REVIEW OF LITERATURE

GLOBAL EMERGENCE OF NON COMMUNICABLE DISEASES

Non Communicable Disease – the Global Epidemic

Non Communicable Diseases (NCDs) are chronic degenerative diseases characterized by long duration, slow progression, multiple risk factors, non-contagious origin, functional impairment and incurability. NCDs such as Heart Disease, Stroke, Cancer, Chronic Respiratory Diseases & Diabetes are, by far, the leading cause of mortality in the world, representing 63% of all deaths. Of the 36 million people who died from chronic disease in 2008, nine million were under 60 and ninety per cent of these premature deaths occurred in low- and middle-income countries (WHO factsheet on Chronic Diseases 2012). It has aptly been termed as the "Neglected Epidemic" by the World Health Organization. Figure 2.1 shows the distribution of mortality by broad cause group where it is apparent that across genders, NCDs contribute maximally to mortality rate. These numbers are particularly high for lower-middle income countries. The trends remain similar across gender. It is reported that in South-East Asia there are currently 54 million people with diabetes, with 41 million in India alone, and this is expected to increase by 71% by 2025 (World Diabetes Foundation 2009); and obesity, which is associated with hypertension, CVD, diabetes, and some cancers, will affect 52.1 million by 2030.

Also, low & middle income countries such as India are facing a tremendous burden of NCDs which is expected to escalate rapidly in the coming decade. In 2008, more than half (53%) of all deaths in India were because of NCDs. WHO estimates say that in 2008, 32.5% Indians had high B.P., 10% were overweight, 1.9% were obese and 27% suffered from high cholesterol (WHO NCD Country Profile 2011). These numbers represent the lower middle income group in India so it can be hypothesized that if urban population also included in the survey, the numbers would certainly escalate. Figure 2.2 shows the estimated DALYs lost due to all causes and particularly NCDs.

It can be seen from the above data that contrary to popular belief where developing countries are believed to be straining under the pressure of rampant under nutrition, in the present time, overweight & obesity and its related complications have overtaken under nutrition and developing countries such as India are now facing an economically draining dual burden of malnutrition. In the context of India, although we, as a country have yet to overcome the problems of poverty, under nutrition and communicable diseases, we are increasingly facing additional challenges related to the affluence that results from industrialization, urbanization and economic

betterment. Over the last two decades, overweight & obesity and obesity have emerged as public health problems; there have been increases in the prevalence of diabetes and cardiovascular disease (CVD), especially in the urban areas (FAO Rome 2006).

The four main types of non communicable diseases are cardiovascular diseases, cancer, chronic obstructed pulmonary disease and diabetes.

Cardiovascular Diseases

Cardiovascular diseases (CVDs) are a group of disorders of the heart and blood vessels and they include:

- Coronary heart disease – disease of the blood vessels supplying the heart muscle;
- Cerebrovascular disease - disease of the blood vessels supplying the brain;
- Peripheral arterial disease – disease of blood vessels supplying the arms & legs;
- Rheumatic heart disease – damage to the heart muscle and heart valves from rheumatic fever, caused by streptococcal bacteria;
- Congenital heart disease - malformations of heart structure existing at birth;
- Deep vein thrombosis and pulmonary embolism – blood clots in the leg veins, which can dislodge and move to the heart & lungs (WHO Factsheet on CVDs 2013).

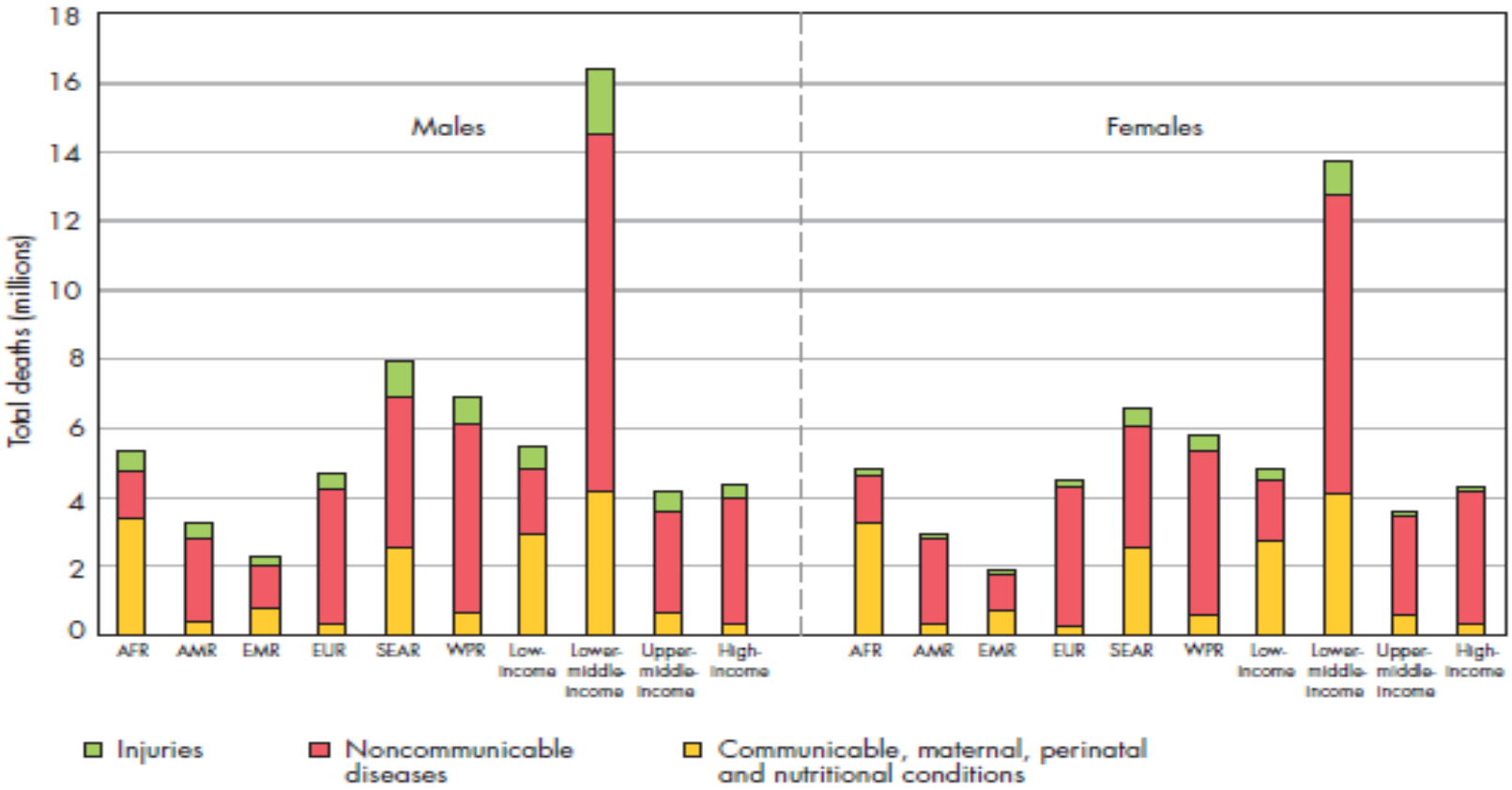
CVDs are the leading cause of death globally: more people die annually from CVDs than from any other cause. An estimated 17.3 million people died from CVDs in 2008, representing 30% of all global deaths. Of these deaths, an estimated 7.3 million were due to coronary heart disease and 6.2 million were due to stroke. The number of people, who die from CVDs, mainly from heart disease and stroke, will increase to reach 23.3. million by 2030. CVDs are projected to remain the single leading cause of death (WHO Global Atlas on CVD Prevention & Control 2011, WHO Global Status Report on NCDs 2011, Mathers and Loncar 2006). About 9.4 million deaths each year, or 16.5% of all deaths can be attributed to high blood pressure (Lim et al 2012) This includes 51% of deaths due to strokes and 45% of deaths due to coronary heart disease (WHO Global Burden of Diseases update 2004).

Cardiovascular diseases - a development issue in low & middle income countries

Low- and middle-income countries are disproportionally affected: over 80% of CVD deaths take place in low and middle income countries and occur almost equally in men and women (WHO Global Status Report on NCDs 2011). In India, 24% of all deaths in 2008 were due to CVD (WHO NCD Country Profile 2011). People in low- and middle-income countries are more exposed to risk factors such as tobacco, leading to CVDs and other non communicable diseases. At the same time

they often do not have the benefit of prevention programmes compared to people in high-income countries. People in low and middle income countries who suffer from CVDs and other non communicable diseases have less access to effective and equitable health care services which respond to their needs (including early detection services). As a result, many people in low and middle income countries die younger from CVDs and other non communicable diseases, often in their most productive years.

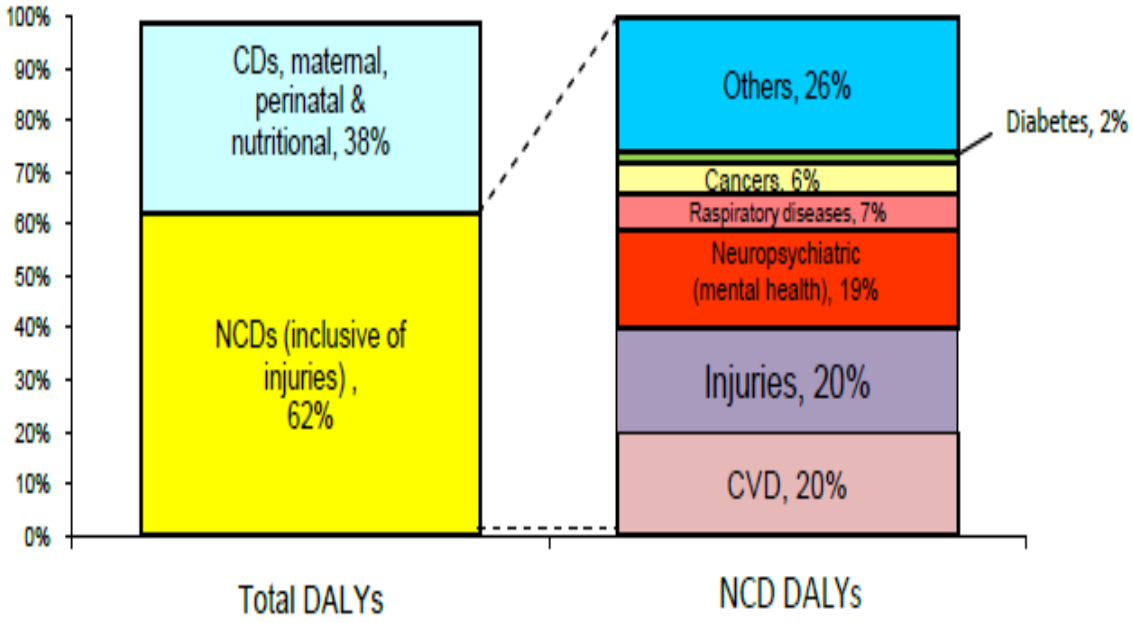
Figure 2.1 Total Deaths by Broad Cause Group, by WHO Region, World Bank Income Group and by Sex, 2008



(Note: AFR=African Region, AMR=Region of the Americas, EMR= Eastern Mediterranean Region, EUR= European Region, SEAR=South-East Asia Region, WPR=Western Pacific Region).

Source: WHO Global Status Report on NCDs 2010

Figure 2.2 Pattern of overall DALYs (age standardized) & NCD related DALYs in India, 2004



Source: World Health Organization, Global Burden of Diseases – Health Statistics and Health Information Systems 2013

http://www.who.int/healthinfo/global_burden_disease/estimates_country/en/index.html

The poorest people in low- and middle-income countries are affected most. At the household level, sufficient evidence is emerging to prove that CVDs and other non communicable diseases contribute to poverty due to catastrophic health spending and high out of pocket expenditures. At macro-economic level, CVDs place a heavy burden on the economies of low- and middle-income countries. Non communicable disease including cardiovascular disease and diabetes are estimated to reduce GDP by up to 6.77% in low- and middle-income countries experiencing rapid economic growth, as many people die prematurely (WHO Global Status Report on NCDs 2011). Thus, the widespread presence of CVD and related disorders, in addition to elevating morbidity and mortality rates, also adversely affect the growth and productivity of the society and country as a whole, inadvertently hampering the economic and social prosperity of a nation and therefore its people.

Cancer

Cancer is the uncontrolled growth and spread of cells. It can affect almost any part of the body. The growths often invade the surrounding tissue and can metastasize to distant sites. Many cancers can be prevented by avoiding exposure to common risk factors, such as tobacco smoke. In addition to this, a significant proportion of cancers can be cured, by surgery, radiotherapy or chemotherapy, especially if they are detected early (WHO Factsheet on Cancer 2013).

Cancer starts when cells in a part of the body start to grow out of control. Cancer cell growth is different from normal cell growth. Instead of dying, cancer cells continue to grow and form new, abnormal cells. Cancer cells can also invade (grow into) other tissues, something that normal cells cannot do. Growing out of control and invading other tissues are what makes a cell a cancer cell. Cells become cancer cells because of DNA (deoxyribonucleic acid) damage. DNA is in every cell and it directs all the cell's actions. In a normal cell, when DNA gets damaged the cell either repairs the damage or the cell dies. In cancer cells, the damaged DNA is not repaired, and the cell doesn't die like it should. Instead, the cell goes on making new cells that the body doesn't need. These new cells all have the same abnormal DNA as the first cell does.

Cancer is one of the leading causes of death worldwide and accounted for 7.6 million deaths (around 13% of all deaths) in 2008 (WHO IARC 2010). Deaths from cancer worldwide are projected to continue to rise to over 13.1 million by 2030. About 70% of all cancer deaths occurred in low and middle income countries and in the Indian context, 6% of all deaths that occurred in 2008 were attributable to some form of cancer. Hence, developing countries are clearly facing the brunt of non communicable diseases which contributes to the morbidity and mortality levels in the population. About 30% of cancer deaths are due to the five leading behavioural & dietary risks:

high BMI, low fruit & vegetable intake, lack of physical activity, tobacco use, alcohol use. Tobacco use is the most important risk factor for cancer causing 22% of global cancer deaths and 71% of global lung cancer deaths. Cancer causing viral infections such as HBV/HCV and HPV are responsible for up to 20% of cancer deaths in low- and middle-income countries (WHO Factsheet on Cancer 2013).

Chronic Obstructive Pulmonary Diseases

Chronic obstructive pulmonary disease (COPD) is a lung ailment that is characterized by a persistent blockage of airflow from the lungs. It is an under-diagnosed and life-threatening lung disease that interferes with normal breathing and is not fully reversible. Hundreds of millions of people suffer every day from chronic respiratory diseases. According to the latest WHO estimates, in 2004, 64 million people had COPD and in 2005 more than 3 million people died of COPD which is equal to 5% of all deaths globally that year. The primary cause of COPD is tobacco smoke i.e. through tobacco use or second-hand smoke (WHO Factsheet on COPD 2013).

Almost 90% of COPD deaths occur in low & middle income countries, where effective strategies for prevention and control are not always implemented or accessible. Almost 11% of the total deaths in India in 2008 were attributable to COPD or related respiratory illnesses (WHO NCD Country Profile 2011). This is a considerably high percentage of mortality and warrants appropriate prevention and management strategies for containing the spread of such chronic respiratory illnesses.

The primary cause of COPD is tobacco smoke (through tobacco use or second-hand smoke). The disease now affects men and women almost equally, due in part to increased tobacco use among women in high-income countries. COPD is not curable, but treatment can slow the progress of the disease. Total deaths from COPD are projected to increase by more than 30% in the next 10 years without interventions to cut risks, particularly exposure to tobacco smoke (WHO Factsheet on COPD 2013).

Diabetes

As defined by the American Diabetes Association, diabetes is a group of diseases characterized by high blood glucose levels that result from defects in body's ability to produce and/or use insulin. Insulin is a hormone needed to convert sugar, starches & other food into energy needed for daily life. There are 3 major types of diabetes:

Type 1 diabetes Results from the body's failure to produce insulin, the hormone that "unlocks" cells of the body, allowing glucose to enter & fuel them. It is estimated that 5-10% of Americans who are diagnosed with diabetes have type 1.

Type 2 diabetes Results from insulin resistance (a condition in which the body fails to properly use insulin), combined with relative insulin deficiency.

Gestational diabetes is a condition in which women without previously diagnosed diabetes exhibit high blood glucose levels during pregnancy (especially during 3rd trimester). Gestational diabetes affects about 4% of all pregnant women.

Global figures say that 347 million people worldwide have diabetes (Danaei et al 2011). In 2004, an estimated 3.4 million people died from consequences of high fasting blood sugar. WHO projects that diabetes will be the 7th leading cause of death in 2030 (WHO Global Status Report on NCDs 2011). Identification of IGT (Impaired Glucose Tolerance) and Diabetes is done based on the criteria developed by the American Diabetes Association in 2011 (Table 2.1)

Table 2.1 Classification for Identification of Impaired Glucose Tolerance and Diabetes

	Normal (mg/dl)	Pre diabetes (mg/dl)	Diabetes (mg/dl)
FBS	70-100	100-125	≥126
PP2BS	<140	140-199	≥200

Diabetes – a public health problem in Low & Middle Income countries

It is noteworthy that more than 80% of diabetes deaths occur in low & middle income countries (Mathers and Loncar 2006). National data shows that 2% of all deaths in India in 2008 occurred due to diabetes. India ranked first in the world in terms of number of people with diabetes with 31.7 million Indians being diabetic in 2000. This number is projected to rise to 79.4 million by 2030. That is why India is dubbed the "Diabetes Capital of the World". According to WHO, the mean fasting blood glucose of Indians has been steadily on the rise since 1980 till 2008 and further rise is predicted (Figure 2.3).

Diabetes – associated co morbidities

In addition to being a direct cause of mortality, diabetes is also a major factor behind development of other morbidities such as heart disease and stroke. Research shows that 50% of the people with

diabetes die of CVDs, primarily heart diseases and stroke (Morrish et al 2001). Persistent high levels of sugar in the blood are instrumental in damaging other organs of the body including the kidneys, nerves and eyes. Diabetes is among the leading causes of kidney failure (WHO Global Status Report on NCDs 2011) and also makes an individual more susceptible to development of neuropathy. Diabetic retinopathy is an important case of blindness and occurs as a result of long term accumulated damage to the small blood vessels in the retina. One percent of global blindness can be attributed to diabetes (WHO Factsheet on Diabetes 2013).

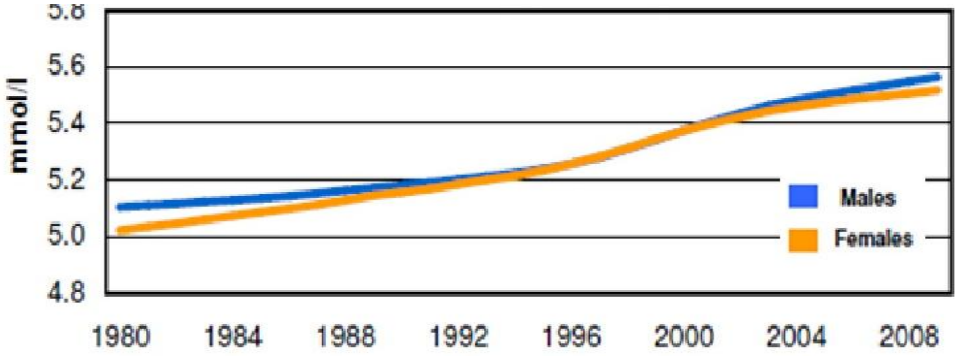
NCDs remains a relatively complex and under-developed discipline, they invariably affect low & middle income countries and households more severely because they have the least financial cushion to withstand the economic consequences of NCDs.

The World Health Report 2010 on Health System financing states that each year, 100 million people are pushed into poverty because they have to pay directly for health services; in some countries, this may represent 5% of the population forced into poverty each year. Thus, there is a vicious cycle of poverty and NCDs which the people of developing nations are facing (Figure 2.4).

Economic Impact of NCDs

The global epidemic of NCDs can be seen in the form of widespread prevalence of CVD, cancer, COPD as well as diabetes and associated co-morbidities in the affluent as well as poor sections of developed and developing countries. NCDs are as much a disease of prosperity as of poverty. Conversely, the economic impact of NCDs cannot be ignored. At the household level, unhealthy behaviours, poor physical status, and the high cost of NCD-related health care, lead to loss of household income. People often become trapped in a dangerous cycle where poverty and NCDs continually reinforce one another.

Figure 2.3 Trend in mean fasting blood glucose of Indians from 1980-2008 (WHO 2010)



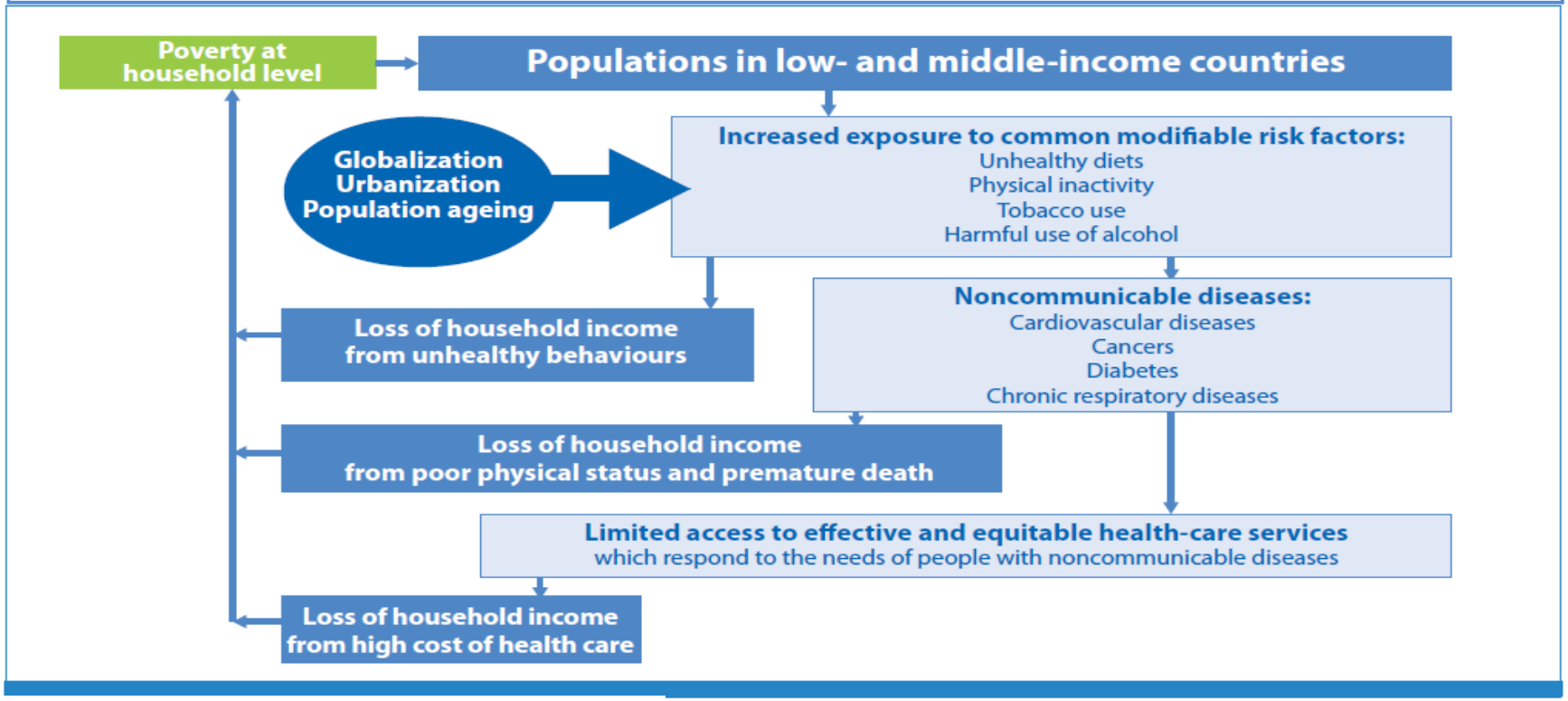
Source: WHO NCD Country Profile for India 2011

Non Communicable Diseases (NCDs) – Underlying Causes

The main culprit behind the spurt in NCDs across the map are urbanization, globalization and mechanization bringing about a nutrition and lifestyle transition which in turn has acted as a precursor to development of widespread chronic degenerative diseases. Like other developing countries, India too has undergone rapid urbanization over the past fifty years. As per the census data of India, (Census of India 2011), in the fifty years from 1951 to 2001, India's urban population grew almost fivefold from around 62 million in 1951 to 286 million in 2001. Further rise was seen in the same during the last decade, with the figure reaching 377 million in 2011 (Figure 2.5). Economic development is normally accompanied by improvements in a country's food supply and the gradual elimination of dietary deficiencies, thus improving the overall nutritional status of the country's population. Increasing urbanization will also have consequences for the dietary patterns and lifestyles of individuals, not all of which are positive. While standards of living have improved, food availability has expanded and become more diversified, and access to services has increased, there have also been significant negative consequences in terms of inappropriate dietary patterns, decreased physical activities and increased tobacco use, and a corresponding increase in diet-related chronic diseases.

Changes in diets, patterns of work and leisure - often referred to as the "nutrition transition" - are already contributing to the causal factors underlying non communicable diseases even in the poorest countries. The Barker hypothesis (Barker 1995), also referred to as "the thrifty phenotype hypothesis" states that poor foetal and infant growth, as a result of early malnutrition, "programmes" the development of NCD risk factors e.g. hypertension and impaired glucose tolerance. The thrifty genotype –theory (Neel 1962) is an additional way of explaining the emerging rates of non communicable diseases. It was first introduced by an American geneticist and thereafter often applied to explain the high prevalence of diabetes and other chronic conditions in populations. The thrifty genotype is described to have a high efficiency in utilizing food allowing survival in times of food shortage. In the dietary transition, with change from food scarcity to food sufficiency, the thrifty genotype no longer confers a survival advantage but enhances the susceptibility to obesity and diabetes. The fact that these changes of urbanization and globalization are accelerating especially in the low-income and middle-income countries, makes the problem of rising NCD epidemic all the more worrisome. The world's health is undergoing an unprecedented transition on several fronts: epidemiological, nutritional and demographic. The result, felt keenly at country level and substantiated unequivocally by scientific evidence is a broad shift in the disease burden.

Figure 2.4 Interrelationship of Poverty and NCDs (Global status report on non communicable diseases 2010)



Source: WHO Global Status Report on NCDs 2010

Nutrition Transition

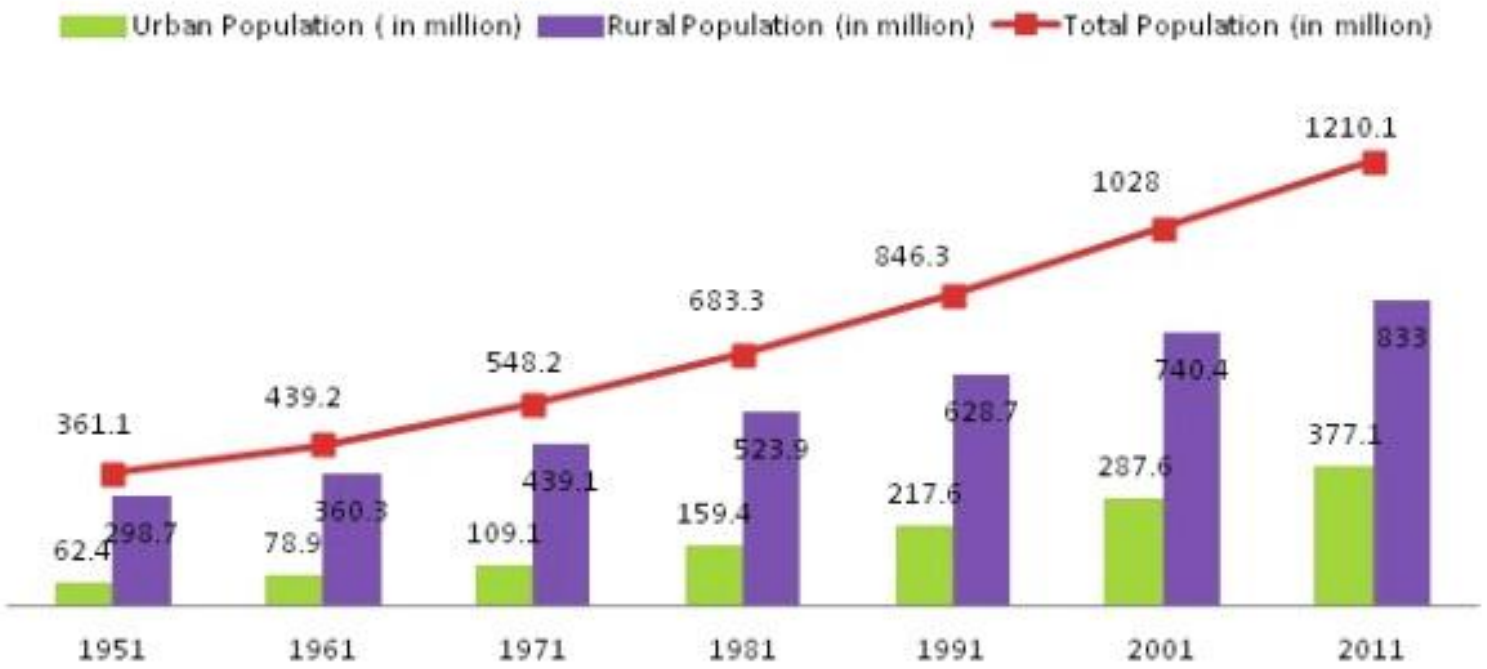
Increased urbanization has seen the rise of middle class and consequent changes in the lifestyle, diet and behaviour patterns of majority of the population. Economic growth, apart from bringing about other changes, has brought a change in the traditional family setup where, now women are also an active part of the workforce with a resulting impact on the family diet. This factor coupled with rising affluence enables and necessitates dependence on commercially available foods which offer convenience at the cost of nutrition. Diets have evolved over time, being influenced by many factors and complex interactions. Income, prices, individual preferences and beliefs, cultural traditions, as well as geographical, environmental, social and economic factors all interact in a complex manner to shape dietary consumption patterns.

The trend of nutrition transition in developing countries has been well explained by Popkin in 1994 (Figure 2.6).

Over the last two decades, food supplies have grown faster than the population in developing countries, resulting in rising food availability per person. Dietary energy supplies have also risen faster than average dietary energy requirements, resulting in higher levels of energy adequacy in most developing regions, bar Western Asia (Figure 2.7 & 2.8). The FAO report 2013 says that average dietary energy supply adequacy – dietary energy supply as a percentage of the average dietary energy requirement – has risen by almost 10 percent over the last two decades in developing regions as a whole. This improvement is consistent with the reduction in undernourishment from about 24 percent to 14 percent of total population between 1990–92 and 2011–13 (FAO, Rome 2013).

The quality of diets has also improved. This is reflected, for instance, in the decline in the share of dietary energy derived from cereals and roots and tubers in most regions since 1990–92 (Figure 9). Overall, the diets of developing regions have seen a number of improvements over the last two decades. For example, per capita availability of fruits and vegetables, livestock products and vegetable oils increased by 90, 70 and 32 percent, respectively, since 1990–92 (FAO, Rome 2013).

Figure 2.5 Growth of Urban Population since 1951-2011 in India



Source: Census of India 2011

The rise in available food energy has been accompanied by changes in the composition of diets. Figure 9 illustrates the changes at regional level in terms of the shares of major food groups in total dietary energy availability. Worldwide, the shares of cereals, roots and tubers declined significantly, whereas shares of fruits, vegetables and animal products, including fish, increased. Regionally, there are contrasts between regions with rapid economic growth and regions that have grown less rapidly. Per capita dietary energy from cereals, roots and tubers declined in Asia, despite an increase in total per capita dietary energy availability. At the same time, dietary energy from animal-source products and fruits and vegetables increased noticeably.

Shifts in Physical Activity Pattern

The paradigm shifts in dietary pattern are accompanied by lifestyle changes that play a pivotal role in reduced physical activity at work and during leisure time. Physical inactivity is the fourth leading risk factor for global mortality. Increasing levels of physical inactivity are seen worldwide, in high-income countries as well as low- and middle-income countries (WHO Global Strategy on Diet, Physical Activity & Health 2013). Globally, around 31% of adults aged 15 and over were insufficiently active in 2008 (men 28% and women 34%). National data from India (WHO NCD Country Profile 2011) reports that nearly 14% of all Indian adults were physically inactive in 2008. This number was higher for females (17.3%) compared to males (10.8%). Studies conducted in Baroda by Mehan et al in 2007, 2008 and 2011 report prevalence of physical inactivity among industrial population ranging from 19% to 38%. Another study conducted by Mehan et al in 2006 on free-living urban adult population of Baroda city reported that nearly 75% of the study population was physically inactive.

Approximately 3.2 million deaths each year are attributable to insufficient physical activity (WHO Global Strategy on Diet, Physical Activity & Health 2011). A multi centric study conducted across 76 countries reports that less developed countries showed the lowest prevalence of physical inactivity (18.7%), while physical inactivity was more prevalent among the most developed countries (27.8%). One out of five adults around the world is physically inactive. Physical inactivity was more prevalent among wealthier and urban countries, and among women and elderly individuals. In case of India, the prevalence of population attaining insufficient physical activity is relatively on lower side as compared to global scenario but is consistently on the rise. The current levels of physical inactivity are partly due to insufficient participation in physical activity during leisure time and an increase in sedentary behaviour during occupational and domestic activities. Likewise, an increase in the use of "passive" modes of transport has also been associated with declining physical activity levels (WHO Global Health Observatory 2013).

Figure 2.6 Nutrition Transition (Popkin's concept)

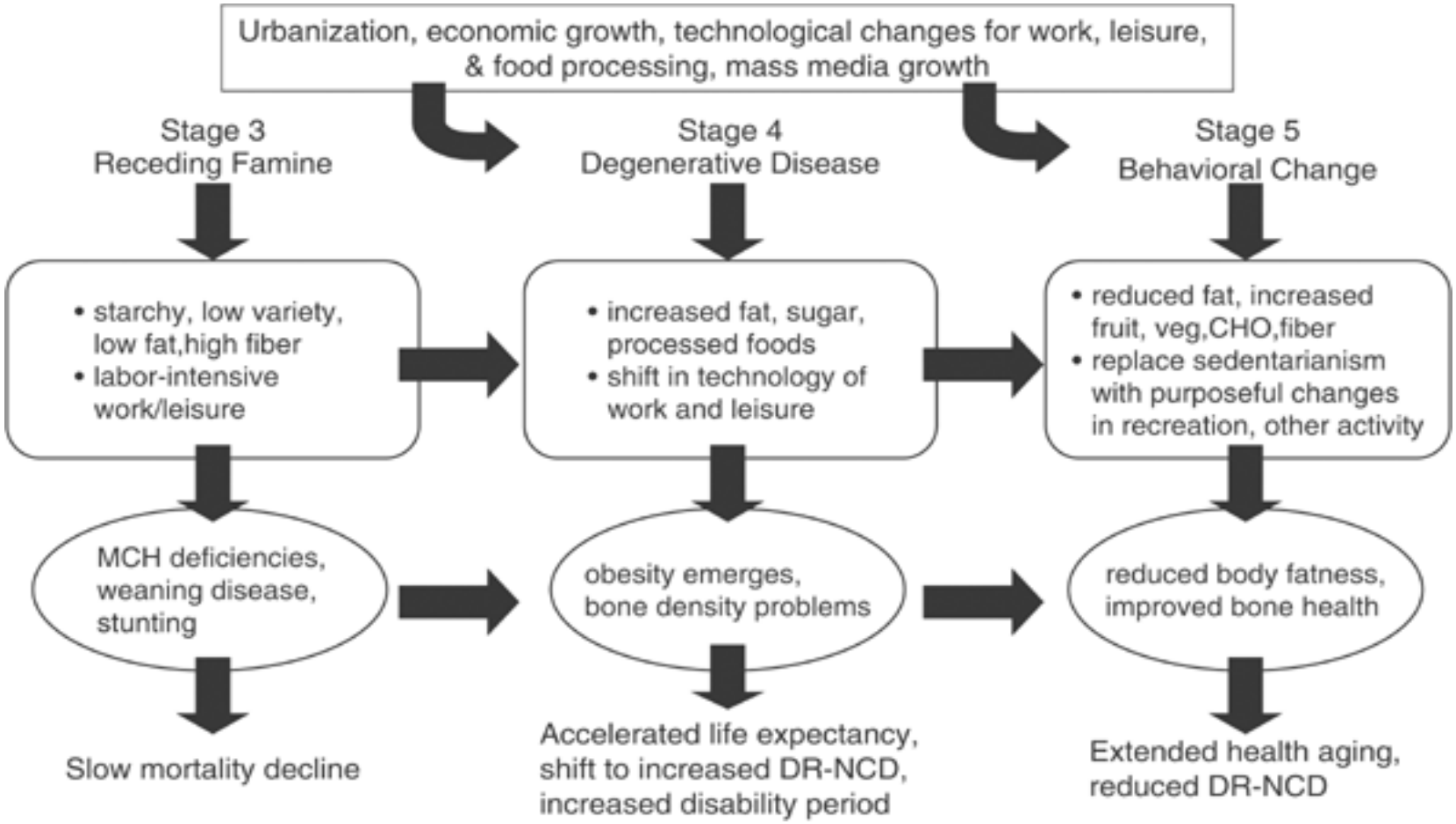
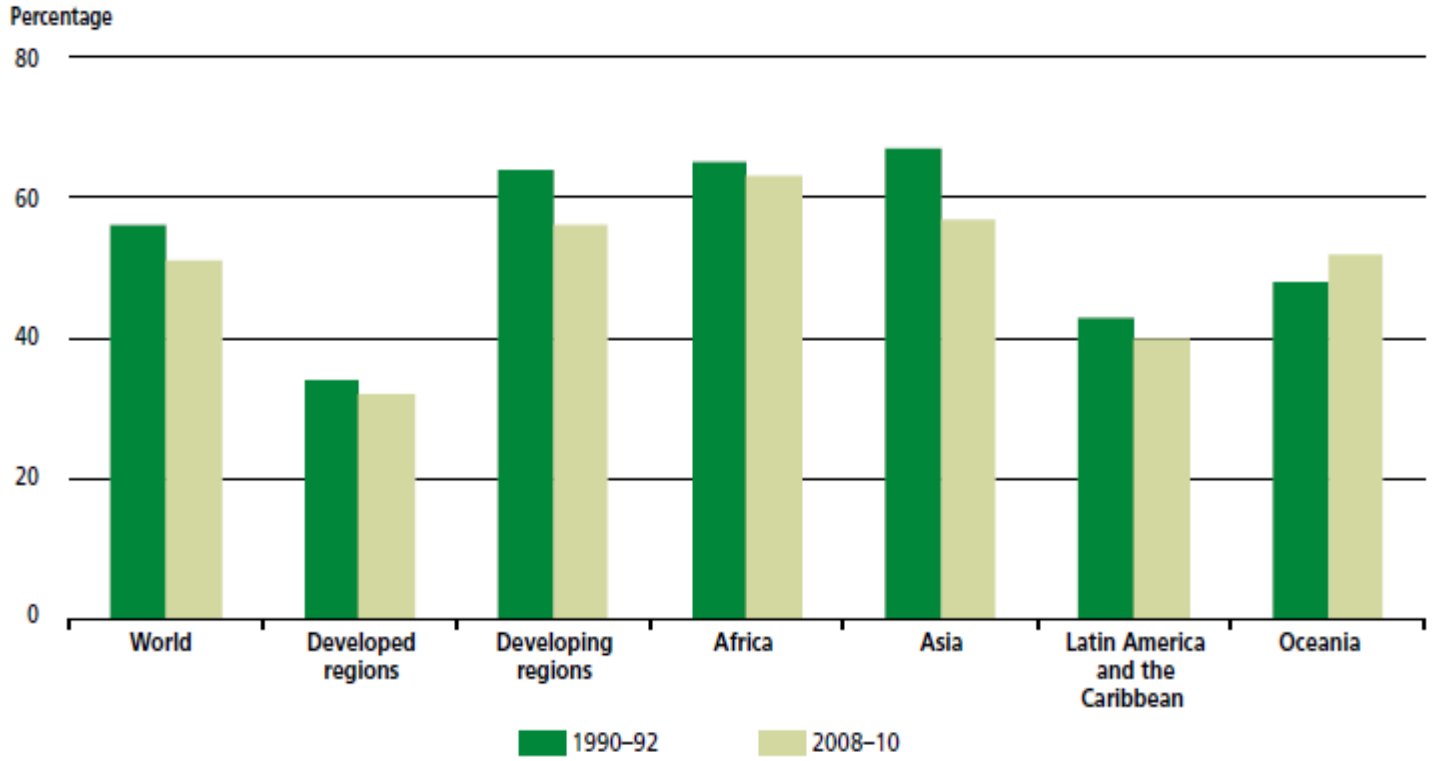


Figure 2.7 Average Dietary Energy Supply Adequacy in the Developing Regions, 1990-92 to 2011-13

	1990–92	2000–02	2005–07	2008–10	2011–13*
			(Percentage)		
World	**114**	**117**	**119**	**120**	**122**
Developed regions	**131**	**134**	**136**	**135**	**135**
Developing regions	**108**	**112**	**114**	**117**	**118**
Least-developed countries	**97**	**97**	**101**	**103**	**105**
Landlocked developing countries	**99**	**98**	**104**	**107**	**110**
Small island developing states	**103**	**109**	**111**	**113**	**114**
Low-income economies	**97**	**96**	**101**	**102**	**105**
Lower-middle-income economies	**107**	**107**	**110**	**112**	**114**
Low-income food-deficit countries	**104**	**103**	**106**	**108**	**110**
Africa	**108**	**110**	**113**	**115**	**117**
Northern Africa	138	139	139	141	144
Sub-Saharan Africa	100	103	108	109	111
Asia	**107**	**111**	**113**	**116**	**117**
Caucasus and Central Asia		105	118	120	125
Eastern Asia	107	118	119	124	124
South-Eastern Asia	99	106	112	116	121
Southern Asia	106	104	105	106	108
Western Asia	142	135	135	134	134
Latin America and the Caribbean	**117**	**121**	**124**	**125**	**127**
Caribbean	101	109	110	112	114
Latin America	118	122	124	126	128
Oceania	**113**	**112**	**115**	**116**	**116**

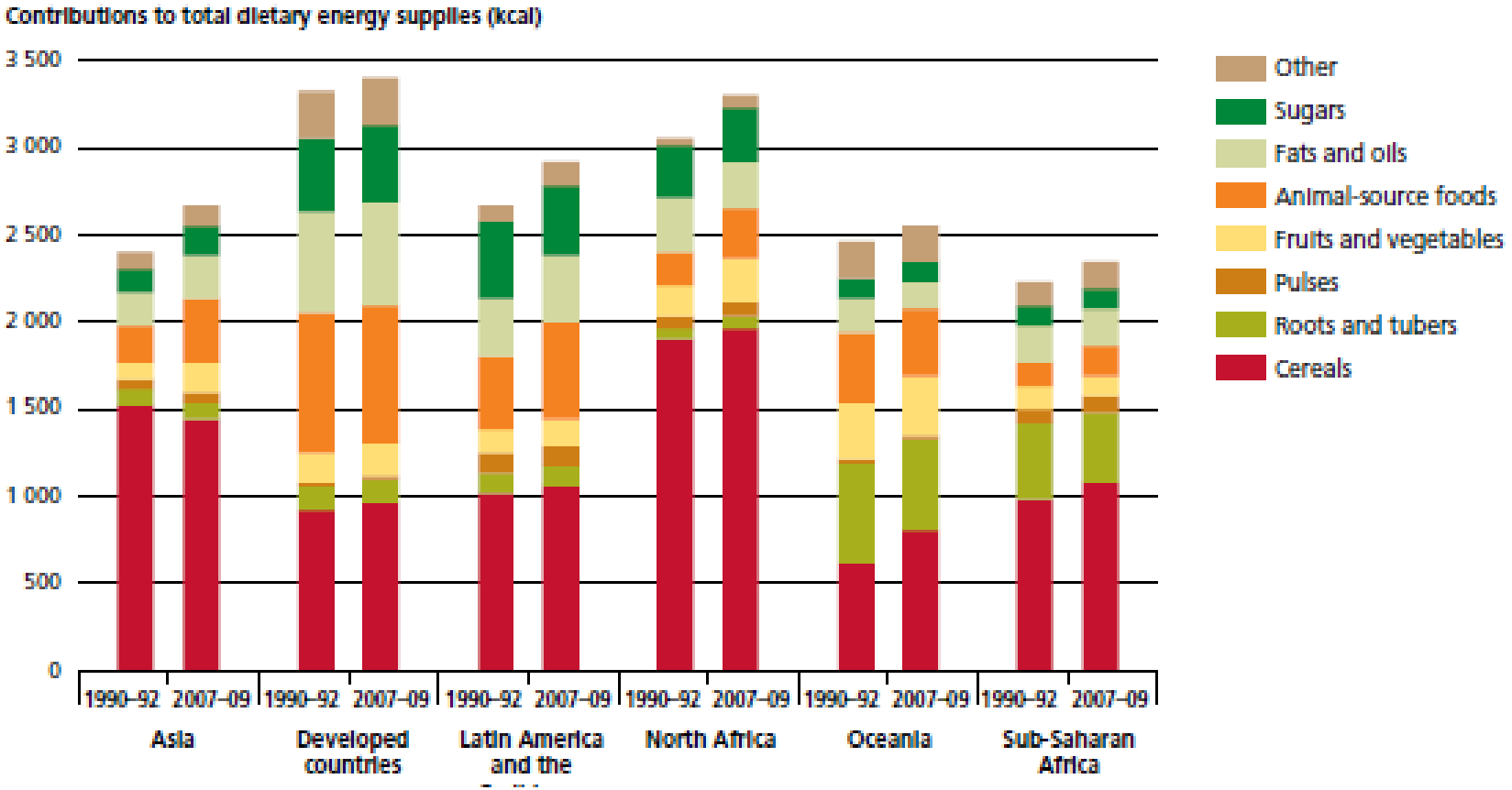
Source: Food and Agricultural Organization of the United Nations, Rome 2013

Figure 2.8 Rise in Dietary Energy Supplies (kcal/person/day) in the world (1990-1992 and 2008-2010)



Source: Food and Agricultural Organization of the United Nations, Rome 2013

Figure 2.9 Changes in Dietary Patterns in the world (1990-1992 and 2007-2009)



Source: Food and Agricultural Organization of the United Nations, Rome 2013

COMMONALITY OF RISK FACTORS IN CAUSATION OF NCDS AND THEIR PREVENTION

A risk factor is any attribute, characteristic or exposure of an individual that increases the likelihood of developing a disease or injury. Common, preventable risk factors underlie most NCDs. Most NCDs are strongly associated and causally linked with four particular behaviours: tobacco use, physical inactivity, unhealthy diet and the harmful use of alcohol. These behaviours lead to four key metabolic/physiological changes: raised blood pressure, overweight/obesity, hyperglycaemia and hyperlipidaemia. In terms of attributable deaths, the leading NCD risk factor globally is raised blood pressure (to which 13% of global deaths are attributed), followed by tobacco use (9%), raised blood glucose (6%), physical inactivity (6%), and high BMI (5%) i.e. overweight & obesity (WHO Global Status Report on NCDs 2011).

Tobacco usage

Tobacco use is a major preventable cause of premature death and disease worldwide and is the single greatest preventable cause of death in the world today. According to WHO estimate (Figure 2.10), tobacco is a risk factor for 6 of the 8 leading causes of death worldwide. Its addiction is due to the constituent nicotine which is a highly addictive psychoactive ingredient. Tobacco use and exposure comes in both smokeless and smoking forms. Smokeless tobacco is consumed in un-burnt forms through chewing or sniffing and contains several carcinogenic, or cancer-causing, compounds. Smokeless tobacco has been associated with oral cancer, hypertension, heart disease and other conditions. Smoking tobacco, by far the most commonly used form globally, contains over 4000 chemicals, of which 50 are known to be carcinogenic (WHO Factsheet on Tobacco 2013).

In addition to cigarettes, other forms of tobacco are also consumed, particularly in Asia, Africa and the Middle East and to a lesser extent in Europe and the Americas. Data on these additional forms of smoked tobacco are not readily available, but are nonetheless substantial. In India alone, about 700 billion 'bidis' (a type of filter-less hand-rolled cigarette) are consumed annually.

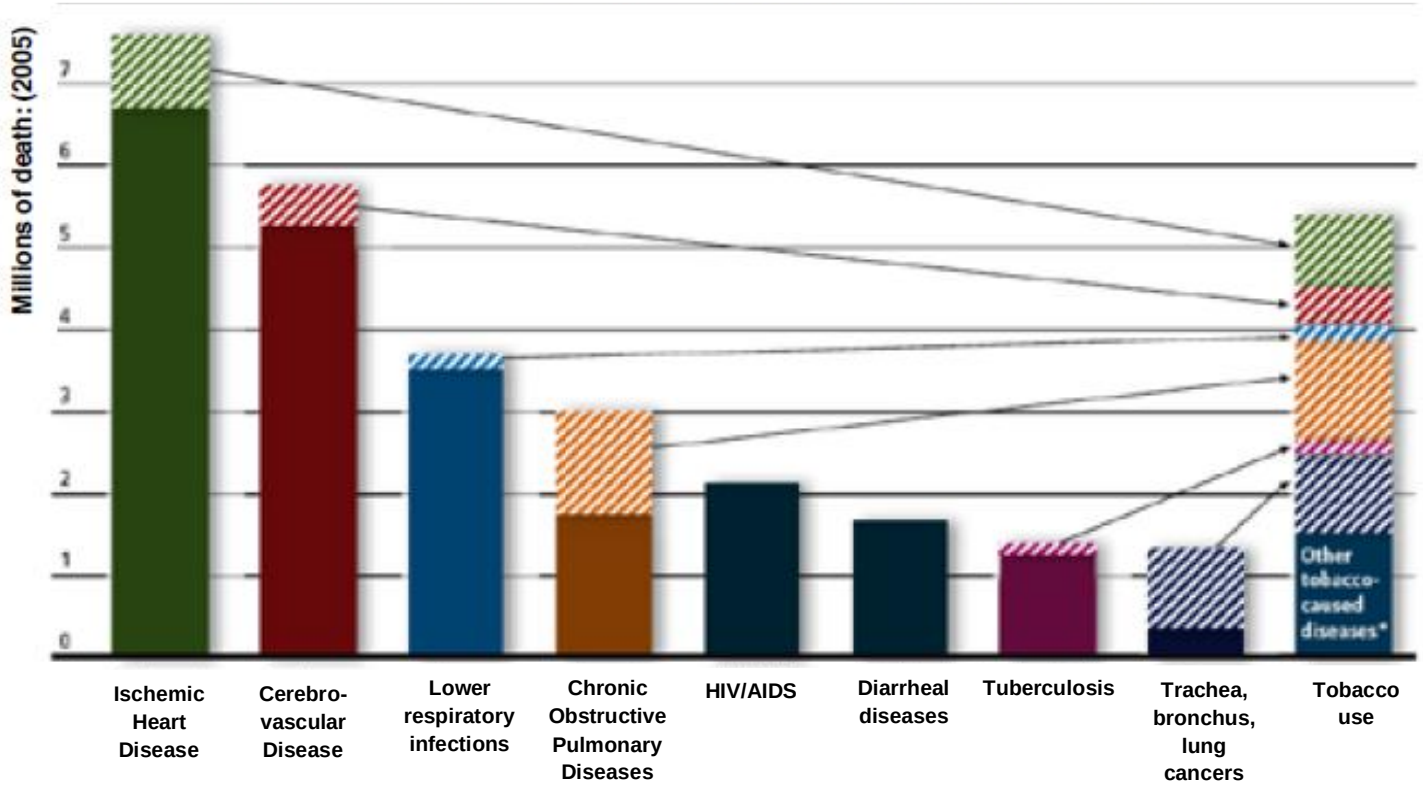
Tobacco kills approximately 6 million people and causes more than half a trillion dollars of economic damage each year. More than five million of those deaths are the result of direct tobacco use while more than 600 000 are the result of non-smokers being exposed to second-hand smoke (WHO Report on the Global Tobacco Epidemic 2013). By 2020, annual tobacco-related deaths are projected to increase to 7.5 million (Mathers and Loncar 2006), accounting for 10% of all deaths

in that year. Smoking is estimated to cause about 71% of all lung cancer deaths, 42% of chronic respiratory disease and nearly 10% of cardiovascular disease globally. Smoking is also an important risk factor for communicable diseases such as tuberculosis and lower respiratory infections (Line et al. 2007).

The estimated, age-standardized prevalence of daily tobacco smoking among adults (15+ years) by WHO Region and World Bank Income Groups is given in Figure 2.11. The prevalence of daily tobacco smoking varied widely among the six WHO regions in 2008. The highest overall prevalence for smoking is estimated at nearly 29% in the European Region, while the lowest is the African Region (8%). The highest prevalence of smoking among men was in the Western Pacific Region (46%) and among women in the European Region (20%).

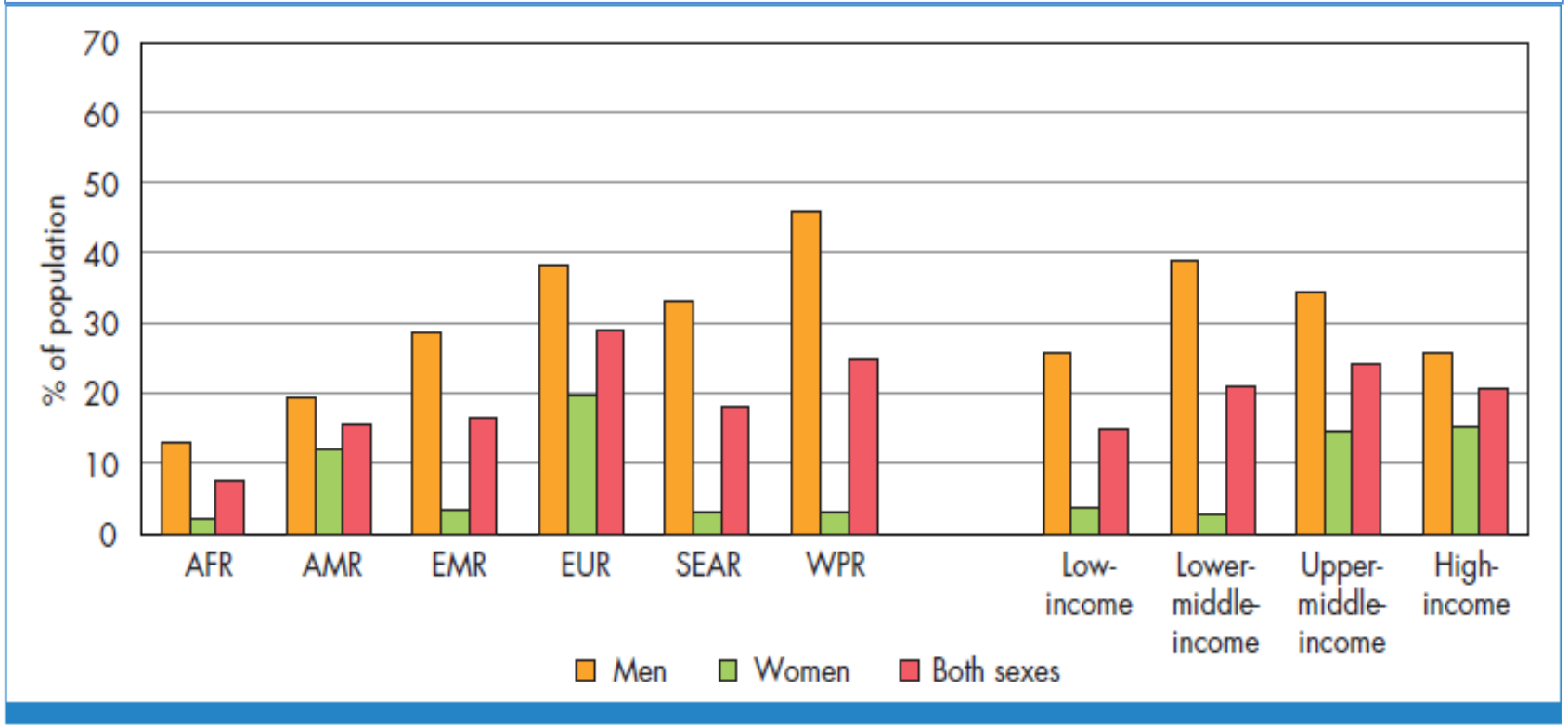
In all regions, men smoked more than women, with the largest disparities for daily cigarette smoking being in the Western Pacific Region, where men smoked 15 times more than women, followed by the South-East Asia Region where men smoked 10 times more than women. The smallest disparity between men and women was in the Region of the Americas, where men smoke about 1.5 times more than women. Among men, the highest prevalence of smoking was in lower-middle-income countries. Smoking then declines as country income rises. Among women, relatively high rates (around 15%) are reported in upper-middle and high-income countries, and about five times lower (between 2% and 4%) in low- and lower-middle-income countries (WHO Global Status Report on NCDs 2011).

Figure 2.10 Global Prevalence of Tobacco related Diseases and Disabilities in 2005 (WHO Tobacco factsheet 2013)



Source: World Health Organization Factsheet on Tobacco, 2013

Figure 2.11 Age-Standardized prevalence of daily tobacco smoking in adults aged 15+ years, by WHO Region and World Bank Group, comparable estimates, 2008



Source: WHO Global Status Report on NCDs 2011

According to the Global Adult Tobacco Survey, India 2009-2010, more than one-third (35%) of adults in India use tobacco in some form: smoking, chewing, application to the teeth and gums or sniffing. About 29 percent of adults use tobacco on a daily basis whereas a little more than 5 percent use it occasionally. In other words, 84 percent of tobacco users use tobacco every day. A small proportion (2%) of adults who were formerly daily users have since stopped using tobacco on a daily basis and use it only occasionally, whereas an additional 2 percent of adults who were formerly daily users have since stopped using tobacco completely. Of all adults, 62 percent have never used any tobacco product in their lifetime. The prevalence of tobacco use among males is 48 percent as compared with 20 percent among females (Figure 2.12). About two in five adults from rural areas and one in four from urban areas use tobacco in some form or the other. Among male and female tobacco users as well as tobacco users from urban and rural areas, 82-85 percent of tobacco users are daily users. A little less than half of all males and 78 percent of all females have never used tobacco at all. The proportion of adults who never used tobacco is much higher in urban areas (72%) than rural areas (58%). The regional differentials in the prevalence of tobacco use for Indian population (+15 years) has been presented in Figure 2.13 & 2.14. There is a large variation in the prevalence of tobacco use all across different regions. The highest prevalence of tobacco was reported in the East (45%) and North East (44%) and the lowest was reported in North (19%). In every region, most o f the tobacco (75-88%) were found to be daily users. Among all states, highest tobacco usage was reported for Mizoram (67%) and lowest for Goa (9%). In Gujarat, 29% prevalence was seen for usage of tobacco.

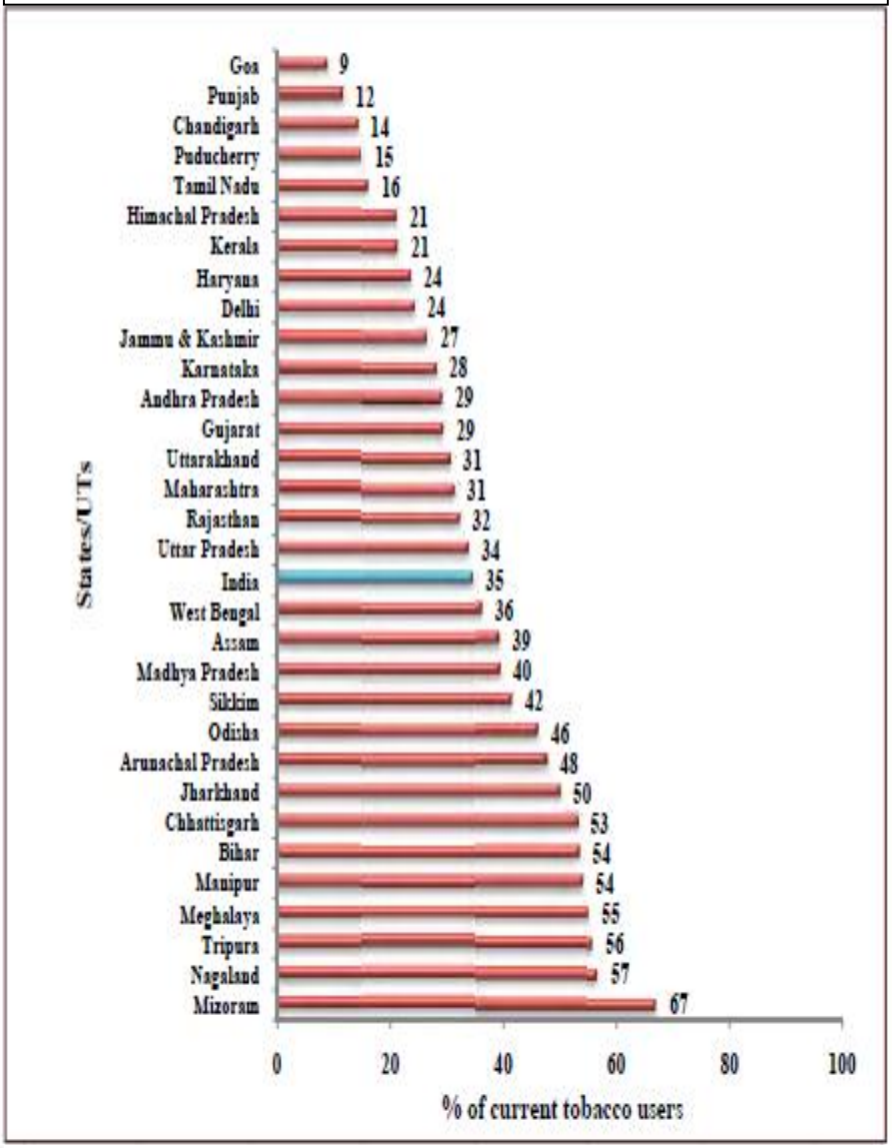
The report also states the average age of initiation for tobacco consumption to be as low as 17.8 years. The most susceptible time for initiation of tobacco use in India is during adolescence and early adulthood, i.e. in the age group of 15 to 24 years (Global Adult Tobacco Survey, India 2009-2010).

Figure 2.12 Percentage of Adults Age 15 and Above by Detailed Status of Tobacco Use, According to Gender and Residence, GATS India, 2009-2010

Status of tobacco use	Overall	Gender		Residence	
		Male	Female	Urban	Rural
Current tobacco user	34.6	47.9	20.3	25.3	38.4
Daily user	29.1	40.8	16.7	21.1	32.5
Occasional user	5.4	7.1	3.5	4.2	5.9
Occasional user, former daily	1.8	2.2	1.3	1.6	1.9
Occasional user, never daily	3.6	4.9	2.2	2.6	4.0
Current non-user	65.4	52.2	79.7	74.7	61.6
Former daily user	1.7	2.3	1.1	1.5	1.8
Never daily user	63.7	49.9	78.6	73.2	59.8
Former occasional user	1.3	1.7	1.0	1.1	1.4
Never user	62.4	48.2	77.6	72.1	58.4

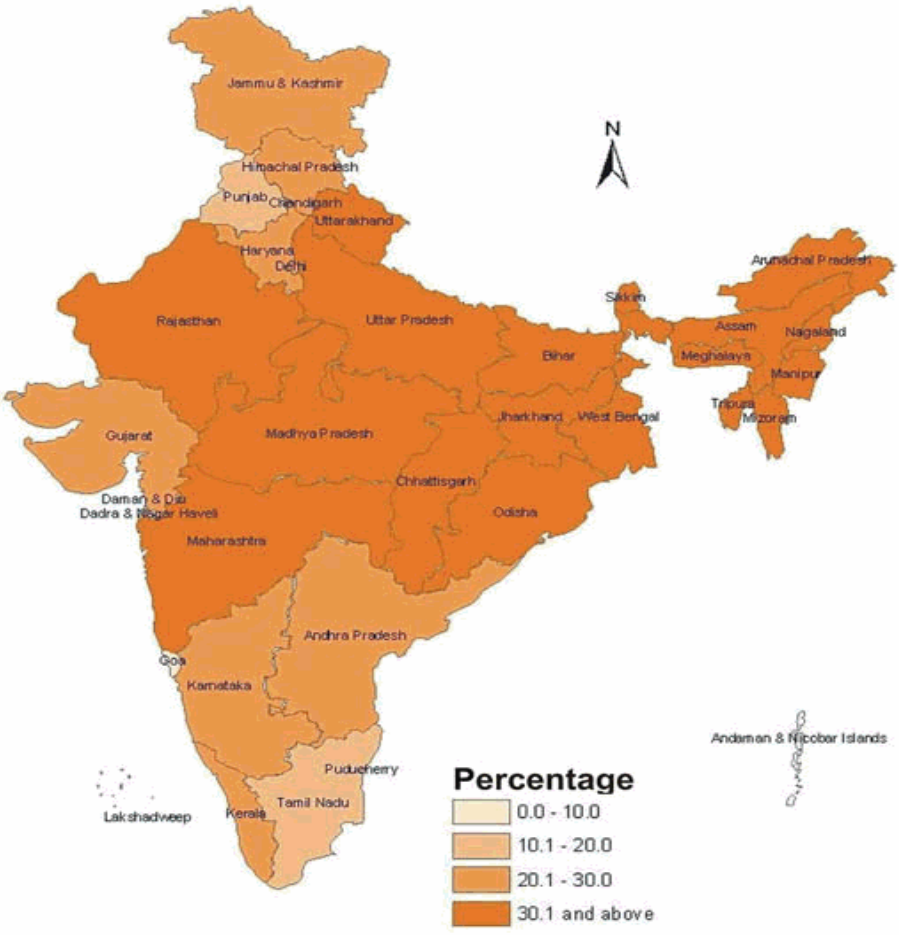
Source: Global Adult Tobacco Survey, India 2009-2010

Figure 2.13 Percentage of Current Tobacco Users According to States/UTs, GATS India, 2009-2010



Source: Global Adult Tobacco Survey, India 2009-2010

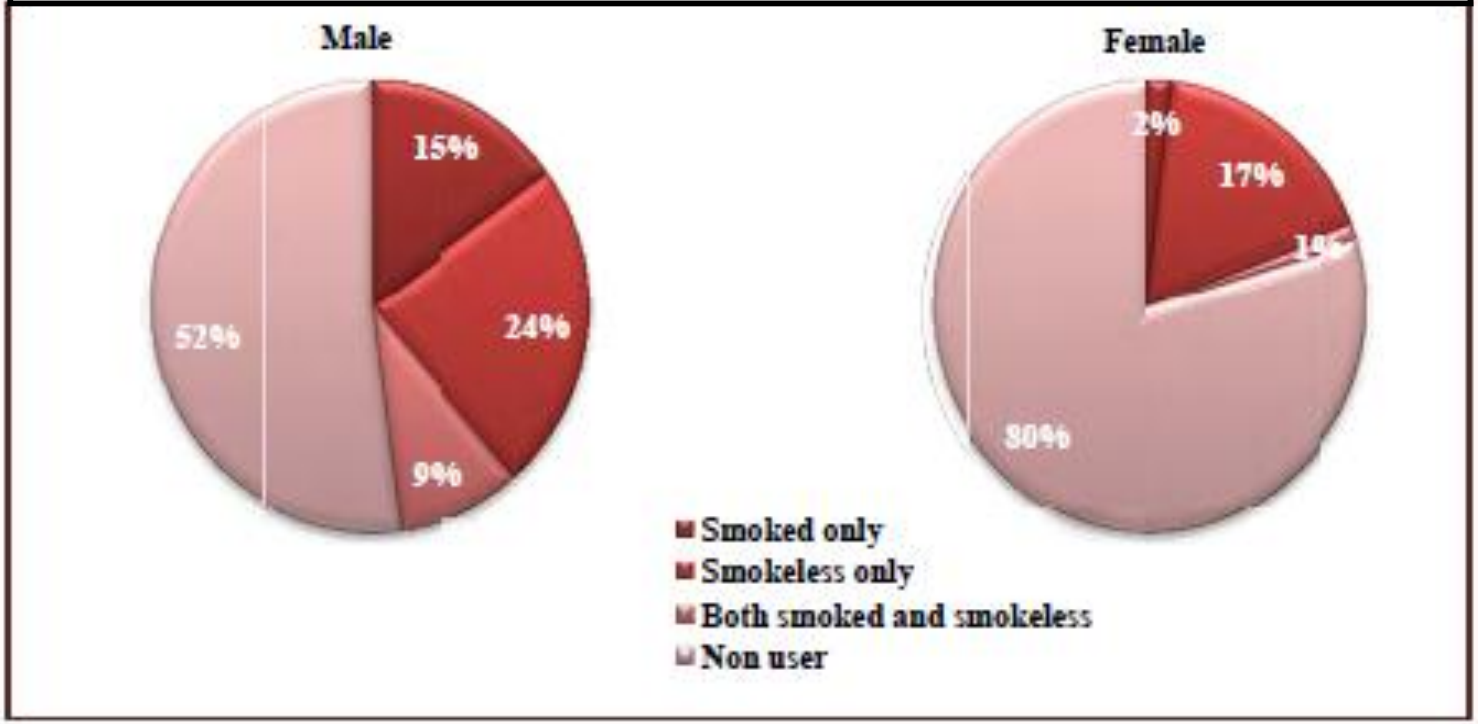
Figure 2.14 Tobacco usage in India (percentage of adults 15+ years) during 2009-2010



Source: Global Adult Tobacco Survey, India 2009-2010

Various studies conducted within India demonstrate widespread use of tobacco among the population. Dixit et al (2012) conducted a study on 848 individuals (>15 years) from urban and rural areas of department of community medicine, Aligarh and found the prevalence of tobacco consumption to be nearly 50% (smoking as well as non smoking form of tobacco). A cross sectional study conducted on 2513 free living individuals residing in Gujarat reports the prevalence of tobacco consumption to be 33% out of which 30% had started consuming it before they turned 20 (Joshi et al 2010). Corsi et al (2013) report the prevalence of tobacco use to be more than 50% among the men and about 5% among women surveyed as part of a cross sectional study conducted in Andhra Pradesh to examine tobacco usage among them. Various studies conducted in Vadodara city report prevalence of tobacco usage between 10% and 32.1% (Mehan et al 2006, Mehan et al 2007, Mehan et al 2008, Mehan et al 2011). Kotecha et al (2006) carried out a study to assess the prevalence of smoking among 14-18 year old school children of Vadodara city and found the same to be 13.1% (1.6% for girls and 25% for boys). As can be seen from Figure 2.15, among males, 15% were found to smoke only, 24% used smokeless tobacco whereas 9% reported using both. Among females, 17% used only smokeless tobacco and 1% used both.

Figure 2.15 Percent Distribution of Tobacco Use According to Gender, GATS India, 2009-2010



Source: Global Adult Tobacco Survey, India 2009-2010

Prevention and control of Tobacco usage

The Centre for Disease Control has termed tobacco control as a "Winnable Battle". According to CDC, if additional effort and support is given for the implementation of evidence-based, cost-effective strategies, a significant impact is possible on reducing tobacco consumption. It is imperative to make the general public aware of the perils of smoking and its long term health consequences.

WHO Framework Convention on Tobacco Control

In May 2003, the 192 WHO Member States adopted the WHO Framework Convention on Tobacco Control (WHO FCTC), the first coordinated global effort to reduce tobacco use. It is WHO's first public health treaty. The WHO FCTC entered into force on 27 February 2005 and requires countries that have ratified it to implement comprehensive measures, covering both the demand for and supply of tobacco products, as well as counteracting the tobacco industry and promoting international cooperation for global action. It has since become one of the most widely embraced treaties in UN history and already has 164 Parties as of 21 April 2009.

The treaty commits countries to:

1. Ban or restrict tobacco advertising, promotion and sponsorship.
2. Place large, graphic health warnings on cigarette packs and prohibit the use of false and misleading terms such as "light" and "low-tar".
3. Implement measures to protect non-smokers from second hand smoke.
4. Increase the price of tobacco products, particularly through taxation, to discourage tobacco use.
5. Eliminate the illicit trade of tobacco products.
6. Regulate the content of tobacco products and require public disclosure of ingredients.
7. Provide cessation assistance and treatment for tobacco dependence.
8. Prevent sales of tobacco products to minors.
9. Protect tobacco control policies from commercial and other vested interests of the tobacco industry.
10. Promote economically viable alternatives to tobacco growing & trade in tobacco products.
11. Co-operate internationally including through transfer of knowledge and technology between the Parties.

The primary tool for tobacco control is comprehensive and active awareness of the population about the ill effects of tobacco use, with special emphasis on all aspects of this impact, i.e. social,

physical, financial and environmental. In India, efforts made by the government and nongovernmental organizations (NGOs) for educating the community on issues related to tobacco control have intensified in the past few years. Well-conducted research globally has established that it is necessary to reduce demand through public awareness campaigns along with changes at the policy level, which also serves to countervail the industry's efforts to promote tobacco. These mass education efforts along with policy changes are targeted at reinforcing and changing the social norms towards no tobacco use (Report on Tobacco Control in India, 2004).

Raising public awareness

Research studies evaluating the effectiveness of health education in India have shown successful results among the youth and adults. Intervention research on awareness related to tobacco avoidance and control have shown to positively alter tobacco use practices among the youth in India (Reddy et al 2002). Health education intervention at the school level has also shown positive results in India. In a group randomized trial conducted with seventh grade students in 30 elementary schools of Delhi, intervention provided at the school and home level had a significant positive impact on tobacco use. This intervention lowered the offers, experimentation and intentions to use tobacco in the intervention group as compared to control schools. The intervention was provided in the form of classroom curricula, posters, booklets and debate at the school level, and informative and engaging materials for families at the home level (Reddy et al 2002). An intervention study in 3 places: Ernakulam - Kerala; Bhavnagar - Gujarat; and Srikakulam - Andhra Pradesh reported the decline of tobacco use by 2%, 1% and 5%, respectively, after 1 year. Additionally, 6% of people had reduced their tobacco use. The intervention was a mix of one on one discussion along with the use of IEC materials, individual discussions with a social scientist, film shows and exhibition of posters (Mehta et al 1982). In another intervention study among 36,471 tobacco users, substantially more people stopped the habit and reduced the frequency of tobacco use in the intervention cohort than in the control cohort in Ernakulam (Kerala) and Srikakulam (Andhra) whereas in Bhavnagar (Gujarat) the intervention group showed a lesser proportion of people stopping their tobacco use and there was no difference in the proportion reducing them after 5 years. The interventions were in the form of health education from dentists at the point of health care delivery. Information was also disseminated via films, posters, radio broadcasts and newspaper articles (Gupta et al 1986). A cohort study which was undertaken in Ernakulam showed (on follow up after 8 years) a greater reduction of tobacco use among intervention cohort compared to control cohort (Report on Tobacco Control in India, 2004).

Ban on smoking in public places

Like India, several countries have successfully introduced smoke-free public places. Regulations restricting smoking in public places appear to have a considerable impact on teenage smoking behaviour. It affects the teenager's decision to become a smoker rather than on reducing the number of cigarettes smoked (Fichtenberg and Glantz 2002). Smoking restrictions in the home and bans in public places allow a limited opportunity for smokers to smoke. Properly enforced school bans have been found to be associated with up to 11% reduction in the initiation of smoking (Wakefield et al 2000). Schools and colleges with no-smoking policies have been shown to have the lowest prevalence of tobacco consumption and their students smoke fewer cigarettes than others (Pentz et al 1989, Charlton and While 1994). However, this may not be the definitive solution for discouraging use of tobacco usage, considering the fact that there may be replacement of smoking (cigarettes/bidis etc.) by use of oral tobacco in "smoke-free" environment because, as has been reported earlier, nearly 26% of Indians use smokeless tobacco out of which about 21% use it extensively.

Prohibition on sale of tobacco products to minors

It is estimated that, as in other developing countries, the most susceptible time for initiation of tobacco use in India is during adolescence and early adulthood, i.e. in the age group of 15.24 years. The majority of users start using tobacco before the age of 18 years, while some even start as young as 10 years. It is estimated that 5500 adolescents start using tobacco every day in India, joining the 4 million people under the age of 15 years who already use tobacco regularly (Arora, Aghi and Reddy 2001). This early age of initiation points to an urgent need to plan effective interventions for this vulnerable age group. The Government of India has been actively working towards enforcing legislations to prevent young people from having any access to tobacco. The Cigarettes and Other Tobacco Products (Prohibition of Advertisement and Regulation of Trade and Commerce, Production, Supply and Distribution) Act, 2003 enforced from 1 May 2004 has provisions to protect the youth in India. The Act prohibits the sale of tobacco products to minors as well as within 100 yards of any educational institution (Report on Tobacco Control in India, 2004).

Increasing price through taxation

One of the mechanisms to raise tobacco prices is taxation. A fundamental principle related to taxation is that taxes which generate substantial revenues while minimizing welfare losses

associated with the higher prices resulting from the taxes are preferable to those that result in higher welfare losses. In the short run the demand for tobacco products is relatively inelastic. Thus, an increase in tobacco taxes, although leading to reduction in use, will lead to significant increases in revenue (Chaloupka et al 2000). Increasing prices through tax increases is the single most effective intervention to reduce tobacco demand. It has been seen that a 10% price rise will lead to a 4% reduction in demand (price elasticity of .0.4) in high-income countries, and 8% reduction in low- and middle-income countries (price elasticity of .0.8). It has been seen that young people, people belonging to a low socioeconomic group and less educated people are more price responsive.

It has been estimated that tax increase which would increase the real price of cigarettes by 10% worldwide will lead to 42 million smokers of the 1995 cohort quitting and would prevent 10 million premature tobacco-related deaths among them (Jha and Chaloupkal 2000). In a study in the USA, it was seen that increasing the price of cigarettes increases the number of young adults who quit smoking. The average price elasticity of cessation was .0.35, i.e. a 10% increase in price will lead to 3.5% reduction in demand (Tauras 2004).

Health Warnings on Cigarette Packets

The Cigarettes and Other Tobacco Products Act, 2003 has asked for the inclusion of a mandatory health warning, which should include a picture of a skull and cross-bones and may include other pictorial warnings. The Cigarettes and Other Tobacco Products (Prohibition of Advertisement and Regulation of Trade and Commerce, Production, Supply and Distribution) Act, 2003, and rules framed there under Government of India.

The WHO and the World Bank recommended warning labels on tobacco products, which are an effective way to inform smokers about the hazards of tobacco consumption, encourage smokers to quit, and discourage non-smokers from starting to smoke. Health warning message labelling on the product package is a critical component of a comprehensive tobacco control strategy. Health warning message labels are a cost-effective way to inform the public, especially smokers, of the hazards of tobacco use (WHO Framework Convention on Tobacco Control 2003).

Ban on Advertising Tobacco Products

A meta-analysis of 48 econometric (development and application of statistical methods to economic data with the aim of unfolding economic relations) studies found that tobacco

advertising significantly increased tobacco sales (Andrews and Franke 1991). On the other hand, several studies have yielded convincing data that a complete ban on advertising makes an important contribution towards reducing the prevalence of smoking. Some of them are summarized in Figure 2.16.

The Cigarettes and Other Tobacco Products Act, 2003 has banned direct and indirect advertising of all tobacco products. However, advertising has been permitted at the point of sale of tobacco products. The restrictions placed on display boards at such sites are not being strictly observed by vendors and the tobacco industry. Further, there is danger that the industry may rapidly increase the number & type of outlets where tobacco products are sold and markets with display boards at points of sale. It is, therefore, ideal if the Act is amended to extend the ban to such point of sale advertising as well. The danger of cleverly disguised surrogate advertising also exists and needs to be carefully monitored & countered through effective enforcement of the Act.

A complete ban on advertisements coupled with an intensive public information campaign on the ill effects of using tobacco products will lead to a reduction in tobacco consumption. In India, surrogate advertisements are still prevalent in the media and the existing laws need to be strengthened and enforced.

Physical inactivity

Physical activity is defined as any bodily movement produced by skeletal muscles that require energy expenditure (WHO Factsheet on Physical Activity 2013). The Consensus Statement for Diagnosis of Obesity, Abdominal Obesity and the Metabolic Syndrome for Asians and Recommendations for Physical Activity, Medical and Surgical Management 2009 gives recommendations for Physical activity levels (Figure 2.17). Physical inactivity (lack of physical activity) has been identified as the fourth leading risk factor for global mortality (6% of deaths globally). This follows high blood pressure (13%), tobacco use (9%) and is equal to high blood glucose (6%). Moreover, physical inactivity is estimated to be the main cause for approximately 21–25% of breast and colon cancers, 27% of diabetes and approximately 30% of ischemic heart disease burden (WHO factsheet on Physical Activity 2013).

Regular and adequate levels of physical activity in adults:

- Reduce the risk of hypertension, coronary heart disease, stroke, diabetes, breast and colon cancer, depression and the risk of falls;
- Improve bone and functional health; and

- A key determinant of energy expenditure, and thus fundamental to energy balance and weight control.

Childhood obesity is an emerging problem in urban Indian children and increases in childhood overweight and obesity may be major contributors to the adult obesity epidemic. Sedentary lifestyle, less time spent in outdoor activities and increased TV viewing has been irrefutably linked to higher BMI and higher prevalence of overweight and obesity among children (Jong et al 2013, Trembley et al 2011, Kurien et al 2007). Thus, the unhealthy behaviour and lifestyle pattern among children play a pivotal role in compromising their health right from childhood which in turn increases their susceptibility to develop chronic diseases during formative years itself.

There is considerable evidence available in literature which links inadequate levels of physical activity to higher health risk among women. Strong evidence shows that physical inactivity increases the risk of many adverse health conditions, including major non-communicable diseases such as coronary heart disease, type 2 diabetes, and breast and colon cancers, and shortens life expectancy (Lee et al 2012, Joubert et al 2007, Oguma et al 2002).

Figure 2.16 Study results within a country before and after a ban on advertising

Country, year	Description of anti-tobacco measures	Effect
Norway, 1975	Complete ban on advertising and sponsoring coupled with health warnings, public information and age limits on sales	Long-term reduction in the prevalence of smoking by 9%
Finland, 1977	Complete ban on advertising, no smoking in public buildings, age limit on sales, strong public information campaigns	Reduction of cigarette consumption by 6.7%
Canada, 1989	Complete ban on advertising and sponsoring, with higher tobacco prices	Corrected for price increases, a long-term reduction of 4% on the prevalence of smoking
New Zealand, 1990	Ban on advertising and sponsoring, higher tobacco prices	Reduction in tobacco sales by 7.5%, of which 5.5% can be attributed to the ban on advertisements
France, 1991	Complete ban on advertising, limiting smoking in public buildings, removal of tobacco from the consumer price index	Reduction of smoking prevalence by 7% in 1991–1993

Figure 2.17 Physical Activity prescription for aerobic & muscle strengthening exercises

	Moderate intensity			Vigorous intensity		
Type of physical activity	Modality	Duration	Frequency/ days per week	Modality repetitions	Duration/	Frequency/ week
Aerobic physical activity	Brisk walking, stair climbing, jogging (4-7m/sec), cycling, treadmill and swimming	30 min	5	Football, badminton, basketball, running, rope jumping, dancing	20 min	3 days
Muscle strengthening activity	Resistance weight training, curls, presses, anti-gravity exercise, isometric exercise Children-Body weight activity (Pull ups)	1-3 sets of 8-12 repetitions targeting major muscle groups	2-3	Resistance training, curls, presses, anti gravity exercise, isometric exercise Children- Body weight activity (Pull ups)	>3 sets of >12 repetitions targeting major muscle groups	2-3 days

Source: Misra et al 2009. Consensus Statement for Diagnosis of Obesity, Abdominal Obesity and the Metabolic Syndrome for Asians and Recommendations for Physical Activity, Medical and Surgical Management.

Rastogi et al (2004) conducted a hospital based case-control study in the Indian cities of Delhi and Bangalore to explore the relationship of physical activity and coronary heart disease (CHD). The study findings revealed that Leisure-time exercise, including as much as 35–40 minutes per day of brisk walking, was protective for CHD risk and sedentary lifestyles were positively associated with risk of CHD. People with >3.6 hours per day of sedentary activity (for example, television viewing) had an elevated risk of 1.88 (95% CI: 1.09, 3.20) compared with <70 minutes per day in multivariate analysis. It is apparent that the role of physical activity in decreasing risk is monumental. Considering this, the widespread global prevalence of insufficiently physically active individuals is thus a major cause of concern.

Globally, around 31% of adults aged 15 and over were insufficiently active in 2008 (men 28% and women 34%). Approximately 3.2 million deaths each year were attributable to insufficient physical activity. In 2008, prevalence of insufficient physical activity was highest in the WHO Region of the Americas and the Eastern Mediterranean Region. In both these regions, almost 50% of women were insufficiently active, while the prevalence for men was 40% in the Americas and 36% in Eastern Mediterranean. The South East Asian Region showed the lowest percentages (15% for men and 19% for women). In all WHO Regions, men were more active than women, with the biggest difference in prevalence between the two sexes in Eastern Mediterranean. This was also the case in nearly every country (WHO Global Strategy on Diet, Physical Activity and Health 2013). National data from India shows the prevalence of physical inactivity among Indian adults to be 14% with a much higher percentage of adult females (17.3%) doing insufficient or no physical activity compared to 10.8% adult males in 2008 (WHO NCD Country Profile 2011). Various studies have also been conducted in Baroda city to measure the prevalence of physical inactivity in the population. Studies conducted by Mehan et al on industrial populations report prevalence of physical inactivity among productive workforce of Baroda to be 19% (Mehan et al 2007), 38% (Mehan et al 2008) and 33% (Mehan et al 2011) while a similar research conducted in free-living urban adult population revealed the prevalence of physical inactivity to be much higher i.e. 74.4% (Mehan et al 2006).

Studies conducted on Indian children and adolescents demonstrate the direct causal relationship between low levels of physical activity and elevated BMI. A study conducted on 12-17 year old urban adolescents in Hyderabad by Laxmaiyah et al in 2007 revealed that the prevalence of overweight & obesity was significantly lower among those participating regularly in outdoor games > or =6 h/wk (3.1%, $p < 0.004$) and household activities > or =3 h/d (4.7%, $p < 0.001$).

Promoting physical activity

The WHO Global Strategy on Diet, Physical Activity and Health 2013, advocate the following three major guiding principles for a population based approach for increasing levels of physical activity;

1. High level political commitment

   Political commitment from government (e.g. from the Prime Minister, King, ministers and/or high ranking officers within ministries of health, education and/or sports) is crucial, as it may facilitate physical activity promotion on the political agenda, particularly if the commitment is officially announced to the public.

2. Integration in National Policy

   A national policy in which physical activity has a central place may foster the implementation of a national physical activity plan. This should include a formal statement that defines physical activity as a priority area, states specific goals and provides a strategic plan for action. A policy on physical activity may be a stand-alone document or be integrated within policies addressing the prevention and control of non communicable disease, or health promotion. The action plan should state the specific strategies of institutions in the government, non-government and private sector that will be undertaken to promote physical activity in the population within a specified time period. Ideally, the plan would specify the accountability of the involved partners and resource allocation.

3. Identification of National Goals and Objectives

   Identification of national goals and objectives will differ from country to country according to the type of physical activity promotion issues to be addressed. Some general goals are suggested below.

A national action plan should include large- scale interventions to reach the whole population and enhance physical activity at population level. In addition, some interventions (e.g. exercise programmes, educational counselling) may be tailored to specific population groups, such as adults, children, older persons, employees, people with disabilities, women, men, cultural groups, people at risk to develop non-communicable diseases. A Review of Best Practice in Interventions to Promote Physical Activity in Developing Countries (WHO Review-best practices for Physical Activity 2005) identified the following as effective settings for physical activity programmes.

1. Point-of-decision prompts signage placed by elevators and escalators to encourage the use of stairs.
2. Community-wide campaigns conducted on a large scale, including multiple components (e.g. self-help and support groups, physical activity counselling/regular contact with an exercise

specialist, risk factor screening and health education, community events, mass media campaigns, the creation of walking trails), as well as targeting different population groups (e.g. adults, children and youth, older people, disabled people, indigenous people) and settings (e.g. worksite, schools, community).

3. School-based physical education including modification of curricula as well as school policies and environments to increase the amount of physical activity during and outside physical education (PE) classes.
4. Social support interventions in community settings involving the development and maintenance of social networks that provide supportive relationships for behaviour change (e.g. setting up a "buddy" system, making contacts with others to jointly engage in physical activity, setting up walking or other groups that provide friendship and support).
5. Individually-adapted health behaviour change programmes tailored to individuals' specific needs, preferences, and readiness for change. Programmes are based on health behaviour change models e.g. social cognitive theory (Bandura 1986), health belief model (Rosenstock 1990), transtheoretical model of change (Prochaska and DiClemente 1984).
6. Creation of access to places for physical activity (physical environmental, structural and policy-changing interventions e.g. building trails and facilities; reducing fees; changing operating hours of facilities) combined with informational activities aimed at increasing awareness, education and motivation.

Unhealthy diet

The 3 main components of unhealthy diet which influence the development of chronic non communicable diseases are: inadequate consumption of fruits and vegetables, high intake of salt and elevated fat intake (WHO Global Health Observatory on Unhealthy Diet 2013).

Inadequate fruit and vegetable intake

Unhealthy diets (especially those which have a high content in fats, free sugars & salt) and physical inactivity are among some of the leading causes of non communicable diseases (NCDs) including cardiovascular diseases (CVD), type 2 diabetes and certain cancers (WHO Global Burden of Diseases update 2004). Among all unhealthy eating habits, prime importance is given by the World Health Organization to the NCD risk attributable to insufficient consumption of fruits and vegetables. Low fruit and vegetable intake is among the top 10 selected risk factors for global mortality. Globally, 1.7 million deaths are attributable to diets low in fruits and vegetables.

Worldwide, low intake of fruits and vegetables is estimated to cause about 19% of gastrointestinal cancer, about 31% of coronary heart disease, and 11% of stroke and approximately 16.0 million (1.0%) disability adjusted life years (DALYs, a measure of the potential life lost due to premature mortality and the years of productive life lost due to disability) are attributable to low fruit and vegetable consumption (WHO World Health Report 2002.)

Many constituents and functional aspects of fruits and vegetables may be responsible for their apparent protective effects on the development of NCDs such as diabetes and CVDs. Among these, fibre, potassium, folate, and antioxidant content of fruits and vegetables, along with their low glycaemic load and potential to aid in weight management are likely to contribute most to their effects on risk of diabetes and CVDs. Other components of fruit and vegetables such as minerals and phytochemicals may also play a role in the prevention of chronic diseases (Bazzano 2004).

Fruits and vegetable are major sources of dietary fibre. Dietary fibre has been shown to delay the absorption of carbohydrates after a meal, thereby decreasing the insulinaemic response to dietary carbohydrates (Anderson 1995). In a multi centric study of 2909 health young adults ages 18-30 years, after adjustment for confounding factors, dietary fibre intake was strongly inversely associated with body weight, wait-to-hip-ratio, fasting insulin levels and 2-h post-glucose insulin levels (Ludwig et al 1999). In addition, several large prospective cohort studies have shown inverse associations between dietary fibre and the risk of developing type 2 diabetes (Stevens et al 2002, Meyer et al 2000, Salmeron et al 1997, Marshall and Hamman 1997, Feskens and Kromhout 1994). Several prospective studies have identified a significant inverse association between dietary fibre intake and risk of coronary heart disease (Pereira et al 2004, Bazzano et al 2003, Liu et al 2002, Mozaffarian et al 2003, Rimm et al 1996). The report of Joint WHO/FAO expert consultation on diet, nutrition and prevention of chronic diseases (Nishida et al 2004), sets population nutrient goals and recommends intake of a minimum of 400 gm of fruits and vegetables (except tubers) per day for the prevention of chronic diseases such as heart diseases, cancer, diabetes and obesity. The dietary guidelines for Indians (National Institute of Nutrition 2007) also recommend consumption of at least 400 gm per day of fruits and vegetables to protect one's self from developing non communicable diseases.

In spite of these guidelines, low consumption of fruits and vegetables in many regions of the developing world is a persistent phenomenon, confirmed by the findings of food consumption surveys. Asian Indians have lower prevalence of daily fruit and vegetable intake: 27% vs. 45% for rest of the world (Yusuf et al 2004). Kinra et al 2010 conducted a cross-sectional study across 1600 villages in rural India to find the prevalence of inadequate fruit and vegetable intake to be as high as 69% in men and even higher (75%) in women. Considering the fact that fruits are an

expensive commodity, the low intake of fruits and vegetable can be partially attributed to the cost factor and low affordability of the same by all classes of society. Hence, even in populations where affordability of fruits and vegetables in not such a major issue, inadequate consumption of the same is rampant. Mehan et al (2006) reported the prevalence of inadequate fruit and vegetable intake among urban, free-living population of Baroda city to be as 76%. Studies conducted on industrial population of Baroda city have reported widespread prevalence of inadequate fruit and vegetable intake among productive age population: 92% (Mehan et al 2011), 70% (Mehan et al 2008) and 93% (Mehan et al 2007).

It can thus be said that in addition to the cost factor, lack of awareness plays a major role as far as inadequate fruit and vegetable consumption is concerned. This clearly points out to the need for educating and sensitizing people towards the importance of eating at least 4 servings of fruits and vegetables every day.

High salt intake

The amount of dietary salt consumed is an important determinant of blood pressure levels and overall cardiovascular risk. Many epidemiological studies have demonstrated that high salt intake is associated with an increased risk of high blood pressure.

A technical report produced by joint WHO/FAO consultation in 2004 (Nishida et al 2004), recommended the consumption of less than 5 g sodium chloride (or 2 g sodium) per day as a population nutrient intake goal, while ensuring that the salt is iodized. This expert consultation stressed that dietary intake of sodium from all sources influences blood pressure levels in the population and should be limited so as to reduce the risk of coronary heart disease and stroke. However, data from various countries indicates that most populations are consuming much more salt than this. With respect to India, it has a diverse dietary culture where salt and spices are used extensively but up-to-date figures on population salt consumption are very limited. However, data is available from a study conducted in south India to determine mean salt intake among of the population. This study reports average daily salt intake of the study subjects to be as high as 8.5gm/day (Radhika et al 2007).

In the INTERSALT Study, the association between blood pressure and salt intake was studied in 52 communities with a wide range of salt intake (INTERSALT Cooperative Group 1988). Four communities studied had a low salt intake (≤ 3 g/day) and the rest had an intake of 6–12 g/day of salt. The study showed there was a positive relationship between salt intake and blood pressure. There was also a positive and highly significant relationship between the increase in blood pressure with age and salt intake.

The efficacy of reduced sodium intake in lowering B.P. is well established. In a Cochrane systematic review (including 17 trials in individuals with elevated B.P. and 11 trials in individuals with normal blood pressure) a modest reduction in salt intake for a duration of 4 weeks or more was found to have a significant and, from a population viewpoint, important effect on blood pressure (He and MacGregor 2004). In those with elevated blood pressure the median reduction in 24-h urinary sodium excretion was 78 mmol (4.6 g/day of salt); the mean reduction in blood pressure was 4.97 mmHg (systolic) and 2.74 mmHg (diastolic). In individuals with normal blood pressure the median reduction in 24-h urinary sodium excretion was 74 mmol (4.4 g/day of salt); the mean reduction in blood pressure was 2.03 mmHg (systolic) and 0.99 mmHg (diastolic). This meta-analysis also demonstrated a correlation between the magnitude of salt reduction and the magnitude of B.P. reduction, within the daily intake range of 3 to 12 g/day of salt.

A case-control study was conducted by Mehan et al in 2011 on hypertensive subjects (40-70 years) in Baroda city to check the efficacy and compliance of 9 days cyclic menu on blood pressure. Subjects were divided into experimental and control group after matching for age, initial blood pressure levels and body mass index. Experimental group was given 9 days prescribed cyclic menus (low sodium<3 gm/day, high potassium-4gm/day, calcium- 1200mg/day, magnesium-500 mg/day with partial substitution of LONa salt) earlier checked for acceptability, while control group did not receive any of these. Compliance of diet was checked using compliance card. Experimental group subjects belonging to pre hypertensive & hypertensive categories demonstrated fall in mean B.P. levels by 4/1.13 mm Hg and 5/1.13–1.97 mm Hg respectively. In contrast, control group subjects showed little change in blood pressure values (Mehan et al 2011).

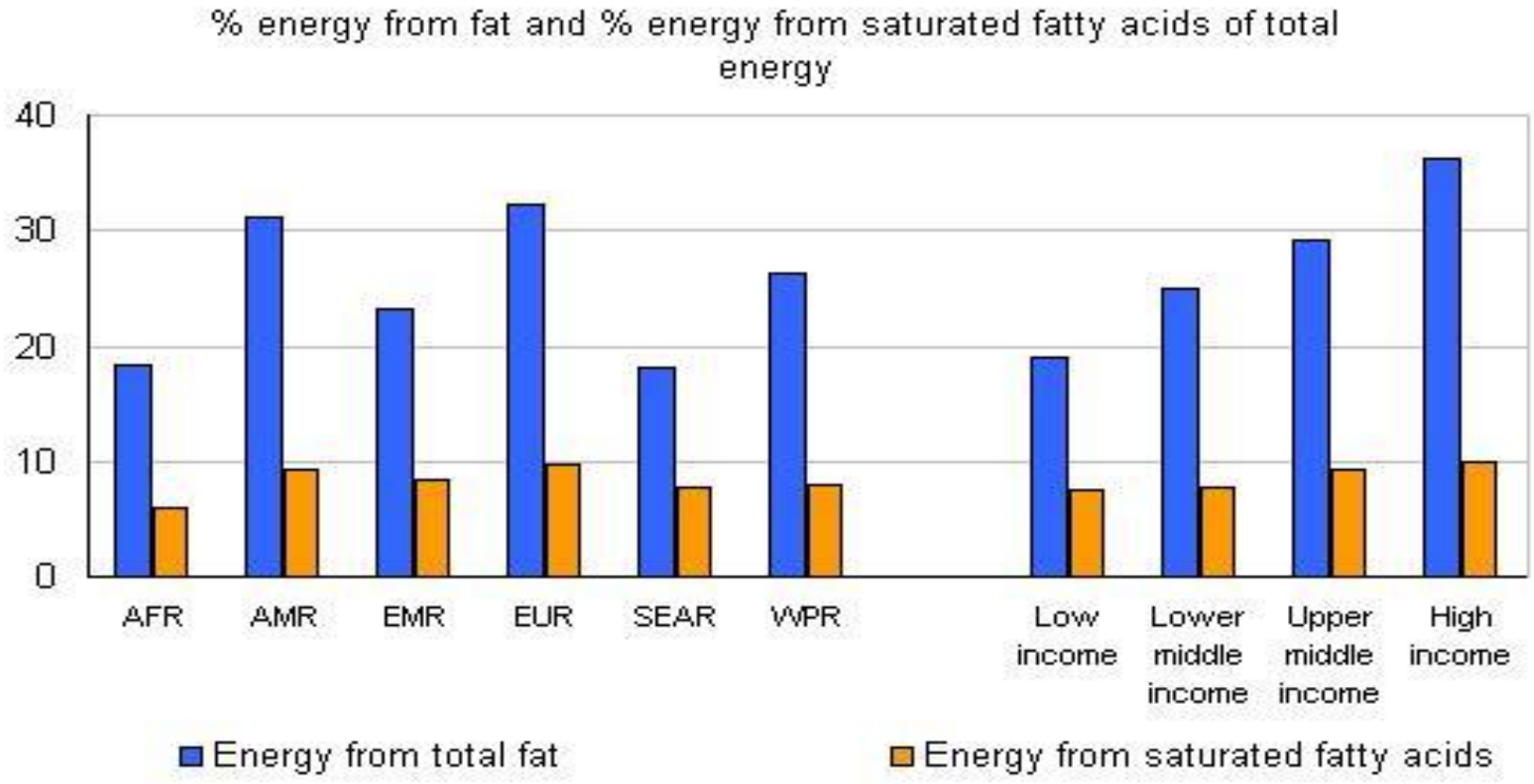
In addition to the harmful effects of high salt and therefore, sodium consumption, research shows that foods with a high salt content increase thirst and lead to increased consumption of calorie-dense soft drinks, thus indirectly contributing to obesity (WHO Guideline: sodium intake for adults and children. Geneva: WHO, 2012). Available information indicates that most salt in India is added during cooking and/or at the table in contrast to the developed world where processed foods contribute most substantially to overall population salt intake. However, with rapidly increasing urbanization, proliferation of multinational food outlets/fast food centres, increasing availability of prepared foods, and increasing frequency of eating out, processed foods are anticipated to become a major source of salt intake (WHO Expert Meeting on Population Sodium Reduction Strategies 2012).

High intake of saturated and trans fats

High consumption of saturated fats and trans-fatty acids is linked to overweight and obesity which in turn are precursors for myriad chronic degenerative diseases such as diabetes, cancer and heart problems. There is enough evidence indicating high-fat diet is the major cause of obesity and insulin resistance (Misra and Khurana 2008).

Looking at the data for fat consumption across the globe (Figure 2.18), it can be seen that there are large variations across WHO regions in the amount of total fats available for human consumption. The lowest quantities available were recorded in the South East Asia Region, and the highest availability in the European Region. For saturated fatty acids (SFA), the lowest rates were in the African Region, and the highest was in the European Region and the Region of the Americas, with very high values observed in some of the Pacific Islands. Energy from SFA usually accounts for a third of the energy from total fat, with the notable exception of the South East Asia Region, where SFAs account for over 40% of total fat intake. The availability of total fat increases with income level, while the availability of saturated fats clusters around the value of 8% in low and lower middle income countries and 10% in upper middle income and in high income countries (WHO Global Health Observatory on Unhealthy Diet 2013).

Figure 2.18 Percent of total energy from fat and percent energy from saturated fatty acids in countries, based on World Bank income groups (2008)



Source: WHO Global Status Report on NCDs 2010

The WHO/FAO Expert consultation on Diet, Nutrition and Prevention of Chronic Disease says that the consumption of high levels of high-energy foods, such as processed foods that are high in fats and sugars, promotes obesity compared to low-energy foods such as fruits and vegetables (Nishida et al 2004). Also, saturated fat and trans-fat increase the risk of coronary heart disease and their replacement with mono saturated and polyunsaturated fat reduces the risk (Hu et al 1997). There is also evidence that the risk of type 2 diabetes is directly associated with consumption of saturated fat and trans-fat and inversely associated with polyunsaturated fat from vegetable sources (Meyer et al 2001).

In addition to saturated fat intake, high consumption of trans fats is also worrisome. The major source of trans fats are commercially available foods, mainly bakery and confectionary foods. Industrially produced trans-fatty acids negatively affect blood lipids and fatty acid metabolism, endothelial function and inflammation, thus increasing the risk of type 2 diabetes and CVD (Hu and Willett 2002).

Promotion of healthy eating habits

To reduce the risk of these diseases, the WHO Global Strategy on Diet, Physical Activity and Health (The WHO Global Strategy on Diet, Physical Activity and Health 2004) recommends developing and implementing national policies which aim to facilitate the:

- Reduction of salt consumption
- Elimination of industrially produced trans fatty acids
- Reduction of saturated fat consumption
- limit intake of free sugars
- increase consumption of fruits and vegetables
- Achievement of a healthy weight
- Practice of adequate levels of physical activity.

Interventions to prevent and control the growing burden exist, and many are simple, cheap and cost effective. These can be implemented through settings based approaches that promote healthy diets and physical activity in schools, workplaces and communities.

In August 2004, "5 A Day" Symposium was conducted (co-sponsored by WHO and the Produce for Better Health Foundation), in Christchurch, New Zealand, from August 9-10. The main aim of this symposium was to encourage increased fruit and vegetable consumption in Asia-Pacific region. The theme of the event was "From Farm to Plate: Globalizing 5 A Day to Increase Fruit and Vegetable Consumption Worldwide." Special focus was on encouraging countries in the

Asia/Pacific region to develop new 5 A Day-type initiatives, such as public-private retail partnerships with supermarkets.

Best Buy Interventions

There is evidence to suggest that multiple intervention strategies have the potential to achieve larger health gains than individual interventions, and often with greater cost-effectiveness (Cecchini et al 2010). However, some interventions stand out as best buys (high impact, very cost-effective, affordable and feasible interventions) in the prevention of NCDs. Enough evidence exists to make salt reduction strategies a best buy in the prevention of NCDs (Asaria 2007, Murray et al 2003). As mentioned, excessive salt intake is linked with raised blood pressure, which is a major cause of mortality (WHO Report on Global Health Risks 2009). In Europe and North America, approximately 75% of salt intake is from sodium added in manufactured foods and meals. In some African and Asian countries, most sodium consumption comes from salt added at home in cooking and at the table or through the use of sauces, such as soy sauce (Brown et al 2009). It has been estimated that if salt consumption is reduced to the recommended level, (up to 2.5 million deaths could be prevented each year (He and MacGregor 2003). Of the countries with salt reduction initiatives, five – Finland, France, Ireland, Japan and the United Kingdom – have demonstrated some positive, measurable results (Webster et al 2010).

In addition to this, increased westernization has led to a dramatic rise in fast food consumption in developing countries such as India. Anticipating the future growth, many big international players are entering into the market by making deals with the domestic players. And those already present in the Indian market are expanding their presence in different provinces of the country. This trend will emerge more strongly during our forecast period, providing opportunities to local players to widen their product portfolios. Results of a study that surveyed Indian adults in their 20s showed that, although they preferred home cooking over fast food, their main reasons for visiting fast food establishments were going there for fun, change of scenery, and socializing (Goyal and Singh 2007).

Sound communication and information strategies are also “best buys” for healthy diet promotion campaigns. Food-based dietary guidelines should be developed and properly disseminated to consumers.

Increased taxation

In addition to public awareness campaigns, one of the most successful strategies undertaken at policy level in many countries is increased taxation on unhealthy foods to discourage their use.

Several countries have explored fiscal measures such as increased taxation on foods that should be consumed in lower quantities and decreased taxation, price subsidies or production incentives for foods that are encouraged. A longitudinal study of food prices and consumption in China found that increases in the prices of unhealthy foods were associated with decreased consumption of those foods (Guo et al 1999).

Harmful use of alcohol

According to definition given by the Dietary Guidelines for Americans 2010, an alcoholic drink is defined as follows: One drink is defined as 12 fluid ounces of regular beer (5% alcohol), 5 fluid ounces of wine (12% alcohol), or 1.5 fluid ounces of 80 proof (40% alcohol) distilled spirits. One drink contains 0.6 fluid ounces of alcohol. The consumption of alcohol can have beneficial or harmful effects, depending on the amount consumed, age, and other characteristics of the person consuming the alcohol. The Dietary Guidelines for Americans 2010 provides key definitions for moderate, heavy/high-risk and binge drinking.

Moderate alcohol consumption Moderate alcohol consumption is defined as up to 1 drink per day for women and up to 2 drinks per day for men.

Heavy/high-risk drinking Heavy or high-risk drinking is the consumption of more than 3 drinks on any day or more than 7 per week for women and more than 4 drinks on any day or more than 14 per week for men.

Binge drinking Binge drinking is the consumption within 2 hours of 4 or more drinks for women and 5 or more drinks for men.

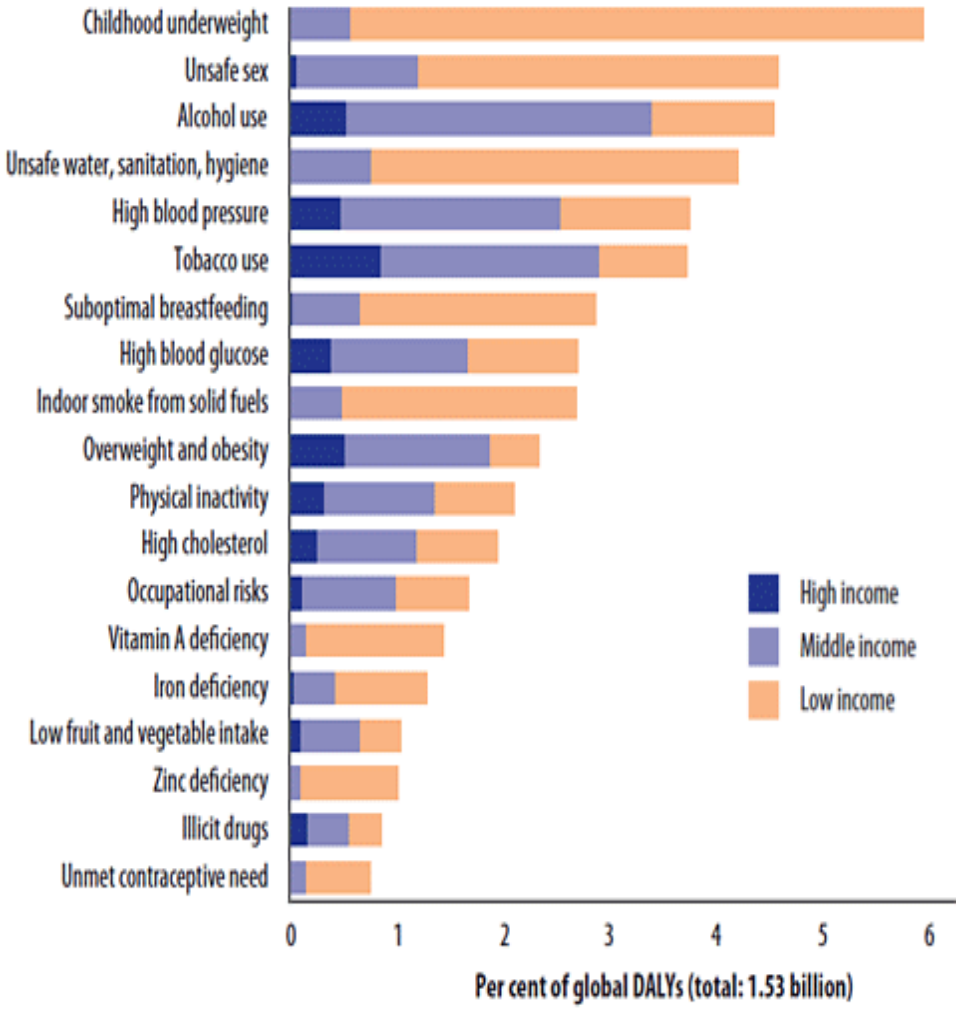
While the Dietary Guidelines for Indians (National Institute of Nutrition 1998, reprint 2007) recommends 'avoiding alcohol consumption' primarily due to its high caloric content (7 kcal/ml) and potential addiction, no guidelines have been provided for safe levels of consumption. Moderate consumption of alcohol is acceptable while heavy/binge drinking increase an individual's risk for developing chronic degenerative diseases. Being an 'empty calorie' beverage, it naturally leads to increased caloric intake and might be a cause of weight gain, leading to overweight and obesity.

In addition to this, the harmful use of alcohol independently is a major global contributing factor to death, disease and injury: to the drinker through health impacts, such as alcohol dependence, liver cirrhosis, cancers and injuries; and to others through the dangerous actions of intoxicated people, such as drink– driving and violence or through the impact of drinking on fetus and child development. The harmful use of alcohol results in approximately 2.5 million deaths each year,

with a net loss of life of 2.25 million, taking into account the estimated beneficial impact of low levels of alcohol use on some diseases in some population groups. Harmful drinking can also be very costly to communities and societies (WHO Global Status Report on Alcohol and Health 2011). In 2004, 4.5% of the global burden of disease and injury was attributable to alcohol: 7.4% for men and 1.4% for women. Alcohol ranks eighth among global risk factors for death, while it is the third leading global risk factor for disease and disability after childhood underweight and unsafe sex (Figure 2.19). Overall, the effect of alcohol consumption on DALYs is more pronounced than on mortality for two reasons: alcohol-attributable deaths occur relatively early in life thus resulting in many years lost due to premature mortality, and because alcohol use disorders are often very disabling. (WHO Global Status Report on Alcohol and Health 2011). Looking at Indian data (Figure 2.14), nearly 3.5% of males and 0.4% females suffer from some or the other form of alcohol use disorders (WHO Country profile Publications and Documents on Substance Abuse 2011).

As can be seen from Figure 2.21, the alcohol induced diseases warrant special attention, given the fact that per capita consumption of alcohol (globally and at national level) has shown a steady rise over the years (WHO Global Status Report on Alcohol 2004). The regional data indicates that for the WHO Regions other than EMR (mostly countries with majority Muslim populations) there is a certain trend towards harmonization of the consumption levels. On a regional level, those with the highest consumption are decreasing, while those with the lowest are increasing their consumption. This also falls within the explanatory model that many developing countries are increasing their alcohol consumption with an increasing level of economic development. National data from World Health Organization, Country profile Publications and Documents on Substance Abuse 2011 (Figure 2.22) suggests a steady increase in the amount of alcohol consumption from 2000 to 2007 in India. On a more general level the link between economic prosperity and rising alcohol consumption can also be seen e.g. for the Nordic countries and Ireland. Of course the regional level also hides large differences within countries, as again increases and decreases may cancel each other out.

Figure 2.19 Global percentages of DALYs attributed to 19 leading risk factors by income group



Source: World Health Organization, Global Status Report on Alcohol and Health, 2011

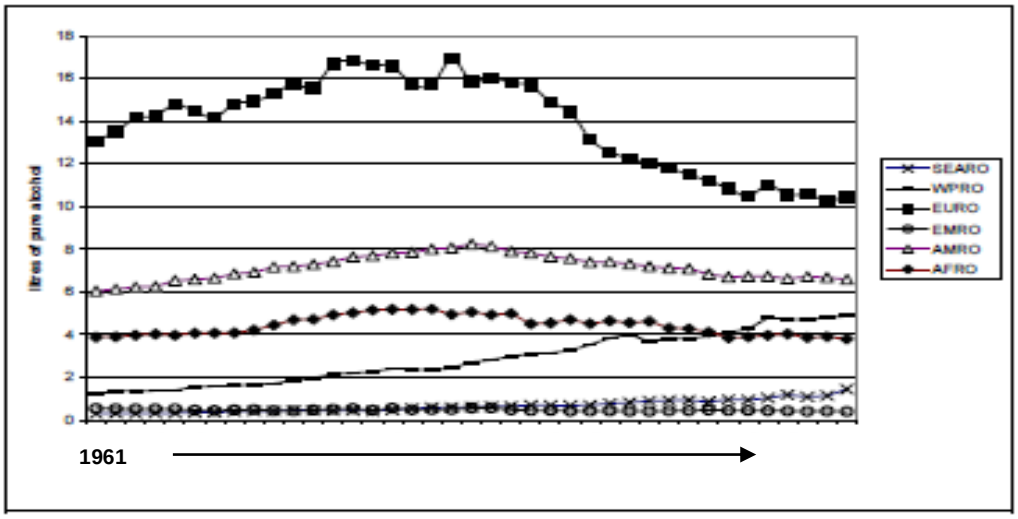
Figure 2.20 Health consequences of alcohol usage in India (2004)

HEALTH CONSEQUENCES

MORBIDITY		
Prevalence estimates (12-month prevalence for 2004):	Males	Females
Alcohol use disorders (15+ years)	3.47%	0.42%

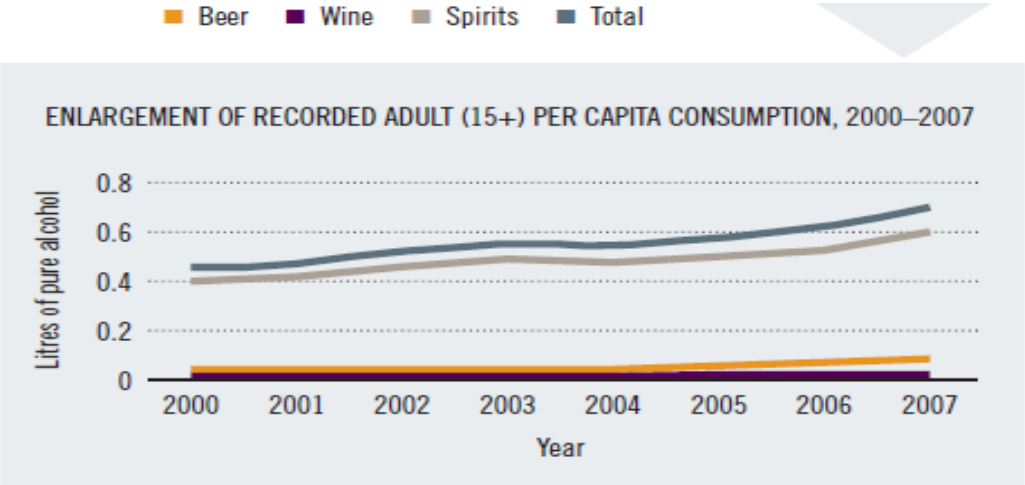
Source: World Health Organization, Country profile Publications and Documents on Substance Abuse 2011

Figure 2.21 Population weighted means of the recorded adult per capita consumption in the WHO region (1961-1999)



Source: World Health Organization Global Status Report on Alcohol and Health 2004.

Figure 2.22 India: trend of alcohol consumption (2000-2007)



Source: World Health Organization, Country profile Publications and Documents on Substance Abuse 2011

Alcohol induced diseases

Liver diseases

There are three main types of alcohol-related liver disease: fatty liver disease, alcoholic hepatitis, and alcoholic cirrhosis (American Liver Foundation 2011).

1. Fatty liver disease

   Fatty liver disease is the build-up of extra fat in liver cells. It is the earliest stage of alcohol-related liver disease. There are usually no symptoms. If symptoms do occur, they may include fatigue, weakness & weight loss. Almost all heavy drinkers have this disease. However, if they stop drinking, fatty liver disease will usually go away.

2. Alcoholic hepatitis

   Alcoholic hepatitis causes the liver to swell and become damaged. Symptoms may include loss of appetite, nausea, vomiting, abdominal pain, fever and jaundice. Up to 35 percent of heavy drinkers develop alcoholic hepatitis. Alcoholic hepatitis can be mild or severe. If it is mild, liver damage may be reversed. If it is severe, it may occur suddenly and quickly lead to serious complications including liver failure and death.

3. Alcoholic cirrhosis

   Alcoholic cirrhosis is the scarring of the liver - hard scar tissue replaces soft healthy tissue. It is the most serious type of alcohol-related liver disease. Symptoms of cirrhosis are similar to those of alcoholic hepatitis. Between 10 and 20 percent of heavy drinkers develop cirrhosis. The damage from cirrhosis cannot be reversed and can cause liver failure. Not drinking alcohol can help prevent further damage.

Cancer

Alcohol consumption has been identified as carcinogenic for the following cancer categories (Baan et al 2007): cancers of the colorectum, female breast, larynx, liver, oesophagus, oral cavity and pharynx. The higher the consumption of alcohol, the greater the risk for these cancers: even the consumption of two drinks/day causes an increased risk for some cancers, such as breast cancer (Hamajima et al 2002).

Cardiovascular diseases

The relationship between alcohol consumption and cardiovascular diseases is complex. Light to moderate drinking can have a beneficial impact on morbidity and mortality for ischemic heart disease and ischemic stroke. However, the beneficial cardio protective effect of drinking disappears with heavy drinking occasions. Roerecke and Rehm (2011) have shown, based on

meta-analyses that, on average, light to moderate drinkers experienced no protective effect if they reported at least one heavy drinking occasion per month. Moreover, alcohol consumption has detrimental effects on hypertension, cardiac dysrhythmias and haemorrhagic stroke, regardless of the drinking pattern (Rehm et al 2010).

Diabetes mellitus

A dual relationship exists between alcohol consumption and diabetes mellitus. In addition to causal effects relationship of heavy drinking and diabetes, research has also shown that light to moderate drinking may be beneficial while heavy drinking is detrimental (Baliunas et al 2009).

Preventing harmful use of Alcohol

As early as 1979, the World Health Assembly (WHA) called on WHO Member States to develop "intensive preventive programmes" and "appropriate legislation and other measures enabling effective action to be taken" to reduce the harmful use of alcohol (WHO Resolution 1979). In 1983, the World Health Assembly recommended that Member States "formulate comprehensive national alcohol policies, with preventive measures as a priority" (WHO Resolution 1983). In 2005, the World Health Assembly again called on Member States to "develop, implement and evaluate effective strategies and programmes for reducing the negative health and social consequences of harmful use of alcohol". In 2010, the World Health Assembly endorsed a global strategy on the harmful use of alcohol. The Global Strategy to Reduce the Harmful Use of Alcohol was endorsed by the Sixty-third World Health Assembly in May 2010. The consensus reached on the global strategy and its endorsement by the WHA is the outcome of close collaboration between WHO Member States and the WHO secretariat. The process that led to the development of the global strategy included consultations with other stakeholders, such as civil society groups and economic operators. The global strategy builds on several WHO global and regional strategic initiatives and represents the commitment by WHO Member States to sustained action at all levels. The strategy contains a set of principles that should guide the development and implementation of policies at all levels; it sets priority areas for global action, recommends target areas for national action and gives a strong mandate to WHO to strengthen action at all levels. The strategy has five objectives:

1. Raised global awareness of the magnitude and nature of the health, social and economic problems caused by the harmful use of alcohol, and increased government commitment to act to address the harmful use of alcohol;
2. Strengthened knowledge base on the magnitude and determinants of alcohol-related harm and on effective interventions to reduce and prevent such harm;

3. Increased technical support to, and enhanced capacity of, Member States to prevent the harmful use of alcohol and manage disorders caused by the use of alcohol and associated health conditions;
4. Strengthened partnerships and better coordination among stakeholders and increased mobilization of resources required for appropriate and concerted action to prevent the harmful use of alcohol;
5. Improved systems for monitoring and surveillance at different levels, and more effective dissemination and application of information for advocacy, policy development and evaluation purposes.

The Global Strategy to Reduce the Harmful Use of Alcohol includes ten recommended target areas for national action:

• Leadership, awareness and commitment
• Health service response
• Community action
• Drink–driving policies and countermeasures
• Availability of alcohol
• Marketing of alcoholic beverages
• Pricing policies
• Reducing the negative consequences of intoxication
• Reducing the public health impact of unrecorded (bootlegging/illegal) alcohol
• Monitoring and surveillance.

The implementation of the global strategy will require active collaboration with Member States, with appropriate engagement of international development partners, civil society, the private sector, as well as public health and research institutions. The WHO Secretariat will report back to the WHA in 2013 on progress in implementing the strategy.

Prohibition

In spite of the fact that harmful use of alcohol is such a large scale health issue, only 31% of WHO member states have a National Alcohol Policy to prevent alcohol use among the population. According to the WHO survey, nine countries report a complete ban on alcohol: Afghanistan, Brunei Darussalam, the Islamic Republic of Iran, Maldives, Mauritania, Pakistan, Saudi Arabia, Somalia and Sudan. Four other countries report partial bans: Bangladesh, Comoros, India and Qatar (WHO Global Status Report on Alcohol and Heath 2011).

Increased taxation

One of the most effective strategies for reducing consumption of alcohol at the population level is through increasing alcohol prices, usually accomplished by raising alcohol taxes. A recent review of 112 studies of the effects of alcohol tax affirmed that when alcohol taxes go up, drinking goes down – including among problem drinkers and youth (Wagenaar et al 2009). However, such steps can only be effective if the illegal alcohol market is under control (Room et al 2002).

Ban on advertisements

Countries use a wide range of policies to control alcohol advertising and marketing. For example, in France there is an alcohol and tobacco policy law that bans the advertising of all alcoholic beverages containing over 1.2% alcohol by volume on television or in cinemas, and prohibits sponsorship of sports or cultural events by alcohol companies. It prohibits the targeting of young people and controls the content of alcohol advertisements. Messages and images should only refer to the characteristics of the products and a health warning must be included in each advertisement. In 2008, this legislation was extended to apply to alcohol advertising on the Internet and in newspaper and magazine editorials. Alcohol advertising is only permitted in the press for adults, on billboards, on radio channels (under certain conditions) and at some special events or places. There are significant monetary sanctions for infringements of the law, which have ensured its implementation (WHO Global Status Report on Alcohol and Health 2011).

Raising awareness

Awareness raising activities are among the most common measures taken by governments. Out of 152 countries that were included in the survey conducted by WHO, 126 (83%) indicated that they had undertaken some kind of alcohol awareness campaign in the past three years (Figure 2.23). While seven countries undertook only one activity, and two countries did as many as nine activities, the most common number of alcohol awareness campaigns reported by countries over the past three years was six (in 31 countries).

Another means of raising awareness about alcohol-related harm is through the mandated use of warnings on alcoholic beverage containers or on alcohol advertising. Such warnings are most common in the countries of the Americas Region. The text of such warnings varies, from blanket proscriptions on drinking ("Consuming alcohol produces damage to health" in Panama, "Drinking alcohol in excess is harmful" in Peru) to focused warnings about specific problems ("Alcohol consumption is dangerous for your health and affects the family" in Ecuador, "Do not drink and drive" in Kenya). At least two countries report using multiple messages: Poland has three different

texts mandated for use on alcoholic beverage advertisements, while Sweden has mandated 11 different texts (Global Status Report on Alcohol and Health 2011).

Overweight, Obesity and Central Obesity

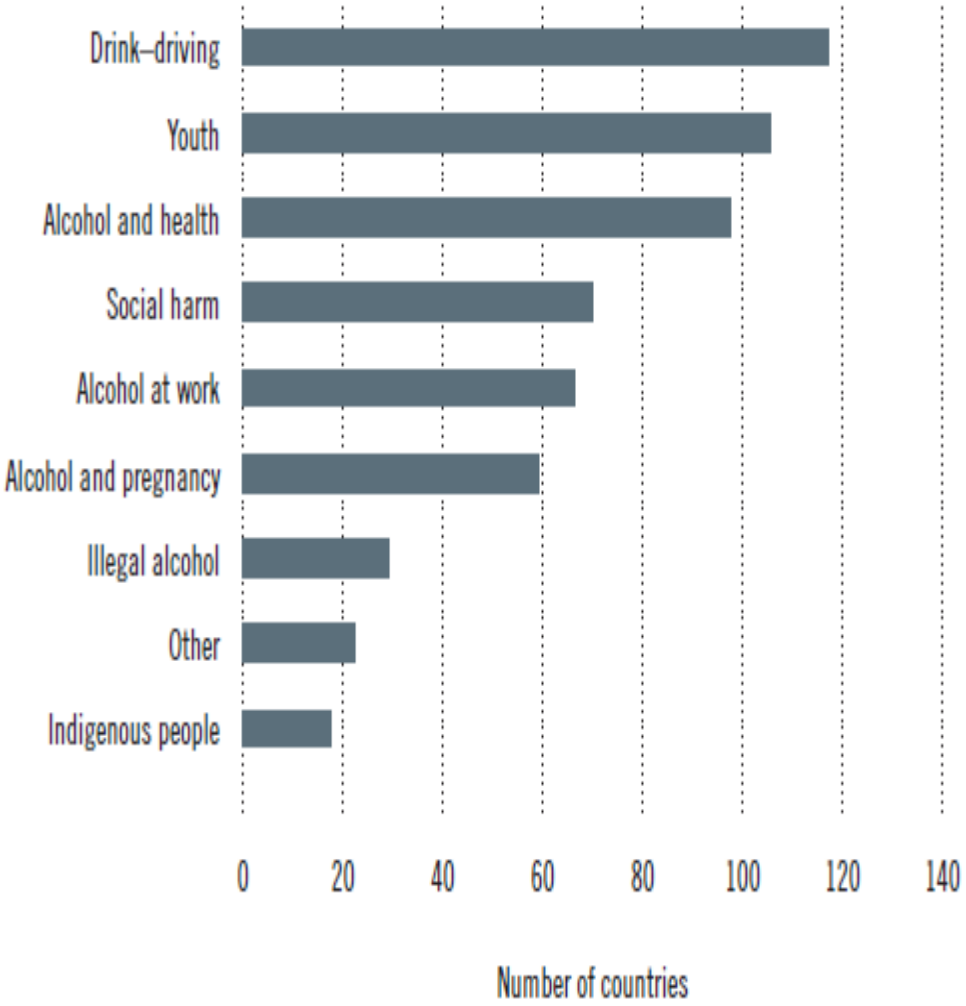
Overweight & obesity are defined as excessive fat accumulation that may impair health. Three simple measures of obesity are widely used in clinical practice; Body Mass Index (BMI), Waist Circumference (WC) and Waist-to-Hip ratio (WHR). The most widely used method to define thinness and fatness is BMI, a ratio of weight in kilograms divided by height in meters squared (kg/m^2). It has been correlated to morbidity & mortality risk in various populations (Willett et al 1999).

Abdominal obesity is defined by easy-to-use parameters; WC and WHR. Though BMI, WC or WHR correlate well with each other, it is also believed that combined use of these parameters of generalized and abdominal obesity may be better in identifying people at risk of CVD than either of them alone (Ardern et al 2003, Janiszewski et al 2007, Meisinger et al 2006).

BMI provides the most useful population-level measure of overweight and obesity as it is the same for both sexes and for all ages of adults. However, it should be considered a rough guide because it may not correspond to the same degree of fatness in different individuals. Also, while it accurately measures whether an individual's weight exceeds the healthy limit, it does not provide any information on the distribution of body fat in a person. To rectify this, it can be used in conjunction with an indicator of central obesity (Waist circumference) as central obesity, like elevated BMI is an important marker of cardiac health as well as diabetes (Wang et al 2005, Yusuf et al 2005). The 2009 Consensus Statement for Asians (Misra et al 2009) suggests that both BMI and WC should be used together (with equal importance) for population- and clinic-based metabolic and cardiovascular risk stratification.

Data suggest that the proposed cut-offs for defining overweight and obesity are not appropriate for Asian Indians, and that Asian Indians are at risk of developing obesity related co-morbidities at lower levels of body mass index (BMI) and waist circumference (WC). Several investigators have shown that Asian Indians are more predisposed to develop insulin resistance and cardiovascular risk factors at lower levels of BMI as compared to other ethnic groups (Vikram et al 2003, Misra 2003, Deurenberg et al 2001, McKeigue et al 1991).

Figure 2.23 Countries reporting awareness campaigns on alcohol, 2008



Source: World Health Organization, Global Status Report on Alcohol and Health, 2011

Also, since Asian Indians have higher percentage body fat, abdominal adiposity at lower or similar BMI levels as compared to white Caucasians (Misra and Vikram 2004, Misra 2003, Raji et al 2001, Chandalia et al 1999) the diagnosis of obesity should be made at a lower level of weight for height than in non-Asian Indian populations.

In response to this, the World Health Organization has decided not to take any firm actions on this issue, and has left to governments of respective Asian countries to take a decision of guidelines for BMI. Hence onus lies on physicians and scientists in India to decide what the best guidelines are for the Asian Indians. In response to this, guidelines have been formed by Misra et al in 2009 in the form of "Consensus Statement for Diagnosis of Obesity, Abdominal Obesity and the Metabolic Syndrome for Asian Indians and Recommendations for Physical Activity, Medical and Surgical Management".

The guidelines provided by the WHO and the guidelines for Asians are as presented in Table 2.2 & 2.3.

Overweight & Obesity – Rising Epidemic

Today, obesity is an increasingly important health problem worldwide including the developing countries. It has achieved epidemic status globally (WHO Technical Report 2000, Eckel et al 2004). Worldwide obesity has nearly doubled since 1980. In 2008, more than 1.4 billion adults, 20 and older, were overweight. Of these over 200 million men and nearly 300 million women were obese. 35% of adults aged 20 and over were overweight in 2008, and 11% were obese. 65% of the world's population live in countries where overweight and obesity kills more people than underweight (WHO Factsheet on Overweight & Obesity 2013).

An estimated 205 million men and 297 million women over the age of 20 were obese in 2008 – a total of more than half a billion adults worldwide (Finucane et al 2011). According to the WHO Global Status Report on NCDs 2010, the prevalence of overweight and obesity were highest in the WHO Region of the Americas (62% for overweight in both sexes, and 26% for obesity) and lowest in the WHO Region for South-East Asia (14% overweight in both sexes and 3% for obesity) (Figure 2.24). In the WHO European Region, the Eastern Mediterranean and the Region for the Americas, over 50% of women were overweight. For all the three regions, roughly half of overweight women are obese (23% of women in Europe, 24% in the Eastern Mediterranean, 29% in the Americas). In all WHO regions, women were more likely to be obese than men. In the African, South-East Asian and Eastern Mediterranean Regions, women had roughly double the obesity prevalence of men.

It can be deduced from the data that the prevalence of raised BMI increases with income level of countries, up to upper-middle-income levels. The prevalence of overweight in high-income and

upper-middle-income countries was more than double that of low- and lower-middle-income countries. For obesity, the difference more than triples from 7% obesity in both sexes in lower-middle-income countries to 24% in upper-middle income countries. Women's obesity was significantly higher than men's, with the exception of high income countries where it was of similar prevalence. In low- and lower-middle-income countries, obesity among women was much higher than that among men.

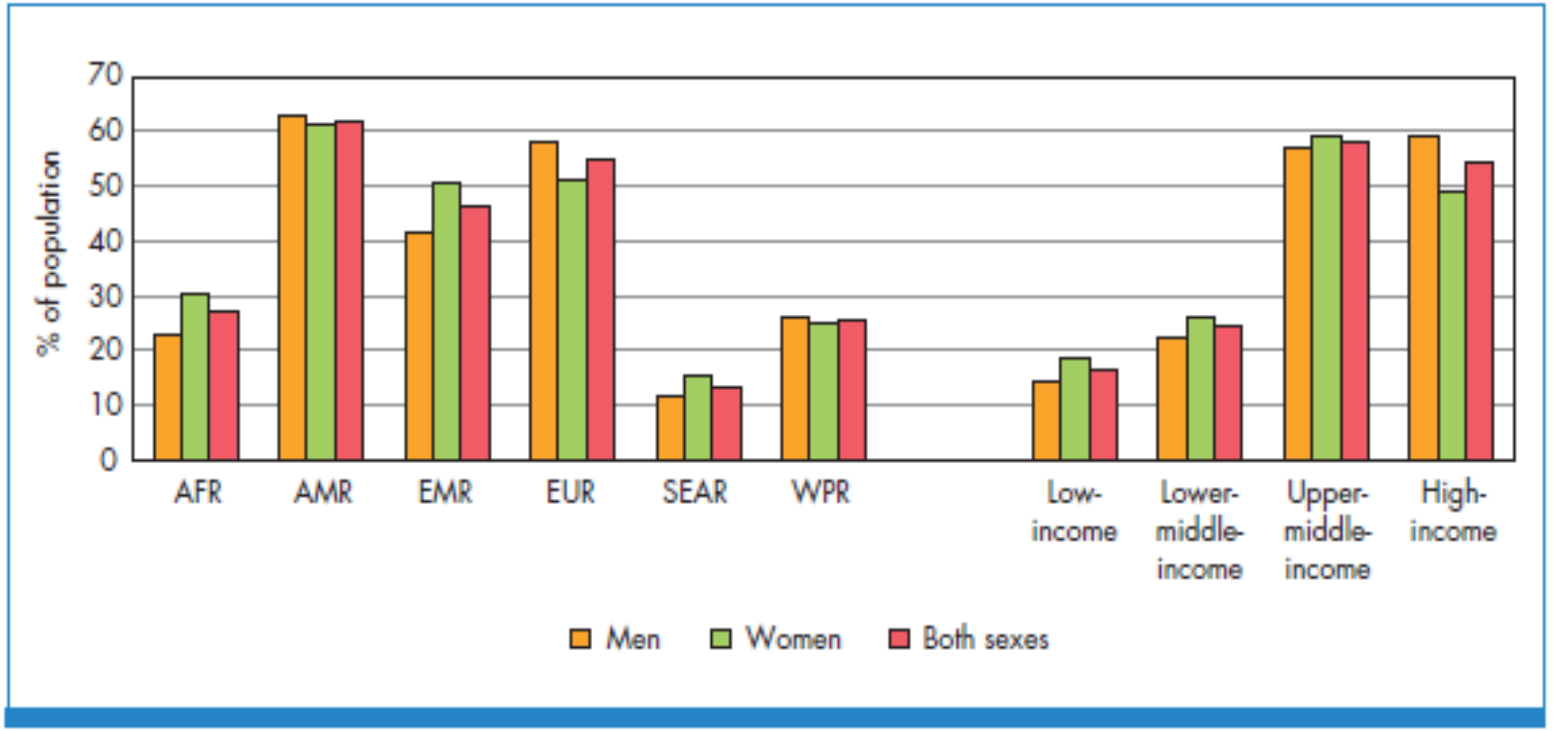
In addition to escalating prevalence of overweight and obesity among adult population, his trend is also present among infants and young children globally. Estimates for overweight among infants and young children globally for 2008 indicate that there were 40 million (or 6%) preschool children with a weight-for-height above more than two standard deviations of the WHO child growth standards median. The highest prevalence of overweight among infants and young children was found in the upper middle- income group, while the fastest rise in overweight was in the lower-middle-income group (Figure 2.25). Low-income countries had the lowest rate but overweight rose over time among all country income groups. The trend suggests that rising income is associated with rising rates of overweight among infants and young children.

Overweight and obesity are linked to more deaths worldwide than underweight. For example, 65% of the world's population live in countries where overweight and obesity kill more people than underweight (this includes all high-income and most middle-income countries).

Table 2.2 Guidelines for Asians (Misra et al 2009)	
BMI (kg/m²)	**Nutrition Status**
<18.5	Underweight
18.5-22.9	Normal
23-24.9	Overweight
≥ 25	Obese
WC (cm)	**Normal**
90	Male
80	Female
Source: Misra et al (2009)	

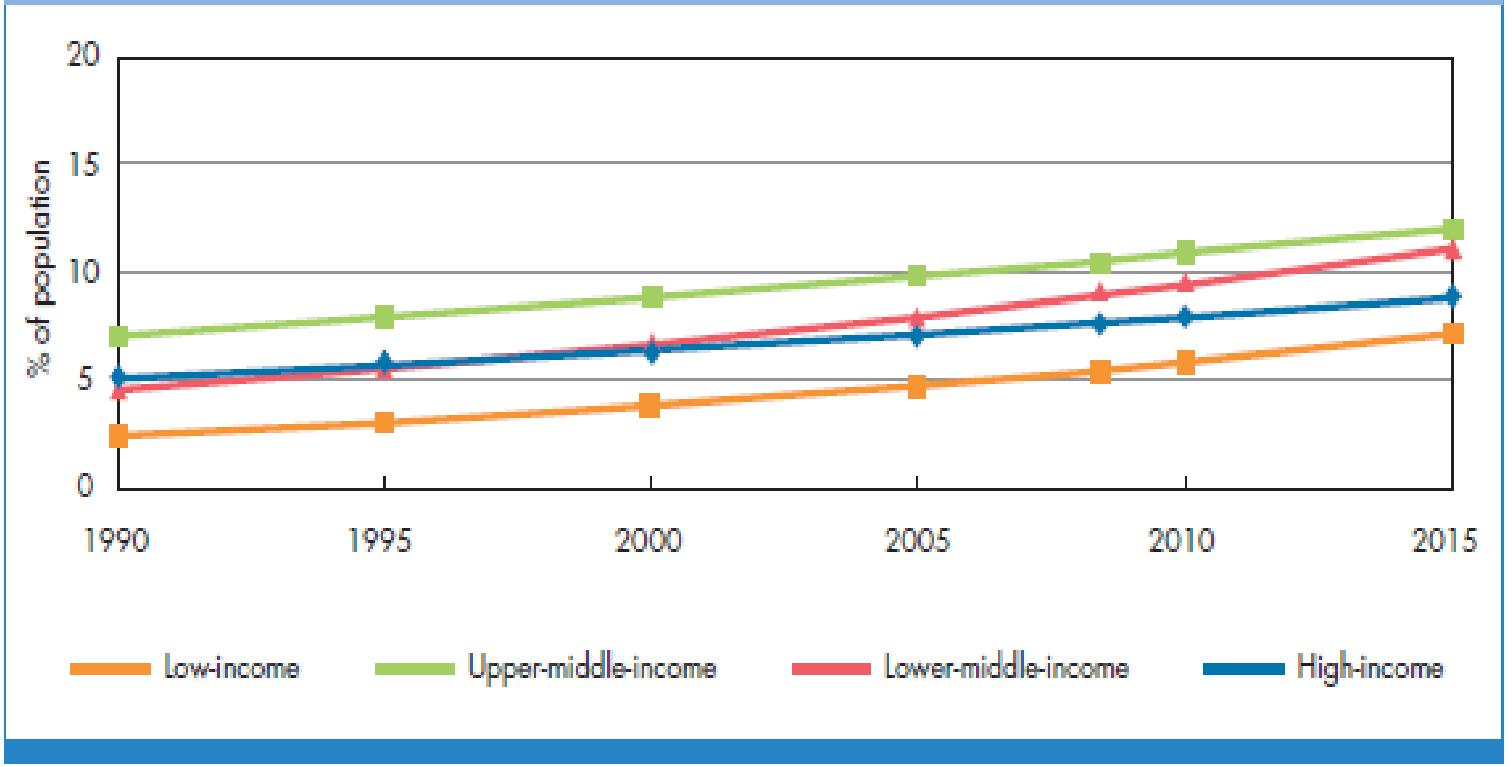
Table 2.3 Guidelines by WHO 1997	
BMI (kg/m²)	**Nutrition Status**
<18.5	Underweight
18.5-22.9	Normal
23-24.9	Overweight
≥ 25	Obese
WC (cm)	**Normal**
102	Male
88	Female
Source: WHO 1997	

Figure 2.24 Age-Standardized prevalence of overweight in adults aged 20+ years, by WHO Region and World Bank Income group, 2008



WHO Global Status Report on NCDs 2010

Figure 2.25 Infant and young child overweight trends from 1990 to 2015, by World Bank Income group



WHO Global Status Report on NCDs 2010

Overweight and obesity are the fifth leading risk for global deaths. At least 2.8 million adults die each year as a result of it. In addition, 44% of the diabetes burden, 23% of the ischemic heart disease burden and between 7% and 41% of certain cancer burdens are attributable to overweight and obesity (WHO Factsheet on Overweight & Obesity 2013). According to the WHO Global Status Report on Alcohol and Health 2011, overweight and obesity is the 10th leading global risk factor for causing disability. If only modifiable risk factors are taken into consideration, it ranks 5th after alcohol use, high B.P., tobacco use and high blood glucose.

Overweight & obesity – A public health problem in Low & Middle Income Countries

Overweight & obesity – once thought to be a problem limited to developed countries has emerged as a public health concern in developing countries such as India, Bangladesh and Pakistan. The result is that many low & middle income countries are now facing a "double burden" of disease in terms of co-existence of under and overweight & obesity within the same region, sometimes the same household. While these low and middle income countries continue to deal with the problems of infectious disease and under-nutrition, they are experiencing a rapid upsurge in non communicable disease risk factors such as obesity and overweight, particularly in urban settings (FAO Rome 2006).

In India, obesity is emerging as an important health problem particularly in urban areas, paradoxically co-existing with under nutrition. As can be seen from Figure 26, there has been a steady rise in the Mean BMI of Indians from 1992 to 2008 with current prevalence of overweight being 11% and obesity being 1.9% among Indians. (WHO NCD Country Profiles 2011). As has been seen in previously reported literature review, where low and middle income countries showed greater prevalence of overweight and obesity among women, Indian women are also more likely to be overweight (12.2% vs 9.9%) and obese (2.4 vs 1.3%) than men. Singh et al (2007), conducted a cross-sectional study in five urban Indian cities to find the prevalence of obesity, under nutrition and physical activity status among them. He found the overall prevalence of overweight and obesity to be 50.8%. In keeping with previously reported literature, significantly higher number of women were overweight and obese compared to male subjects ($p<0.05$). The highest prevalence of elevated BMI was among those aged 35-44 years in both the sexes. More than half the subjects had high WHR i.e. $\geq$ 0.9 for men and $\geq$ 0.85 for women (5.6%).

Obesity – the mother of all diseases

Due to the well-documented relationship of obesity with various morbidities, it has been aptly termed 'the mother of all diseases'. Obesity is a serious condition in its own right. It increases the risk of disability and death and requires focused prevention and control measures. It is also causally linked to many other chronic diseases such as diabetes, hypertension, heart disease and some cancers. Together these diseases constitute an enormous public health problem.

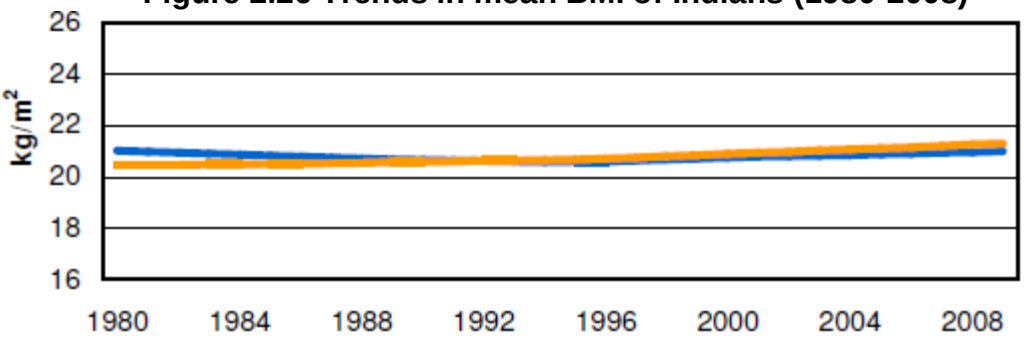
The rising prevalence overweight and obesity has a direct correlation with the increasing prevalence of obesity-related co-morbidities; hypertension, the metabolic syndrome, dyslipidemia, type 2 diabetes mellitus (T2DM), and cardiovascular disease (Misra and Khurana 2008, Gupta Gupta and Sarna 2002, Gupta and Misra 2007).

Obesity and Hypertension

Obesity is an important predictor of hypertension (high blood pressure). High Blood Pressure is defined by Joint National Commission VII (2004) classification as presented in Table 2.4.

Research has shown that both systolic and diastolic blood pressure increase with an increase in BMI and that obese individual are at a higher risk of developing hypertension as compared to their leaner counterparts (Stamler and Wentworth 1989, Mikhail et al 1999, Redon 2001). Hypertension is about 6 times more frequent in obese subjects than in lean men and women (Stamler et al 1978). A study conducted on Indians (30-50 years) reported that hypertensives had significantly higher body weight, body fat, BMI and WHR compared to subjects having normal B.P. readings (Kodali et al 1997).

Figure 2.26 Trends in mean BMI of Indians (1980-2008)



Source: World Health Organization NCD country profile, India 2011

Table 2.4 JNC VII Classification for Blood Pressure

SBP (mm Hg)		DBP (mm Hg)	Category
< 120	and/or	<80	Normal
120-139	and/or	80-89	Pre hypertensive
140-159	and/or	90-99	Hypertension (Stage 1)
≥ 160	and/or	≥ 100	Hypertension (Stage 2)

Obesity and Dyslipidaemia

Studies have shown that the rising prevalence of overweight and obesity has a direct correlation with the increasing prevalence of obesity-related co-morbidities; hypertension, the metabolic syndrome, dyslipidaemia, type 2 diabetes mellitus (T2DM), and cardiovascular disease (Gupta et al 2002, Gupta and Misra 2007). Dyslipidaemia is defined by the guidelines provided in Adult Treatment Panel (ATP) III as presented in Table 2.5.

Obesity and Cardiovascular Diseases

Obesity is a chronic metabolic disorder associated with cardiovascular disease and increased morbidity and mortality. A variety of adaptations/alterations in cardiac structure and function occur as excessive adipose tissue accumulates, even in the absence of co morbidities. Obesity is an independent risk factor for CVD (Poirier and Eckel 2002, Poirier and Eckel 2000. Intentional weight loss in obese patients can improve or prevent many of the obesity-related risk factors for cardiac diseases (Sjostrom et al 2004, Klein et al 2004).

Obesity and Diabetes

Obesity is a major risk factor for development of type 2 diabetes. Many studies have unequivocally established the relationship between excess weight and diabetes. There is overwhelming evidence to prove that fatter people are more likely to develop diabetes. The association of obesity with diabetes has been observed in comparisons of different populations as well as within populations (Tataranni 2002). Prospective studies of pre-diabetic subjects have shown conclusively that obesity and its duration are a major risk factor for type 2 diabetes (Everhart et al 1992). Obese individuals develop resistance to the cellular actions of insulin, characterized by an impaired ability of insulin to inhibit glucose output from the liver and to promote glucose uptake in fat and muscle. The association between obesity and insulin resistances likely a cause-and-effect relationship since human and animal studies indicate that weight loss/gain correlates closely with increasing/decreasing insulin sensitivity, respectively (Qatanani and Lazar 2007)

Prevention of overweight and obesity

Overweight and obesity, as well as their related non communicable diseases, are largely preventable. Supportive environments and communities are fundamental in shaping people's choices, making the healthier choice of foods and regular physical activity the easiest choice (accessible, available and affordable), and therefore preventing obesity.

At the individual level, people can:

- Limit energy intake from total fats and sugars;
- Increase consumption of fruit & vegetables, as well as legumes, whole grains & nuts;
- Engage in regular physical activity (60 minutes a day for children and 150 minutes per week for adults).

Individual responsibility can only have its full effect where people have access to a healthy lifestyle. Therefore, at the societal level it is important to:

- Support individuals in following the recommendations above, through sustained political commitment and the collaboration of many public and private stakeholders;
- Make regular physical activity and healthier dietary choices available, affordable and easily accessible to all - especially the poorest individuals.

The food industry can play a significant role in promoting healthy diets by:

- Reducing the fat, sugar and salt content of processed foods;
- Ensuring that healthy, nutritious choices are available & affordable to all consumers;
- Practicing responsible marketing especially those aimed at children and teenagers;
- Ensuring the availability of healthy food choices and supporting regular physical activity practice in the workplace.

Table 2.5 ATP III Guidelines for Dyslipidaemia			
	Normal (mg/dl)	**Borderline high (mg/dl)**	**High (mg/dl)**
Total Cholesterol	200	200-239	≥240
HDL C			
Men	40-60		>60
Women	50-60		>60
LDL C	<100	100-159	≥160
Triglycerides	<150	150-199	≥200

WHO initiatives

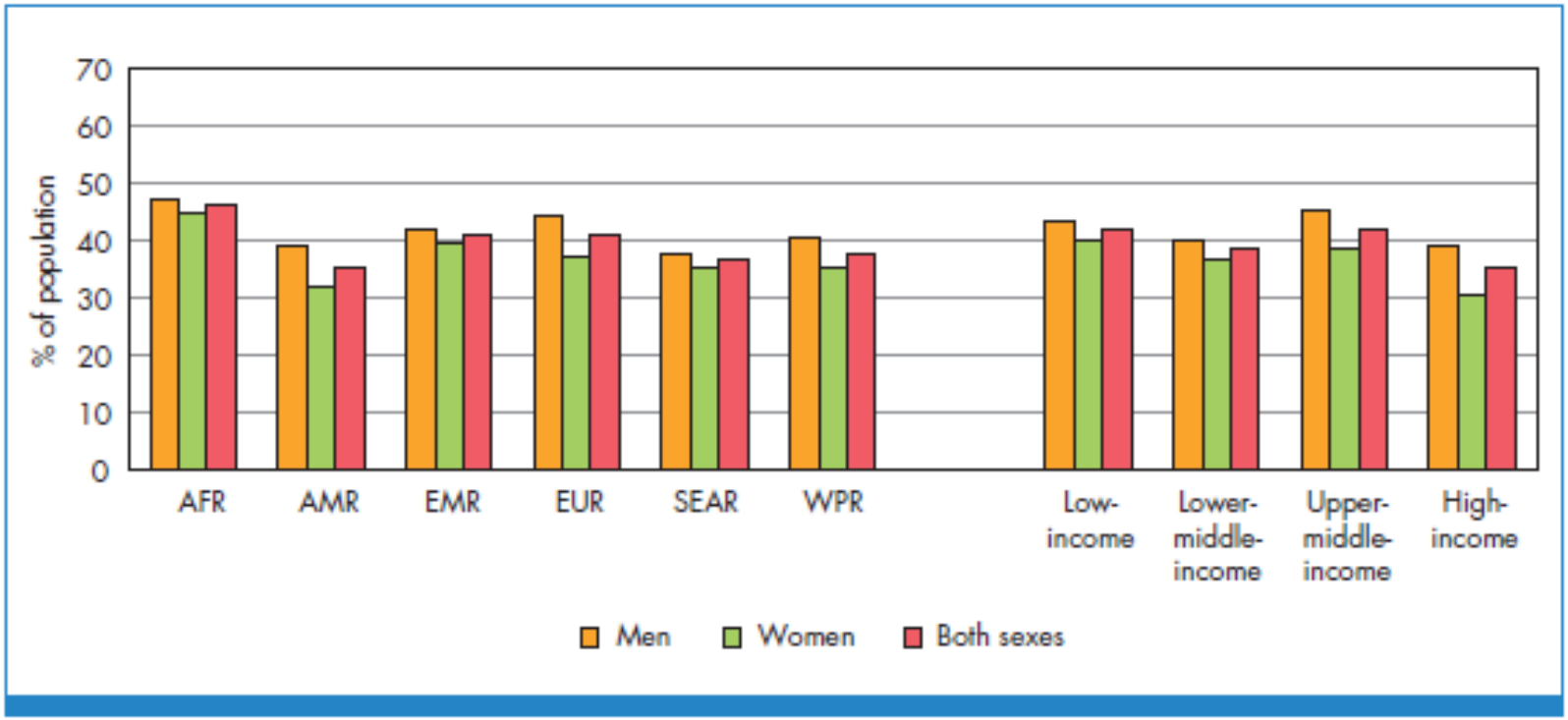
Adopted by the World Health Assembly in 2004, the WHO Global Strategy on Diet, Physical Activity and Health describes the actions needed to support healthy diets and regular physical activity. The Strategy calls upon all stakeholders to take action at global, regional and local levels to improve diets and physical activity patterns at the population level. WHO has developed the *2008-2013 Action plan for the global strategy for the prevention and control of non communicable diseases* to help the millions who are already affected cope with these lifelong illnesses and prevent secondary complications. This action plan aims to build on, the WHO Framework Convention on Tobacco Control and the WHO Global Strategy on Diet, Physical Activity and Health. The action plan provides a roadmap to establish and strengthen initiatives for the surveillance, prevention and management of NCDs. The Political Declaration of the High Level Meeting of the United Nations General Assembly on the Prevention and Control of Non communicable Diseases of September 2011, recognizes the critical importance of reducing the level of exposure of individuals and populations to unhealthy diet and physical inactivity. The political declaration commits to advance the implementation of the WHO Global Strategy on Diet, Physical Activity and Health, including, where appropriate, through the introduction of policies and actions aimed at promoting healthy diets and increasing physical activity in the entire population. In spite of these global level guidelines provided by WHO, at present, apart from laws regarding nutritional labelling of big brands of food products, no national guidelines are in place for prevention of overweight and obesity in India.

High Blood Pressure

"Blood pressure" is the force of blood pushing against the walls of the arteries as the heart pumps blood. If this pressure rises and stays high over time, it can damage the body in many ways (National Heart Lung and Blood Institute 2012). High blood pressure is a public health problem worldwide. On a global scale, raised blood pressure is estimated to cause 7.5 million deaths, about 12.8% of the total of all deaths. This accounts for 57 million disability adjusted life years (DALYS) or 3.7% of total DALYS. Raised blood pressure is a major risk factor for coronary heart disease and ischemic as well as hemorrhagic stroke. Blood pressure levels have been shown to be positively and continuously related to the risk for stroke and coronary heart disease (WHO Global Health Observatory on Raised Blood Pressure 2013).

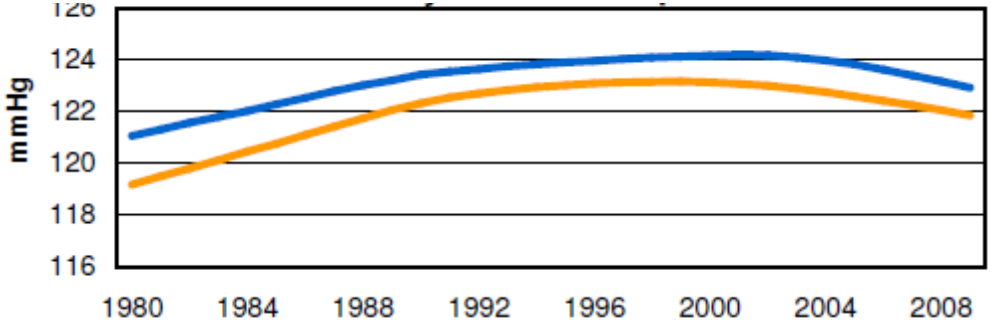
As can be seen from Figure 2.27, globally, the overall prevalence of raised blood pressure in adults aged 25 and over was around 40% in 2008 (WHO Global Status Report on NCDs 2010). Across the WHO regions, the prevalence of raised blood pressure was highest in Africa, where it was 46% for both sexes combined. Both men and women have high rates of raised blood pressure in the Africa region, with prevalence rates over 40%. The lowest prevalence of raised blood pressure was in the WHO Region of the Americas at 35% for both sexes. Men in this region had higher prevalence than women (39% for men and 32% for women). In all WHO regions, men have slightly higher prevalence of raised blood pressure than women. This difference was only statistically significant in the Americas & Europe. Across income groups of countries, the prevalence of raised B.P. was consistently high with all income groups having rates of around 40%. The prevalence in high income countries was lower, at 35% (WHO Global Health Observatory on Raised Blood Pressure 2013). In the Indian context, data from WHO NCD country profile says that in 2008, 32.5% Indians (3.2% males and 31.7% females) were suffering from high B.P. i.e. SBP >139 mm Hg and/or DBP >89 mm Hg. The mean systolic blood pressure increased sharply from 1980 to 2003 and then showed decline towards 2008. The data has been graphically presented in Figure 2.28 (WHO NCD Country Profiles 2011).

Figure 2.27 Age-Standardized prevalence of raised blood pressure in adults aged 25+ years, by WHO Region and World Bank Income group, comparable estimated (2008)



WHO Global Status Report on NCDs 2010

Figure 2.28 Trend in mean systolic blood pressure of Indians (1980-2008)



Source: World Health Organization NCD country profile, India 2011

Consequences of uncontrolled hypertension

If left uncontrolled, hypertension can lead to a heart attack, an enlargement of the heart and eventually heart failure. Raised blood pressure is a major risk factor for coronary heart disease and ischemic as well as hemorrhagic stroke. Blood pressure levels have been shown to be positively and continuously related to the risk for stroke and coronary heart disease. In some age groups, the risk of cardiovascular disease doubles for each increment of 20/10 mmHg of blood pressure, starting as low as 115/75 mmHg. In addition to coronary heart diseases and stroke, complications of raised blood pressure include heart failure, peripheral vascular disease, renal impairment, retinal haemorrhage and visual impairment.

Treating systolic blood pressure and diastolic blood pressure until they are less than 140/90 mmHg is associated with a reduction in cardiovascular complications (WHO Global Health Observatory on Raised Blood Pressure 2013). Contrary to popular belief that only hypertensives are at risk of developing stroke and CHD, literature has revealed that there is an increased risk in the 'normotensive' individuals as well as their SBP and DBP readings rise (Macmohan et al 1997). The risk of developing adverse consequences of rising blood pressure levels is thus continuous and constant, steadily increasing with a rise in blood pressure.

Prevention and management of high blood pressure

Unhealthy diet, particularly high sodium intake, physical inactivity, stress, excessive use of alcohol, tobacco intake, overweight & obesity and central obesity are the major modifiable risk factor for hypertension. Thus, a control over these factors and adoption of healthy lifestyle behaviours plays an important role in prevention of hypertension. In context of management of existing hypertension, there are two methods for the same: pharmacological management and non pharmacological management of hypertension.

Pharmacological management of hypertension

The benefits of treatment include reduction in risk of cardiac failure, reduction in incidence of dementia (Addington 1979), preservation of renal function and prevention of blindness in diabetic patients with hypertension (Urquhart 1996, Volmink and Garner 2000, Urquhart 1992). Poor adherence to treatment is the most important cause of uncontrolled blood pressure (Banerji 2002, Hudelson 1996, Farmer 1996).

Despite the availability of effective treatment, over half of the patients being treated for hypertension drop out of care entirely within a year of diagnosis (Diwan and Thorson 1999) and of those who remain under medical supervision only about 50% take at least 80% of their

prescribed medications. Consequently, because of poor adherence to antihypertensive treatment patients with a diagnosis of hypertension do not achieve optimum blood-pressure control (Dick and Lombard 1997).

Good adherence has been associated with improved blood pressure control (Banerji 2002) and reduced complications of hypertension (Fisher and Fisher 1992). For example, in one study, health education interventions for urban-poor patients with hypertension were introduced sequentially in a randomized factorial design to a cohort of 400 ambulatory outpatients with hypertension over a 5-year period. The interventions resulted in an improvement in adherence, which was associated with better blood pressure control and a significant reduction (53.2% less) in hypertension-related mortality rates (Glanz et al 2008). In another study, patients who did not adhere to beta-blocker therapy were found to be 4.5 times more likely to have complications of coronary heart disease than those who did (Davis 1967).

Non Pharmacological management of Hypertension

The efficacy of non-pharmacological therapy, including reduction in dietary salt intake, weight reduction, moderation of alcohol intake & increased physical activity, in lowering blood pressure has been well documented in literature (Sbarbaro and Sbarbaro 1994). In general, among small, well-supervised and motivated groups of patients receiving counselling on moderate salt restriction, most of the patients followed the regimen (Raviglione and Pio 2002, Bayer and Wilkinson 1995). There is limited information, however, on adherence to other lifestyle measures intended to lower blood pressure. Most of the problems related to adherence to non-pharmacological treatment are currently assumed to be similar to those related to adherence to antihypertensive drug therapy and this is an area that warrants further investigation. Additionally, the sodium and potassium values of most processed foods in India are unavailable due to lack of mandatory nutrition labelling laws. It is thus next to impossible to counsel individuals regarding their sodium and potassium intakes in absence of available nutrition content information.

HEALTH PROMOTION AS A STRATEGY FOR PREVENTION OF NCDs

The World Health Organization defines Health promotion as the process of enabling people to increase control over, and to improve, their health. To reach a state of complete physical, mental and social well-being, an individual or group must be able to identify and to realize aspirations, to satisfy needs, and to change or cope with the environment. Health is, therefore, seen as a resource for everyday life, not the objective of living. Health is a positive concept emphasizing social and personal resources, as well as physical capacities. Therefore, health promotion is not just the responsibility of the health sector, but goes beyond healthy life-styles to well-being.

The Need for Health Promotion

The enjoyment of the highest attainable standard of health is one of the fundamental rights of every human being without discrimination. Good health is a major resource for social, economic and personal development and an important dimension of quality of life. Political, economic, social, cultural, environmental, behavioral and biological factors can all favors health or be harmful to it. Health promotion action aims at making these conditions favorable through advocacy for health. The previous literature review highlights the deteriorating health profile of population all over the world in terms of both under and overweight & obesity. This clearly calls for action in terms of improvement in health which justifies the need for health promotion in various areas such as: child health, adolescent health, maternal nutrition, communicable and non communicable diseases.

Health promotion focuses on achieving equity in health. It aims at reducing differences in current health status and ensuring equal opportunities and resources to enable all people to achieve their fullest health potential. This includes a secure foundation in a supportive environment, access to information, life skills and opportunities for making healthy choices. People cannot achieve their fullest health potential unless they are able to take control of those things which determine their health (WHO 1986).

Various health promotion initiatives have been undertaken at a global level to help countries to adapt and adopt health promotion strategies at local level thus creating enabling environment towards healthier nations.

The Ottawa Charter for Health Promotion – 1986

The Ottawa charter for Health Promotion was adopted at the first International Conference on Health Promotion 'The Move towards a New Public Health', meeting in Ottawa, Ontario, Canada held on 21st November 1986. This conference was primarily a response to growing expectations for a new public health movement around the world. Discussions focused on the needs in industrialized countries, but took into account similar concerns in all other regions. It built on the progress made through the Declaration on Primary Health Care at Alma-Ata, the World Health Organization's Targets for Health for All document, and the recent debate at the World Health Assembly on intersect oral action for health. The Charter focuses on 4 main areas for successful health promotion:

1. *Creating Supportive Environment*

Our societies are complex and interrelated. Health cannot be separated from other goals. The inextricable links between people and their environment constitutes the basis for a socio-ecological approach to health. The overall guiding principle for the world, nations, regions and communities alike, is the need to encourage reciprocal maintenance - to take care of each other, our communities and our natural environment. Systematic assessment of the health impact of a rapidly changing environment - particularly in areas of technology, work, energy production & urbanization - is essential and must be followed by action to ensure positive benefit to public health.

2. *Strengthen Community Actions*

Health promotion works through concrete and effective community action in setting priorities, making decisions, planning strategies and implementing them to achieve better health. At the heart of this process is the empowerment of communities - their ownership and control of their own endeavours and destinies. Community development draws on existing human and material resources in the community to enhance self-help and social support, and to develop flexible systems for strengthening public participation in and direction of health matters. This requires full and continuous access to information, learning opportunities for health, as well as funding support.

3. *Develop Personal Skills*

Health promotion supports personal and social development through providing information, education for health, and enhancing life skills. By so doing, it increases the options available to people to exercise more control over their own health and over their environments, and to make choices conducive to health. Enabling people to learn, throughout life, to prepare them for all of its stages and to cope with chronic illness and injuries is essential. This has to be facilitated in

school, home, work and community settings. Action is required through educational, professional, commercial and voluntary bodies, and within the institutions themselves.

4. Reorient Health Services

The responsibility for health promotion in health services is shared among individuals, community groups, health professionals, health service institutions and governments.

They must work together towards a health care system which contributes to the pursuit of health. The role of the health sector must move increasingly in a health promotion direction, beyond its responsibility for providing clinical and curative services. Health services need to embrace an expanded mandate which is sensitive and respects cultural needs. This mandate should support the needs of individuals and communities for a healthier life, and open channels between the health sector and broader social, political, economic and physical environmental components. Reorienting health services also requires stronger attention to health research as well as changes in professional education and training. This must lead to a change of attitude and organization of health services which refocuses on the total needs of the individual as a whole person.

The Conference called on the World Health Organization and other international organizations to advocate the promotion of health in all appropriate forums and to support countries in setting up strategies and programmes for health promotion.

Adelaide Recommendations on Healthy Public Policy – 1988

The Adelaide Conference on Healthy Public Policy continued in the direction set at Ottawa, and built on their momentum. The Adelaide Recommendations on Healthy Public Policy were presented at the Second International Conference on Health Promotion, Adelaide, South Australia. 5-9 April 1988, jointly by the WHO and the Department of Community Services & Health, Adelaide (WHO 1988). Two hundred and twenty participants from forty-two countries shared experiences in formulating and implementing healthy public policy.

The Charter identified five health promotion action areas:

- Build Healthy Public Policy,
- Create Supportive Environments,
- Develop Personal Skills,
- Strengthen Community Action, And
- Reorient Health Services.

The following recommended strategies for healthy public policy action reflect the consensus achieved at the Conference.

Healthy Public Policy

Healthy public policy is characterized by an explicit concern for health and equity in all areas of policy and by accountability for health impact. The main aim of healthy public policy is to create a supportive environment to enable people to lead healthy lives. Such a policy makes health choices possible or easier for citizens. It makes social and physical environments health-enhancing. In the pursuit of healthy public policy, government sectors concerned with agriculture, trade, education, industry, and communications need to take into account health as an essential factor when formulating policy. These sectors should be accountable for the health consequences of their policy decisions. They should pay as much attention to health as to economic considerations.

Accountability for Health

The recommendations of this Conference will be realized only if governments at national, regional and local levels take action. The development of healthy public policy is as important at the local levels of government as it is nationally. Governments should set explicit health goals that emphasize health promotion. Public accountability for health is an essential nutrient for the growth of healthy public policy. A commitment to healthy public policy means that governments must measure and report the health impact of their policies in language that all groups in society readily understand. Taking education and literacy into account, special efforts must be made to communicate with

those groups most affected by the policy concerned. The Conference emphasizes the need to evaluate the impact of policy. Health information systems that support this process need to be developed. This will encourage informed decision-making over the future allocation of resources for the implementation of healthy public policy.

Action Areas

The Conference identified four key areas as priorities for health public policy for immediate action:

a. Supporting the health of women
b. Food and nutrition
c. Tobacco and alcohol
d. Creating supportive environments

Renewal of Commitment

In the interests of global health, the participants at the Adelaide Conference urged all concerned to reaffirm the commitment to a strong public health alliance that the Ottawa Charter called for.

Jakarta Declaration on Leading Health Promotion into the 21st Century - 1997

The Fourth International Conference on Health Promotion: New Players for a New Era - Leading Health Promotion into the 21st Century, meeting in Jakarta from 21 to 25 July 1997 came at a critical moment in the development of international strategies for health. It was almost 20 years since the World Health Organization's Member States made an ambitious commitment to a global strategy for Health for all and the principles of primary health care through the Declaration of Alma-Ata. It was 11 years since the First International Conference on Health Promotion was held in Ottawa, Canada. That Conference resulted in proclamation of the Ottawa Charter for Health Promotion, which has been a source of guidance and inspiration for health promotion since that time. Subsequent international conferences and meetings have further clarified the relevance and meaning of key strategies in health promotion, including healthy public policy (Adelaide Recommendations for Healthy Public Policy 1988), and supportive environments for health (Sundsvall Statement on Supportive Environments for Health 1991). The Fourth International Conference on Health Promotion was the first to be held in a developing country, and the first to involve the private sector in supporting health promotion. It provided an opportunity to reflect on what had been learned about effective health promotion, to re-examine the determinants of health, and to identify the directions and strategies that must be adopted to address the challenges of promoting health in the 21st century.

The Jakarta Declaration (1997) terms Health Promotion as a 'key investment' and says that Health promotion strategies can develop and change lifestyles, and have an impact on the social, economic and environmental conditions that determine health. Health promotion is a practical approach to achieving greater equity in health.

Priorities for health promotion in the 21st Century

1. Promote social responsibility for health

Decision-makers must be firmly committed to social responsibility. Both the public and private sectors should promote health by pursuing policies and practices that:

• avoid harming the health of individuals

• protect the environment and ensure sustainable use of resources

• restrict production of and trade in inherently harmful goods and substances such as tobacco and armaments, as well as discourage unhealthy marketing practices

• safeguard both the citizen in the marketplace and the individual in the workplace

• include equity-focused health impact assessments as an integral part of policy development.

2. Increase investments for health development

In many countries, current investment in health is inadequate and often ineffective. Increasing investment for health development requires a truly multisectorial approach including, for example, additional resources for education and housing as well as for the health sector. Greater investment for health and reorientation of existing investments, both within and among countries, has the potential to achieve significant advances in human development, health and quality of life. Investments for health should reflect the needs of particular groups such as women, children, older people, and indigenous, poor and marginalized populations.

3. Consolidate and expand partnerships for health

Health promotion requires partnerships for health and social development between the different sectors at all levels of governance and society. Existing partnerships need to be strengthened and the potential for new partnerships must be explored. Partnerships offer mutual benefit for health through the sharing of expertise, skills and resources. Each partnership must be transparent and accountable and be based on agreed ethical principles, mutual understanding and respect. WHO guidelines should be adhered to.

4. Increase community capacity and empower the individual

Health promotion is carried out by and with people, not on or to people. It improves both the ability of individuals to take action, and the capacity of groups, organizations or communities to influence the determinants of health. Improving the capacity of communities for health promotion requires practical education, leadership training, and access to resources. Empowering individuals demands more consistent, reliable access to the decision-making process and the skills and knowledge essential to effect change.

Both traditional communication and the new information media support this process. Social, cultural and spiritual resources need to be harnessed in innovative ways.

5. Secure an infrastructure for health promotion

To secure an infrastructure for health promotion, new mechanisms for funding it locally, nationally and globally must be found. Incentives should be developed to influence the actions of governments, nongovernmental organizations, educational institutions and the private sector to make sure that resource mobilization for health promotion is maximized. “Settings for health” represent the organizational base of the infrastructure required for health promotion. New health challenges mean that new and diverse networks need to be created to achieve intersectorial collaboration. Such networks should provide mutual assistance within and among countries and facilitate exchange of information on which strategies have proved effective and in which settings. Training in and practice of local leadership skills should be encouraged in order to support health

promotion activities. Documentation of experiences in health promotion through research and project reporting should be enhanced to improve planning, implementation and evaluation. All countries should develop the appropriate political, legal, educational, social and economic environments required to support health promotion.

Mexico Ministerial Statement for the Promotion of Health: From Ideas to Action – 2000

The Mexico Ministerial Statement for the Promotion of Health: From Ideas to Action – 2000 was given during the Fifth Global Conference on Health Promotion, Health Promotion: Bridging the Equity Gap, Mexico City, 5-9 June (WHO 2000). The Statement:

1. Recognize that attainment of the highest possible health standard is a positive asset for the enjoyment of life and necessary for social & economic development & equity.
2. Acknowledge that the promotion of health and social development is a central duty and responsibility of governments that all sectors of society share.
3. Are mindful that, in recent years, through the sustained efforts of governments and societies working together, there have been significant health improvements and progress in the provision of health services in many countries of the world.
4. Realize that, despite this progress, many health problems still persist which hinder social and economic development and must therefore be urgently addressed to further equity in the attainment of health and wellbeing.
5. Are mindful that, at the same time, new and emerging diseases threaten the progress made in health.
6. Realize that it is urgent to address the social, economic & environmental determinants of health and that this requires strengthened mechanisms of collaboration for the promotion of health across all sectors and all levels of society.
7. Conclude that health promotion must be a fundamental component of public policies and programmes in all countries in the pursuit of equity and better health for all.
8. Realize that there is ample evidence that good health promotion strategies of promoting health are effective.

Considering the above, the statement subscribes to the following:

a) To position the promotion of health as a fundamental priority in local, regional, national and international policies and programmes.
b) To take the leading role in ensuring the active participation of all sectors and civil society, in the implementation of health promoting actions which strengthen and expand partnerships for health.

c) To support the preparation of country-wide plans of action for promoting health, if necessary drawing on the expertise in this area of WHO and its partners. These plans will vary according to the national context, but will follow a basic framework agreed upon during the Fifth Global Conference on Health Promotion (2000), and may include among others:

- The identification of health priorities and the establishment of healthy public policies and programmes to address these.
- The support of research which advances knowledge on selected priorities.
- The mobilization of financial & operational resources to build human & institutional
- Capacity for the development, implementation, monitoring and evaluation of country-wide plans of action.

d) To establish or strengthen national & international networks which promote health.

e) To advocate that UN agencies be accountable for the health impact of their development agenda.

f) To inform the Director General of the World Health Organization, for the purpose of her report to the 107th session of the Executive Board, of the progress made in the performance of the above actions.

The Bangkok Charter for Health Promotion in a Globalized World - 2005

The 'Bangkok Charter for Health Promotion in a globalized world' has been agreed to by participants at the 6th Global Conference on Health Promotion held in Thailand from 7-11 August, 2005 (WHO 2005). The Bangkok Charter reaches out to people, groups and organizations that are critical to the achievement of health, including: governments and politicians at all levels, civil society, the private sector, international organizations, and the public health community. The Bangkok charter identifies four key commitments to make the promotion of health:

- Central to the global development agenda
- A core responsibility for all of government
- A key focus of communities and civil society
- A requirement for good corporate practice.

1. <u>Make the promotion of health central to the global development agenda</u>

Strong intergovernmental agreements that increase health and collective health security are needed. Government and international bodies must act to close the health gap between rich and poor. Effective mechanisms for global governance for health are required to address all the

harmful effects of: Trade, Products, Services and Marketing Strategies. Health promotion must become an integral part of domestic and foreign policy and international relations, including in situations of war and conflict. This requires actions to promote dialogue and cooperation among nation states, civil society, and the private sector. These efforts can build on the example of existing treaties such as the World Health Organization Framework Convention for Tobacco Control.

2. Make the promotion of health a core responsibility for all of government

All governments at all levels must tackle poor health and inequalities as a matter of urgency because health is a major determinant of socioeconomic and political development. Local, regional and national governments must:

• Give priority to investments in health, within and outside the health sector

• Provide sustainable financing for health promotion.

To ensure this, all levels of government should make the health consequences of policies and legislation explicit, using tools such as equity-focused health impact assessment.

3. Make the promotion of health a key focus of communities and civil society

Communities and civil society often lead in initiating, shaping and undertaking health promotion. They need to have the rights, resources and opportunities to enable their contributions to be amplified and sustained. In less developed communities, support for capacity building is particularly important. Well organized and empowered communities are highly effective in determining their own health, and are capable of making governments and the private sector accountable for the health consequences of

their policies and practices. Civil society needs to exercise its power in the marketplace by giving preference to the goods, services and shares of companies that exemplify corporate social responsibility. Grass-roots community projects, civil society groups and women's organizations have demonstrated their effectiveness in health promotion, and provide models of practice for others to follow. Health professional associations have a special contribution to make.

4. Make the promotion of health a requirement for good corporate practice

The corporate sector has a direct impact on the health of people and on the determinants of health through its influence on:

• Local settings

• National cultures

• Environments, and

• Wealth distribution.

The private sector, like other employers and the informal sector, has a responsibility to ensure health and safety in the workplace, and to promote the health and well-being of their employees, their families and communities. The private sector can also contribute to lessening wider global health impacts, such as those associated with global environmental change by complying with local national and international regulations and agreements that promote and protect health. Ethical and responsible business practices and fair trade exemplify the type of business practice that should be supported by consumers and civil society, by government incentives and regulations.

Health Promotion – a Strategy for reducing burden of NCDs

The World Health Report 2002 highlights the potential for improving public health through measures that reduce the prevalence of risk factors (most notably the combination of unhealthy diets and physical inactivity) of non communicable diseases.

Development of an integrated approach that will target all major common risk factors of cardiovascular diseases (CVD), diabetes mellitus (DM), cancer and chronic respiratory diseases is the most cost-effective way to prevent and control them. An integrated approach responds not only to the need of intervention on major common risk factors with the aim of reducing premature mortality and morbidity of chronic non communicable diseases, but also the need to integrate primary, secondary and tertiary prevention, health promotion, and related programmes across sectors and different disciplines.

In keeping with this, the objectives of Integrated Chronic Disease Prevention and Control Programme initiated by the WHO are:

- To strengthen prevention and control of chronic non communicable diseases by tackling the major risk factors, focusing on WHO's four priority non communicable diseases - cardiovascular diseases, cancer, diabetes, and chronic respiratory diseases, and underlying determinants of health;
- To reduce premature mortality and morbidity, and
- To improve quality of life, with particular focus on developing countries, working through the Global Forum and the regional networks in line with the global strategy approved by the 53rd World Health Assembly.

One of the top priorities is the implementation of the WHO Global Strategy on Diet, Physical Activity and Health, which was endorsed by the World Health Assembly in 2004. The strategy describes actions needed to support the adoption of healthy diets and regular physical activity.

Given the projections of the severe burden of chronic non communicable diseases, it is of central importance to begin the application of this expertise on a global level and particularly in low and middle-income countries. Joint action on the main factors in the population is an efficient, cost effective and sustainable way to reduce the incidence of major chronic non communicable diseases. It is crucial towards the implementation of the strategy to assist countries in developing national integrated strategic action plan and comprehensive policy frameworks for chronic disease prevention and control.

In 2010, the World Health Organization conducted a survey to assess national capacity for the prevention and control of non communicable diseases (WHO Report of the Global Survey 2010). Analysis of responses from the survey showed that 89% of countries reported having a unit, branch or department in their ministry of health with responsibility for NCDs. Eighty per cent (80%) of countries reported that funding is available for NCD treatment and control and 81% had funding for NCD prevention and health promotion. Major sources of funding for NCDs included government revenues (84% of countries), international donors (56%), health insurance (39%), and earmarked taxes (20%). Ninety per cent of countries (90%) have at least one agency, institute, academic centre or other government department that supports the ministry of health (or equivalent) in their NCD efforts.

Ninety-two per cent of countries (92%) have developed at least one policy, plan, or strategy to address NCDs and/or their risk factors. However, many fewer reported that such policies were operational or funded. While 92% of countries have at least one policy, only 79% have at least one operational policy and only 71% have at least one operational policy with dedicated funding. For NCD surveillance, only 48% of countries reported including population-based mortality data and only 23% reported including population-based morbidity data in their national health reporting systems. Fifty-nine per cent of countries (59%) include data on NCD risk factors in their national health reporting system and 49% have population-based NCD risk factor data.

Eighty-five per cent of countries (85%) provide primary prevention and health promotion risk factor detection (77%) and risk factor and disease management (81%) in their primary health care systems. However, fewer countries have support for self-help and self-care (58%) or home-based care (50%) in their primary health care systems. While majority of the countries reported having evidence-based guidelines, protocols or standards available for the management of diabetes, hypertension, and dietary counseling, less than a third of countries have a guideline that

is currently fully implemented. Essential medicines for the management of diabetes, hypertension and cardiovascular disease were reported as generally available in the vast majority of countries. The survey clearly indicated serious shortages in human manpower with basic skills and expertise in NCD prevention and control. For example, only two thirds of health professionals were reported to receive training in the management of hypertension. Similar patterns were also observed in relation to basic training in the management of other major chronic diseases like diabetes and bronchial asthma. Another major constraint encountered is the lack of essential standards of health care for people with chronic diseases.

Successful community based interventions for prevention and control of NCDs

North Karelia Project

North Karelia in Finland and Stanford in the USA in the early 1970s provided the settings for the first real community intervention programmes, whose goal was to bring about social and health-oriented behavioural changes on several levels in the community - from the individual to the institutional and organizational levels (Puska 2002). In the early 1970's Finland had the greatest CVD mortality rate in the world. The North Karelia Project was started in 1972 as a national pilot and demonstration programme for CVD prevention. Reduction in the population levels of the well-established risk factors (smoking, elevated cholesterol and elevated blood pressure) was the main intermediate objective. A comprehensive community-based intervention in the form of media campaigns, involvement of various community organizations, mobilization of local leaders & youth, involving health services, NGO's, industry and public policy was used with major emphasis on CHD prevention through cholesterol lowering dietary changes (intensified collaboration with food manufacturers). After the initial period (1972-77), the project experiences have been actively used for comprehensive national heart health programme. Carefully conducted evaluation involving population surveys and disease registers have shown that the population risk factor levels had greatly reduced, and consequently the age-adjusted CHD mortality rate among 30-64 year old male population reduced, from 1970 to 1995, by 73% in North Karelia and 65% in all Finland. Very favourable changes have also been shown with cancer and all-cause mortality and the general health of the population. International collaboration, especially through WHO, will test similar approaches in other parts of the world and help control this major global disease burden.

Stanford Community Study

The Stanford Community Study was started in 1974. Information was broadcast via the mass media to the inhabitants in two towns with a total of 30,000 inhabitants, with the aim of reducing the fat content in the daily diet (Fortmann et al 1981). Individual information was also provided in one of the two towns. A third town served as the reference. After two years of intervention - including intensive information campaigns and individual counseling - a reduction in the average fat content in diets of 25 grams per day was demonstrated in the two intervention areas, compared to three grams per day in the reference area. Similarly, a significant drop in the population's cholesterol count could be seen in both intervention areas.

The contemporary view of capacity-building goes beyond the conventional perception of training, it refers to creating sustainable environment for prevention and control of chronic diseases, strengthening or building technical organizations, applying knowledge, experiences, best practices, ensuring that data and information are shared, developing and implementing national policies & strategies, programmes for integrated chronic disease prevention and control, fostering communication, enhancing coordination, and sustaining profound change. Training is a key ingredient for implementing the global strategy for chronic disease prevention and control. WHO headquarters and regional offices have initiated a number of training programmes for chronic disease prevention and control:

- CINDI Winter School - "New Public Health: Theory And Practice"

  CINDI (Countrywide Integrated Non communicable Disease Intervention) is a major, WHO coordinated, international collaborative activity for theory-based, practical nation-wide intervention. The Programme aims at preventing major non communicable diseases and promoting the health of populations in its 33 member countries across Europe through integrated, innovative activities. Comprehensive action is based upon sound theories and policy frameworks, involvement of the health services and intersectorial collaboration. Practical information systems, sound evaluation and exchange of international experience are important facets of the CINDI approach. Over 200 trainees from 60 countries received training. CINDI is coordinated by the WHO Regional Office for Europe, Copenhagen, Denmark.
- CARMEN School

  CARMEN (Conjunto de Acciones para la Reducción Multifactorial de Enfermedades Notransmissibles) is an initiative of the Pan American Health Organization and aims to improve the health status of populations in the Americas by reducing the risk factors associated with Non communicable diseases (NCDs). CARMEN School held its first training course in March 2004 in Chile, in close cooperation with Chile University.

In addition to these, NCD prevention and control programmes are also emerging as a priority in many developing countries. Accordingly, there is a pressing need to strengthen and link NCD prevention and control initiatives in presently under-served regions. There are, however, encouraging signs in all WHO regions concerning NCD prevention and control initiative and networking efforts:

- Eastern Mediterranean region: EMAN network
- South-East Asia region: SEANET-NCD network
- African region: NANDI network - The Network of African Non communicable Diseases Interventions (NANDI) was established in 2001.

Availability of funding for NCD prevention and Control

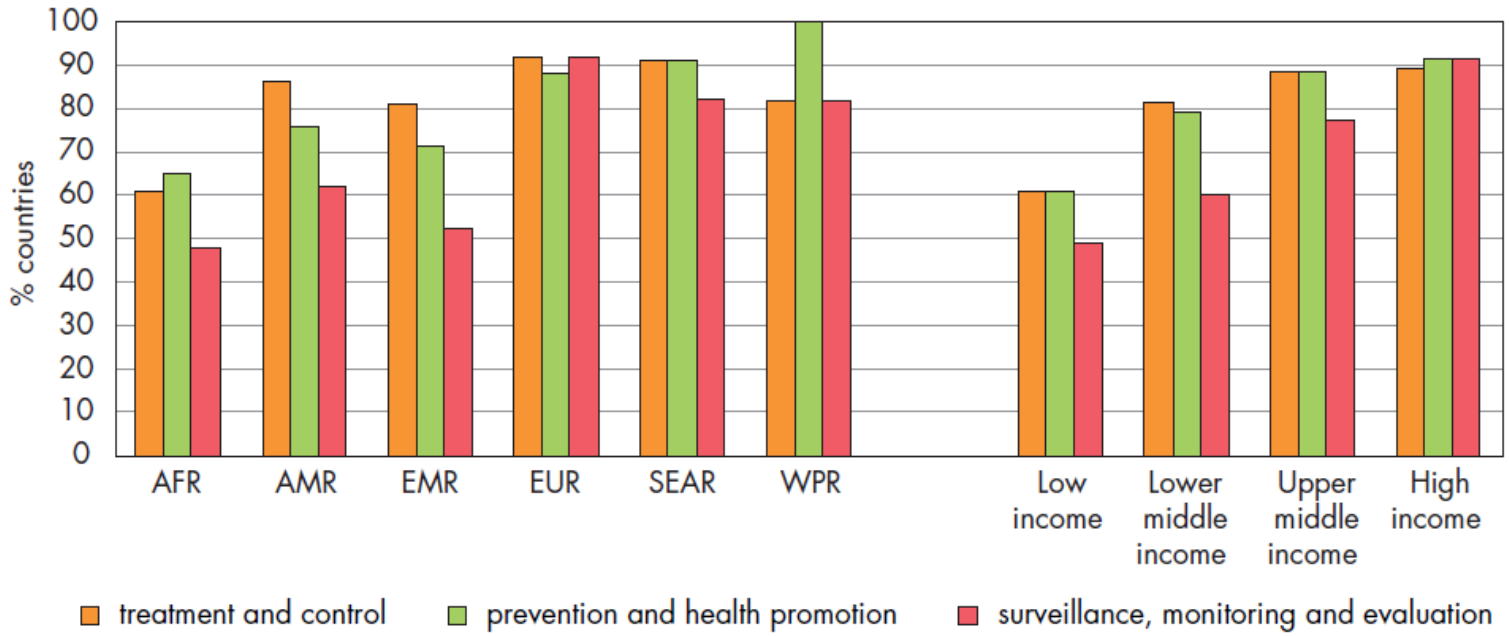
The Global Status Report on NCDs 2010 states that in 2010 almost 90% of countries reported that some funding was available for NCD prevention and control. Funding was greatest in the WHO Western Pacific Region, the South-East Asia Region, and European Region (Figure 2.29). Not surprisingly, funding was also more likely to exist in higher-income countries. When assessed according to funding targets, 80% of countries had funding for NCD treatment, and the same percentage report funding for NCD prevention and health promotion. In most cases, the major source of funding was the national government (85%), but health insurance, earmarked taxes and international donors are also important sources of NCD funding. International donors were reported as a source of some funding for NCD activities in low & lower-middle-income countries, despite the generally limited funding provided to this area of work by international development agencies. Twenty countries had no NCD funding stream, and there was a lower level of funding in low-income countries: one third of low-income countries have no funding at all for NCD prevention and control. This is a particular problem in the African Region.

Funding and policies for NCD prevention and Control in India

According to the data available from WHO NCD country profile (Figure 2.30), India does have a department in the Ministry of Health, Government of India with responsibility for NCDs. There is funding available for the treatment and control of Non Communicable Diseases, their prevention, health promotion, NCD surveillance, monitoring and evaluation. While CVD, cancer, diabetes alcohol, unhealthy diet, overweight & obesity, physical inactivity and tobacco use are part of integrated or topic-specific policy/programme/action plan, no such policy is in place for chronic respiratory diseases. India does not have a national, population-based cancer registry. However, there is a national health reporting system which includes NCD-specific mortality, NCD morbidity

and NCD risk factors. In spite of these policies and programmes being in place, the NCD burden in India continues to rise. This indicates either incompetent implementation of well-developed policies and programmes or inefficiency of the implemented measure. Thus, in the face of the enormous NCD burden, the country is inadequately prepared to tackle with the same, necessitating highly motivated national level health promotion activities for the prevention & control of Non Communicable Diseases.

Figure 2.29 Proportion of countries with funding for NCD activities, by function, WHO Region and World Bank income group, 2010



WHO Global Status Report on NCDs 2010

Figure 2.30 National Capacity for Prevention and Control of NCDs 2010

Country capacity to address and respond to NCDs			
Has a Unit / Branch / Dept in MOH with responsibility for NCDs	**Yes**	*Has an integrated or topic-specific policy / programme / action plan which is currently operational for:*	
There is funding available for:		Cardiovascular diseases	**Yes****
NCD treatment and control	**Yes**	Cancer	**Yes****
NCD prevention and health promotion	**Yes**	Chronic respiratory diseases	**No**
NCD surveillance, monitoring and evaluation	**Yes**	Diabetes	**Yes****
		Alcohol	**Yes****
National health reporting system includes:		Unhealthy diet / Overweight / Obesity	**Yes****
NCD cause-specific mortality	**Yes**	Physical inactivity	**Yes****
NCD morbidity	**Yes**	Tobacco	**Yes****
NCD risk factors	**Yes**		
Has a national, population-based cancer registry	**No**	Number of tobacco (m)POWER measures implemented at the highest level of achievement	**0/5**

** = covered by integrated policy/programme/action plan

Source: World Health Organization NCD Country Profiles, India 2010.

NON COMMUNCABLE DISEASES IN PRODUCTIVE AGE POPULATION

Premature death is a major consideration when evaluating the impact of NCDs on a given population, with approximately 44% of all NCD deaths occurring before the age of 70. In low- and middle income countries, a higher proportion (48%) of all NCD deaths are estimated to occur in people under the age of 70, compared with high-income countries (26%). The difference is even more marked for NCD deaths in younger age ranges: in low- and middle-income countries, 29% of NCD deaths occur among people under the age of 60, compared to 13% in high-income countries (WHO Factsheet on Chronic Disease 2013). The NCD risk factor in STEPS surveys in South East Asian region (2003-2005) showed the prevalence of risk factors among 25-64 year olds were as follows: Current smokers 16-32%, current consumers of alcohol 3-41%, inadequate fruit and vegetable intake 81-99%, physical inactivity 4-24%, overweight & obesity 9-44%, hypertension 8-42%, high fasting blood glucose 4-9%, raised cholesterol 13-54% (World Diabetes Foundation 2009).

The greatest wealth & strength of any nation is its productive population (18-60 years of age). The health, well-being & potential of these individuals determines the kind of future, the nation will have. Therefore, in order to ensure the nation's and thereby the world's economic, social and fiscal prosperity, we primarily need to strengthen and empower them. However, as previously reviewed literature shows, the growing burden of non communicable diseases exerts considerable pressure on the health and thus the work ability, efficiency and productivity of the population. It is a matter of growing concern that the productive age population is very largely affected by the NCD epidemic with a majority of them falling prey to it.

NCDs in productive age Indians

Research shows that India suffers a greater loss in economically productive life due to CVD deaths compared to other countries: by 2030, this will be equivalent to 17.9 million years lost among 35–64 year-olds (World Diabetes Foundation 2009). The findings of a baseline cross-sectional study of industrial population conducted in 10 companies across India, on 20-69 year olds (mean age 40 years) subjects showed the prevalence of overweight and

obesity to be 50.9% among men and 51.9% among women. Nearly 31% of the males and 32.8% of females enrolled in the study were centrally obese i.e. had high waist circumference (> 90 cm for men and > 80 cm for women) while 40% of the men and 15% women reported use of tobacco. The prevalence of diabetes and hypertension among the productive age subjects was 10.15 and 27.7% respectively (Reddy et al 2006). Kaur et al (2007) conducted a cross-sectional study on urban industrial population in South India (18-69 years) reported that 30.3% had raised levels of cholesterol, 16.3% had diabetes , 20.2% of them currently smoked, 66.8% were either overweight or obese, 70.2% were centrally obese and 27.2% suffered from hypertension.

Another cross-sectional survey conducted by Prabhakaran et al in 2005 on 20-59 year old (mean age 42 years) industry employees of India's capital – Delhi showed high prevalence of NCDs and their risk factors such as: overweight & obesity (35%), central obesity (43%), smoking (36%), hypertension (30%) and diabetes (15%). Earlier studies carried out in the department of Foods and Nutrition, The Maharaja Sayajirao University of Baroda have also shown high prevalence of NCDs and their risk factors in industrial productive workforce of Baroda city, with the prevalence of overweight & obesity ranging from 53.5% to 79.4%, physical inactivity being 19% to 38%, tobacco consumption ranging from 10% to 32%, inadequate intake of fruits & vegetables being 69%-93%, while abdominal obesity ranged from 32.3%-48% among different industrial populations (Mehan et al 2007, Mehan et al 2008 and Mehan et al 2011).

This is the direct result of the various changes that have taken place in the workplace in the last decade. Changes such as replacement of manual labour by desk jobs, increased workload, increased stress levels, more money power and availability of convenience foods which are rich in calories and poor in nutrients are the root cause of NCD burden among productive population. Today, growing number of young people are spending long working hours at their workplace, in a competitive environment. They are, hence at an increased risk of falling into unhealthy lifestyle habits such as increased consumption of junk foods coupled with sedentary lifestyle resulting in overweight, obesity, hypertension, diabetes, heart disease etc. NCDs are largely preventable by means of effective interventions that tackle

shared risk factors, namely: tobacco use, unhealthy diet, physical inactivity and harmful use of alcohol.

Economic Impact of NCDs on populations

At household level, unhealthy behaviours, poor physical status, and high cost of NCD-related health care, lead to loss of household income. People often become trapped in a dangerous cycle where poverty and NCDs continually reinforce one another. While measuring the economic impacts of NCDs remains a relatively complex and under-developed discipline, they invariably affect low & middle income countries and households more severely because they have the least financial cushion to withstand the economic consequences of NCDs. The World Health Report 2010 states that each year, 100 million people are pushed into poverty because they have to pay directly for health services; in some countries, this may represent 5% of the population forced into poverty each year. Financial hardship is not restricted to low & middle income countries: almost 4 million people in six countries (Greece, Hungary, Mexico, Poland, Portugal and Korea) reported forms of financial hardship caused by paying for health care. The report indicates that direct out-of pocket payments still represent more than 50% of total health expenditures in a large number of low & middle income countries.
In low-resource settings, treatment for cardiovascular disease, cancer, diabetes or chronic lung disease can quickly drain household resources, driving families into impoverishment. NCDs exacerbate social inequity because most payments for health care in low & middle income countries are private and out-of-pocket; such costs weigh more heavily on those least able to afford them, increasing the risk of impoverishment. If those who become sick or die are the main income earners, NCDs can force a drastic cut in spending on food and education, the liquidation of family assets and a loss of care and investment in children. Where males are the primary income earners, widowhood or burden of caring for a permanently disabled partner are routes to poverty. The high rate of disability due to NCDs is a particular burden on women and children. This may result in children losing opportunities for schooling, women losing the main sustenance for their families, and families losing stability. In some countries, the lowest income households have the highest levels of NCD risk factors, with negative consequences on household income. In Nepal, the poor spent 10% of their income

on cigarettes (Karki et al 2003). In India, the risk of distress borrowing & distress selling of assets was notably higher for hospitalized patients who were smokers (Bonu et al 2005).

On an average, 10 days are lost per employee per year due to NCDs and injuries in the Russian Federation (Suhrcke M et al. 2007.). Annual income loss from NCDs, arising from days spent ill and in care-giving efforts, amounted to US$ 23 billion (0.7% GDP) in India in 2004. In the Province of Taiwan, China, the probability of being in the labour force was reduced by 27% by cardiovascular disease and 19% by diabetes (Mete and Schultz 2002). Studies in China showed that tobacco use increased the odds of sick leave between 32% and 56% (Tsai S et al. 2005, Qun and Dobson 1992). Financial catastrophe due to health problems can occur in countries of all levels of development. Yet the problem is most severe in low- and middle-income countries (Xu 2003, Xu et al 2007). Studies from India showed that the contribution to poverty of high out-of-pocket expenditure for health care and NCDs is significant (The World Bank 2010). An estimated 1.4 - 2 million Indians experienced catastrophic spending in 2004 and 6-8 lakh people were impoverished by the costs of caring for cardiovascular disease and cancer (Mahal et al 2010). The findings of another study also revealed that one of every four families living in the world's poorest countries borrowed money or sold assets to pay for health care (Kruk et al 2009). The costs of NCD treatments place a considerable burden on household income. A review of medicine prices in two multi-country studies showed that in the public sector, it cost on average from two to eight days' wages to purchase one month's supply of at least one cardiovascular medicine (Gelders et al 2006) and one day's wage to purchase one month's supply of at least one anti-diabetic medicine (Cameron et al 2009).

Economic impact of NCDs on health systems and national incomes

National health-care budgets are being increasingly allocated to treatment of CVDs, cancer, diabetes and COPD. At national level, threats and impacts of NCDs also include large-scale loss of productivity as a result of absenteeism and inability to work, and ultimately a decrease in national income. From 2005 to 2015, India is projected to lose International $ 237 billion (1.5% of the GDP) respectively as a result of heart disease, strokes and diabetes. Significant losses are also estimated for other countries (Stuckler 2008, Fuster and Kellz 2010, Abegunde and Stanicole 2006).

WORKPLACE HEALTH PROMOTION AS A STRATEGY FOR NCD PREVENTION IN PRODUCTIVE POPULATION

The workplace has been internationally recognized as an appropriate setting for health promotion. The importance of workplace health promotion has been broadly recommended by international bodies through numerous charters and declarations, including the 1986 Ottawa Charter for Health Promotion, the 1997 Jakarta Declaration on Leading Health Promotion into the 21st Century and the 2005 Bangkok Charter for Health Promotion in a Globalized World (WHO 1986, WHO 1997, WHO 2005). The European Network for Workplace Health Promotion 2007 has similarly issued a number of statements in support of workplace health promotion, including the Luxemburg Declaration on Workplace Health Promotion in the European Union, the Lisbon Statement on Workplace Health in Small/Medium Sized Enterprises, and the Barcelona Declaration on Developing Good Workplace Health Practice in Europe (European network for workplace health promotion 2007).

The WHO's 2004 Global Strategy on Diet, Physical Activity and Health, as endorsed by the Fifty-seventh World Health Assembly in resolution WHA57.17, highlights the workplace as an important setting for health promotion in Point 62:

"Workplaces are important settings for health promotion and disease prevention. People need to be given the opportunity to make healthy choices in the workplace in order to reduce their exposure to risk. Further, the cost to employers of morbidity attributed to non communicable diseases is increasing rapidly. Workplaces should make possible healthy food choices and support and encourage physical activity".

Moreover, the WHO's Global Plan of Action on Worker's Health 2008-2017, as endorsed by the Sixtieth World Health Assembly in resolution WHA60.26, states in Point 14:

"Health promotion and prevention of non communicable diseases should be further stimulated in the workplace, in particular by advocating healthy diet and physical activity among workers, and promoting mental health at work…"

Worksite Wellness Index - a useful tool for assessing workplace wellness policies

The Worksite Wellness Index for Cardiovascular Health is a self-assessment and planning guide developed by the Cardiovascular Health and Wellness Programme, Texas Department of State Health Services in 2004. It has been adapted from the Centres for Disease Control and Prevention (CDC) School Health Index.

The Worksite Wellness Index is a very helpful tool which can be used to assess the wellness policies and environment of a worksite. Results from this survey can be used to help plan a wellness program that meets the needs of employees at the worksite. Worksite wellness is defined as an organized program in the worksite that is intended to assist employees and their family members (and/or retirees) in making voluntary behaviour changes which reduce their health and injury risks, improve their health consumer skills and enhance their individual productivity and well-being. It is a comprehensive survey which can be used to evaluate whether a workplace can be called a “health-promoting” workplace.

WHO STEPS Methodology

The WHO STEPwise approach to Surveillance (STEPS) is a simple, standardized method for collecting, analyzing and disseminating data in WHO member countries. By using the same standardized questions and protocols, all countries can use STEPS information not only for monitoring within-country trends, but also for making comparisons across countries. This approach focuses on obtaining core data on the established risk factors that determine the major disease burden. It is sufficiently flexible to allow each country to expand on the core variables and risk factors, and to incorporate optional modules related to local or regional interests. The WHO STEPwise approach to chronic disease risk factor surveillance provides an entry point for low and middle income countries to get started on chronic disease surveillance activities. It is also designed to help countries build and strengthen their capacity to conduct surveillance.

The STEPS Instrument covers three different levels of "steps" of risk factor assessment. These steps are:

1. Questionnaire
2. Physical measurements
3. Biochemical measurements

It is available as a free download from the World Health Organization's official website http://www.who.int/en

Health care cost

It is well documented in literature that high levels of stress, excessive body weight, and multiple risk factors are associated with increased health care costs and illness-related absenteeism while workplace health promotion programs are associated with lower levels of absenteeism and health care costs (Baicker et al 2010, Milani and Lavie 2009, Pelletier 2005, Aldana 2001,).

Keeping workers healthy boosts productivity by decreasing both absenteeism and presenteeism (employees present at work but less productive due to illness, high stress, or injury). A study conducted by Loeppke et al (2009) on more than 50,000 employees at 10 employers found that the costs of reduced productivity were significantly greater than medical and pharmacy costs (by 2.3 to 1).

Successful health promotion programmes

The 2004 National Workplace Health Promotion Survey conducted in the USA among 730 worksites found that many companies provide some type of health promotion programming, for example, 26% provided health education, 30% provided supportive social and physical environments, and 23.5% provided worksite screening (Linnan et al 2004). However, only 7% of employers with 50 or more employees met the more restrictive standard for offering comprehensive programs, defined by the Healthy People 2010 criteria as having five main elements. These include: 1) health education, including a focus on skill development for health behavior change, and information dissemination and awareness building, preferably tailored to employees' interests and needs; 2) supportive social and physical environments, including implementation of policies that promote health and reduce risk of disease; 3)

integration of the workplace program into the workplace's organizational structure; 4) linkage to related programs**,** such as employee assistance programs and programs to help employees balance work and family; and 5) workplace screening programs, ideally linked to medical care to ensure follow-up and appropriate treatment as necessary. Comprehensive programs are more often offered (24.1%) by the nation's largest employers - those with 750+ employees (Linnan et al 2004). This survey also found that approximately 65% of employers had a full or part-time employee responsible for health promotion and worksite wellness activities, providing a solid foundation for future efforts.

The Chairman of Johnson & Johnson James Burke established 2 health related goals in the late 1970s: encourage employees to become the healthiest in the world and reduce the cost of health care for the firm. The company started a wide-ranging employee health promotion programmes including nutrition education, onsite fitness and other services. Between 1995 and 2010 the percentage of employees who smoked declined by more than two-thirds and the number with high blood pressure or who were physically inactive declined by more than half (Berry and Mirabito 2011).

A worksite-based study evaluated clinical efficacy and cost-effectiveness of a 6-month health intervention using cardiac rehabilitation and exercise training. Employees (n=308) and spouses (n=31) were randomized to receive the intervention (n=185) vs usual care (n=154). Significant improvements were demonstrated in quality-of-life scores (+10%, p = 0.001), behavioural symptoms (depression -33%, anxiety -32%, somatization -33%, and hostility -47%, all p values <0.001), body fat (-9%, p = 0.001), high-density lipoprotein cholesterol (+13%, p = 0.0001), diastolic blood pressure (-2%, p = 0.01), health habits (-60%, p = 0.0001), and total health risk (-25%, p = 0.0001). Of employees categorized as high risk at baseline, 57% were converted to low-risk status. Average employee annual claim costs decreased 48% (p = 0.002) for the 12 months after the intervention, whereas control employees' costs remained unchanged (-16%, p = NS), thus creating a six fold return on investment. In conclusion, worksite health intervention decreased total health risk and markedly decreased medical claim costs within 12 months (Milani and Lavie 2009).

A 2010 meta-analysis of 15 WHP studies found that on average $3.37 in health care costs was saved for every dollar spent over 3 years (Baicker et al 2010). That finding echoes earlier analyses of peer-reviewed studies (Aldana 2001, Chapman 2005, Pelletier 2005).

Barriers to success

Although overall participation rates are important, to gain the most benefit in terms of disease prevention, employees who are 'at risk' of adverse health outcomes particularly need to participate. However, studies suggest that smokers, hypertensives, employees with elevated cholesterol levels and those who lead sedentary lifestyles are less likely to join (Heany and English 1995). Even when programs are available, participation rates are not equivalent across workers. Participants are most likely to be salaried, white-collar employees whose general health is better than average (Linnan et al 2001). Consistent evidence indicates that blue-collar workers are less likely to participate in workplace health promotion programs than are white-collar workers (Glasgow et al 1993, Gebhardt and Crump 1990, Conrad 1987). Studies also suggest that participation rates differ according to the focus of the programme. Spilman (1988) found that women participated in weight reduction programmes regardless of whether or not they were overweight.

Overcoming the barriers

Effective workplace health promotion partly depends on the interest and willingness of employers to support such programmes and of employees to participate. Taking together the findings about the effectiveness of workplace health promotion and employee partnerships from the critical review of over a 100 workplace health promotion studies conducted by Harden et al in 1999, the following pre requisites are necessary for a successful and effective workplace health promotion programme:

- There should be visible and enthusiastic support for, and involvement in, the intervention from top management;
- There should be involvement of employees at all organizational levels in the planning, implementation and activities of the intervention;

- A focus on a definable and modifiable risk factor, which constitutes a priority for the specific worker group, can make an intervention more acceptable to that group of workers and increase their participation and
- Interventions should be tailor-made to the characteristics and needs of recipients.

If these critical guidelines are taken care of, majority of the barriers to successful implementation of workplace health promotion programmes can be overcome. Employee participation would be greatly enhanced if the top management and subsequent levels of hierarchy in the management are all involved and enthusiastic about the programme. In addition to this, adequate time allocated to health promotion activities in company premises as part of the regular working hours would also boost participation from the industrial subjects.