REVEIW OF

LITERATURE

Adolescence: An age of opportunity

The world is home to 1.2 billion adolescents aged 10–19 years who are standing at the crossroads between childhood and the adult world. As they stand at these crossroads, so do societies at large – the crossroads between losing out on the potential of a generation or nurturing them to transform society. As adolescents flourish, so do their communities, hence, it is a collective responsibility of the community in ensuring that adolescence does in fact become an age of opportunity (UNICEF 2010). Around 243 million of the adolescents live in India, accounting for nearly one quarter of the total population, deserving our attention as they hold the key to breaking vicious cycle of malnutrition (UNICEF 2011).

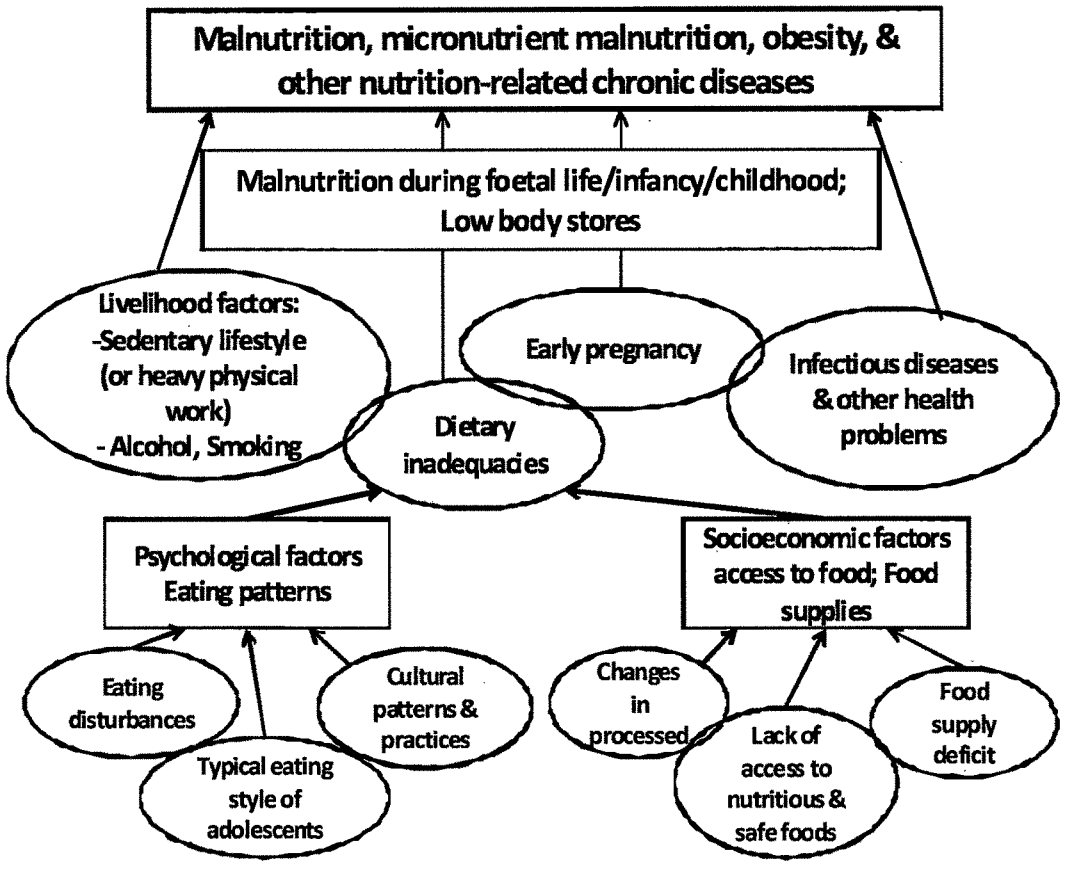
As per WHO, apart from the growth spurt, what makes adolescents nutritionally vulnerable, is their risk taking behavior and influence of the environment because they are in an impressionable age. Malnutrition, (under nutrition or over nutrition) during adolescence initiates a vicious chain of events affecting the most productive years of life and putting next generation at an increased risk (WHO, 2005).

The diagrammatic representation (Figure 2.1) of the vicious cycle of malnutrition demonstrates how adolescent health is altered and affected by the social, psychological and ecological factors, leading to dietary inadequacies and compromised health status. This causes physiological changes resulting in fetal malnutrition acting as a gateway for malnutrition to transcend into the next generation.

Hence, the major concerns of adolescent health as identified by WHO (Sawyer et al 2012) are:

- Under nutrition and associated deficiencies, often originating earlier in life;
- Iron deficiency anemia and other micronutrient deficiencies
- Obesity and associated cardiovascular disease risk markers
- Early pregnancy
- Inadequate or unhealthy diets and lifestyles

Figure 2.1: A conceptual framework of nutritional problems and causal factors in adolescence



Source: WHO Discussion Papers On Adolescence, 2005

Nutrition, hence, becomes a challenge in these years given the fact that appropriate nutrition in adolescence can help to break the viscous cycle of malnutrition. Moreover, nutrition education may help to bestow healthy behaviors in adolescents hence reducing or delaying the development of risk factors of non communicable diseases (NCDs) in adult years (Sawyer et al., 2012).

Hence, NCD-related deaths are increasing, especially in low and middle-income countries (WHO 2011) and over half are associated with behaviors that begin or are reinforced during adolescence, including tobacco and alcohol use, poor eating habits, and lack of exercise (WHO 2002). Global trends indicate that these NCD-related behaviors are on the rise among young people, and that they establish patterns of

behavior that persist throughout life and are often hard to change (WHO 2012). Adolescence is a time when the influence of peers and parents, as well as the targeted marketing of unhealthy products and lifestyles, is significant (WHO 2012, Ralph 2006). Hence, adolescence is arguably the last best chance to build positive health habits and limit the negative ones. Hence, interventions aimed at reducing the burden of NCDs, must include addressing risk factors during adolescence also (WHO 2012).

Chronic diseases have multiple preventable risk factors, which operate at different levels, from the most proximal (i.e. biological), to the most distal (i.e. structural). These risk factors can be classified as 'modifiable' and 'non-modifiable'. Modifiable determinants include factors that can be altered, such as individual and community influences, living and working conditions and socio-cultural factors. On the other hand, non-modifiable determinants include those factors that are beyond the control of the individual, such as age, sex and hereditary factors.

Hence, biological factors include:

- High blood cholesterol
- Genetics
- Early life origin
- Excess body weight- high body mass index
- Hypertension
- Type 2 diabetes

Behavioral (lifestyle) risk factors include:

- Poor diet
- Physical inactivity
- Tobacco usage
- Inappropriate use of alcohol

Social determinants of health include underlying causes of health problems such as urbanization and globalization, environmental factors (obesogenic, structural environment), socio economic status, working and living conditions and socio-cultural factors that affect the health of the population. These also place individuals at risk for the development of non-communicable diseases.

Therefore, chronic non-communicable diseases and their associated risk factors are a major contributor to the burden of disease in developed countries as well as in developing countries (Iyer et al 2011, Mushtaq et al 2011, Özgüven et al 2010, Opara et al 2010, Khadilkar et al 2010, Goyal et al 2010, Jeemon et al 2009, Bhardwaj et al 2008, Shah et al 2008, Tang et al 2007, Srihari et al 2007). They are also becoming a major public health challenge worldwide among the adolescents also (WHO 2011, Khuwaja et al 2007).

Chronic non-communicable diseases are largely due to preventable and modifiable risk factors (high blood cholesterol, high blood pressure, obesity, physical inactivity, unhealthy diet, tobacco use and inappropriate use of alcohol) resulting in various long-term disease processes, culminating in premature morbidity, high mortality rates and economic loss attributable to stroke, heart attack, tobacco- and nutrition-induced cancers, obstructive lung diseases and many others (Steyn et al 2006).

An extensive literature also demonstrates that NCDs are more likely to occur with unhealthy diet, physical inactivity, active and passive smoking, and use of betel nut and smokeless tobacco (Khowaja et al 2010, Weiderpass 2010, Ali et al 2009, Khuwaja et al 2007). Hence, prevention of these modifiable risk factors has positive effects on reducing NCDs rates and all-cause mortality (Weiderpass 2010, Ramachandran et al 2006). Thus it is reported that up to 80% of deaths due to heart disease, stroke, and type 2 diabetes and 40% of deaths due to cancers could be prevented by eliminating known modifiable dietary and lifestyle risk factors (WHO 2011).

The World Health Organization also supports the fact that NCDs are becoming an emerging public health problem among the adolescents, and hence, advocates the health promotion programs among this age groups also, as many serious diseases in adulthood have their roots in adolescence (WHO 2011, Michaud et al 2007).

Prevalence of NCD risk factors among the adolescents belonging to middle to high socio economic status

Overweight and obesity

Continuous changes in the body composition intricate the definition of obesity and overweight during periods of growth (childhood & adolescence), making it age, gender and race specific. Hence, various cut offs have been developed over the years to assess the nutritional status of children and adolescents.

Assessment of nutritional status of children and adolescents with different indicators

Overweight is generally defined as weight that exceeds the threshold of a criterion standard or reference value while obesity is defined as a condition of abnormal or excessive fat accumulation in adipose tissue, to the extent that health may be impaired (Opara et al 2010). In simpler terms obesity is caused when energy is consumed in surplus of what can be spent. This surplus is stored in the body in fat cells which enlarge and multiply to accommodate excess of energy resulting in the clinical condition of obesity.

Evaluation of body fat and its distribution can be done by accurate measurements of the fat which requires special techniques, some of which are often expensive and not useful for children. Careful measurement of height and weight is currently the initial step in the clinical assessment or in school setting to screen over weight/ obese/ underweight children, as it is cost effective, feasible and with high accuracy (Bray 1992).

Anthropometry based on weight and height measurements is one of the commonly used methods of identifying obese people and can detect children at higher risk for nutritional and health disease (WHO 1997). The likelihood of nutritional disorders can be diagnosed by comparing an anthropometric index with reference values. The body mass index (weight in Kg / (Height)^2 in meters) is widely accepted and used in adult anthropometry with highest and lowest limits of normality based on statistical criterion relating the higher mortality of people having higher or lower BMI than these values (Bellizi et al 1999).

The use of BMI for nutritional evaluation of children and adolescents has become more common after Must et al (1991) published the percentile values according to age and sex which were considered by WHO as reference values to classify adolescents as overweight and obese. Since then alternative percentile curves for children have been proposed by several authors (Table 2.1). The reference used and the type of obesity indicators used influence the prevalence of overweight / obesity rates (Abrantes et al 2002).

Cole et al 2000 developed international cut off points for BMI for over weight and obesity by sex between 2-18 years, defined to pass through BMI of 25 and 30 kg/mt^2 at age of 18 years, by averaging data from Brazil, Great Britain, Hong Kong, Netherlands, Singapore and United States. Cole et al standards were recommended by International Obesity Task Force (IOTF) and were internationally used for classification of overweight and obesity in children after 2000.

The Centre for Disease Control and Prevention (CDC) at Atlanta introduced the clinical use of BMI in new and revised BMI for age charts for young males and females aged 2-20 years using data from National Health Examination Survey cycle II and III, data from National Health and Nutrition Examination Survey (NHANES) I and II and data for children for 2-6 years of age from NHANES III which was being used largely (Kuczmarski et al 2000).

Later, the need to develop an appropriate single growth reference for the screening, surveillance and monitoring of school aged children and adolescents was also stirred by two contemporary events:

i. The increasing public health concern over childhood obesity (Lobstein et al 2004) and
ii. The April 2006 release of the WHO Child Growth Standards for preschool children based on a prescriptive approach (WHO 2006).

As countries proceed with the implementation of growth standards for children under 5 years of age, the gap across all centiles between these standards and existing growth references for older children became a matter of great concern. It is now widely accepted that using descriptive samples of populations that reflect a secular trend towards overweight and obesity to construct growth references results inadvertently in

an undesirable upward skewness leading to an underestimation of overweight and obesity, and an overestimation of undernutrition (De Onis 2004).

Table 2.1: Summary of common standards to classify over weight and obesity in children

Standard	Year	Age group	Sample size	Subjects	Criterion used to develop cut off points
Must et al (WHO)	1991	6-74 years with 1 year interval	20839	US NHANES I	>85th percentile of BMI for over weight >95th percentile of BMI for obesity
Cole et al (IOTF)	2000	2-18 years with 6 months interval	192727	Six large national survey on children from Brazil, Great Britain, Hong Kong, Netherlands, Singapore and US.	Age and Sex specific BMI cut offs related to adult cut off of BMI 25 for over weight and BMI 30 for obesity at the age of 18.
CDC	2000	2-20 years with 6 months interval	11096	US NHES II, III and NHANES I, II, III	Age and sex specific BMI growth charts: >85th percentile of BMI for over weight >95th percentile of BMI for obesity
Agarwal et al	2003	5-19 years with 1 year interval	19557	Private school children from 23 schools of 12 cities from India	>85th percentile of BMI for over weight >95th percentile of BMI for obesity
WHO (2007)	2006	0-5 years			
WHO (2007)	2006	5-18 years		Data from 1977 National Center for Health Statistics (NCHS)/WHO growth reference (1-24) were merged with data from the under – five growth standards' cross sectional sample (18-71 months) to smooth the transition between the two samples.	≥85th percentile of BMI for over weight ≥97th percentile of BMI for obesity

The reference previously recommended by WHO for children above 5 years of age, i.e. the National Center for Health Statistics (NCHS)/WHO international growth reference (WHO 1995), had several drawbacks (Wang et al 2006). In particular,

- The body mass index-for-age reference, developed in 1991(Must et al 1991), only started at 9 years of age,
- Grouped data annually and
- Covered a limited percentile range.

Many countries pointed to the need to have body mass index (BMI) curves that start at 5 years and permit unrestricted calculation of percentile and *z*-score curves on a continuous age scale from 5 to 19 years. The need to harmonize growth assessment tools conceptually and pragmatically prompted an expert group meeting in January 2006 to evaluate the feasibility of developing a single international growth reference for school aged children and adolescents (Butte et al 2007, Butte et al 2006). The experts agreed that appropriate growth references for these age groups should be developed for clinical and public health applications. They also agreed that a multicentre study, similar to the one that led to the development of the WHO Child Growth Standards for 0 to 5 years, would not be feasible for older children, as it would not be possible to control the dynamics of their environment. Therefore, as an alternative, the experts suggested that a growth reference be constructed for this age group using existing historical data and discussed the criteria for selecting the data sets.

However, now studies are being conducted to compare the various growth standards for their use. Pascal et al, in 2011 compared the two international growth references indicating the prevalence of thinness (BMI for age) in children and adolescents in the Seychells, Africa. The two international references were International survey cut offs (IS cut offs) developed by Cole et al in 2000 for children aged 6 to 18 years and WHO 2007 growth references for 5-19 years children. The prevalence of the first thinness (low BMI for age) category was higher with the WHO cut-offs than with the IS cut-offs. Further more studies have compared the prevalence of thinness (BMI for age) categories in school-aged children based on the IS and the WHO cut-offs (Baya et al 2010, Khasnutdinova and Grjibovski 2010, Gomes et al 2009, Silva et al 2008,). Studies in Russia (Khasnutdinova and Grjibovski 2010) and Brazil (Gomes et al 2009, Silva et al 2008), indicate the prevalence of thinness (low BMI for age) higher when

assessed with the WHO 2007 growth references than with the IS cut-offs, while the opposite was found in Bolivia (Baya et al 2010). Hence, there is a need for studies assessing the performance of the IS and WHO 2007 cut-offs of thinness (low BMI for age) in different populations.

For Asian population, health experts have suggested a lower BMI scale because of evidence showing higher susceptibility of Asians to the risk of obesity related disease such as high blood pressure, abnormal cholesterol and development of diabetes risk if their BMI is >23 kg/mt^2. As the global standard for measuring over weight and obesity is based on western criterion the BMI cut off needs to be adjusted for Asians (James 2004).

Therefore, the need was felt to establish normal reference for BMI for diagnostic purpose of obesity and thinness for Indian children. Ethnic group specific standards are more appropriate for comparing health compromised children especially in country like India where the problem is more pronounced for under nutrition than over nutrition. There were no standards available for BMI percentiles for Indian affluent children on an accepTable number of children. So the data on affluent school children (5-18 years) of 23 public schools from 12 different cities in India was assessed and percentiles for BMI, height, weight and SFT were calculated in relation to age and sexual maturity also (Agarwal et al 2003).

Recently, **Stigler et al (2011)** compared the three growth references, i.e., IOTF reference, new WHO 2007 reference and national reference (Agarwal standards). The study reported that the IOTF reference consistently classified participants in a lower weight status category, compared with the national reference (k=0.57) and the WHO reference (kappas index =0.69). The agreement between the WHO and the national references was higher (kappas index =0.84).

However, to date, all published studies of childhood obesity in India have used the IOTF reference, the national reference (Aggarwal et al 2003), or an old WHO reference to measure weight status among school-going youth. The new WHO reference may be a better choice, compared to the IOTF reference, WHO references (2007) does not appear to underestimate obesity and can still be used to compare trends, globally.

Prevalence of overweight and obesity among middle to high socio economic status (MHSES) adolescents

Worldwide

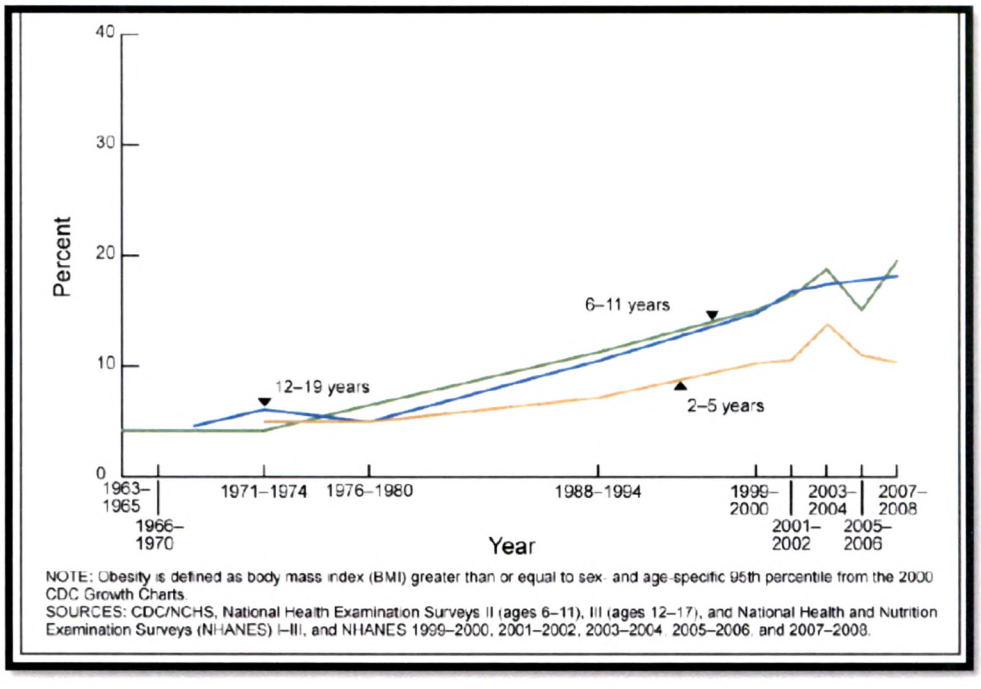
Childhood and adolescent obesity is growing at an alarming rate presenting it as a serious public health concern and is further forecasted to increase dramatically in most parts of the world giving no reprieve (Wang and Lobstein 2006). In several industrialized countries and in societies that have been undergoing rapid socioeconomic transitions, obesity has increased at an accelerated rate.

The results from 1963-2008 National Health and Nutrition Examination Survey (NHANES), showed the increase in obesity that occurred from 1976–1980 (Figure 2.2). Among adolescents aged 12–19, obesity increased from 5.0% to 18.1% during the same period (NHANES 2007-2008) indicating a continuous increase in the obesity trends in all age groups. According to Ogden and Caroll in 2010, the obesity trend was also observed to be high in boys than girls (16.7% non Hispanic white boys vs 14.5% non Hispanic white girls; 26.8% Mexican American boys vs 17.4% Mexican American girls).

A five year longitudinal cohort study of a socioeconomically and ethnically diverse sample of school students aged 11-12 years from 36 schools of London showed, the prevalence of overweight and obesity (combined) to be almost 25%, with higher rates in girls at 29% using IOTF standards (Wardle et al 2006).

Figure 2.2: Trends in Obesity among children and adolescents:

United States, 1963-2008



Bergen Growth Study from European region (Norway), was conducted on children and adolescents aged 2-19 years to assess the prevalence of over weight and obesity (according to IOTF standards). The secondary data from a national health survey was assessed, which depicted 13.8 % of children and adolescents (2-19 years) being overweight (including obesity) and 2.3% being obese alone. Among the adolescent age groups the prevalence of overweight (including obesity) was 17.0 (6-11 years) and 11.7% (12-19 years),Obesity per se was present in 3.6% (6-11 years) and 1.6% (12-19 years). (Julisson et al 2010)

The prevalence of overweight and obesity is now not only the problem of the developed countries, but, it is also affecting the children and adolescents from the developing countries as shown in African regions, which undergoing nutritional transition, and urbanization. From 2002 to 2006 (the overweight increased from 12.6% to 31.9% and obesity from 3.8% to 8.1% for the respective years among adolescents using IOTF standards (Armstrong et al 2006, Stettler 2002,)

Another study, conducted in Egypt, among adolescents (10-18 years) using CDC 2000 growth charts also depicted high prevalence of overweight (including obesity) at 19% (Ella et al 2011).

Some studies also depict the fluctuating trends of overweight and obesity with gender, like in South Africa, 25 % of girls (13-19 years) were found to be overweight (obesity inclusive) by IOTF criteria though for boys the reported prevalence was lower at 7% (Lobstein et al 2004). However in 2008, males were found to be more over weight (8.1% vs 1.3-8.1%) and obese (0-2.7% vs 0-1.9%) than females using IOTF standards. (Akinpelu 2008)

Coming to the Asia, consisting of all the developing countries undergoing nutritional transition, urbanization and globalization, many studies showed the rising prevalence of over weight and obesity in adolescents. A study in 2005 conducted in one of the Arabian countries (Yemen), on school going children (10-15 years) showed the prevalence of over weight as 6.2% and 1.8% obesity, using IOTF standards (Raja'a and Bin Mohanna 2005). Similar study from Iraq, on adolescents (6-12 years) showed nearly same prevalence of over weight (6.0%) and obesity (1.3%). A recent review study from Arab regions, on school children (6–18 years) reported the prevalence of overweight and obesity (IOTF standards) in the range of 18%–46.9%, among boys and ranged from 17.6% to 46.9% among girls (Musaiger 2011). However, later most evidence from several studies indicated that obesity has become a major public health issue in Arab countries although it varies widely from one Arab country to the other (Musaiger 2011).

Southern Asia also shows the presence of overweight and obesity among adolescents. All the studies conducted in Iran, used CDC 2000 Growth Standards to identify over weight and obese adolescents. In Iran, Mostafavi in 2005 and Gargari in 2004 conducted study on adolescents in different regions. The results demonstrated similar prevalence of over weight (11.3-11.6%) and obesity (2.9- 3.6%). Again in 2006, in Tehran, very high percentage of over weight (21.1%) and obesity (7.8%) in adolescents (7-18 years) were reported (Moayeri 2006). A study in 2009, conducted in Birjand, reported the low prevalence of overweight (4.8%) and obesity (1.8%) among adolescents (7-18 years). Females (5.8%) were reported to be more over weight than males (3.7), however reverse was in obesity, males (2.1%) being more obese than

females (1.5%). The reason for low prevalence in Birjand (Iran) was unknown (Taheri 2009).

Another study conducted in Pakistan, among children and adolescents aged 6-17 years, showed high prevalence of over weight (19.0%) and obesity (6.0%). The standard growth reference used was CDC 2000 Growth standards (Aziz 2009). The above trends in various parts of Asia, demonstrates clearly, the rising trend of over weight and obesity among the adolescents and the need to initiate preventive measures at population level.

In India

In Indian society chubbiness is perceived as sign of affluence and good health. Traditionally, in India, a chubby child is regarded as healthy and well nurtured, accomplished to face the brunt of life. However, as we urbanize more and more into this new millennium, obesity especially, childhood obesity presents a grave threat to the health (Bhave et al, 2004)

In various studies conducted in different cities of India, lack of agreement on use of any one particular reference standards to classify obesity in adolescents has resulted in dearth of good nationally representative data and further inconsistencies between the studies of classification of obesity make it difficult to compare the data from the studies.

Srihari et al (2007), nevertheless, reviewed the available literature on nutritional status of Indian school children (6-18 years) from middle and high socio economic status (MHSES) and reported the trends in obesity and overweight as shown in Table (2.2).The review studies, using various growth references, shows a higher prevalence of overweight in the northern part of the country ranging from 10.9-29 %.

From the eastern region, only two studies were reported, indicating very low prevalence of over weight and obesity among adolescents. Bisai et al (2010), reported 5.69% of over weight and 0.79% of obese adolescents (10 – 12 years) in Midnapur town from West Bengal belonging to low middle to high income groups, with girls (7.20%) being more over weight than boys (4.22%). Another study was carried out on adolescents from class VIII to XII), belonging to capital city of Manipur. The

prevalence of over weight among these adolescents was 4.2% and obesity was 0.8%. In both the studies, IOTF standards were used to define adolescent's nutritional status.

Table 2.2: Prevalence of overweight and obesity among children aged 6-18 years from middle to high socio economic status (MHSES) groups

Region, [Year of data collection]	Age in years	Overweight (%)			Obesity (%)		
		Total	Boys	Girls	Total	Boys	Girls
Northern India							
Delhi, N=5000 , [2000]	4-18	29.0	–	–	6.0	–	–
Delhi, N=3861, [2001]	10-16	24.7	23.1	27.7	7.4	8.3	5.5
Punjab, [1999]	9-15	14.2	15.7	12.9	–	–	–
Punjab, N=640 [2000-2001]	10-15	10.9	9.9	12.0	5.6	5.0	6.3
Western India							
Baroda, N=5329 [2001-2004]	12-18	8.5	8.0	9.0	1.5	1.4	1.7
Pune, N=1228 [2003]	10-15	19.9	19.9	–	5.7	5.7	–
Southern India							
Chennai	10-15						
[1981, N=707]		9.62	–	–	5.94	–	–
[1998, N=610]		9.67	–	–	6.23	–	–
Chennai, N=4700 [July-Nov 2000]	13-18	–	17.8	15.8	–	3.6	2.9

Source: Srihari et al, Indian Paediatrics, 2007

In 2006, a study conducted in a western state of Rajasthan (Udaipur), which included 268 affluent children (12-17 years). The study reported over weight and obesity as only 4.8% and 3.7% respectively by IOTF standards (Kaneria et al 2006). Looking, into the present rise of childhood obesity in other parts of India, more studies need to be under taken, to study the current scenario in the state of Rajasthan.

A multi centric study from Maharashtra (Pune) in 2010, indicated a high prevalence of over weight and obesity among children and adolescents (2-17 years). The study was conducted in eleven affluent urban schools, from five geographical zones (central

zone, east zone, north zone, south zone, and west zone) of India. Over weight and obesity was reported as 18.2% according to IOTF standards, which increased to 23.9% after applying WHO 2007 growth standards. The prevalence of overweight and obesity was higher in boys than girls. Hence, suggesting the use of WHO 2007 Growth Standards here after. (Khadilkar et al 2010)

Coming to Gujarat region, the capital city (Ahmadabad) also projected the high prevalence of over weight and obesity among adolescents (12-18 years) in different SES (middle to high). The BMI of each child was determined and adjusted for expected BMI at age 18 (Goyal et al 2010).The prevalence of overweight among children was 65% from middle SES compared to 33.2% in high SES group. While a reverse trend was observed regarding the obesity prevalence, more (70.0%) children from high SES being obese than middle SES (30.0). The gender difference also showed different pattern. The boys belonging from middle SES were more over weight than girls (67.4 vs 60.8%), while in high SES, girls were more over weight than boys (38.0% vs 30.6%).

Another study from Gujarat, also indicates the high prevalence of overweight and obesity. The study was conducted in Vadodara city on 6-12 years school going children. the schools selected for the study represented middle to high income group. According to IOTF standards, the total prevalence of over weight and obesity was 20.3% (over weight: 14.4%, obesity: 5.9%). No sex difference was observed. More girls were over weight (15.2% vs 13.7%) while more boys (6.8% vs 4.9%) were obese. (Iyer et al 2011).

Hence, it can be concluded that irrespective of the SES and gender, the prevalence of overweight and obesity are on the increasing trend.

Moving on to northern region, the prevalence of over weight and obesity in adolescents belonging to middle to high SES also existed in this region. A study involving affluent families of Amritsar district of Punjab, showed the prevalence of over weight and obesity as 9.9% and 4.95 % respectively among boys (10–15 years) as compared to 11.9% of overweight and 6.31 % obese in girls, by applying CDC 2000 Growth standards (Sidhu et al 2005) Another study in Patiala district of Punjab, involved five private schools and total of 1250 school children in the age group of 6-

15 years. According to IOTF standards, 7.6% of the children were found to be obese, indicating a rise in the prevalence of obesity. The data also reported that more than half of the females were obese than males (64.2% vs 35.8%). Both the studies, carried out in Punjab state, indicated that girls are more at risk of NCDs than boys (Marwah et al 2012).

A review study, conducted in 2008 in Delhi region, on childhood obesity, reported an increase overweight/obesity prevalence in urban children in Delhi from 16% in 2002 to about 24% in 2006. Also, the prevalence among adolescent children (14-17 y) was 29% belonging to private schools (Bharadwaj et al 2008)

Another study conducted during the same (2008) year in Delhi, shows the prevalence of over weight and obesity in middle to high SES (Kaur et al 2008). The study involved children in the age group of 5-18 years, belonging to different SES (low, middle and high). The prevalence of over weight and obesity was lower in middle SES (6.5% and 0.6% respectively) than high SES (15.3 and 6.8 respectively).

The southern region is also affected by the rising trend of child hood obesity. A study conducted in Karnataka state (Davangere), on adolescence from middle to high SES, reported the prevalence of obesity (IOTF standards) as 5.7%, in subjects studying between 5th and 10th standard. Prevalence of obesity was reported, to be more in girls (8.82%) than boys (4.42%) as reported by Kumar et al in 2005. Similarly, two studies from Tamil Nadu (Chennai), reported the prevalence of overweight and obesity amongst girls, ranging from 9.6 % - 15.8 % and 2.9 % to approximately 6% respectively. For boys, overweight was reported to be 17.8 % and obesity 3.6 %, indicating boys being more over weight and girls being more obese (Srihari et al 2007).

Another state from southern region, Andhra Pradesh, reports the prevalence of over weight among the urban adolescents (12-17 years). According to IOTF standards, the prevalence of over weight was 7.2%, with girls (8.2%) being more over weight than boys (6.1%). The adolescents belonging to private schools were significantly more over weight (9.6%) than government schools (Balakrishna 2007).

The difference in prevalence of over nutrition among different SES, could again be observed from a study in Kochi, Kerala (Cherian et al 2012). The study was

conducted on school going children (6-15 years) from different SES (upper, middle and lower class). The authors applied CDC 2000 Growth standards to screen over weight and obese subjects. The data revealed that, over all obesity and over weight prevalence among girls (5.3% vs 12.1% respectively) was more than boys (3.0% vs 10.2% respectively). Looking into the SES category also, in upper income groups (UIG) females were more obese (10% vs 5%) and overweight (28% vs 16%) than boys. While in the middle income group (MIG), obesity was present in similar percent of girls and boys (4% vs 3%), with more boys (12%) being overweight than girls (5%).

After reviewing the above studies, it s clear that over weight and obesity is increasing among the adolescents and if the preventive measure are not taken at the right time, the prevalence will be on a continuous rise with far reaching health consequences for the future generation.

2.2.1c Co existence of under nutrition and over nutrition among middle to high socio economic status (MHSES) adolescents

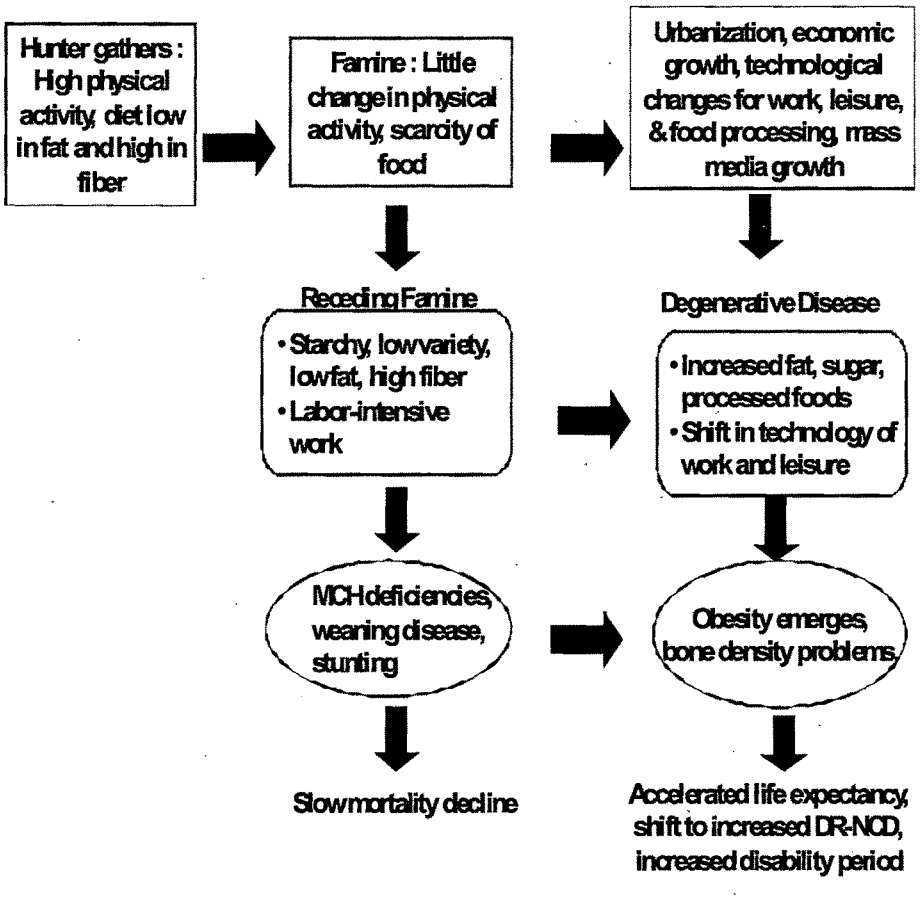
Nutrition during adolescence plays an important role in the individual's life. Malnutrition in adolescence encompasses under nutrition as well as over nutrition (Butte et al 2007). Under nutrition implies being underweight (low weight for one's age), stunting (too short for one's age), or deficient in vitamins and minerals (Opara et al 2010). Long-term under nutrition is an important cause of stunting or short height-for-age (Coly 2006).

The emerging health crises due to the coalescing of the health effects of under nutrition and over nutrition in the same countries, communities and even households, has been termed the double burden of malnutrition (Thiam et al 2006).

This phenomenon has been attributed to the polarized model of epidemiological nutrition transition (Figure 2.3) from stage 1 to stage 2, creating an obesogenic environment (Kennedy et al 2007, Uauy and Solomons 2006). To stem this current and projected epidemic of morbidities and premature mortalities due to diet-related chronic disease, there has been a call for the protection of foetal and childhood growth, which is central to the prevention of both under and over nutrition (Opara et al 2010, Barker 2004, Barker et al 2005, Ene-Obong 2001). There is a call for the surveillance of trends of the major risk factors for the double burden of mal-nutrition

such as stunting, underweight, obesity, dietary patterns etc (Opara et al 2010, Shumei et al 2002).

Figure 2.3: Stages of nutrition transition



Nutrition research in India has focused primarily on the problem of under nutrition, particularly among vulnerable women and children. There is ample evidence of an emerging nutrition transition in India. The rising urbanization and improvements in economic development has lead to concurrent under and over nutrition in the population. The nutrition transition is closely related to the demographic and epidemiological transition. Large shifts have occurred in diet and in physical activity patterns, particularly in the last decades. (Iyer et al. 2011)

Worldwide

Very few studies have been conducted in the developing countries, to study the prevalence of coexistence of over nutrition and under nutrition among adolescents from middle to high income groups or developing countries that are under going nutritional transition. A study in Europe, was undertaken in Turkish adolescents (14-18 years) from both public and private schools to study the double burden of malnutrition. For the screening of under nourished children NCHS standards were used and for over weight and obesity, > 85th percentile (CDC 2000 Growth standards) were used. Results revealed the coexistence of under nutrition (4.4% stunted and 5.0% under weight) and over nutrition (16.8% overweight and obese). Although frequency of being underweight in adolescents of low SES was higher than in adolescents of other SES groups, the difference was not significant. Frequency of being overweight and obese in adolescents of middle SES was higher compared to that in adolescents belonging to other socioeconomic groups, but the difference was not significant. Same percentage of males and females had stunting, while more boys were under weight than girls. Regarding over weight and obesity, it was present more in girls than in boys.(Özgüven et al 2010)

Another study conducted in African country (Nigeria), showed the coexistence of over nutrition and under nutrition. the study was carried out on children (2.5 – 14 years). The standards used to define to Stunting, was <-2SD of the WHO 2003 reference standard height for age and sex (Z-score). Underweight: was defined as <-2SD of WHO 2003 reference BMI for age and sex (Z-score). Obesity: was defined as >+2SD of BMI for age and sex (Z-score). The prevalence of underweight in the private schools was 27.3%, being higher in girls (15.6%) than boys (11.7%). The prevalence of stunting, in private schools, was 17.6% with more percent of stunted boys than girls (9.7% vs 7.9%). The prevalence of obesity according to Opara et al (2010), in private schools was 11.1% with girls being more likely to be obese (6.9%) than boys (4.2%).

The double burden of malnutrition is also evident in the Asian region. A study conducted in Eastern Asia (China), was based on adolescents aged 11-16 years from the urban region (Tang et al 2007). The cut off standards used for overweight and obesity were IOTF and for under weight, NCHS/CDC growth charts (< 5th percentile).

The prevalence of overweight, obesity and underweight was 4.9%, 0.6%, and 13.1% respectively. Over weight and obesity prevalence was more in boys (5.8% and 0.9% respectively) than in girls (4.1% and 0.3% respectively). The prevalence of under weight was significantly higher in boys (16.0%) than girls (10.3%).

Similarly, a study conducted in western Asia (Arabian country: Qatar) on adolescents (10-17 years) from urban and semi urban districts of Qatar (Raja'a and Bin Mohanna 2005). The cut off standards used for overweight and obesity were IOTF and for under weight, NCHS/CDC growth charts (< 5^{th} percentile). The results demonstrated that the prevalence of overweight, obesity and underweight was high in boys (28.6%, 7.9% and 8.6% respectively) than girls (18.9%, 4.7% and 5.8% respectively).

The coexistence of over nutrition and under nutrition is also present in few regions of Southern Asia. The developing country, like Iran showed the prevalence of over weight, obesity and underweight was 8.6%, 1.5% and 16.2 % respectively. The study was conducted on adolescents (14-18 years).

In India

In the Indian context also, the coexistence of over nutrition and under nutrition is prevalent, although very few studies have been conducted to estimate the double burden of malnutrition together in the same population. A review study by Srihari (2007), on affluent school going children (6-18 years), revealed the double burden in this group also. Overweight and obesity were defined according to IOTF standards and under weight by NCHS standards. The results revealed the presence of 8.5-29% and 1.5-7.4% of subjects being over weight and obese respectively. Prevalence of under nutrition was also present in 10-13 % of the subjects belonging to the same SES. (Srihari 2007).

Another review study, conducted for children from 10-19 years also demonstrated the same trend. Over weight and under weight were defined using two criterias: national (Agarwal cut offs) and international (Cole standards). The proportion of overweight children was highest in the highly urban category (19.1% and 13.4% as per Indian and international criteria, respectively). Overall, 9.9% of boys and 7.9% of girls were overweight by either criteria. While in the urban and highly urban areas, the prevalence of under weight was 14.1% and 9.8%, respectively, according to Indian

criteria and 27.1% and 19.2%, respectively, according to international criteria. (Jeemon et al 2009)

Coming to Gujarat state, a study conducted in private school, on children from class 7th, also revealed coexistence of double burden in the study subjects. In this study, the nutritional status of the study subjects were classified according to the national standards (Agarwal standards). Hence, the results revealed, 9.2% and 5.5% of the subjects being overweight and obese respectively. The girls were more over weight than boys (13.3% vs 4.1%) while boys were more obese than girls (8.3% vs 3.3%). The results also revealed, 70.3% of the subjects being underweight with no gender difference. (Shah et al 2008)

Another study (Iyer et al 2010) from Gujarat (Vadodara), was conducted on adolescents (12-16 years) and the cut offs for overweight and obesity used were CDC 2000 growth standards and Must et al, while for under weight, 5th percentile values for BMI of Must et al (1991), Agarwal standards and CDC standards were applied. Using CDC standards 11.59 % boys and 7.84 % girls were found to be overweight, where as 2.89 % and 3.92% of boys and girls were found to be obese. The prevalence of underweight as defined by three classifications, namely, Must et al, CDC and Agarwal was found to be more in boys (30.4, 30.4, and 8.6% respectively) than in girls (11.7, 5.8, and 33.9% respectively).

Thus it can be concluded that in all the regions of the world as well as in India, double burden of malnutrition coexists, and nutritional assessment for adolescents should take into consideration the indices of both overweight including obesity and under weight.

Hypertension

Hypertension, in adults is a known risk factor for coronary artery disease (CAD), while the presence of childhood hypertension contributes to the early development of CAD. It is known as a "silent killer" which goes undetected during childhood unless it is specifically looked for **(Kaur et al 2013, Sundar et al 2013)**. Therefore, early detection of hypertension along with its precipitating or aggravating factors are

important if one is to evolve measures so that complications of hypertension can be prevented.

The cut offs used for classifying high blood pressure in children and adolescents are used recommended in "The Fourth report on the diagnosis, evaluation and treatment of high blood pressure in children and adolescents". BP standards based on sex, age, and height provide a precise classification of BP according to body size. The revised BP Tables now include the 50th, 90th, 95th, and 99th percentiles (with standard deviations) by sex, age, and height **(NIH 2005)**.

The classifications are:

Normal BP: is defined as SBP and DBP that is less than the 90th percentile for sex, age, and height.

Prehypertension: is defined as average SBP or DBP levels that are greater than or equal to the 90th percentile, but less than the 95th percentile.

Hypertension: is defined as average SBP or DBP that is greater than or equal to the 95th percentile for sex, age, and height on at least three separate occasions. In all the studies mentioned below, the above mentioned classification for high blood pressure in children and adolescents have been used.

Hypertensive children tend to have other medical problems also, such as obesity, high blood lipids and/or diabetes mellitus. Risk factors like smoking, physical inactivity, obesity and improper diet are well recognized. Cardiovascular diseases, particularly hypertension, account for high mortality in the form of cardiovascular strokes in countries like India, Taiwan and Japan **(Khor 2008)**. Studies from Boston and Pennsylvania had reported that the role of hypertension as a risk factor is defined and familial aggregation of blood pressure and tracking phenomenon support the concept that children with hypertension are likely to be hypertensive adults and will be at risk for early Coronary heart disease **(Soudarssanane et al 2008)**.

Though the above mentioned literature recommends that children and adolescents should be screened for hypertension in early years of life, to prevent cardiovascular events and death in adulthood, U.S. Preventive Services Task Force (USPSTF),

highlights the need to have more evidence to balance the benefits and harms of screening for primary hypertension (stage I) in asymptomatic children and adolescents **(Moyer 2013)**.

2.5.2a Prevalence of hypertension

Worldwide

The prevalence of hypertension in children and adolescents in the United States has been reported at 1% to 5%. However, in obese children, it is estimated to be 11% **(Moyer 2013)**. While in Brazil, hypertension among children and adolescents aged 2-18 years, was classified using Brazilian Guidelines of Blood Hypertension. The prevalence was found to be 70.5% **(Noronha et al 2012)**.

In Europe, also high prevalence of pre hypertension (22.9%) and hypertension (24.1%) among the children and adolescents aged 5-12 years, was reported. The classification used was referred from NIH 2005 (Kollias et al 2011).

Moving to Asian region, no studies could be retrieved which have reported the prevalence of pre hypertension or hypertension in adolescents, while only one study in Malaysia reported pre hypertension (12.23%) and hypertension (13.4%) among primary school children. The reference used to classify hypertensive subjects was 4th report on diagnosis of hypertension in children and adolescents from NIH 2005 (Chandrashekhar et al 2013).

In India

In India, though very few studies have been conducted to map the prevalence of pre hypertension and hypertension among children and adolescents, they show emerging trends of hypertension.

A study from eastern region, West Bengal (Kolkata), reported 2.9% hypertension among the adolescents aged 10-19 years, using WHO 1996 hypertension classification (Saha et al 2008).

WHO criteria for hypertension for 10–18 years age group had been adapted from Task Force on Blood Pressure Control in Children which was generated from mean systolic/ diastolic blood pressure equal to or greater than 95th percentile for age. For

persons aged 18 years and above, hypertension is defined as systolic blood pressure of ≥140mmHg or a level of diastolic blood pressure of ≥90mmHg.

From the western region, a study from Rajasthan (Udaipur) was conducted to assess the prevalence of hypertension among all the adolescents of various categories of age groups (9-10, 10-11 and 11-12 years). The study reported high prevalence of hypertension in 10-11 years (36.6%) and 11-12 years (41.1%) than 9-10 years (30.0%). The hypertension values were measured and compared with Ghai 2002 (Mogra and Kaur 2012).

Another study from Gujarat (Anand), reported 10.8% prehypertension and 9.2% hypertension in children and adolescents aged 5-18 years. However, in girls, overall prevalence of prehypertension and hypertension was found to be more (10.31%) than boys (9.63%). The classification used for identifying hypertension was IVth report on diagnosis for children and adolescents (Verma and Singh 2012, NIH 2005).

From the northern region, only two studies could be retrieved which showed the prevalence of hypertension among children and adolescents in this region. A study from Punjab (Amritsar) reported the prevalence of hypertension to be 7.5%, among children and adolescents aged 6-14 years. The children, whose blood pressure levels exceeded 95th percentile (for age and sex) of the Report of the Second Task Force (1987), were considered as hypertensive (Prabhjot 2005, JNC VII 2003).

Another recent study, in Delhi assessed the prevalence of hypertension according to the socio economic status of the children aged 5- 16 years, with the help of The Fourth report on the diagnosis, evaluation and treatment of high blood pressure in children and adolescents" **(NIH 2005)**. The results revealed that the prevalence of high Systolic Blood Pressure (SBP) in low income group (LIG) and middle income group (MIG) was 3.8% and 4.4%, respectively. While Diastolic Blood Pressure (DBP) was 2.6% and 4.1% in LIG and MIG respectively (Kaur et al 2013).

The prevalence of hypertension among the children and adolescents was also observed in southern region of India, in a study conducted on adolescents aged 13-17 years. The study reported the high prevalence of hypertension than any other regions of India, i.e., 21.5% indicating an emerging epidemic among this age group (Sundar et al 2013).

Hypertension in children and adolescents are well correlated with high BMI, central obesity and family history (Prabhjot 2005, Kaur et al 2013, Sundar et al 2013, Kollias et al 2011, Chandrashekhar et al 2013, Saha et al 2008, Verma and Singh 2012, NIH 2005, Sundar et al 2013).

Thus, the above studies show that hypertension during childhood and adolescents is rising and there is a need to take various steps to reduce or curtail this rising trend.

Poor dietary habits (low intake of fruits and veg, skipping breakfast, high carbonated bev, high snacks)

Nutrition is a major modifiable determinant of chronic non-communicable diseases, with scientific evidence supporting the view that alterations in diet and activity have effects on health throughout life. Non-communicable diseases are linked to high consumption of energy dense foods, made of animal origin and of foods processed or prepared with added fat, sugar and salt (Bourne et al 2002, Jaisheeba et al 2012, Kumari and Krishna 2011, Rema and Vasanthamani 2011).

Low fruits and vegetable Intake

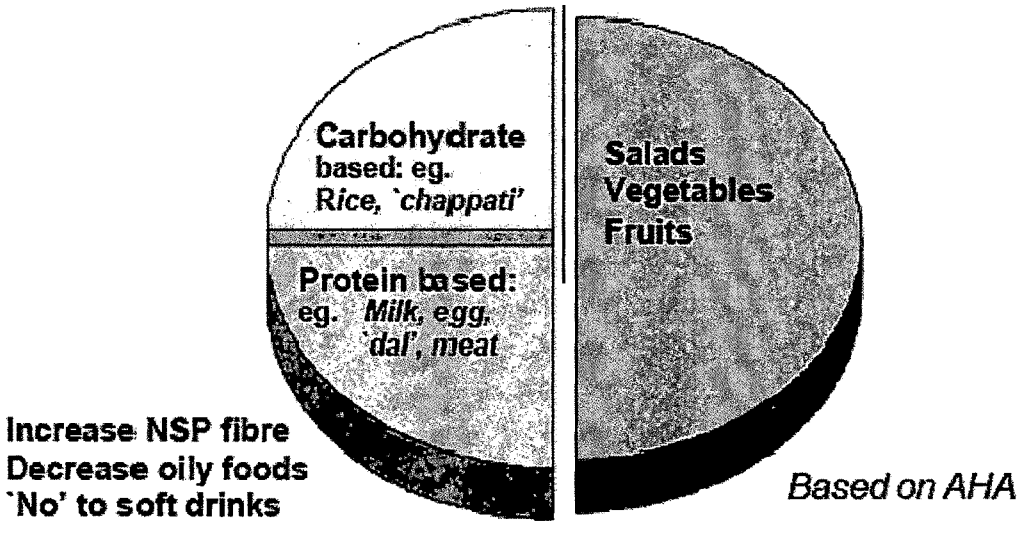
A diet high in fruits and vegetables is considered to be panacea for a number of health risks given its high antioxidant and rich mineral content. Fruits and vegetables are high in fibre and water content hence promotes satiety and decrease total energy intake by displacing energy-dense foods (Krebs et al, 2007). Consuming a diet high in these is hence associated with lower risks for numerous chronic diseases, including cancer and cardiovascular diseases.

Nevertheless, recognizing the plethora of scientific evidence on the relationship of low fruit and vegetable intake and development of non-communicable diseases, joint WHO/FAO report recommends 400g of fruit and vegetables intake per day (excluding potatoes and other starchy tubers) for the prevention of chronic diseases and alleviation of several micronutrient deficiencies, especially in less developed countries (WHO 2004).

Indian Academy of Paediatrics (IAP) on the other hand gives a simple "Indianised" message (Figure 2.4) based on recommendations of American Heart Association as a

'Thali' wherein 50% (half) should be full of vegetables, salads and fruits (Bhave et al, 2004).

Figure 2.4: Recommended constituents of day's food intake



Source: IAP National Task Force for Childhood Prevention of Adult Diseases: Childhood Obesity, Bhave et al, IAP recommendations, 2004

However, low fruits and vegetables have been associated with high BMI values, no consumption of milk and milk products and regular consumption of junk food (high calorie intake) outside home and high intake of carbonated beverages (Mandal and Mandal 2012, Thakre et al 2011, Goyal et al 2010, Bansal et al 2013).

Fast foods intake / sweetened carbonated beverages consumption / breakfast skipping

Backed by strong and attractive advertising, the advent of western fast food joints has had a bearing on the eating habits and preferences of the adolescent populations in the developing world. With a spread of health awareness in the developed countries, fast food stores have now moved towards the developing world and so have reported a rapid growth in these countries. Increase in the availability and promotion of energy dense foods in the developing world has lead to the development of unhealthy dietary behaviours by affecting and modifying the preferences in children and adolescents

(Hasting et al 2006). Food messages at fast food outlets also promote and encourage eating away from home (Lobstein et al, 2006). For example, fast food stores like McDonald's offer collecTable models, toys, puzzles and child attractive food packages (happy meal) designed specifically to influence the child's choice. Market research in Russia in 2005 showed children aged five years, were rapidly adapting to 'western' foods as 81% reported to be regularly eating potato chips, 66% regularly consumed carbonated drinks whereas 78% and 70% reported regular chocolate and chewing gum consumption (Russian legislative overhaul, 2005).

In a study assessing the relationship between eating food purchased away from home and longitudinal change in body mass index (BMI), z-score among girls (8-12 year), found that the frequency of eating quick-service food at baseline was positively associated with change in BMI z-score and participants who ate quick-service food twice a week or more at baseline had the greatest mean increase in BMI z-score compared to those who ate quick-service food once a week or not at all (Thompson et al, 2004).

Further, Taveras et al (2005), in a study, examined the cross-sectional and longitudinal associations between consumption of fried foods away from home (FFA) and BMI which revealed that at baseline, frequency of eating FFA was associated with greater intakes of total energy, sugar-sweetened beverages, and trans fat, as well as lower consumption of low-fat dairy foods and fruits and vegetables. The longitudinal results revealed that increasing (over 1 year) consumption of FFA "never or <1/week" to "4 to 7/week" was associated with increasing BMI compared with those with low consumption of FFA at baseline and 1 year later. The study hence, suggested that increasing consumption of FFA over time may lead to excess weight gain.

Huge portion sized and high in calories from simple sugars and fat, fast food snacks/drinks increase the total energy intake and promote increased conservation and accumulation of fat ensuing from postprandial carbohydrate oxidation thus altering fuel partitioning which increases the risk of overweight and obesity (Kaur et al 2008, Goyal et al 2010, Bansal et al 2013). Similarly in a study from urban Vadodara, Gandhi (2004) found that the higher percentage of overweight and obese children

consumed $\geq$ 30% calories from fat hence showing the role of a high fat diet in development of overweight and obesity.

The relationship of carbonated drinks per se, with BMI is still unclear. Although several studies show an association between sweetened beverage consumption and risk of obesity (Ludwig et al 2001), few indicated a weak or negative relationship (Krebs et al 2007). Dubois et al (2007), in a study conducted on 2,103 preschool children in Canada, concluded that regular (more than 3 days per week) sugar-sweetened beverage (carbonated and fruit drink) consumption between meals may put young children at a greater risk for overweight where as, Forshee and Storey (2003) found no association between consumption of carbonated beverages and BMI in American children and adolescents (6-19 years). No data is available on this association in India and so this area needs further research to establish these findings in an Indian setting.

Though no linear relationship between sweetened-beverage consumption and BMI has been established Rajeshwari et al (2005) in Bogalusa Heart study found that children with increased sweetened beverage intake compromised on their recommended milk consumption nevertheless accounting for unhealthy behaviours.

Thus, IAP National Task Force for Childhood Prevention of Adult Diseases (2004), contemplates that a shift from a traditionally micronutrient rich diet to energy dense highly processed, micronutrient poor foods with greatly increased portions and high calorie snacks coupled with junk food and cola revolution may be one of the main contributors to the increasing prevalence of overweight in Indian children and adolescents leading to grave consequences (Bhave et al 2004, Bansal et al 2013, Goyal et al 2010, Thakre et al 2011).

Breakfast is considered the most important meal of the day (Adolphus et al 2013). Children who consume breakfast regularly, are more likely to have adequate nutrient intakes including higher intake of dietary fiber, total carbohydrate and lower total fat and cholesterol levels (Deshmukh-Taskar et al 2010). Breakfast also contributes to the daily micronutrient intake (Balvin Frantzen et al 2013). Iron, B vitamins (folate, thiamine, riboflavin, niacin, vitamin B_6, and vitamin B_{12}) and Vitamin D are approximately 20–60% higher in children who regularly eat breakfast compared with

breakfast skippers (Gibson 2003). It also helps in maintaining normal body mass index (BMI). Two systematic reviews report that children and adolescents who regularly consume breakfast have reduced likelihood of being overweight (Szajewska and Ruszczynski 2010, de la Hunty et al 2013).

Breakfast consumption is also associated with other healthy lifestyle factors. Children and adolescents who do not consume breakfast are more likely to be less physically active and have a lower cardio respiratory fitness level (Sandercock et al 2010). Moreover, breakfast positively affects learning in children in terms of behavior, cognitive, and school performance (Hoyland et al 2009). Also, a few studies indicate that breakfast skipping could be part of a constellation of other unhealthy dietary behaviours that compound the many deleterious effects of obesity on health (Keski-Rahkonen et al 2003, Cho et al 2003, Wilsgaard et al 2005).

However, in India, no studies have been conducted to look into the beneficial or harmful effects of breakfast consumption on nutritional status (BMI), or other lifestyle behaviors (physical inactivity or on screen time).

Physical Inactivity

Physical activity (PA) is any activity that increases one's heart rate and makes one get out of breath for some of the time. Physical activity can be done in sports, playing with friends, exercising or walking to school. Some examples of physical activity are running, fast walking, biking, dancing, or football.

Therefore, the recommended levels of PA for children and adolescents by American dietary guidelines (2005) are, at least 60 minutes of moderate intensity physical activity most days of the week, preferably daily. IAP, on the other hand recommends least 30 minutes of cumulative moderate exercise (equivalent to walking briskly) plus an additional 20 minutes of vigorous exercise (equivalent to running), three times a week similar to the WHO (2010) physical activity guidelines.

Physical activity has an important role in maintaining health and fitness. As Centre of Disease Control (CDC) reiterates, regular physical activity reduces people's risk for various chronic degenerative diseases (heart attack, colon cancer, diabetes, and high blood pressure). It may also help to reduce the risk of obesity and overweight.

Both organized and unorganized sport and physical activity were reported to have a positive effect in reducing the risk of overweight (10–24% reduced risk) as well as obesity (23–43% reduced risk) by Tremblay and Willams (2003) in their study on 7,216 Canadian children (7-11 years). Given its important role, lack of physical activity has been reported to lead to accumulation of excess of calories leading to an increased susceptibility to overweight and obesity.

Centre for Disease Control (CDC, 2007) reported about two-thirds of young people in grades 9–12 were not engaged in recommended levels of physical activity apart from the fact that daily participation in high school physical education classes dropped from 42% in 1991 to 33% in 2005.

According to WHO – NIN obesity study on urban adolescents carried out during 2007 in Andhra Pradesh, multi logistic regression analysis revealed that the risk of over weight was 3 times higher among the adolescents, who did not participate in out door games and sports and 2 times among the adolescents who did not participate in household activities. (Laxmaiah et al 2007)

Another study conducted among adolescents residing in Karnataka revealed that the risk of getting over weight or obese is 21 times higher among those who participated in < 2 hrs in any type of physical acitivity (Kotian et al 2010)

Micronutrient deficiencies: Anemia

Various factors have been shown to be associated with the prevalence of iron deficiency anaemia namely, increased physiological requirements at certain stages of life cycle, low bio availability of iron, inadequate dietary intake of iron, blood losses, parasitic infestation (Chandra and Kutty 2008).

Prevalence of anemia among MHSES adolescents

Worldwide

The burden of anaemia is highest in South East Asia including Pakistan, Nepal, Bangladesh and India. It is well documented that iron deficiency anaemia is an important public health problem in most developing countries. It is more prevalent micronutrient deficiency among adolescents. WHO estimates that 27% of adolescents

in developing countries are anaemic; the International Center for Research on Women (ICRW) studies documented high rates in Nepal (42%), Cameroon (32%) and Gautemala (48%) and in India also more than 55% of the adolescents population has been reported to be suffering from Iron Deficiency Anaemia (Adolescent Nutrition 2006).

A study in Baghdad on 1051 adolescent children from High (n=487) and Low socio economic area (n= 564) established the prevalence of iron deficiency anaemia among adolescents in high socio economic area was 12.9% compared with 17.6% in low socio economic area **(Sharbatti et al 2003).**

In Bangladesh **(Persson et al 2000)**, 31% children showed below the cut-off point for anaemia (<11.5 g/dl haemoglobin). Serum ferritin levels lower than 12.0 mg/l was reported in 30% of the children and 14% were suffering from iron deficiency anaemia.

In India

National Health Family Survey III (2005-06) reports the prevalence of anemia as high as 24.3% to 56.2% among the adolescents population.

The overall prevalence of anaemia among adolescents was relatively higher in the states of West Bengal (88-90%), Orissa (78-82%), Madhya Pradesh (72-76%) and Andhra Pradesh (73%).

Srihari et al. (2007), reviewed twelve studies and reported that anaemia prevalence (haemoglobin concentration <120 g/L) ranged from 19-88% across five different cities in India (Delhi, Punjab, Baroda, Pune, Chennai). A survey reported by Lancet (2002) revealed that nutritional anaemia affects 79% of children in the lowest economic strata and 64 per cent in the better-off families (Table 2.4).

Table 2.4: Prevalence of Iron Deficiency Anaemia in adolescents

Author	Country	Study subjects		Prevalence of Anaemia	
		Girls	Boys	Girls	Boys
Ahmed et al. (2004)	Bangladesh	12-15 years	---	22%	---
Gupta et al. (2002)	Peru, Indonesia and Bangladesh	adolescent girls	---	25-30%	---
Shah et al. (2002)	Nepal	11-18 years	---	68.8%	---
Gawarika et al. (2006)	Ujjain city	10.5 – 18 yrs	-----	65.02%	---
Agarwal et al. (2003)	North East Delhi	Adolescent girls	---	45%	---
Kanani and Shah (2001)	Vadodara	12- 15	---	12% [1] 30% [2]	---

Source: Srihari et 2007

Sen and Kanani, 2006, in their study stated very high prevalence (67%) of anaemia in adolescent girls of Vadodara. Though no case of severe anaemia was found; 32.6 % girls were mildly anaemic (Hb = 11.0-11.9 g/dL) and 34.7 % girls were moderately anaemic (Hb = 7.1-10.9 g/dL).

In the review of literature under the topic of anaemia extensive data was available for adolescent girls very few studies were conducted for adolescent boys. However, as can be seen in Table 2.6, the prevalence of iron deficiency anaemia amongst girls, ranged from 22- 78%.

The paucity of data on anemia levels in Indian adolescents especially points to the fact that this most important and vulnerable age group has remained neglected by researchers and policy makers.

Factors associated with anemia

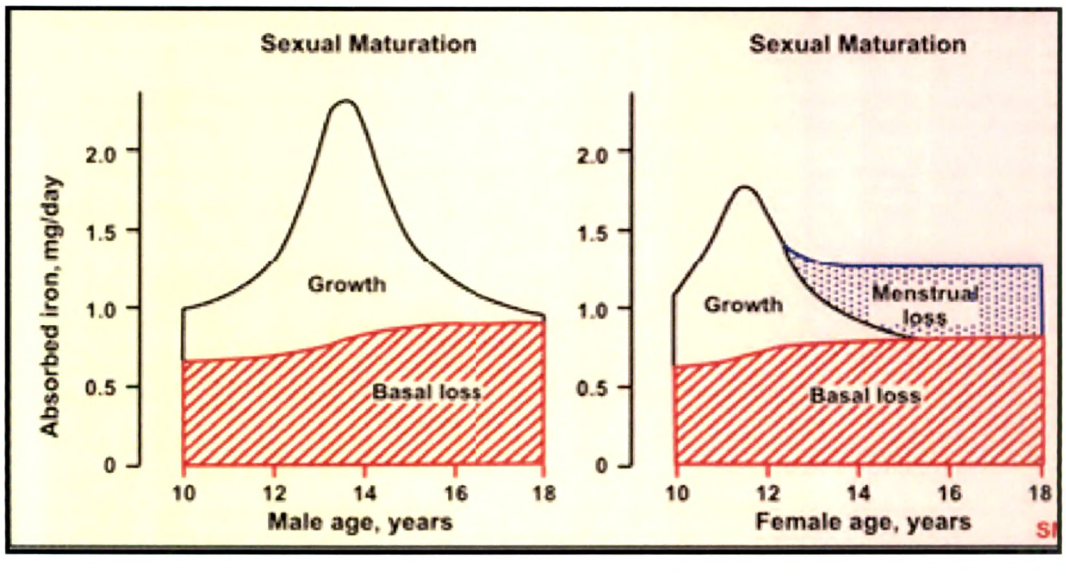
Increased Iron Requirement

The requirement for dietary iron arises from three major needs of body: endogenous loss of iron, requirement for growth and building up of iron stores over the period from infancy to adolescent (Kanani and Poojara 2000).

The requirements for iron are highest during infancy and adolescence when the iron stores are completely depleted and the rate of growth is as its peak, resulting in a negative iron balance (Rees et al 2008)

. The peak need for iron has been shown to be more closely related to maximal growth spurt and maturation than to age. Growth implies a corresponding increase in the total haemoglobin mass and for this formation of new haemoglobin, iron is needed (Woodruff and Duffield 2000). Besides iron is essential for the formation of myoglobin and is a cofactor of number of enzymes system. Iron requirements remain higher in girls after menarche to replace the menstrual losses and in boys in this phase due to muscle mass development (Figure 2.5). Therefore, iron demand increases during accelerated growth in adolescent particularly due to increase in biochemical activities and physical parameters such as increase in height of about 22cm, increase in blood volume from 2.5 to 6.0 liter and haemoglobin increment by 8gm/dl.

Figure 2.5 Iron needs during adolescence



Low bioavailability of the dietary iron

Bioavailability of iron is defined as that fraction of iron in food which is absorbed and utilized by the body. Low bioavailability of iron refers to simple, monotonous diets based on cereals, roots, tubers, maize, beans, whole wheat, sorghum (rich iron inhibitor). The average iron absorption varies extremely, ranging from 1-5% from plant origin foods and 10-25% from animal origin foods (Gawarika et al 2006, Anupama et al 2002). The bio availability of iron is low in predominantly cereal based diets as in India, because of their high phytate and phosphate content. Tanins present in tea are also known to inhibit the absorption of iron when consumed with meal is shown in the Table 2.3. Among the adolescent girls of Gujarat drinking tea with thepla and bhakri is common (Gawarika et al 2006).

Table 2.3: Bioavailability of iron from typical Indian meal

Meal	Bioavailability
Wheat chapattis, potato, vegetable and tea	1.8
Rice, Dal, Potato, vegetable and milk	4.5
Ragi balls, potato vegetable and tea	0.9
Sorghum, potato, vegetable and tea	0.8
Wheat bhakris	3.8
Wheat bhakris with tea	2.5

Source: Seshadri, 1996

Parasitic infestation

Adolescent iron requirements are even higher in developing countries because of infectious disease and parasitic infestation that cause iron loss (Kanani and Poojara 2000). Parasites can increase iron requirement through blood loss or by impairing iron absorption. Iron requirement increase incases in case of chronic blood loss cause by parasitic infection.

High parasitic infestation rate (30-80%) could be one of the major cause of anaemia (Tiwari, 2000). Hook worm infestation load can induce the iron deficiency anaemia, especially in children and adolescents, whose dietary iron is low and whose body iron stores are exhausted due to increased demand of iron for growth. Even normal levels of dietary iron intake may not be sufficient to protect from anaemia in the situation of high hook worm load.

Koukounari et al (2008) reviewed the relation between parasitc infection and anaemia among Kenyan School children (aged 10-21 years). The study reported that children heavily infected with parasite were also more likely to be anaemic (more than 90% in both cases) compared to uninfected children. Similarly other study was carried out by Uddin and Khanum (2008) in two different districts (Kutumbopur and Gazirchat) of Bangladesh and reported that parasitic infestation was observed among 33.82% adolescent where as in the other district the prevalence was 84.21%. Parasitic infestation was observed much higher in Gazirchat than Kutumbopur. The prevalence of anaemia was high in Kutumbopur (94.83%) than Gazirchat (41.2%) but the correlation between anaemia and parasitic infestation was statistically insignificant.

SABLA program has been initiated by Government of India to improve the nutritional and iron status of adolescent girls, in view of the widespread prevalence of anemia (56.2%). On comparing the high prevalence of anemia among the urban regions of five cities (Delhi, Punjab, Baroda, Pune, Chennai), 19% - 88% (Srihari et al 2007) with the 56.2%, it is clearly seen that the children from middle to high socio economic remain neglected due to absence of any such policy in private schools.

Though the current school health promotion program has been started for private schools also, the implementation and the IFA supplementation part still remains neglected in private schools on the pretext that children from private schools are not anemic.

Functional consequences of anemia

Reduced learning capacity and cognitive development

The term 'cognition' has broad application and refers to activities, chiefly thinking, reasoning, problem solving and psychological processes such as attention, memory and learning (McCann and Ames 2007)

Laboratory animal studies have shown reduced aldehyde oxidase activity in iron deficient rats that resulted in accumulation of serotonin and 5-hydroxyindol compounds, which have been reported to produce drowsiness, decrease attentiveness, and decreased ability to learn. Thus it is postulated that iron deficiency anaemia may lead to defects in cognitive development and function in human (Sen and Kanani 2005).

In animals, deficits in motor activity are consistently associated with severe iron deficiency and anaemia A (McCann & Ames, 2007). The study also suggested behavioural and cognitive deficits in children older than two years of age and adolescents.

Even mild anaemia had an impact on cognitive function of adolescent girls which aggravated with fall in haemoglobin levels (Sen and Kanani, 2006). A study reported that the scholastic performance was influenced by nutritional status. The study related anaemia and IQ (mental function) and found a significantly greater proportion of children with higher IQ among non-anemic children. (Parmar et al 2005)

Reduced work capacity

Anaemia represents a major threat to tissue oxygenation, hence certain tissues and organ that require much oxygen may suffer resulting in diminished capacity to perform energy consuming task. The key role that haemoglobin plays in transporting oxygen accounts for the diminished work capacity. Tissues develop slugginess in action owing to inadequate oxidation. Breathlessness and palpitation are commonly experienced by anaemic people (Bruner 2006). A study conducted in Vadodara demonstrated deleterious impact of anaemia on physical work capacity of adolescent girls (Sen and Kanani, 2006).

Loss of appetite

Iron deficiency leads to loss of appetite or anorexia. With loss of appetite the consumption of the food decreases, intern decreasing the growth and also worsening the condition of anaemia due to decreased micronutrients intake (Sen and Kanani, 2006).

Effect on growth

Growth is adversely affected in anaemic adolescents. Weights of anaemic children tend to be lower than those of normal children (Anupama & Manjula 2002).

In a study done by Bhanushali et al 2011, children with iron deficiency anaemia weighed less and shorter than those who were normal. Supplementation with iron resulted in better growth velocity. A systematic review showed that weekly iron supplementation (60 mg of elemental iron) has a beneficial impact on linear growth in anaemic children (Jack et al 2012).

Reduced immunocompetence

Nutritional status is one of the crucial factors that influence human immunity mechanism. Iron is essential for the normal development of immunity and deficiency of iron may be expected to impair immune responses (Basu et al 2005).

An expert group of WHO (2000) reported that individuals with nutritional anaemia revealed that individual with nutritional anaemia tend to have more frequent infections.

Iron deficiency anaemia may impair immunocompetence thus compromising health. There is a decrease in morbidity as the iron status improved.Some controversial views have been expressed regarding the association between morbidity and anaemia. Some literature highlights anaemia is a cause of morbidity occurrences and some studies support anaemia as a consequence of morbidity (Chandra and Kutty 2008).

Adolescents apparently have a low prevalence of infections and disease compared to children under five and the elderly, they receive little health and nutrition attention (WHO 2006). Programmes addressing adolescent nutrition in south east asian region are very few, small, experimental, and mostly for the under privileged section (WHO 2006). They are mainly aimed at the prevention and control of anemia among adolescents.

Thus it can be concluded that adolescents from middle to high socio economic schools also suffer from triple burden of malnutrition.

Health promotion

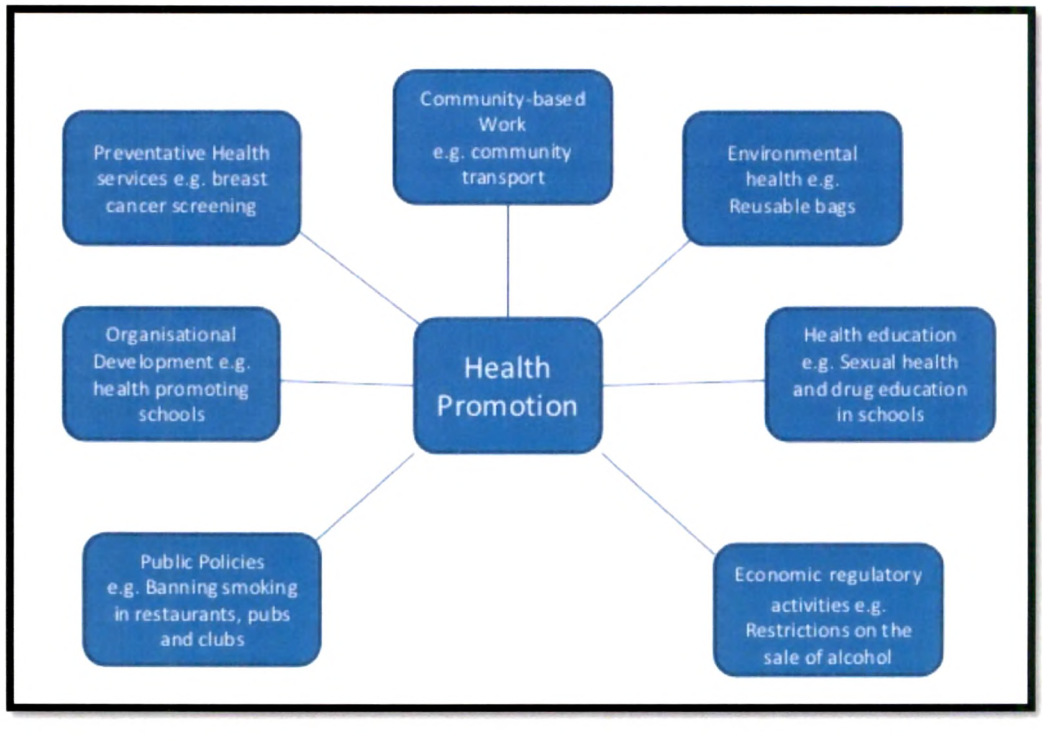
Health promotion is the process that enables people to improve or have greater control over their health. The aim of health promotion is to help an individual or a group to reach a state of complete physical, mental and social well- being, by

- Enabling them to identify and realize aspirations
- Satisfy their own requirements of being well
- Change with the environment

Health promotion makes it possible for people to have more control over the determinants of health and thereby improve their health. Health promotion encompasses range of activities, as explained in Figure 2.6.

Health promotion is not alone the responsibility of health sector, while the individuals themselves, community groups / schools, health professionals, health service institutions and governments should also be made aware of the problems and motivated to participate in the health promotion programs.

Figure 2.6: Health promotion encompasses a range of activities



Source: Kreuter et 2003

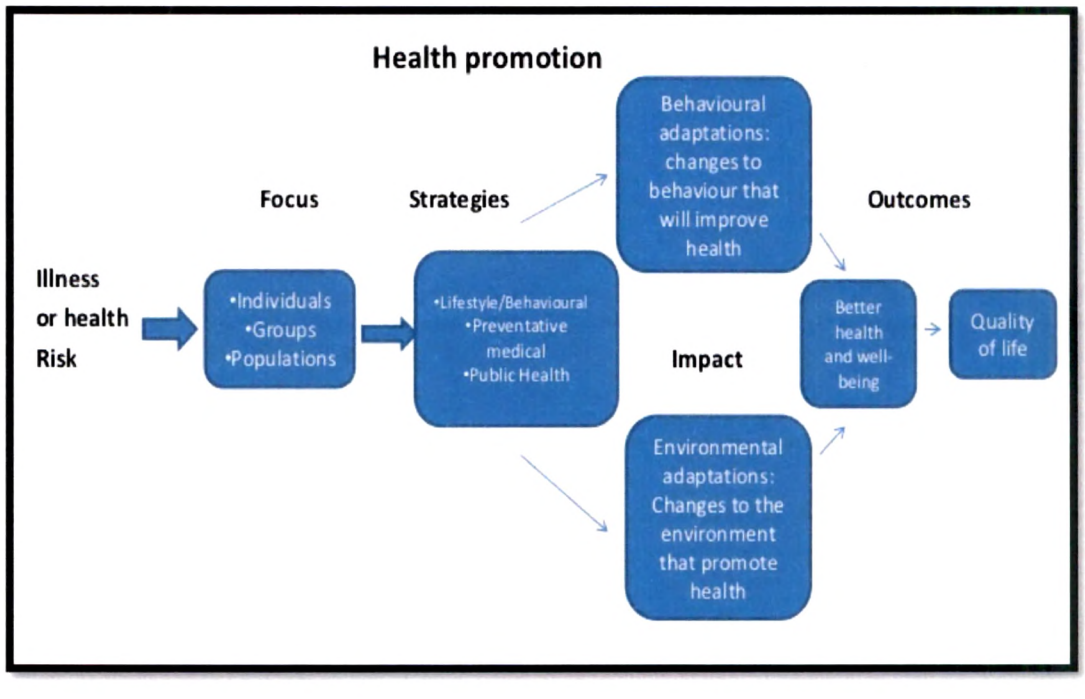
Health promotion approaches

It ranges from individually focused interventions (such as posters providing positive health messages) to development of a national health promoting policy (such as school health promotion program). Figure 2.7, explains the framework of health promotion.

2.6.1a Lifestyle / behavioural approaches

Lifestyle / behavioural approaches are concerned with individual or groups whose behavioural or social situations place them at greater risk of developing unhealthy lifestyle. These approaches target smaller "at risk" groups within a population to change their behaviors. This is based on the theory that a change in behavior of a small percentage of the whole population results in significantly more people changing behaviors.

Figure 2.7: A framework for health promotion



Source: Kreuter et 2003

Individual lifestyle approaches

The individual lifestyle approach to health promotion is based on the principles that the major causes of morbidity and mortality are diseases resulting from poor dietary and lifestyle behavior choices. Hence, with relevant information, people will change their actions and way of thinking to improve their health.

Socio cultural environmental approach

The socio cultural environment approach promotes health by addressing the social determinants of health, such as access to food, housing, income, employment, transport and education and factors such as addiction, social isolation and early life experiences. Health promotion commonly in the socio- cultural environment approach includes:

- Creating environments that support nutrition and health (eg. A school developing a nutrition policy to promote healthy eating and selling nutritious food in the canteen).
- Working with communities to strengthen their development (eg. A school working with families to reinforce the nutrition and health messages to children outside school hours).
- Advocating for public policy (eg. A school becoming a health promoting school).

Preventive medical approach

Preventive medical approaches are the traditional approaches of the health sector, which regards health as the absence of illness and disease. These approaches are directed at the way living things function. Example: high blood pressure, lack of immunization etc. These approaches also focus on the treatment and prevention o diseases. The current school health promotions program in India are based on medical approaches with identifying diseases through sporadic check ups and referrals.

Public health approach

Public health approaches aim to provide the maximum benefit for the largest number of people. They are concerned with preventing disease or injury from occurring or reoccurring, promoting health, and returning health to populations and communities following natural or man- made disasters.

Health promotion strategies

A life-course perspective is essential for the prevention and control of non communicable diseases. This approach starts with maternal health and prenatal nutrition, pregnancy outcomes, exclusive breastfeeding for six months, and child and adolescent health; reaches children at schools, adults at worksites and other settings, and the elderly; and encourages a healthy diet and regular physical activity from youth into old age (WHO 2009).

Strategies to reduce non communicable diseases should be part of broader, comprehensive and coordinated public health efforts. All partners, especially governments, need to address simultaneously a number of issues. In relation to diet, these include all aspects of nutrition (for example, both overnutrition and undernutrition, micronutrient deficiency and excess consumption of certain nutrients); food security (accessibility, availability and affordability of healthy food); food safety; and support for and promotion of six months of exclusive breastfeeding. Regarding physical activity, issues include requirements for physical activity in working, home and school life, increasing urbanization leading to long travel time and less amount of time available for physical activity, and various aspects of city planning (like having cycle pathways, community centers etc) transportation, safety and access to physical activity during leisure time (WHO 2009).

Strategies need to be based on the best available scientific research and evidence; comprehensive, incorporating both policies and action and addressing all major causes of non communicable diseases together; multisectoral, taking a long-term perspective and involving

all sectors of society; and multidisciplinary and participatory, consistent with the principles contained in the Ottawa Charter for Health Promotion (WHO 1986) and confirmed in subsequent conferences on health promotion and recognizing the complex interactions between personal choices, social norms, economic and environmental factors (WHO 2009).

Milestones in health promotion

There are different milestones in health promotion, conceived during the conferences held over a period of time. The following milestones are:

- The Ottawa Charter for Health Promotion *17-21 November 1986*
- Adelaide Recommendations on Healthy Public Policy *5-9 April 1988*
- Sundsvall Statement on Supportive Environments for Health *9-15 June 1991*
- Jakarta Declaration on Leading Health Promotion into the 21st Century *21-25 July 1997*
- Mexico Ministerial Statement for the Promotion of Health: From Ideas to Action *5-9 June 2000*
- The Bangkok Charter for Health Promotion in the Globalized World *7-11 August 2005*
- The Helsinki statement on Health in All Policies (Helsinki, Finland, 10-14 June 2013)

The Ottawa Charter for Health Promotion (17-21 November 1986)

The first International Conference on Health Promotion, held in Ottawa from 17-21 November 1986, presented this CHARTER for action to achieve Health for All by the year 2000 and beyond. 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.

Prerequisites for Health

The fundamental conditions and resources for health are:

- Peace,
- Shelter,
- Education,
- Food,
- Income,
- A sTable eco-system,
- Sustainable resources,
- Social justice, and equity.

Improvement in health requires a secure foundation in these basic prerequisites. Hence the three main strategies for the implementation of the health promotion programs are: advocate, enable and mediate.

Advocate

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, behavioural and biological factors can all favour health or be harmful to it. Health promotion action aims at making these conditions favourable through advocacy for health.

Enable

Health promotion focuses on achieving equity in health. Health promotion action 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. This must apply equally to women and men.

Mediate

The prerequisites and prospects for health cannot be ensured by the health sector alone. More importantly, health promotion demands coordinated action by all concerned: by governments, by health and other social and economic sectors, by nongovernmental and voluntary organization, by local authorities, by industry and by the media. People in all walks of life are involved as individuals, families and communities. Professional and social groups and health personnel have a major responsibility to mediate between differing interests in society for the pursuit of health.

Health promotion strategies and programmes should be adapted to the local needs and possibilities of individual countries and regions to take into account differing social, cultural and economic systems.

❖ ***Health promotion action strategies as proposed in Ottawa charter***

They major five health promotion action strategies are:

i. Build Healthy Public Policy

Health promotion goes beyond health care. It puts health on the agenda of policy makers in all sectors and at all levels, directing them to be aware of the health consequences of their decisions and to accept their responsibilities for health.

Health promotion policy combines diverse but complementary approaches including legislation, fiscal measures, taxation and organizational change. It is coordinated action that leads to health, income and social policies that foster greater equity. Joint action contributes to ensuring safer and healthier goods and services, healthier public services, and cleaner, more enjoyable environments.

Health promotion policy requires the identification of obstacles to the adoption of healthy public policies in non-health sectors, and ways of removing them. The aim must be to make the healthier choice the easier choice for policy makers as well.

ii. Create Supportive Environments

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 socioecological 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. The conservation of natural resources throughout the world should be emphasized as a global responsibility.

Changing patterns of life, work and leisure have a significant impact on health. Work and leisure should be a source of health for people. The way society organizes work should help create a healthy society. Health promotion generates living and working conditions that are safe, stimulating, satisfying and enjoyable. Systematic assessment of the health impact of a rapidly changing environment - particularly in areas of technology, work, energy production and urbanization - is essential and must be followed by action to ensure positive benefit to the health of the public. The

protection of the natural and built environments and the conservation of natural resources must be addressed in any health promotion strategy.

iii. 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 direction of health matters. This requires full and continuous access to information, learning opportunities for health, as well as funding support.

iv. Develop Personal Skills

Health promotion supports personal and social development through providing information, education for health, and enhancing life skills. By doing so, 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 themselves 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.

v. 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.

Adelaide Recommendations on Healthy Public Policy (South Australia, 5-9 April 1988)

The adoption of the Declaration of Alma-Ata a decade ago was a major milestone in the Health for All movement which the World Health Assembly launched in 1977. Building on the recognition of health as a fundamental social goal, the Declaration set a new direction for health policy by emphasizing people's involvement, cooperation between sectors of society and primary health care as its foundation.

Developing New Health Alliances

The commitment to healthy public policy demands an approach that emphasizes consultation and negotiation. Healthy public policy requires strong advocates who put health high on the agenda of policy-makers. This means fostering the work of advocacy groups and helping the media to interpret complex policy issues.

Educational institutions must respond to the emerging needs of the new public health by reorienting existing curricula to include enabling, mediating, and advocating skills. There must be a power shift from control to technical support in policy development. In addition, forums for the exchange of experiences at local, national and international levels are needed. The

Conference recommends that local, national and international bodies:

- Establish clearing-houses to promote good practice in developing healthy public policy;
- Develop networks of research workers, training personnel, and programme managers to help analyse and implement healthy public policy.

Sundsvall Statement on Supportive Environments for Health (Sweden, 9-15 June 1991)

The Third International Conference on Health Promotion: Supportive Environments for Health – the Sundsvall Conference - fits into a sequence of events which began with the commitment of WHO to the goals of Health For All (1977). This was followed by the UNICEF/WHO International Conference on Primary Health Care, in Alma-Ata (1978), and the First International Conference on Health Promotion in Industrialized Countries (Ottawa 1986). Subsequent meetings on Healthy Public Policy, (Adelaide 1988) and a Call for Action: Health Promotion in Developing countries, (Geneva 1989) have further clarified the relevance and meaning of health promotion. In parallel with these developments in the health arena, public concern over threats to the global environment has grown dramatically. This was clearly expressed by the World Commission on Environment and Development in its report Our Common Future, which provided a new understanding of the imperative of sustainable development.

The Conference highlighted four aspects of supportive environments:

i. The social dimension, which includes the ways in which norms, customs and social processes affect health. In many societies traditional social relationships are changing in ways that threaten health, for example, by increasing social isolation, by depriving life of a meaningful coherence and purpose, or by challenging traditional values and cultural heritage.

ii. The political dimension, which requires governments to guarantee democratic participation in decision- making and the decentralization of responsibilities and resources. It also requires a commitment to human rights, peace, and a shifting of resources from the arms race.

iii. The economic dimension, which requires a rechanneling of resources for the achievement of Health for All and sustainable development, including the transfer of safe and reliable technology.

iv. The need to recognize and use women's skills and knowledge in all sectors - including policymaking, and the economy - in order to develop a more positive infrastructure for supportive environments. The burden of the workload of women should be recognized and shared between men and

women. Women's community based organizations must have a stronger voice in the development of health promotion policies and structures.

Jakarta Declaration on Leading Health Promotion into the 21st Century (Jakarta, Indonesia, 21-25 July 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, has come at a critical moment in the development of international strategies for health. It is 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 is 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, Australia, 1988), and supportive environments for health (Sundsvall, Sweden, 1991).

The Fourth International Conference on Health Promotion is the first to be held in a developing country, and the first to involve the private sector in supporting health promotion. It has provided an opportunity to reflect on what has 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 participants in the Jakarta Conference hereby present this Declaration on action for health promotion into the next century.

The Jakarta Declaration on Health Promotion offers a vision and focus for health promotion into the next century. It reflects the firm commitment of participants in the Fourth International Conference on Health Promotion to draw upon the widest possible range of resources to tackle health determinants in the 21st century.

Determinants of health: new challenges

The prerequisites for health are peace, shelter, education, social security, social relations, food, income, the empowerment of women, a sTable eco-system, sustainable resource use, social justice, respect for human rights, and equity. Above all, poverty is the greatest threat to health.

Demographic trends such as urbanization, an increase in the number of older people and the high prevalence of chronic diseases pose new problems in all countries. Other social, behavioural and biological changes such as increased sedentary behaviour, resistance to antibiotics and other commonly available drugs, increased drug abuse, and civil and domestic violence threaten the health and well-being of hundreds of millions of people.

New and re-emerging infectious diseases, and the greater recognition of mental health problems, require an urgent response. It is vital that approaches to health promotion evolve to meet changes in the determinants of health.

Transnational factors also have a significant impact on health. These include the integration of the global economy, financial markets and trade, wide access to media and communications technology, and environmental degradation as a result of the irresponsible use of resources.

These changes shape peoples values, their lifestyles throughout the lifespan, and living conditions across the world. Some have great potential for health, such as the development of communications technology, while others, such as international trade in tobacco, have a major negative impact.

Health promotion makes a difference

Research and case studies from around the world provide convincing evidence that health promotion is effective. 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.

The five strategies set out in the Ottawa Charter for Health Promotion are essential for success:

- Build healthy public policy
- Create supportive environments
- Strengthen community action
- Develop personal skills
- Reorient health services.

There is now clear evidence that:

- Comprehensive approaches to health development are the most effective. Those that use combinations of the five strategies are more effective than single- track approaches.
- Particular settings offer practical opportunities for the implementation of comprehensive strategies. These include mega-cities, islands, cities, municipalities, local communities, markets, schools, the workplace, and health care facilities.
- Participation is essential to sustain efforts. People have to be at the centre of health promotion action and decision-making processes for them to be effective.
- Health learning fosters participation. Access to education and information is essential to achieving effective participation and the empowerment of people and communities.

These strategies are core elements of health promotion and are relevant for all countries.

New responses needed

To address emerging threats to health, new forms of action are needed. The challenge for the coming years will be to unlock the potential for health promotion inherent in many sectors of society, among local communities, and within families.

There is a clear need to break through traditional boundaries within government sectors, between governmental and nongovernmental organizations, and between the public and private sectors.

Cooperation is essential; this requires the creation of new partnerships for health, on an equal footing, between the different sectors at all levels of governance in societies.

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 multisectoral 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 intersectoral 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 (Mexico City, 5-9 June 2000)

Statement

Gathered in Mexico City on the occasion of the Fifth Global Conference on Health Promotion, the Ministers of Health who sign this Statement:

1. Recognize that the attainment of the highest possible standard of health is a positive asset for the enjoyment of life and necessary for social and economic development and 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 well being.
5. Are mindful that, at the same time, new and reemerging diseases threaten the progress made in health.
6. Realize that it is urgent to address the social, economic and environmental determinants of health and that this requires strengthened mechanisms of collaboration for the promotion of health across al sectors and at 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.

The Bangkok Charter for Health Promotion in a Globalized World (7-11 August 2005)

Purpose

The Bangkok Charter affirms that policies and partnerships to empower communities, and to improve health and health equality, should be at the centre of global and national development.

The Bangkok Charter complements and builds upon the values, principles and action strategies of health promotion established by the *Ottawa Charter for Health Promotion* and the recommendations of the subsequent global health promotion conferences which have been confirmed by Member States through the World Health Assembly.

Audience

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.

Health promotion

The United Nations recognizes that the enjoyment of the highest attainable standard of health is one of the fundamental rights of every human being without discrimination.

Health promotion is based on this critical human right and offers a positive and inclusive concept of health as a determinant of the quality of life and encompassing mental and spiritual wellbeing.

Addressing the determinants of health Changing context

The global context for health promotion has changed markedly since the development of the *Ottawa Charter.*

Critical factors

Some of the critical factors that now influence health include:

- Increasing inequalities within and between countries
- New patterns of consumption and communication commercialization global environmental change, and urbanization.

Further challenges

Other factors that influence health include rapid and often adverse social, economic and demographic changes that affect working conditions, learning environments, family patterns, and the culture and social fabric of communities.

Women and men are affected differently. The vulnerability of children and exclusion of marginalized, disabled and indigenous peoples have increased.

New opportunities

Globalization opens up new opportunities for cooperation to improve health and reduce transnational health risks; these opportunities include:

- Enhanced information and communications technology, and
- Improved mechanisms for global governance and the sharing of experiences.

Policy coherence

To manage the challenges of globalization, policy must be coherent across all:

- Levels of governments
- United Nations bodies, and
- Other organizations, including the private sector.

This coherence will strengthen compliance, transparency and accountability with international agreements and treaties that affect health.

Progress made

Progress has been made in placing health at the centre of development, for example through the Millennium Development Goals, but much more remains to be achieved; the active participation of civil society is crucial in this process.

Strategies for health promotion in a globalized world

Effective interventions

Progress towards a healthier world requires strong political action, broad participation and sustained advocacy. Health promotion has an established repertoire of proven effective strategies which need to be fully utilized.

Required actions

To make further advances in implementing these strategies, all sectors and settings must act to:

- Advocate for health based on human rights and solidarity
- Invest in sustainable policies, actions and infrastructure to address the determinants of health
- Build capacity for policy development, leadership, health promotion practice, knowledge transfer and research, and health literacy
- Regulate and legislate to ensure a high level of protection from harm and enable equal opportunity for health and well-being for all people
- Partner And Build Alliances with public, private, nongovernmental and international organizations and civil society to create sustainable actions.

Commitments to Health for All Rationale

The health sector has a key leadership role in the building of policies and partnerships for health promotion. An integrated policy approach within government and international organizations, as well as a commitment to working with civil society and the private sector and across settings, are essential if progress is to be made in addressing the determinants of health.

Key commitments

The four key commitments are to make the promotion of health:

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

1. Make the promotion of health central to the global development agenda

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.

Call for action

Conference participants request the World Health Organization and its Member States, in collaboration with others, to allocate resources for health promotion, initiate plans of action and monitor performance through appropriate indicators and targets, and to report on progress at regular intervals. United Nations organizations are asked to explore the benefits of developing a Global Treaty for Health.

Worldwide partnership

This Bangkok Charter urges all stakeholders to join in a worldwide partnership to promote health, with both global and local engagement and action.

The Helsinki statement on Health in All Policies (Helsinki, Finland, 10-14 June 2013)

Policies designed to enable people to lead healthy lives face opposition from many sides. Often they are challenged by the interests of powerful economic forces that resist regulation. Business interests and market power can affect the ability of

governments and health systems to promote and protect health and respond to health needs. *Health in All Policies* is a practical response to these challenges. It can provide a framework for regulation and practical tools that combine health, social and equity goals with economic development, and manage conflicts of interest transparently. These can support relationships with all sectors, including the private sector, to contribute positively to public health outcomes.

Action for Government

To fulfill their obligations to their peoples' health and well-being by taking the following actions:

- Commit to health and health equity as a political priority by adopting the principles of Health in All Policies and taking action on the social determinants of health.
- Ensure effective structures, processes and resources that enable implementation of the Health in All Policies approach across governments at all levels and between governments.
- Strengthen the capacity of Ministries of Health to engage other sectors of government through leadership, partnership, advocacy and mediation to achieve improved health outcomes.
- Build institutional capacity and skills that enable the implementation of Health in All Policies and provide evidence on the determinants of health and inequity and on effective responses.
- Adopt transparent audit and accountability mechanisms for health and equity impacts that build trust across government and between governments and their people.
- Establish conflict of interest measures that include effective safeguards to protect policies from distortion by commercial and vested interests and influence.
- Include communities, social movements and civil society in the development, implementation and monitoring of Health in All Policies, building health literacy in the population.

The Helsinki Statement wrests the major responsibility of mainstreaming health in all policy to WHO, where major role is to:

- Support Member States to put Health in All Policies into practice.
- Strengthen its own capacity in Health in All Policies.
- Use the Health in All Policies approach in working with United Nations agencies and other partners on the unfinished Millennium Development Goals agenda and the post-2015 Development Agenda.
- Urge the United Nations family, other international organizations, multilateral development banks and development agencies to achieve coherence and synergy in their work with Member States to enable implementation of Health in All Policies.

Health Promotion through school settings

Schools have direct contact with students for approximately 6 hours each day and for up to 13 critical years of their social, psychological, physical, and intellectual development **(US 2010)**. The health of students is strongly linked to their academic success, and the academic success of students is strongly linked with their health. Therefore, helping students stay healthy is a fundamental part of the mission of schools **(Dewey *1999*, Dunkle and 1991, Mandell et al 2002, Shephard 1996)**. School health programs and policies might be one of the most efficient means to prevent or reduce risk behaviors, prevent serious health problems among students, and help close the educational achievement gap **(Kolbe 2002, Allensworth et al 1997)**. Schools offer an ideal setting for delivering health promotion strategies that provide opportunities for students to learn about and practice healthy behaviors. Schools, across all regional, demographic, and income categories, share the responsibility with families and communities to provide students with healthy environments that foster regular opportunities for healthy eating and physical activity. Healthy eating and physical activity also play a significant role in students' academic performance (CDC 2011).

The importance of healthy eating, including eating breakfast, for the overall health and well-being of school-aged children cannot be understated. Most research on healthy eating and academic performance has focused on the negative effects of hunger and food insufficiency (Alaimo et al 2001) and the importance of eating breakfast (Murphy *et al 1998,* Kleinman *et al 2002,* Widenhorn-Muller *et al 2008.* Recent reviews of breakfast and cognition in students (Taras *2005,* Rampersaud et al 2005, Hoyland et al 2009) report that eating a healthy breakfast might :

- Enhance cognitive function (especially memory),
- Increase attendance rates,
- Reduce absenteeism, and
- Improve psychosocial function and mood.

Certain improvements in academic performance such as improved math scores also were noted (Murphy et al 1998, Kleinman et al 2002).

A growing body of research focuses on the association between school-based physical activity, including physical education, and academic performance among school-aged children and adolescents. A comprehensive CDC literature review that included 50 studies synthesized the scientific literature on the association between school-based physical activity, including physical education, and academic performance, including indicators of cognitive skills and attitudes, academic behaviors (e.g., concentration, attentiveness, and time on task), and academic achievement (e.g., grade point average and test scores). The review identified a total of 251 associations between school-based physical activity and academic performance. Of all the associations examined, 51% were positive, 48% were not significant, and 2% were negative. Therefore, the evidence suggests that:

- Substantial evidence indicates that physical activity can help improve academic achievement, including grades and standardized test scores;
- Physical activity can affect cognitive skills and attitudes and academic behavior (including enhanced concentration, attention, and improved classroom behavior); and
- Increasing or maintaining time dedicated to physical education might help and does not appear to adversely affect academic performance **(CDC 2010).**

Coordinated school health approach

Schools can promote the acquisition of lifelong healthy eating and physical activity behaviors through strategies that provide opportunities to practice and reinforce these behaviors. School efforts to promote healthy eating and physical activity should be part of a coordinated school health framework, which provides an integrated set of planned, sequential, and school-affiliated strategies, activities, and services designed to promote the optimal physical, emotional, social, and educational development of students. A coordinated school health framework involves families and is based on school and community needs, resources, and standards. The framework is coordinated by a multidisciplinary team such as a school health council and is accounTable to the school and community for program quality and effectiveness (Allensworth et al 1997).

School personnel, students, families, community organizations and agencies, and businesses can collaborate to successfully implement the coordinated school health approach and develop, implement, and evaluate healthy eating and physical activity efforts. Ideally, a coordinated school health framework integrates the efforts of eight components of the school environment (i.e., comprehensive health education, physical education, and health services: mental health and social services, school nutrition services, healthy and safe school environment, school employee wellness, and family and community involvement) that influence student health (Marx et al 1998). The following guidelines reflect the coordinated school health approach and include additional areas deemed to be important contributors to school health: policy development and implementation and professional development for program staff.

Evaluation of school environment and ethos

School Health Index (SHI)

As is clear from the above discussion, school ethos and environment have a vital role to play in developing heath behaviours among children. For this, the School Health Index (SHI) can be used to determine state of school health policies and its environment. It is a self-assessment and planning guide that enables a school:

- To identify the strengths and weaknesses of its policies and programs for promoting health and safety.
- Develop an action plan for improving student health and safety, and
- Involve teachers, parents, students, and the community in improving school health
- Policies, programs, and services

The *School Health Index* has hence been designed by CDC to help schools involve teachers, parents, students, and the community in identifying the strengths and weaknesses of their school's health policies and programs, and then in developing an action plan to improve these (CDC, 2006).

Health Topics Addressed Via Modules

The SHI is structured around CDC's eight-component model of a coordinated school health program (CSHP). This model highlights the importance of involving all eight components (modules), which can have a profound influence on the development of risk behaviours in students. The eight modules are:

1. School Health and Safety Policies and Environment
2. Health Education
3. Physical Education and Other Physical Activity Programs
4. Nutrition Services
5. Health Services
6. Counselling, Psychological & Social Services
7. Health Promotion for Staff

8. Family and Community Involvement

The latest edition of the School Health Index focuses on how schools can address the following health topics in the 8 modules.

- Physical activity and physical education,
- Nutrition,
- Tobacco use prevention,
- Asthma, and
- Unintentional injury and violence prevention (safety)

SHI has been available for years but still little is known about it and its use in India is nonexistent. As reported by CDC (2004) it's being used in used in 46 schools of America plus Canada where its efficacy has been well established. Outcome data of a study conducted in 102 elementary schools of Rhode Island using SHI showed that all schools developed at least one policy or environmental strategy to create a healthy school environment (Dowling et al, 2005). SHI could hence be used as a tool to introduce public health technical expertise to schools as they develop school wellness policies and programs (Austin et al 2006).

Implementation

Implementation of SHI can be done in a way that suits a particular school set up. The only thing to remember is that the aim of SHI is to involve the whole school community in evaluating the school health policies and give recommendations for improvement. The most feasible approach hence is formation of a team which is representative of administrators, teachers, students and parents. This would further include selecting a coordinator of the team who can plan the whole process (CDC, 2006). Austin et al (2006) in their qualitative study on 6 schools from 3 states of New England using SHI recommended an outside facilitator for enhancing schools' efforts to work with SHI and better implementation of health initiatives. In addition, the involvement of an outside facilitator was also reported to support schools in undertaking more complex tasks with a greater degree of collaboration across the school and local communities in order to achieve goals.

Process of implementation

- Review the eight modules
- Assemble the School Health Index team
- Identify a coordinator for the School Health Index team
- Site coordinator assigns modules.
- Team answers Discussion Questions from 8 modules, then develop and rate recommended actions.
- Make each member fill the given/ required modules
- Score each module
- Score the over all index
- Review recommendations,
- Select a manageable number of top priority actions,
- Complete the School Health Improvement Plan.

However, it may not be possible to implement all the modules together in an academic session. Therefore, it appears more practical to focus on or two modules in a year and introduce the other modules in subsequent years. Nevertheless, "school health promotion" needs to be tested for its efficacy in an Indian setting.

Thus it can be concluded from the review of literature that:

- Adolescents are an age group requiring attention and concern by all stakeholders including government, school administration, parents etc.
- Schools in a backdrop setting are an ideal setting to target programmes and interventions needed to promote health.
- Creation of an enabling environment in schools by involving school community, parents and adolescents for promotion of health is thus, a feasible approach.

Nine School Health Guidelines to Promote Healthy Eating and Physical Activity

There are nine general guidelines for school health programs to promote healthy eating and physical activity in USA. Each guideline is followed by a series of strategies for implementing them. Since each guideline is important to school health, there is no priority order. Guidelines presented first focus on the importance of a coor-

dinated approach for nutrition and physical activity policies and practices within a health-promoting school environment. Then, guidelines pertaining to nutrition services and physical education are provided, followed by guidelines for health education, health, mental health and social services, family and community involvement, staff wellness, and professional development for staff.

Although the ultimate goal is to implement all guidelines recommended, not every guideline and its corresponding strategies will be feasible for every school to implement. Due to resource limitations, some schools might need to implement the guidelines incrementally. Therefore, the recommendation is for schools to identify which guidelines are feasible to implement, based on the top health needs and priorities of the school and available resources. Families, school personnel, health-care providers, businesses, the media, religious organizations, community organizations that serve children and adolescents, and the students themselves also should be systematically involved in implementing the guidelines to optimize a coordinated approach to healthy eating and regular physical activity among school-aged children and adolescents.

However, these guidelines not clinical guidelines; hence, compliance is neither mandatory nor tracked by CDC. However, CDC monitors the status of student health behaviors and school health policies and practices nationwide through three surveillance systems, which are:

i. Youth Risk Behavior Surveillance System (YRBSS)
ii. School Health Policies and Practices Study (SHPPS)
iii. School Health Profiles (SHP)

These systems provide information about the degree to which students are participating in healthy behaviors and schools are developing and implementing the policies and practices recommended in the guidelines.

Youth Risk Behavior Surveillance System (YRBSS)

The Youth Risk Behavior Surveillance System (YRBSS) monitors priority health-risk behaviors (e.g., unhealthy dietary behaviors and physical inactivity) and the prevalence of obesity and asthma among high school students. YRBSS includes a

national, school-based survey conducted by CDC and state, territorial, tribal, and district surveys conducted by state, territorial, and local education and health agencies and tribal governments. YRBSS data are used to:

a. Measure progress toward achieving national health objectives for *Healthy People 2020* and other program and policy indicators,
b. Assess trends in priority health-risk behaviors among adolescents and young adults, and
c. Evaluate the effect of broad school and community interventions at the national, state, and local levels.

In addition, state, territorial, and local agencies and nongovernmental organizations use YRBSS data to set and track progress toward meeting school health and health promotion program goals, support modification of school health curricula or other programs, support new legislation and policies that promote health, and seek funding and other support for new initiatives.

School Health Policies and Practices Study (SHPPS)

The CDC School Health Policies and Practices Study (SHPPS) is a national survey conducted periodically to assess school health policies and practices at the state, district, school, and classroom levels. SHPPS data are used to:

a. Identify the characteristics of each school health program component (e.g., physical education and activity and nutrition services) at the state, district, school, and classroom (where applicable) levels across elementary, middle, and high schools;
b. Identify persons responsible for coordinating and delivering each school health program component and their qualifications and educational background;
c. Identify collaborations that occur among staff members from each school health program component and with staff members from outside agencies and organizations; and
d. Describe changes in key policies and practices over time.

School Health Profiles (SHP)

The School Health Profiles, SHP (i.e., Profiles) is a system of surveys assessing school health policies and practices in states, large urban school districts, territories, and tribal governments. State, local, and territorial education and health officials use Profiles data to:

a. Describe school health policies and practices and compare them across jurisdictions,
b. Identify professional development needs,
c. Plan and monitor programs,
d. Support health-related policies and legislation,
e. Seek funding, and
f. Garner support for future surveys.

The nine guidelines along with their strategies to promote healthy eating and physical activity in a school setting are as follows:

Guideline 1

Use a Coordinated Approach to Develop, Implement, and Evaluate Healthy Eating and Physical Activity Policies and Practices

- Coordinate Healthy Eating and Physical Activity Policies and Practices Through a School Health Council and School Health Coordinator
  - Establish a school health council and designate a school health coordinator at the district level.
  - Establish a school health team and designate a school health coordinator at the school level.
- Assess Healthy Eating and Physical Activity Policies and Practices
- Use a Systematic Approach To Develop, Implement, and Monitor Healthy Eating and Physical Activity Policies
  - Identify and involve key stakeholders from the beginning of the policy process.
  - Draft the policy language
  - Adopt, implement, and monitor healthy eating and physical activity policies
- Evaluate Healthy Eating and Physical Activity Policies and Practices

- Conduct process evaluation of nutrition and physical activity policies and practices
- Conduct outcome evaluation of healthy eating and physical activity policies, programs, and practices

Guideline 2.

Establish School Environments that Support Healthy Eating and Physical Activity

- Provide Access to Healthy Foods and Physical Activity Opportunities and to Safe Spaces, Facilities, and Equipment for Healthy Eating and Physical Activity
  - Provide adequate and safe spaces and facilities for healthy eating.
  - Ensure that spaces and facilities for physical activity meet or exceed recommended safety standards.
  - Develop, teach, implement, and enforce safety rules
  - Maintain high levels of supervision during structured and unstructured physical activity programs.
  - Increase community access to school physical activity facilities
- Establish a Climate that Encourages and Does Not Stigmatize Healthy Eating and Physical Activity
  - Adopt marketing techniques to promote healthy dietary choices.
  - Use student rewards that support health
  - Do not use physical activity as punishment
- Create a School Environment that Encourages a Healthy Body Image, Shape, and Size Among All Students and Staff Members, Is Accepting of Diverse Abilities, and Does Not Tolerate Weight-Based Teasing

Guideline 3.

Provide a Quality School Meal Program and Ensure that Students Have Only Appealing, Healthy Food and Beverage Choices Offered Outside of the School Meal Program

- Promote Access to and Participation in School Meals
  - Encourage participation in school meal programs among all students
- Provide Nutritious and Appealing School Meals that Comply with the *Dietary Guidelines for Americans*

- Ensure that meals meet federally defined nutrition standards.
- Ensure that schools have kitchen facilities and equipment needed to cook quality, appealing meals.
- Use healthy food preparation methods and purchasing techniques.

- Ensure that all Foods and Beverages Sold or Served Outside of School Meal Programs Are Nutritious and Appealing
  - Establish strong nutrition standards for competitive foods consistent with the IOM Nutrition Standards for Foods in Schools.
  - Use the contracting process to improve the nutritional quality of competitive foods and beverages
  - Market healthier foods and beverages
  - Use fundraising activities and student rewards that support health.

Guideline 4.

Implement a Comprehensive Physical Activity Program with Quality Physical Education as the Cornerstone

- Require Students in Grades K–12 To Participate in Daily Physical Education that Uses a Planned and Sequential Curriculum and Instructional Practices that Are Consistent with National or State Standards for Physical Education
  - Require daily physical education for students in grades K–12.
  - Implement physical education curricula consistent with national or state physical education standards
  - Include protocols for student assessment in physical education.
- Provide a Substantial Percentage of Each Student's Recommended Daily Amount of Physical Activity in Physical Education Class
  - Implement curricular and instructional practices to increase student physical activity during physical education.
- Use Instructional Strategies in Physical Education that Enhance Students' Behavioral Skills, Confidence in Their Abilities, and Desire To Adopt and Maintain a Physically Active Lifestyle
  - Incorporate instructional strategies to improve students' behavioral skills in physical education and physical activity programs.

- Incorporate instructional strategies in physical education to improve students' confidence in their ability to be physically active and maintain physical activity behaviors
- Incorporate instructional strategies in physical education and physical activity programs that lead to positive attitudes and perceptions toward physical activity

- Provide Ample Opportunities for All Students To Engage in Physical Activity Outside of Physical Education Class
  - Require daily recess
  - Provide physical activity breaks during the school day.
  - Offer students opportunities to participate in intramural physical activity programs during after-school hours
  - Offer interscholastic sports
  - Implement and promote walk- and bicycle-to-school programs
- Ensure that Physical Education and Other Physical Activity Programs Meet the Needs and Interests of All Students
  - Promote and ensure inclusion of all students.

Guideline 5.

Implement Health Education that Provides Students with the Knowledge, Attitudes, Skills, and Experiences Needed for Healthy Eating and Physical Activity

- Require Health Education from Prekindergarten Through Grade 12
- Implement a Planned and Sequential Health Education Curriculum that Is Culturally and Developmentally Appropriate, Addresses a Clear Set of Behavioral Outcomes that Promote Healthy Eating and Physical Activity, and Is Based on National Standards
  - Implement a planned and sequential curriculum that is culturally and developmentally appropriate
  - Implement a curriculum that addresses a clear set of behavioral outcomes that promote healthy eating and physical activity.
  - Implement health education curricula that are consistent with the National Health Education Standards

- Use Curricula that Are Consistent with Scientific Evidence of Effectiveness in Helping Students Improve Healthy Eating and Physical Activity Behaviors
- Use Classroom Instructional Methods and Strategies that Are Interactive, Engage All Students, and Are Relevant to Their Daily Lives and Experiences
  - Use interactive learning strategies
  - Use methods and strategies that are developmentally appropriate
  - Integrate computer-based instruction into health education

Guideline 6.

Provide Students with Health, Mental Health, and Social Services to Address Healthy Eating, Physical Activity, and Related Chronic Disease Prevention

- Assess Student Needs Related to Physical Activity, Nutrition, and Obesity, and Provide Counseling and Other Services To Meet Those Needs
  - Assess eating and physical activity behaviors of students
  - Schools initiating BMI measurement programs should implement safeguards
  - Counsel students on how to achieve healthy eating and physical activity recommendations
  - Manage the physical activity and nutritional needs of students with chronic health conditions
- Ensure Students Have Access to Needed Health, Mental Health, and Social Services
  - Refer students to community-based health-care providers and healthy eating and physical activity services
- Provide Leadership in Advocacy and Coordination of Effective School Physical Activity and Nutrition Policies and Practices
  - Advocate on behalf of students to create a healthy, safe, and supportive school environment that allows students to make healthy dietary and physical activity choices both in and out of school.

Guideline 7.

Partner with Families and Community Members in the Development and Implementation of Healthy Eating and Physical Activity Policies, Practices, and Programs

- Encourage Communication Among Schools, Families, and Community Members to Promote Adoption of Healthy Eating and Physical Activity Behaviors Among Students
  - Communicate frequently and use various dissemination methods..
- Involve Families and Community Members on the School Health Council
  - The school health council should identify strategies for establishing partnerships with families and community members.
- Develop and Implement Strategies for Motivating Families To Participate in School-Based Programs and Activities that Promote Healthy Eating and Physical Activity
  - Provide various formats for involving families and offer frequent opportunities for participation.
- Access Community Resources To Help Provide Healthy Eating and Physical Activity Opportunities for Students
  - Involve staff members from universities, hospitals, health centers, and other health organizations in school initiatives on healthy eating and physical activity
  - Recruit parent, family, and community volunteers to assist with healthy eating and physical activity initiatives.
  - Link to out-of-school programs that promote healthy eating and physical activity.
- Demonstrate Cultural Awareness in Healthy Eating and Physical Activity Practices Throughout the School
  - Customize activities and communication to reflect the culture of the community

Guideline 8.

Provide a School Employee Wellness Program that Includes Healthy Eating and Physical Activity Services for All School Staff Members

- Gather Data and Information To Determine the Nutrition and Physical Activity Needs of School Staff Members and Assess the Availability of Existing School Employee Wellness Activities and Resources
  - Determine employee health-related costs

  - Assess the status of school employee wellness activities, and identify the nutrition and physical activity interests and needs of school employees
- Encourage Administrative Support for and Staff Involvement in School Employee Wellness
  - Obtain administrative support for school employee wellness programs that include healthy eating and physical activity.
  - Establish a school employee wellness committee, and identify a leader for the committee
- Develop, Implement, and Evaluate Healthy Eating and Physical Activity Programs for All School Employees
  - Establish broad goals and specific objectives for healthy eating and physical activity programs for school employees
  - Implement activities to promote healthy eating and physical activity that emphasize informational, behavioral skill, and policy and environmental approaches
  - Evaluate and adapt the school employee wellness program

Guideline 9.

Employ Qualified Persons, and Provide Professional Development Opportunities for Physical Education, Health Education, Nutrition Services, and Health, Mental Health, and Social Services Staff Members, as well as Staff Members Who Supervise Recess, Cafeteria Time, and Out-Of-School–Time Programs

- Require the Hiring of Physical Education Teachers, Health Education Teachers, and Nutrition Services Staff Members Who Are Certified and Appropriately Prepared To Deliver Quality Instruction, Programs, and Practices
  - Require the hiring of certified physical education teachers to teach physical education in grades K–12
  - Require the hiring of certified health education teachers to teach health education in grades K–12
  - Require the hiring of qualified nutrition service directors, managers, and staff.
- Provide School Staff Members with Annual Professional Development Opportunities To Deliver Quality Physical Education, Health Education, and Nutrition Services

- Provide annual professional development opportunities for physical education teachers
- Provide annual professional development opportunities for health education teachers
- Provide annual professional development opportunities for nutrition services staff members

- Provide Annual Professional Development Opportunities for School Health, Mental Health, and Social Services Staff Members and Staff Members Who Lead or Supervise Out-Of-School–Time Programs, Recess, and Cafeteria Time
  - Provide annual professional development opportunities to school health, mental health, and social services staff members.

2.7.3 School based Intervention studies that are effective:

Based on the above nine guidelines, high intensity school based programs that focus on diet and physical activity, are comprehensive and multi component, which includes:

- Curriculum on diet and physical activity taught by trained teachers (Simon et al 2006, Lytle et al 2006, Engels et al 2005, Anderson et al 2005, Bayne-Smith et al 2004, Simon et al 2004, Lytle et al 2004, Williams et al 2004, Kain et al 2004, Trevino et al 2004, Hoelscher et al 2004,).
- supportive school environment/policies (Bartholomew et al 2006, Paradis et al 2005, French et al 2004, Perry et al 2004, Jimenez et al 2003)
- a physical activity programme (Naylor et al 2006, Simon et al 2006, Simon et al 2004)
- a parental/family component (Lytle et al 2006, Simon et al 2006, Engels et al 2005, Saksvig et al 2005, Anderson et al 2005, Simon et al 2004,)
- healthy food options available through school food services: cafeteria, vending machines, etc. (Lytle et al 2006, French et al 2005, Saksvig et al 2005, Prell et al 2005, Lytle et al 2004, French et al 2004, Kain et al 2004, Hoelscher et al 2004, Perry et al 2004, Rinderknecht and Smith 2004,)

Few benchmark school nutrition health promotions

- CATCH, a three-year programme from grade 3 through to grade 5 in the United States of America (Hoelscher et al 2004, Hoelscher et al 2003, Kelder et al 2005, McKenzie et al 2001),
- Pathways, a three year intervention targeting 8 to 11-year-old indigenous American children (Caballero et al 2003, Davis et al 2001, Gittelsohn et al 2003, Going et al 2003, Steckler et al 2003, Stevens et al 2003), and
- Know Your Body, a six-year programme targeting pupils in grades 1 to 6 in Crete (Manios et al 2002) are all example interventions that are comprehensive, multicomponent, school-based, and focus on diet and physical activity.

All were grounded on constructs from social learning theory with Pathways placing a strong emphasis on cultural identity. The programmes included curricula offered by trained teachers, a physical activity component and healthier meals offered in the school canteen (CATCH and Pathways). There was also a strong parental focus. The fact that teachers implemented the intervention made it sustainable and cost-effective. Of the family based components, events at school were the most successful. These programmes demonstrated significant improvements in knowledge and food choices. Children in the Know Your Body programme demonstrated substantive reductions in intake of dietary fat, particularly saturated fat, and four- to five-fold increases in self-reported leisure-time activity.

Pathways' process evaluation found that the intervention was successfully implemented with good reach, and high coverage and intervention fidelity. These programmes demonstrated the importance of community-based participatory research, and that a careful process of formative assessment is key to effectiveness and long-term success.

School Health Promotion Program in India

School Health program is a program for school health service under National Rural Health Mission, which has been necessitated and launched in fulfilling the vision of NRHM to provide effective health care to population throughout the country It also focuses on effective integration of health concerns through decentralized management

at district with determinant of health like sanitation, hygiene, nutrition, safe drinking water, gender and social concern.

The School Health Programme intends to cover 12,88,750 Government and private aided schools covering around 22 Crore students all over India.

This School health programme is the only public sector programme specifically focused on school age children. Its main focus is to address the health needs of children, both physical and mental, and in addition, it provides for nutrition interventions, yoga facilities and counseling. It responds to an increased need; increases the efficacy of other investments in child development, ensures good current and future health, better educational outcomes and improves social equity and all the services are provided for in a cost effective manner.

Components of School Health Program in India:

Health service provision:

- Screening, health care and referral:
  - Screening of general health, assessment of Anaemia/Nutritional status, visual acuity, hearng problems, dental check up, common skin conditions,
  - Heart defects, physical disabilities, learning disorders, behavior problems, etc.

- Basic medicine kit will be provided to take care of common ailments prevalent among young school going children.
  - Referral Cards for priority services at District / Sub-District hospitals.

    Immunisation:
  - As per national schedule
  - Fixed day activity
  - Coupled with education about the issue
- Micronutrient (Vitamin A & IFA) management:
  - Weekly supervised distribution of Iron-Folate Tablets coupled with education about the issue
  - Administration of Vitamin-A in needy cases.
- De-worming
  - As per national guidelines
  - Biannually supervised schedule

- Prior IEC
- Siblings of students also to be covered

- Health Promoting Schools
  - Counseling services
  - Regular practice of Yoga, Physical education, health education
  - Peer leaders as health educators.
- Adolescent health education-existing in few places
  - Linkages with the out of school children
  - Health clubs, Health cabinets
  - First Aid room/corners or clinics.
- Capacity building
- Monitoring & Evaluation
- Mid Day Meal

Therefore, the present school health program in India needs to integrate the nine guideline with respect to nutrition health promotion program in government as well as in non government aided schools. As school based interventions show consistent improvements in knowledge and attitudes, behaviour and, when tested, physical and clinical outcomes. There is strong evidence to show that schools should include a diet and physical activity component in the curriculum taught by trained teachers; ensure parental involvement; provide asupportive environment; include a food service with healthy choices; and offer a physical activity programme. However there is lack of cost-effectiveness research in this area.