Review of the Literature

A longitudinal study in Delhi from birth to thirty two years demonstrated that during nutrition transition, under-nutrition in childhood may increase the risk of over-nutrition, diabetes and hypertension in adult life. At thirty years of age half of these erstwhile undernourished children were overweight and one-sixth had hypertension, diabetes, or impaired glucose tolerance emphasizes the urgent need for identifying children who are crossing the BMI percentiles in school age and initiating interventions to increase their physical activity and make their life styles healthier. [61].

Varela-Silva, Kim, and Bogin found that, the estimates of fat reserves of the arm provide a useful indication of nutritional status for Third-World children. But, those studies did not estimate cross-sectional muscle and fat areas and only considered the extremes of the population distribution for muscle and fat. [55]

Bandyopadhyay and Chattopadhyay, in their study on Body fat in urban and rural male college students of Eastern India found that the college students of Eastern India were leaner than the youths of North America, Europe, Japan, and Northern India. [56].

Davis et al conducted a study on Health behaviours and Weight status among urban and rural children and found that the BMI percentile was equivalent across rural and urban children but rural children were more often over Weight and urban children
were more often at risk for overweight. Although some variables were equivalent across urban and rural children, results indicate some key health behaviour differences between groups. [57]

Chiara Milanese et al surveyed children aged 6-12 years and found BMI positively correlated with waist circumference and subcutaneous fat, and negatively correlated with body density. Also motor fitness significantly correlated with age, and performance was higher in males. Moreover, motor fitness tests positively correlated with each other, especially in females. [58].

Harrow rashid et al from their study found no correlation between BMI and PFI score and a positive correlation was observed between BMI and waist hip ratio in both the age groups. [59]

Andreasi et al have conducted a study on physical fitness and associations with anthropometric measurements in 7 to 15-year-old school children. They concluded that, unhealthy physical fitness levels were related to female sex, obesity and excessive abdominal adiposity. [60]

According to the American Heart Association [62], a sedentary lifestyle has been identified as a primary risk factor for heart disease, thus indicating that activity is of primary importance in preventing diseases and in particular lifestyle diseases. It has been shown that a sedentary lifestyle is a major underlying cause of death, disease and disability with about 2 million deaths every year attributable to physical inactivity. It has also been shown that physical inactivity doubles the risk of developing
cardiovascular diseases, Type 2 diabetes and obesity while also increasing the risk of colon and breast cancer, hypertension, lipid disorders, osteoporosis, depression and anxiety [63]. It has been reported that appropriate participation in some form of physical activity assists young people to develop healthy musculoskeletal tissues (bones, muscles and joints), a healthy cardiovascular system (heart and lungs) and neuromuscular awareness (coordination and movement control). It also assists in maintaining a healthy bodyweight and has been shown to have psychological benefits such as an improvement in control over anxiety and depression [64]. Bechtel [65] reported that participation in regular physical activity or sports is associated with less substance abuse and supports positive feelings towards school attendance. It is also known to reduce healthcare costs, increases productivity and renders better performance in sports and recreational activities [63].

The downward trend in the physical activity pattern found in adolescents could also be attributed to the fact that the pre-adolescence adolescence stage of life marks the beginning of a critical development transitional stage during which many youths have a tendency to become sedentary [66].

According to Pate et al [67], the general physical activity recommendation to enhance health involves at least 30 minutes of moderate to intense physical activity on most days of the week.

Trost et al [68], Kimm et al [69] and Thompson et al [70] reported that there was a significant association between physical activity and age in both boys and girls. There is a curvilinear relationship between physical activity and health status, such
that increases in physical activity and fitness will lead to additional improvements in health status [71, 72, 73].

The degree to which inactivity is contributing to the rising levels of obesity in children has not been clearly defined. However, there is strong evidence to suggest that inactive children are more likely to have excess fat [74], even as early as late infancy [75].

Children with lower activity levels have a higher prevalence of psychological and emotional distress. Sport and exercise provides an important medium for children and teenagers to be successful and this helps to improve social wellbeing, self-esteem and self perceptions of body image and competence, with a stronger effect for those already low in self-esteem. Moreover, children with higher physical activity levels are also more likely to have better cognitive functioning [76]. Generally, cardiovascular disease is not a disease of childhood, but research has shown that less physically active children and those with lower cardiovascular (aerobic) fitness are more likely to possess risk factors for this disease such as a lower levels of “good” cholesterol (high density lipoprotein cholesterol, HDL), higher blood pressure, raised insulin levels and excess fat [77, 78].

It is highly likely that physical inactivity is contributing to the increasing appearance of obesity, increased insulin resistance, disordered lipid profile and elevated blood pressure in children. This in turn is probably responsible for the increasing prevalence of type 2 diabetes in children and adolescents [79], a disease that until recently was usually only found in overweight and obese adults.
Studies have shown that childhood obesity tracks into adulthood. By maintaining childhood aerobic fitness, physical activity during childhood reduces the adult risk of cardiovascular disease [80]. During the growing years, especially during adolescence, boys and girls rapidly gain bone mineral density. This is important as attainment of as high a skeletal mass as possible during one’s youth reduces the chances of excessive loss of bone mass later in life (known as osteoporosis). It has been clearly shown that physical activity during early puberty, especially weight bearing activities that stress the bones to a greater extent, can result in the attainment of greater bone mass which is protective against osteoporosis in old age [81]. Examples of beneficial activities include those that involve jumping, dancing, aerobics, gymnastics, volleyball, handball, racquet sports, soccer and mountain biking. It should be noted that low-impact activities like swimming are not effective for stimulating improvements in bone mass. Peak bone mass is achieved by the age of 20-30 and so attempts to enhance it must concentrate on childhood and adolescence [81].

Similar to the research that has shown that obesity tends to track from childhood into adulthood, there is also a large body of evidence that suggests that the physical activity habits established during one’s younger years also tend to track into young adulthood and later life [82-85].

The International Obesity Task Force (IOTF) has highlighted examples of problematic social trends to the World Health Organization (WHO) that are believed to be contributing to the childhood obesity epidemic [86]. These included:
a) An increase in the use of motorized transport, eg. to school.

b) Reduced opportunities for recreational physical activity.

c) Increased sedentary recreation.

d) Multiple TV channels around the clock.

e) Greater quantities and variety of energy dense foods available.

f) Rising levels of promotion and marketing of energy-dense foods.

g) More frequent and widespread food purchasing opportunities.

h) More use of restaurants and fast food stores.

i) Larger portions of food offering better ‘value’ for money.

j) Increased frequency of eating occasions.

k) Rising use of soft drinks to replace water, eg. in schools.

Therefore, lack of sufficient physical activity (points a-d) is strongly indicated as a contributor to the rising problem of obesity. It is now widely accepted that increasing physical activity participation and decreasing sedentary behaviour should be the major focus of strategies aimed at preventing and treating overweight and obesity in young people [87].

In adults, overweight can be defined as excess weight relative to a desirable body weight (>120% of desirable weight) or, more accurately, a BMI of between 25 and 30 kg/m2. Overweight is considered to be the precursor of obesity, the latter of which is defined as a BMI of over 30 kg/m2 [88]. In children overweight and obesity are more
difficult to define because BMI and body composition change substantially during growth and development. Two major approaches have been taken to address this problem. The first is to define overweight and obesity in terms of percentiles of BMI for age. Using this approach, overweight and obesity have been defined as at or above the 85th percentile and at or above the 95th percentile of BMI for age, respectively [89]. The second approach is an international classification that is directly linked to the adult BMI cut off points of 25 and 30 kg/m2, with adjustments for the growth and development of children included [88]. Both techniques have been used in the research literature.

The negative consequences of obesity during the early years of life are both physiological (medical) and psychosocial. Probably the most widespread consequences of childhood obesity are psychosocial. Obese children become targets of early and systematic discrimination and tend to develop a negative self-image that appears to persist into adulthood [90]. In addition, there are numerous health complications that become apparent during youth including [90, 91]:

a) Disturbances in blood lipids (i.e. elevated triglycerides, elevated low-density lipoprotein (LDL) cholesterol and lowered high-density lipoprotein (HDL) cholesterol).

b) Glucose intolerance (i.e. insulin resistance) and type 2 diabetes.

c) Atherosclerotic changes within arteries (coronary heart disease).

d) Hepatic problems such as cirrhosis.

e) Hypertension.
f) Sleep problems.

g) Orthopaedic complications, especially of the hips and lower extremities.

Data from many studies has shown that the steepest decline in physical activity during the lifespan tends to occur between the ages of 13 to 18 years [93]. Data on Spanish young people has indicated that the age at which physical activity begins to plateau or decrease may be earlier – around 11 years of age [92].

Certain types of activities may be more appropriate than others depending on the characteristics of the individual concerned such as age, gender, body type, personality traits, cultural background, etc. An important consideration is the issue of team vs. individual sports. More extrovert and sociable children may feel more comfortable in team sports scenarios (eg. rugby or handball) whereas other less sociable or shy children may prefer individual sports or activities (eg. skating or jogging). Some children with natural hand-eye or foot-eye coordination will likely be attracted to sports requiring those traits (eg. racquet sports or football), whereas those lacking these skills may become easily frustrated or discouraged. Some young people will be attracted to activities that are highly structured (eg. rules-based sports and games), whereas others will prefer less structured activities with minimal rules or restrictions. The level of perceived risk or uncertainty in an activity (eg. wall/rock climbing or surfing) may be a motivational factor for some bolder young people whereas others will gravitate towards predictable activities where they perceive minimal risk. More adventurous young people may need a higher level of stimulation to keep them challenged and therefore may be more likely to be attracted to activities such as waterslides in swimming pools, assault or high ropes courses,
paintball or other adventurous pursuits. Ultimately, there are numerous possible ways of classifying activities – the most important factor is that children are provided with variety and choice and that adults are sensitive to their abilities and wishes. The bottom line is that activities should be fun and interesting for young people so that they take a positive attitude towards physical activity into adolescence and adulthood.

Parents and other adults must ensure that they do not pressure children and adolescents to take part in certain sports or activities as discussed previously [94]. It is also important to remember that a child’s physical activity preferences often change as they progress into adolescence. As long as adolescents remain physically active, the choice of physical activity is of secondary importance.

Food insecurity, homelessness, lack of safe drinking water and polluted air are becoming the hallmarks of the environment of third world countries of Asia, Latin America and Africa. There is widespread malnutrition, impairment of physical and intellectual development, diminished working capacity and sub-optimal health of the residents of these continents. There seems to be a clear relationship of the undesirable factors listed above with the lowered health status of these populations. Anthropometry is emerging as an important indicator to evaluate the physical status of individuals and populations, which in turn, highlights, the nutritional status of the populations and the history of their economic development.

Overnutrition occurs in many situations of new found richness, in fast growing economies, as a result of acculturation, green revolution, etc. Expanding technology
and modernization brings with it new values, new foods, new directions, social freedom and thrilling ways of enjoying life, which naturally had to take its toll in the form of overnutrition and obesity in its initial phases. While acute undernutrition brings with it lower levels of health and susceptibility to infections, overnutrition and obesity are generally inviting non-insulin dependent diabetes mellitus, hypertension and cardiovascular disease.

Kopelman highlighted obesity as a major health problem in the new millennium which is related to numerous diseases [95]. It results from a combination of genetic susceptibility, increased availability of high energy foods and decreased requirements for physical activity. Studies have indicated that the signals for energy homeostasis regulate food intake by monitoring the meal size which require modulation of the responses to satiety signals in the brain [96, 97, 98]. The above biological systems seem to work under normal deviations in food intake. But if a person keeps on eating in spite of the satiety signals, then this system becomes taxed and gives in. Our modernised settings of social parties force the guests to consume extra quantities of eatables. On the other hand, the patients of anorexia nervosa simply refuse to eat as they always feel panicky about becoming overweight although they are not so and thus become thin, skinny and underweight. Therefore, not all deviations are caused by the failure of the biological system of ‘energy homeostasis’, but the onus of responsibility falls on the individuals themselves in many cases.

Studies indicate that in many developing countries more than one-third of adolescents are anaemic [99, 100]. Anaemia is common among both boys and girls
indicating that they need higher nutritional requirements for their rapid physical and mental growth and development. A study conducted in rural Maharashtra found that more than half (54%) of the adolescents were thin but just two percent were overweight [101]. In another study conducted among adolescents of tea garden workers in Assam, the mean body mass index was higher among girls of all ages than among boys [102]. A study conducted among urban slum adolescent girls in Andhra Pradesh showed iron deficiency anaemia was found to be the most common nutritional problem observed among them [103]. In a study conducted among adolescent girls in South Delhi, just one-fourth had normal body mass index and all others were undernourished [104].