heart failure, stroke, and cardiac arrhythmias.<sup>2</sup>

The causes of this dramatic population-wide increase in overweight and obesity are multi-factorial. Implicated factors include increased portion sizes; high-calorie-density foods; easy access to plentiful, inexpensive food; sedentary lifestyle; and commercial and cultural influences that, in aggregate, encourage calorie consumption in excess of calorie utilization. No one factor appears responsible for the epidemic. Hence, the optimal strategy to retard the epidemic must likewise be multi-factorial.<sup>2</sup>

Achieving and maintaining a healthy weight throughout the life cycle are critical factors in reducing CVD/diabetes risk in the general population. Data indicate that body weight at 18 years tracks with subsequent risk of developing CVD and diabetes, as does weight gain after 18 years of age.<sup>11,12</sup> It is important to intensify efforts in the general population to help individuals avoid inappropriate weight gain during childhood and subsequent weight gain during adult years. Increased emphasis should be put on prevention of weight gain, because achievement and maintenance of weight loss, although certainly possible, require more difficult behavioral changes (ie, greater calorie reduction and more physical activity) than prevention of weight gain in the first place.<sup>2,12</sup>

**Maintaining a Balance between Calorie Intake and Physical Activity is Necessary to Achieve or Maintain a Healthy Body Weight**

To avoid weight gain after childhood, individuals must control calorie intake so that energy balance is achieved—that is, energy intake matches energy expenditure. To control calorie intake, individuals should increase their awareness of the calorie content of foods and beverages per portion consumed and should control portion size. The macronutrient composition of a diet (ie, the amount of fat, carbohydrate, and protein) has little effect on energy balance unless macronutrient manipulation influences total energy intake or expenditure.<sup>2</sup>

A physically active lifestyle is recommended to reduce risk for obesity and other degenerative diseases in all individuals, regardless of body weight.<sup>12</sup> Regular physical activity also reduces symptoms in patients with established CVD. Among individuals who are overweight or obese, regular physical activity along with calorie restriction is recommended as a means to achieve weight loss. Regular daily physical activity has been shown to be particularly effective in maintaining weight loss once achieved.<sup>2</sup>

The AHA/WHO/NCEP recommends that all adults must involve themselves with  $\geq 30$  minutes of physical activity most days of the week. Additional benefits will likely be derived if activity levels exceed this minimum recommendation. At least 60 minutes of physical activity most days of the week is recommended for adults who are attempting to

lose weight or maintain weight loss and for children. The physical activity can be accumulated throughout the day. It is not easy for individuals to achieve these goals. However, it is important to encourage behaviors that will facilitate achieving and maintaining these goals over time. Achieving a physically active lifestyle requires effective time management, with a particular focus on reducing sedentary activities such as screen time (eg, watching television, surfing the Web, playing computer games) and making daily choices to move rather than be moved (eg, taking the stairs instead of the elevator).

## **(ii) Achieving and Maintaining a Desirable Lipid Profile**

LDL, which is the major cholesterol-carrying lipoprotein particle in plasma, is primarily derived from lipoprotein particles made by the liver. As levels of LDL cholesterol increase, so does the risk of developing CVD. LDL levels are classified as follows: optimal, <100 mg/dL; near or above optimal, 100 to 129 mg/dL; borderline high, 130 to 159 mg/dL; high, 160 to 189 mg/dL; and very high,  $\geq$ 190 mg/dL.<sup>2,13</sup>

Current recommendations for LDL cholesterol goals depend on the estimated 10-year risk of developing CVD and the presence of CVD-related risk factors.<sup>2</sup> Although drug therapy is often prescribed for those at moderate or high risk, dietary changes are recommended for all individuals. The strongest dietary determinants of elevated LDL cholesterol concentrations are dietary saturated fatty acid and *trans* fatty acid intakes. *Trans* fatty acids tend to increase LDL cholesterol levels slightly less than saturated fatty acids, whereas saturated fatty acids increase HDL cholesterol concentrations but *trans* fatty acids do not. To a lesser extent, dietary cholesterol and excess body weight are positively related to levels of LDL cholesterol.<sup>2,14</sup>

HDL cholesterol and triglycerides are other plasma lipid measures related to CVD risk that can be affected by diet and body weight. The concentration of HDL cholesterol is inversely associated with the risk of developing CVD.<sup>13,14,15</sup> This association is thought to be mediated by a constellation of events collectively referred to as reverse cholesterol transport—the transport of cholesterol from peripheral tissues to the liver for subsequent metabolism or excretion. HDL directly protects against the development of atherosclerosis. The major non-genetic determinants of low HDL cholesterol levels are hyperglycemia, diabetes, hyper-triglyceridemia, very low-fat diets (<15% energy as fat), and excess body weight.<sup>17</sup> Although at this time there are no HDL cholesterol goals as there are for LDL cholesterol, levels <50 mg/dL in women and <40 mg/dL in men are considered one of the criteria for the classification of metabolic syndrome. Likewise, although at this time there are no triglyceride goals, levels >150 mg/dL are considered one of the criteria for the classification of metabolic syndrome.<sup>14</sup> In general, a moderate inverse relationship exists between triglyceride and HDL cholesterol concentrations, and determinants of high triglycerides are mainly the same as those of low HDL cholesterol.<sup>15</sup>

## **(iii) Achieving and Maintaining Normal Blood Pressure**

A normal blood pressure (BP) is a systolic BP <120 mm Hg and a diastolic BP <80 mm Hg. Excess body weight predisposes a person to rising BP. BP is a strong, consistent, continuous, independent, and etiologically relevant risk factor for cardiovascular-renal disease. Notably, no evidence of a BP threshold exists—that is, the risk of CVD increases progressively throughout the range of BP, including the pre-hypertensive range (a systolic BP of 120 to 139 mm Hg or diastolic BP of 80 to 89 mm Hg).<sup>17</sup> Hence, efforts to reduce BP to normal levels are necessary, even among individuals with pre-hypertension.

According to the most recent National Health and Nutrition Examination Survey (NHANES) (1999–2000), 27% of adult Americans have hypertension (systolic BP  $\geq$ 140 mm Hg, diastolic BP  $\geq$ 90 mm Hg, or used of antihypertensive medication), and another 31% have prehypertension.<sup>20</sup> It has been estimated that among adults >50 years of age, the lifetime risk of developing hypertension approaches 90%. On average, blacks have higher BP than do non-blacks, as well as an increased risk of BP-related complications.<sup>2</sup>

Elevated BP results from environmental factors, genetic factors, and interactions among these factors. Of the environmental factors that affect BP (ie, diet, physical inactivity, toxins, and psychosocial factors), dietary factors have a prominent, and likely predominant, role. A substantial body of evidence strongly supports the concept that multiple dietary factors affect BP.<sup>21</sup> Dietary modifications that lower BP are reduced salt intake, caloric deficit to induce weight loss, moderation of alcohol consumption (among those who drink), increased potassium intake, and consumption of an overall healthy diet, based on the DASH (Dietary Approaches to Stop Hypertension) diet.<sup>5,19</sup> The latter is a diet that emphasizes fruits, vegetables, and low-fat dairy products; includes whole grains, poultry, fish, and nuts; and is restricted in fats, red meat, sweets, and sugar-containing beverages. Replacement of some carbohydrates with either protein from plant sources or with monounsaturated fat can further lower BP.<sup>2,6</sup>

#### **(iv) Achieving and Maintaining a Normal Blood Glucose Level**

A normal fasting glucose level is  $\leq$ 100 mg/dl, whereas diabetes is defined by a fasting glucose level  $\geq$ 126 mg/dl. Hyperglycemia and the often-associated insulin resistance are related to numerous cardiovascular complications, including CHD, stroke, peripheral vascular disease, cardio-myopathy, and heart failure. Type 2 diabetes is the most common form of diabetes. Reducing calorie intake and increasing physical activity to achieve even a modest weight loss can decrease insulin resistance and improve glucose control and the concomitant metabolic abnormalities. In non-diabetic individuals, weight loss and increased physical activity can delay the onset of and possibly prevent diabetes.<sup>2,21</sup>

### **Recommendations for Special Age Groups**

#### **(i) Children Over 2 Years of Age**

Overweight and obesity are a particular concern for children as the prevalence of overweight is 16% among children and adolescents. Achieving energy balance may be

more complicated in children and adolescents because calorie and micronutrient intake must be adequate to support normal growth and development. However, many children are eating excess calories and experiencing unhealthy weight gain especially in the urban sector. Children can eat a diet consistent with the AHA 2006 Diet and Lifestyle Recommendations/NCEP recommendations and maintain appropriate growth while lowering risk for future development of obesity and other degenerative diseases. Furthermore, because diet in youth is associated with the occurrence of CVD outcomes later in life and because lifestyle habits in youth track into adulthood, adoption of a healthy diet and lifestyle at early ages is recommended <sup>2</sup>.

### **(ii) Elderly and Adults:**

Atherosclerosis is a chronic process beginning in youth. The risk of developing CVD increases dramatically with advancing age particularly among overweight/obese. Diet and lifestyle behaviors can decrease CVD risk. Also, ample evidence from clinical trials indicates that older-aged persons can make and sustain lifestyle changes, perhaps more so than younger adults. In view of the high incidence of CVD events in older-aged individuals, even relatively small improvements in risk factors (eg, small reductions in BP and LDL cholesterol through diet and lifestyle changes) would be of substantial benefit. Elderly have decreased energy needs while their vitamin and mineral requirements remain constant or increase, however, older individuals should be counseled to select nutrient-dense choices within each food group.<sup>2,81,82,83,84</sup>

### **(iii) Patients With Metabolic Syndrome:**

Metabolic syndrome refers to a cluster of abnormalities that are related to insulin resistance and that commonly occur in the setting of overweight and obesity.<sup>91</sup> Characteristic features of the metabolic syndrome are abdominal obesity, atherogenic dyslipidemia (elevated triglycerides, low HDL cholesterol), increased BP, insulin resistance (with or without glucose intolerance), and prothrombotic and proinflammatory states.<sup>17,89</sup> The primary approach to reducing CVD risk in persons with the metabolic syndrome is to control the individual risk factors by diet and lifestyle intervention.<sup>85</sup> Physical activity and weight maintenance are recommended as a means to prevent the development of metabolic syndrome and lower the risk of developing type 2 diabetes or CHD. Very low-fat diets should be avoided if elevated triglyceride or depressed HDL cholesterol levels are present.<sup>90</sup> Reducing caloric intake while maintaining a moderate-fat diet and increasing physical activity to achieve even a modest weight loss can improve insulin resistance and the concomitant metabolic abnormalities.<sup>2</sup>

### **(iv) Patients With Other Chronic Diseases**

Among various chronic disease, chronic renal failure which precedes end-stage kidney disease, substantially increases the risk of CVD, at least in part through diet-related CVD risk factors. Chronic renal failure is associated with a high prevalence of diabetes, dyslipidemia (especially hyper-triglyceridemia), and hypertension. In particular, a reduced salt intake is recommended as a means to reduce BP and preventing fluid

overload, and dietary strategies to manage dyslipidemia are also recommended. Replacing meat with dairy and vegetable alternatives may also slow loss of kidney function.<sup>90</sup> At advanced stages of chronic renal failure, a reduced intake of protein, phosphorus, and potassium is recommended.<sup>2</sup>

#### **(v) Socioeconomic Groups at High Risk of CVD**

Barker's hypothesis has long substantiated the fact that individuals of lower socioeconomic status have a higher incidence of CVD than do individuals of higher socioeconomic status. Population subgroups of racial/ethnic minorities (eg, Mexican Americans, American Indians, and blacks), who are over-represented in lower socioeconomic status groups, have a strikingly high prevalence of overweight and obesity—a condition that precedes the development of many other risk factors for development of degenerative diseases.<sup>2</sup> Although the reasons for such disparities are complex and multifactorial, available research is sufficient to advocate diet and lifestyle changes as a means to reduce disparities. For example, blacks are especially sensitive to the BP-lowering effects of a reduced salt intake, increased potassium intake, and the DASH diet.<sup>5</sup>

Promotion of a desirable diet should be culturally sensitive and should encourage healthy preparation of traditional ethnic foods. Unfortunately, social and economic barriers make widespread adoption of current diet and lifestyle recommendations difficult for many segments of society.

#### **Impact of Environment and Behavioural Choices – Influence on Policy Decisions**

Individuals ultimately are their own choosers on the types and amount of food they eat and the amount of physical activity they perform. Still, the environment has a powerful influence on whether people would consume excess calories, follow a healthy diet, and are physically active. Environment, refers to constellation of cultural forces, societal norms, and commercial interests that influence the behavior of individuals.<sup>2</sup>

The obesity epidemic, which has unfolded over the past 2 decades in genetically stable populations, illustrates the adverse impact of environment on diet and lifestyle behaviors. In brief, it is well recognized that the current environment encourages over consumption of calories and discourages expenditure of energy. There is a growing agreement among experts that changes in the environment are a major driving force behind the obesity epidemic. Environmental factors that contribute to excess calorie intake are increased portion sizes, high-calorie foods, and easy access to plentiful inexpensive food. Environmental factors that discourage physical activity include an environment that encourages automobile use rather than walking and that has few cues to promote activity and numerous cues that discourage activity (eg, poor pedestrian infrastructure, lack of sidewalks and other safety features, and poor street aesthetics). Other factors include reduced energy expenditures at school, work, and home, and increased time spent on sedentary activities such as watching television, using computers, and playing video games.<sup>2</sup>

The effects of environmental factors and of individual nutrients and food groups on overweight and obesity (eg, role of fat, added sugars, alcohol, fruits and vegetables, dairy products, physical inactivity) have been explored. No one factor appears responsible for the epidemic. Such findings reinforce the belief that multiple factors are responsible for the obesity epidemic and that the optimal strategy to arrest the epidemic will be multi-factorial. Because many of these factors are beyond the control of individuals (eg, size of portions served in restaurants, lack of information on calorie content at point of purchase, presence of sidewalks, adequate street-lights after dark), substantial changes to the environment will be required. Furthermore, the obesity epidemic highlights the importance of primary prevention efforts in children so that adverse diet and lifestyle behaviors do not become habits.

### ***Target Group Recommendations<sup>2</sup>***

#### ***➤ Practitioners***

- *Advocate a healthy dietary pattern consistent with AHA recommendations.*
- *Encourage regular physical activity.*
- *Calculate BMI and discuss results with patients.*
- *Discourage smoking among nonsmokers and encourage smoking cessation among patients who do smoke.*
- *Encourage moderation of alcohol intake among those who do drink alcohol.*

#### ***➤ Restaurants***

- *Display calorie content prominently on menus, or make calorie and other nutrition information easily accessible to consumers at point of decision and point of purchase.*
- *Reduce portion sizes and provide options for selecting smaller portions.*
- *Reformulate products to reduce calories, sodium, and saturated and trans fats.*
- *Use trans fat-free and low-saturated fat oils in food preparation to eliminate added trans fat without increasing saturated fat.*
- *Provide more vegetable options, and prepare them with minimal added calories and salt.*
- *Provide more fruit options, and serve them without added sugar.*
- *Develop creative approaches to including and marketing fruits and vegetables to make them more attractive to consumers.*
- *Allow substitution of non-fried and low-fat vegetables for usual side dishes (eg, French fries and potato salad).*
- *Provide whole-grain options for bread, pasta and rice.*

#### ***➤ Food industry***

- *Reduce the salt and sugar content of processed foods.*
- *Replace saturated and trans fats in prepared foods and baked goods with low-saturated fat liquid vegetable oils.*
- *Increase the proportion of whole-grain foods available.*
- *Package foods in smaller individual portion sizes.*
- *Develop packaging that allows for greater stability, preservation, and palatability of fresh fruits and vegetables without added sodium and reduces refrigeration needs in grocery stores.*

#### ***➤ Schools***

- *Adopt competitive food policies that limit foods high in added sugar, saturated and trans fat, sodium, and calories while encouraging consumption of fruits, vegetables, whole-grain foods, and low-fat or fat-free dairy. (Competitive food policies should address vending, a la carte, school stores, fundraising, and all food sold outside of the reimbursable school lunch.)*
- *Ensure the availability of nutritionally balanced mid-day meal programmes*
- *Offer daily physical education taught by qualified teachers at all grade levels.*
- *Expand physical activity opportunities by providing noncompetitive as well as competitive extracurricular physical activity options. Examples include intermural and intramural sports, dance classes, and walking clubs.*
- *Incorporate healthy nutrition and increased physical activity policy into after-school activities.*
- *Adopt 100% smoke-free policies on school campus, including parking lots and surrounding school grounds.*

➤ **Local government**

- *Develop and implement Safe Routes to School plan.*
- *Implement land-use practices that promote non-motorized transportation (walking and biking), such as complete streets and community parks.*
- *Promote policies that increase availability of healthy foods (eg, use of public land for farmers' markets and full-service grocery stores in low-income areas).*

## **CONCLUSION**

A substantial and expanding body of evidence has implicated several aspects of diet in the pathogenesis of degenerative diseases particularly obesity, hypertension and CVD as well as their risk factors. Importantly, lifestyle modifications can effectively control these risk factors and lower the incidence. To realize these benefits, individuals should aim for a desirable body weight, be physically active, avoid tobacco exposure, and follow a diet and lifestyle consistent with American Heart Association/National Heart Institute dietary recommendations. Accomplishing these objectives will require individuals to change their behavior and society to make substantial environmental changes. The current challenge to healthcare providers, researchers, and government officials is to develop and implement effective clinical and public health strategies especially need-based educational programmes (accessible, viable and adaptable to all age groups across communities) that would lead to sustained lifestyle changes among individuals and, more broadly, among populations.

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