Excess body fat and deficiency of protective nutrients play an important role in the development of up to thirty percent of cancers. Randomized trials, which intervened by reducing fats, increasing fruits and vegetables or adding supplements for 5 to 10 years in adult life didn’t have a major impact on common cancers. These studies teach us that short term dietary interventions in adult life can’t help and there are no shortcuts to cancer prevention using dietary supplements.

Growing prosperity is changing the diet and lifestyles in South Asia. Increasing intake of calories, consumption of calorie dense snacks between meals, decreased intake of vegetables and reduced physical activity has increased the risk of lifestyle related diseases in middle age. This is reflected in increasing body mass index of the young and middle aged the in urban South Asia and big increase in diabetes, cardiovascular disease and an increasing trend in life style related cancers. Dietary recommendations are broad for reducing premature death from several life style diseases that include cardiovascular disease, stroke and cancer.

Based on large population based observational studies the broad dietary guidelines for prevention of cancer are as follows. Maintain ideal body mass index (20.0 to 24.0 Kg/ M²), consume five serving of vegetables and fruits per day and undertake regular physical activities. Traditional diets in South Asia are rich in protective nutrients and quite close to the recommendations. It is important that these dietary habits are acquired in early childhood and retained through out adult life. Given the social-economic and cultural-religious diversity, no single intervention will suit every one in South Asia. A combination of programmes at individual, household, community, state and country levels are needed to achieve the goals. Governments in South Asia have started to promote local food processing industries and removed the barriers for the import and marketing of processed foods and beverages. Any attempts to change the dietary behavior of the populations will confront the big budget promotions by the food and beverage industry. Population explosion and urban migration has depleted parks, playgrounds and open recreational space that is necessary to maintain daily physical activity. These facilities need protection by governmental legislation. All governmental policies and non-governmental efforts during the last 60 years were to prevent or manage undernutrition and specific nutritional deficiencies. Undernutrition and micronutrient deficiency affect over 800 million people in the subcontinent. Extra efforts will be needed to tackle the dual problems of deprivation related nutritional deficiency and affluence related nutritional excess.
Dietary Prevention of Cancer
Role Of Diet In The Development Of Cancer
Dietary Patterns Of Individuals And Populations
Preventing Obesity And Related Diseases
Community Approach To Dietary Change
What Can Be Done In South Asia
Do’s And Don’t
Future Research Needs
Dietary Prevention of Cancer

Mohandas KM
Tata Memorial Hospital
Mumbai, India

“One swears by whole meal bread, one by sour milk; vegetarianism is the only road to salvation of some, others insist not only on vegetables alone, but on eating those raw. At one time the only thing that matters is calories; at another time they are crazy about vitamins and roughage. The scientific truth may be put quite briefly; eat moderately, have an ordinary mixed diet and don’t worry”.

Sir Robert Hutchinson, in Newcastle Medical Journal 1932

Background

Three decades of war on cancer with advances in screening, diagnosis, and treatment has slightly reduced deaths from cancers. In the absence of population based screening, vast majority of common cancers in South Asia are diagnosed in an advanced stage. Primary prevention will offer most cost-effective approach in South Asian countries, given the limited resources and competing health care demands. Chronic infections and tobacco abuse are the leading causes of cancer in South Asia. Diet has smaller role in the development of cancer and a big role in the causation of heart disease and strokes in South Asia. The principles for dietary prevention of most non-communicable diseases are similar.

Therefore, any dietary prevention strategy offers global benefits in reducing premature mortality from non-communicable diseases. The traditional foods, dietary habits and life styles of South Asia are not very different from the current recommendations for developed countries. The growing prosperity, adequate food supplies and epidemiological transition has resulted in a lifestyle paradox. “Affluent people in South Asia eat and live like economically disadvantaged people in developed countries”. They consume too many calories and undertake little physical work resulting in increasing Body Mass Index (BMI). The public health burden is associated with both, the extremes of thinness and overweight. The group at risk for thinness is illiterate, less educated and old while the college educated middle age groups are at-risk of overweight.

Since ancient times, the balancing dietary excess and dietary deficiencies have been used health promotion and disease prevention. Little has changed since the days of Sir Robert Hutchinson whose book on clinical medicine instructs every medical student in South Asia. Dietary risk factors contribute towards 10% to 30% of cancer deaths worldwide. In recent times increased body fat (overweight and
obesity) has been implicated as a cause of death from several non-communicable diseases including cardiovascular disease, diabetes, hypertension, kidney failure, degenerative osteoarthritis and cancer.\textsuperscript{13-15} Dietary modification programmes for weight control has met with variable success in developed countries.\textsuperscript{16} Implementing similar programmes in South Asia is a big challenge. The strategies for tobacco control won’t help controlling the obesity epidemic. Bipolar situation of undernutrition and micronutrient deficiencies (affecting 70% of population mostly rural regions) and increasing body fat (affecting 5-10% mostly urban populations) create practical problems at all levels of preventive intervention.

Not all the risk for cancer is by excess fats and calories. A substantial burden is from the deficiency of fiber and nutrients like calcium, antioxidant nutrients, selenium, etc.\textsuperscript{6} Therefore, the nutritional guidelines are for everyone. Meeting ideal dietary guidelines in South Asia is relatively expensive. Consuming 400 gm/person/day of different vegetables and fruits will cost over one US dollar per day for a family with four-members. Dealing with this challenge would require prolonged commitment, multidisciplinary approach and much more research on different aspects of human nutrition.

Table 1. Some examples of protective nutrients in traditional foods of South Asia

<table>
<thead>
<tr>
<th>Principal food</th>
<th>Protective nutrients</th>
<th>Destruction of protective foods</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cereals and pulses</td>
<td>Rich in complex carbohydrates having low calorie density</td>
<td>Excess cooking destroys vitamins and the fiber. Refining of the flour results in loss of vitamins,</td>
</tr>
<tr>
<td></td>
<td>and low glycemic index. Rich in soluble and insoluble fiber.</td>
<td>fiber, and increase calorie density.</td>
</tr>
<tr>
<td>Milk and milk</td>
<td>Rich in calcium and vitamins those are beneficial in protecting against colon cancer.</td>
<td>Pesticide residues are seen in milk due to contamination of water and grazing lands. Excess use</td>
</tr>
<tr>
<td>products</td>
<td></td>
<td>of high fat (e.g. Buffalo) milk, butter and rectified butter predisposes to obesity and metabolic</td>
</tr>
<tr>
<td></td>
<td></td>
<td>syndrome.</td>
</tr>
<tr>
<td>Fresh vegetables</td>
<td>Rich in vitamins, fiber and antioxidants Reduce calorie intake</td>
<td>Destruction of the nutrients due to prolonged cooking or frying. Pesticide residues due to</td>
</tr>
<tr>
<td>and fruits</td>
<td></td>
<td>uncontrolled spraying.</td>
</tr>
<tr>
<td>Spices like turmeric</td>
<td>Rich in antioxidants like curcumin which is protective against colorectal cancer.</td>
<td>Adulteration of spices using artificial colours is a big problem in India.</td>
</tr>
<tr>
<td>Allium vegetables</td>
<td>Onion is poor mans staple food in north India. It is protective against stomach cancer.</td>
<td>Contamination with the aspergillum fungi is common.</td>
</tr>
</tbody>
</table>

Scientific articles and non-scientific tips on diet and cancer are freely available but usually misleading and very confusing. There are few population based controlled interventional studies on dietary prevention of cancer from South Asia. Most reports, guidelines and statements from experts in South Asia are based on case-control studies and animal experiments or by extrapolation of Western studies. In the absence of randomized trials, such reports would be prone for selection bias and confounding. Carcinogens can be present in natural foods in small quantities and some carcinogens are generated during the preservation, storage and cooking of the foods. Some dietary toxins function as co-
carcinogens that interact with other carcinogens. For example, the progression of Helicobacter pylori gastritis to metaplasia and adenocarcinoma is potentated by nitrate salts in diet. Liver cancer in chronic hepatitis B virus infection is potentated by the aflatoxins produced by moulds growing on oil seeds. Unlike radiation, the risk for cancer from diet does not come by short exposures to one or two carcinogens in the foods. Exposure to dietary risk factors and absence of protective factors is akin to passive smoking. They work silently in steady manner for decades. The change from a traditional diet (rich in protective foods rich in fruits, vegetables and fibers) to a diet rich in energy and fats, and low in protective nutrients is gradual and happen over several decades. Dietary recommendations need to follow these principles. The best and current scientific evidence is presented below with special reference to the South Asia.

Table 2. Examples of carcinogenic substances in food

<table>
<thead>
<tr>
<th>Agent</th>
<th>Foods and mechanisms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Polycyclic aromatic hydrocarbons</td>
<td>Several food items due to smoking, charring and grilling</td>
</tr>
<tr>
<td>Aflatoxins</td>
<td>Nuts, tubers and oils made from contaminated nuts</td>
</tr>
<tr>
<td>Nitroso compounds</td>
<td>Nitrite salts used for pickling or preserving meat and vegetables</td>
</tr>
<tr>
<td>Acetaldehyde</td>
<td>Present in alcoholic drinks or produced in the body after drinking.</td>
</tr>
<tr>
<td>Acrylamide</td>
<td>Fried and baked carbohydrate-rich foods.</td>
</tr>
<tr>
<td>Dyes and colours</td>
<td>Artificial colouring of foods and drinks with unsafe chemical and by adulteration.</td>
</tr>
<tr>
<td>Pesticides and toxin residues in food</td>
<td>Due to uncontrolled use of these in agriculture.</td>
</tr>
</tbody>
</table>

Role Of Diet In The Development Of Cancer

Of all the environmental exposures, diet is a universal exposure, comprising a complex mixture of different compounds that varies over time, space and according to a number of historical, ethnic, religious, agricultural, socioeconomic and psychological factors, at the individual and population levels. Dietary factors account for up to one third of different cancers among non-smokers in Western countries. Traditional diets in South Asia and foods may be responsible for the lower incidence [the frequency with which different cancer occurs in a community] of many cancers. The traditional diet is not calorie dense and is rich in protective foods like fruits and vegetables. Unfortunately, as a price of development, the dietary habits of South Asia began to change in the post green revolution era, and gained momentum in the last decade. For these reasons there is a steady rise in the incidence of lifestyle related cancers in these countries. After infections and tobacco, the dietary factors constitute the third most common cause of cancer in South Asia. The role of foods in causing and preventing cancer vary widely with cancer sites. Some cancers common in Western countries (e.g. breast, colon, prostate, etc.) are associated with excess energy and fat intakes and other cancers common in South Asia (e.g. head and neck, esophagus, stomach, etc.), are associated with deficiency of protective nutrients. Temporal changes in dietary habits are influenced by changes in processing, cooking and storing practices. Interactions between foods, diets, processing, storing, cooking and consumption are complex. This results in marked changes in dietary habits.
variation in the research findings of the association of dietary factors and cancer in different parts of the world.

The role of diet in the causation and prevention of cancer has been studied extensively in developed countries. Several individuals, institutions and organizations such as the World Cancer Research Fund, the Department of Health in the United Kingdom, the Center for Disease Control and National Institutes of Health in USA, and the European Union have published their recommendations. Most recent evidence is summarized by the World Health Organization (WHO) and Food and Agricultural Organization (FAO) of the United Nations. The evidence that hold diet guilty of causing cancer comes from a variety of studies including inter-country comparisons, study of immigrants, case-control studies, prospective observational studies and Randomized Controlled Trials (RCT). The RCTs provide the most reliable evidence. Nutritional RCTs are expensive and labor intensive and rarely undertaken in developing countries. Randomized dietary interventions are not foolproof because of the complex interaction of diet and cancers over long periods of life. Furthermore, any extrapolation of results from one population to another is difficult. For example, there is very good evidence that beta-carotene pills can’t reduce deaths from cancer and cardiovascular disease in the US. Will the results be the same in South Asia where large proportions of the population is deficient in this nutrient?

The strength of the evidence linking different dietary factors with cancers varies widely. Colorectal cancer is positively associated with being overweight and high alcohol intakes and inversely associated with intake of fruit, vegetables, folates and calcium. However, RCTs for dietary prevention of colorectal adenoma and carcinoma did not reveal a protective effect. This raises an important question about the role of diet in different stages of a disease. Are specific (or general) dietary constituents that are important, and at which stage of life the dietary intervention have the greatest impact for preventing cancer? Studies on seventh day Adventists suggest that early start is important. Dietary carcinogenesis is a life long process and randomized trials with dietary modifications for short periods do not reproduce the situation. Therefore, we need to consider the prospective trials that are inferior to RCT. There is plenty of evidence that weight gain in adult life with or without little physical activity is associated with excess incidence many cancers in men and women. Observational studies suggest that increasing energy expenditure, limiting alcohol intake and consuming adequate quantities of fruits and vegetables will reduce the incidence of several cancers. The currently recommended diet is similar to traditional diet eaten in the Mediterranean region. This diet is rich in protective nutrients (vitamins A and C) and antioxidants derived from fruit, vegetables, olive oil, and have fewer calories per meal. The scientific evidence for a role of cooking habits such as high intakes of red meat, salted food, poorly stored perishable foods, additives, pesticides and high-temperature cooking increasing the risk for cancer is epidemiological suggestive but not compelling.
Table 3: General Guidelines for Cancer Prevention for South Asia

<table>
<thead>
<tr>
<th>Broad guidelines</th>
<th>Basic principles</th>
<th>Specific recommendation</th>
</tr>
</thead>
<tbody>
<tr>
<td>High intake of plant foods including cereals, vegetables and fruits.</td>
<td>Diet rich in variety of plant foods helps to reduce calories and increase anti-oxidants.</td>
<td>At least five to seven portions of fruit and vegetables per day</td>
</tr>
<tr>
<td>Maintain the body mass index in normal range.</td>
<td>Avoid excess weight gain after 18 years.</td>
<td>BMI of 20.0 to 24.0 Kg/M²</td>
</tr>
<tr>
<td>Increase physical activity of all kinds throughout life.</td>
<td>Moderate physical activity for 30 min for 5 days a week for adults and 60 min for 5 days of the week for adolescents.</td>
<td>Undertake physical activities to burn 3500 calories per week.</td>
</tr>
<tr>
<td>Avoid alcohol</td>
<td>Alcohol increases the risk of several cancers</td>
<td>No specific recommendation</td>
</tr>
<tr>
<td>Don’t replace the dietary modifications with food supplements.</td>
<td>Randomized trials using supplements have failed to reduce cancer mortality.</td>
<td>Dietary supplements are costly and won’t help.</td>
</tr>
</tbody>
</table>

* Body Mass Index

Because of the trials and tribulations of modern day living, people have been tempted to use dietary supplements as an easier means to meet the dietary recommendations. More than a dozen large RCT using nutritional supplements have been undertaken in North America, Europe and China. They evaluated the role of supplemental fiber or micronutrients singly or in combination. Majority of these RCT failed to reduce the cancer rates. On the contrary some increased mortality was noted in smokers who took beta carotene. Few promising preventive strategies that emerge from these trials include alpha-tocopherol and selenium for prostate cancer, the combination of beta-carotene plus alpha-tocopherol plus selenium for stomach cancer, retinol plus zinc for gastric non-cardia cancer. Overall, preventive experts agree that dietary supplements are unhelpful in reducing the cancer risk, as they do not provide a wide range of bioactive components present in fruits and vegetables. Because of these reasons, the American Cancer Society proposes a broad goal-centered diet for prevention of cancer. In the absence of good interventional trials from South Asia, similar recommendations may be followed with some modifications. The recommended upper limit of BMI for Asians is 24.0 Kg/M² due to higher body fat content in South Asians.

**Dietary Patterns Of Individuals And Populations**

Unlike stopping tobacco that saves money, following the nutritional guidelines will increase the household expenditure. Several interventions are needed to change the dietary habits of populations. This includes governmental policy changes and efforts at national, community, household and individual levels. A well-planned programme sustained for decades can change the dietary practices of communities. For example, with widespread availability of affordable refrigeration at home, community markets and during transport, the incidence of stomach cancer has dropped in many developed countries. This is probably attributed to reduced use of salt as a preservative. This type of change is heavily dependent on the social and economic reforms and progress-taking place in the developing countries. Food is a major ingredient of cultural identity in South Asia. All interventions or policy changes need to consider the pleasures associated with food (e.g. celebration, satisfaction of appetite, etc.) and its role in shaping the
daily lives, rituals and routines of a community.19

Dietary prevention of cancer requires the improvement of diet of both undernourished and overnourished people both of who are at increased risk for developing cancer.6 Preventing obesity while eliminating the macro and micronutritional deficiencies presents a formidable challenge to South Asia. Successful dietary interventions should be pragmatic and must reach the population at risk. We can’t take for granted that the access and availability of foods is adequate, while raising the awareness about preventive diets. Until recently, obesity was not considered an important public health problem by the government and policy makers. South Asia’s nutrition policies have continued to focus on undernutrition, because of which research and expertise in dealing with problems of weight gain and obesity is restricted to few interested individuals.

Preventing Obesity And Related Diseases

Numerous interventions have looked at individual dietary behavior as their primary outcome. Most have had a modest effect on life style.28, 41 Interventions are generally more successful at changing dietary behavior in populations at risk of or with disease than in healthy populations. Most intervention studies have short-term results, which indicate that effective change is possible, but the effects on long-term behavior are not always or not yet clear. Chronic energy deficiency, maternal and child malnutrition and micronutrient deficiencies are rampant in South Asia for centuries. Governmental and non-governmental programmes have aimed at reducing malnutrition by increasing the intake of food and supplements. Dietary intervention for obesity control is quite the opposite and a lot more difficult. Unlike interventions for malnutrition, which may be achieved by food subsidy and similar programmes, long-term sustained maintenance of the dietary intervention is necessary to bring about a reduction in body fat. Dietary intervention programs do not address this long-term maintenance component and governmental policies tend to change with time. Allocation of funds and resources in a situation where half the population suffers from under nutrition and another 5% to 10% over nutrition is a challenge. Cardiovascular diseases (CVD) are several folds more common in South Asia than cancer. Fortunately, the diet advocated for preventing CVD is low in saturated fat, high in complex carbohydrates, fruit and vegetables, and very similar to the diet recommended for cancer prevention. Universal availability of cable and satellite television and internet with 24 hours access is another reason for the increasing obesity.45 Preventing obesity and related chronic diseases should be a priority of central and state governments, as well as of international, bilateral, and national organizations while efforts to eliminate nutritional deficiencies should continue. Overweight and obesity will keep increasing as the per capita income in South Asia increases. People in South Asia are highly prone for metabolic syndrome and have more body fat than Chinese and Caucasian counterparts.53-45

With the implementation of a web enabled administration, we need to develop information systems to collect data about chronic diseases to define national policies and help support advocacy activities. These efforts must target secondary school children, elderly women, and men and not merely the women of reproductive age and young children. The role of voluntary calorie restriction through religious fasting (a common practice in South Asia) has not been studied and is worthy of future research.

Information on nutrition and healthy lifestyles should be increased in the school curriculum, and physical activity should be promoted in schools, colleges and among laity. For example, the “Trim and Fit Scheme”- a comprehensive 10-year programme that began in 1992 in Singapore featured teacher education and training, assessment of students, a program to reduce sugar in children’s beverages, and more physical activity during school hours.46 A recent review of this programme showed a marked improvement in fitness and some evidence of reduction in obesity. Similar efforts will be useful, albeit in the schools with resources.
(where childhood obesity is a major health problem). Knowledge, beliefs and attitudes of Asians for cancer prevention are suboptimal. An educational program akin to the family planning and AIDS control programme need to be launched for cancer prevention in South Asia. City and suburban planning must ensure facilities to encourage a physically active living environment to reduce television watching and other sedentary behavior. Measures like increased physical activities, sports, protection of open spaces and parks for recreation and pedestrian-friendly streets need to be considered.

Agricultural research should evaluate the energy, fat and micronutrient composition of their food supply. Vegetarian diets in South Asia are rich in protective phyto-chemicals, and these can be increased through agricultural research. In the developed countries, consumers have choice of foods with various nutritious and caloric values that are displayed by food labels. Sugar free foods low fat milk and meat are widely available at affordable costs. In South Asia, the health foods are scarce and more expensive. Agriculture and food industry's role in developing healthy food products and in promoting public health nutrition should be recognized and encouraged. Effective public education as commercial advertisements and campaigns in promoting healthy diets and lifestyles could help. Nutrition labeling should go beyond mere vegetarian and non-vegetarian labels. Nutritional value labels should be mandated by law and enforced by food inspectors for all prepared or processed foods to help consumers select food. The film and entertainment industry in South Asia or involved in major advertising campaigns by the snack food and beverage industry and their support must be sought for public education campaigns.

Current dietary recommendations are directed towards whole populations, rather than ‘at-risk’ groups. The communities in South Asia vary widely in their economic, cultural, linguistic and religious background and practices. The dietary and food habits are reinforced by these factors and the local availability of the foods that vary from season to season. Different strategies are needed to target these diverse population groups or individuals. Theoretically, there are five important levels for health care behavior. These are intrapersonal (individual), interpersonal, institutional or organizational, community and public policy. Population interventions need to take into account individual psychological determinants and environmental perspectives (e.g., life circumstances) provide an appropriate framework for action.

Community Approach To Dietary Change

Community interventions are targeted on a particular region, village or rural area, and are implemented in different settings like schools, work places, retail outlets or whole sale markets and places of worship. This involves collaboration and partnership between the private, public and voluntary sectors in the community. These national initiatives facilitate individual access to healthy, acceptable food at affordable prices. Evidence for effective dietary change from comprehensive, community-based studies has been sparse, and the results community-based programmes in developed countries have been mixed. It is difficult to conclude that the changes in behavior and health outcomes were due solely to the effect of an intervention program. Secular trends (e.g., economic and social changes) take place, which would have facilitated the impact of the intervention, and these cannot be replicated elsewhere. Community-based programmes for simpler problems like anemia has not been successful in all parts of South Asia. For example in India, several populous north Indians states have high prevalence of anemia along with dismal human development indices. Further work is needed in the design and evaluation of the community projects.

What Can Be Done In South Asia

In the absence of studies in South Asia, any evidence-based recommendation is borrowed. Readers must be cautious of extrapolating Western studies to South Asia. This is fallacy is typified in the finding that while vegetables and fruits were not
protective against breast cancer in North America and Europe, and lifelong vegetarian was found to reduce the risk among South Asian immigrants. The preventive approaches described in this chapter are broad based and cover common causes of death including cardiovascular disease, strokes, diabetes and cancer. The collective benefits are important in South Asia, because only 5-10% of all deaths are from cancer, while three out of four deaths are due to cardiovascular disease. Based on the western experience, interventions at three levels are suggested. The intensity of intervention will vary depending on the socio-political-cultural considerations. The first is national planning, policy and legislation. The second level is community programmes in schools, health services and local authorities that involve private, public and voluntary bodies and address issues as wide-ranging as health promotion and local pricing. Third level interventions are for changing the behavior of individuals. Aims of the interventions are as follows.

1. Control calorie intake and obesity

Overweight individuals carry the highest risk for becoming obese in later years. There are two phases in life when an individual is at the greatest risk of becoming overweight. During weaning from breast milk (when caloric dense processed foods are given to the child) and in the fourth decade (when the basal metabolism and physical activity starts to reduce). Promotion of breast feeding and proper weaning is important, particularly among urban population of South Asia. In a region where malnutrition and famines flourished for centuries, there is a popular notion among laity that a “chubby child is a healthy child”. Calorie dense processed foods have replaced the traditional whole grain and cereal based weaning foods in this region due to convenience and effective marketing. Overweight children are likely to become obese in later life. The Indian academy of pediatrics has published pragmatic guidelines that can be followed in South Asia. Subsidizing food at workplace is another reason for weight gain among the middle aged South Asia. In South Asia the food is not served in portions or courses and eaten in social groups (family or friends). This creates an opportunity for small increase of calories at each meal and cumulative excess over decades.

In South Asia like world over, a large “Weight loss” industry exists and alternate medicine like Ayurveda, Yoga, Unani, Homeopathy, Naturopathy, Tibetan Medicine, etc. are a part of this industry. Review of randomized controlled trials reveal strong and consistent evidence that weight loss amounting to 8% of initial body weight can be obtained within 3-12 months on a low-calorie diet. Considerable effort has to be made to increase the public awareness and interests on health issues associated with obesity, its causes and management. Despite the wide media coverage, obesity rates are rising throughout Europe indicating failure of the obesity prevention programmes. Schools are the good setting for such an intervention, but there is little evidence (except Singapore) for the efficacy of school approaches. Overall, the review of evidence concludes that there is a little high quality of data on the effectiveness of obesity management programmes. There is a need for well-designed studies that examine a range of interventions. Obesity prevention studies must be started in South Asia that includes alternative system of Medicine and this should be funded by governmental and non-governmental agencies.

2. Maintain the high fruit and vegetable intake

The National Institutes of Health and the National Cancer Institute (USA) reported that behavioral and food service interventions in elementary schools had a positive effect on the pupils vegetable and fruit consumption. An analysis by the Agency for Healthcare Research and Quality suggests that the interventions are more successful in increasing fruit intake among children and vegetable intake among adults. Interventions in populations at higher risk for disease have significantly higher increase in fruit and vegetable intakes than studies in the general population. Studies carried out in schools, work places and primary care settings showed a reduction in blood cholesterol of
2-10% while community-based interventions showed no effect on blood cholesterol. The greatest reductions in fat intake (10-16% of energy intake) and blood cholesterol (7-10%) were in highly motivated individuals in intensive programmes.

The consumption of vegetables in South Asia is relatively higher than in other parts of the world. Three out of four persons in South Asia directly or indirectly depend on agriculture for livelihood. The same may not be true for fruits, which are relatively more expensive (except banana) and eaten seasonally in smaller amounts. Cooking the vegetables before eating, a common practice in South Asia could lower the protective value of vegetables by destroying fiber, micronutrients and antioxidants and need to be researched. Recommendations for increasing the fruits and vegetables in South Asia without strengthening all links of the supply chain from agricultural production transport, storage, and purchase by consumers will be useless. The household expenditure on food is an important determinant of dietary habits and healthy foods are relatively more expensive. According to the World Bank, 1128 million (84.8%) of people in South Asia live with less than two US dollar a day in 1999. Guidelines are unlikely to affect the eating habits of these people until the per capita income increases.

3. Increase physical activity
To handle the challenges of obesity and overweight, the planners and developers must provide for an active living environment in cities, suburbs and villages. Simple measures like increased physical education in schools, protection of open spaces and parks for recreation and pedestrian-friendly streets need to be considered. Unfortunately, the development activities in almost all cities, towns and even villages in India continue to ignore this. In the absence of proper space, activities like walking, cycling, jogging, swimming and playing will remain a mere theoretical process. Present urban and rural planning and development processes are contradict these recommendations and will contribute greatly in increasing burden of non-communicable diseases in South Asia in the coming decades.

<table>
<thead>
<tr>
<th>Do’s and Don’t</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>DO</strong></td>
</tr>
<tr>
<td>Regular physical activities 5 or more times a week.</td>
</tr>
<tr>
<td>Eat meals rich in whole grain cereals, pulses, vegetables, and fruits.</td>
</tr>
<tr>
<td>Develop the concept of portion size. Avoid large portion size.</td>
</tr>
<tr>
<td>Reduce the intake of saturated fats, cut down fried snacks and foods,</td>
</tr>
<tr>
<td>Record your weight at least once a year.</td>
</tr>
<tr>
<td>Start in early childhood and continue life long.</td>
</tr>
<tr>
<td><strong>DON’T</strong></td>
</tr>
<tr>
<td>Eat calorie dense snacks and beverages between meals.</td>
</tr>
<tr>
<td>Eat plenty of sweets and sugar rich snacks, puddings and beverages.</td>
</tr>
<tr>
<td>Eat large portions or unlimited amounts of food with each meal.</td>
</tr>
<tr>
<td>Put on weight after 20 years of age.</td>
</tr>
<tr>
<td>Feel shy to discuss your eating and weight problems.</td>
</tr>
<tr>
<td>Try shortcuts. They don’t help in the long term.</td>
</tr>
</tbody>
</table>
Future Research Needs

What are the best diets for cancer prevention and what are the best means to achieve those diets remains elusive. There is paucity of credible information on dietary and physical activity patterns that are practical and have the potential to reverse the increasing obesity, and reduce the risk of common cancers and other life style related worldwide. Creating such information is a challenging task, and there is considerable diversity of opinion concerning research designs and priorities. Good studies on the preventive role of dietary factors are lacking from South Asia. High quality population based research is urgently needed in this region.

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