

INTRODUCTION

Coexistence of under and over nutrition is a picture which is different, less visible but alarming and is emerging (Gales-Camus, 2006) at a global level especially in low-income countries including India.

GLOBAL CHALLENGES:

DEVELOPMENTAL AND NUTRITIONAL TRANSITIONS

Development causes lifestyle alterations and nutrition transitions affecting people right from childhood. The agro-industrial development has resulted in major demographic shifts and tremendous economic growth (Schmidhuber and Shetty, 2005). Such an economic growth has accelerated urbanization and has brought an elemental transformation of lifestyle and dietary habits.

The urban life panorama is one of calorie dense and nutrient deficient food coupled with low energy activities (Uauy and Solomons, 2006). Consumption of poor quality of food results in persistent micronutrient deficiencies on one hand and growing over nutrition on the other hand (Popkin, 2003). Moreover, the technological advancement, atomization, and competitive environment have increased sedentariness and indoor activities for children, youth, adults and elders.

The “Third World Transition” has shown lifestyle impact on the gene expression, which is evident from the overgrowing prevalence of macro vascular and non-communicable diseases Wahlqvist (2002).

Poor nutritional status does not remain limited to the underprivileged but also seen among the financially better off population (Sarbib, 2006). Recent FAO, 2013 report documents, 12.5 percent of the world’s population (868 million people) to be undernourished. An estimated 180 million children are stunted (Uauy and Solomons, 2006), 1.4 billion people are overweight, of

whom 500 million are obese (FAO, 2013). The sub-Saharan Africa, has >40% of stunting; followed by countries in South-Central and Southeast Asia and <20% prevalence is seen in the majority of Latin American and Caribbean nations (Swinburn, 2004).

Micronutrient deficiencies, a kind of 'hidden hunger' are widespread among school-age children. Iron Deficiency Anemia (IDA) affects about 210 million school-age children worldwide; Vitamin A Deficiency (VAD) affects 85 million children; and Iodine Deficiency Disorders (IDD) affect about 60 million children (FAO, 2005). These problems seldom occur in isolation but rather as multiple micronutrient deficiencies; often coexisting with stunting and overnutrition within a community, family and even household (FAO, 2013). Despite of numerous interventions, undernutrition has not gone away as a malnutrition problem in many economically deprived regions of the world. Instead, chronic diseases (Uauy and Solomons, 2006) suppress it due to poor lifestyle and nutrition.

Adding to the existing trouble, undernutrition is accompanied by its sinister companion from the spectrum of malnutrition. Globally, more than 5% children face dual malnutrition. China has a pattern of lean parents and grandparents but overweight children; while in wealthy countries, such as Australia and the United States proportion of overweight and undernourished children is one-quarter to one-third (Swinburn, 2004). Thereby existing burden of micronutrient malnutrition is coupled with simultaneous rise in the prevalence of childhood overnutrition and obesity Shashidhar et al. (2010) which tracks into adulthood.

EMERGING PANDEMIC OF TWIN MALNUTRITION IN INDIA

India's escalating economy and developing physical environment has direly altered the healthy life for its citizens; more specifically for individuals up to

25 years of age that contribute to 50% of India's total population (India's Population Report, 2013).

In spite of the economic development observed by India, it is still a home to 20% of undernourished children (Warraich et al., 2009). Studies conducted across the Indian states reveal 59% - 63% prevalence of sub-clinical anemia of moderate intensity among 5 - 14 year old children (Sahu et al., 2007), while clinical signs of anemia have been noted among 95% of the children (Vyas and Choudhry, 2005). Signs and symptoms of vitamin A deficiency have been recorded up to 80% among Indian school going children (Chandna and Sehgal, 1994). Nambiar and Roy (2010); Nambiar and Patel (2010) have reported high prevalence of undernutrition and frank signs and symptoms of micronutrient deficiencies including anaemia in the tribal areas of Vadodara district of Gujarat.

Indian data on childhood obesity ranging from 4% to 28% (Gupta et al., 1990; Kapil et al., 2002; Ranachandran et al., 2002; Mohan et al., 2004 and Sharma et al., 2007) is now in tandem with childhood globesity (10%) (Bharadwaj et al., 2008). Childhood obesity increased among school children of Vadodara (age 10-18 years) from 9.9% - 16.5% in a span of 4 years (Mani et al., 2004; Iyer and Gandhi, 2004; Kanani and Saxena, 2008) Thus there is a paradoxical co-occurrence of under nutrition and overnutrition (Subramanian et al., 2007) in India.

Yagnik (2003), states that the Indian phenotype characterized by shorter height, lower BMI and more body fat, (especially abdominal fat) cause early occurrence of metabolic morbidities. Exposure of such children, to poor dietary habits and unhealthy lifestyle during adolescence, over-rides their influence of genetic predisposition towards NCD's (Singhal et al., 2010; Misra and Khurana, 2008).

Childhood metabolic aberrations track into adulthood as irreversible diseased condition (Misra et al., 2008). It has been projected by WHO in 1998 that 70%

of deaths in developing country would be due to non-communicable diseases, where highest would be contributed by China and India (WHO, 2002). Thus India will continue be the Diabetes capital of world and Gujarat to be the diabetes capital among the Indian states (Shroff, 2012) if preventive lifestyle interventions are not initiated early among Indian children.

NEED TO ADDRESS THE SCHOOL GOING POPULATION

Approximately one-third babies are born with low birth weight in India; majority of them grow up as stunted or wasted pre-school children (Ramchandran, 2011); become overweight adolescents due rapid catch up growth in the improved physical environment and turn as obese adults.

Currently, the median age of population has moved higher (Wahlqvist, 2002) and the vulnerability to infectious childhood diseases have shifted towards risk of degenerative diseases. NFHS III (2005-2006) data reveals two fold higher prevalence of undernutrition in adults than that of preschool children; while overnutrition prevails up to 2% in preschool children and 9 – 13% among adults. Such a steep rise can be controlled by screening the school children for early detection and correction of under and over nutrition.

Considering the phenomena of demographic transition, a systematic “Early life approach”, can address the nutrition-infection complex affecting a child at an early stage and the diet-physical activity interactions influencing an adolescent in the later life (Uauy and Solomons, 2006). Successful strategies, incorporating local resources may overcome this perplexing problem (Krawinkel, 2012) and can considerably reverse the quick transition within an individual from being wasted to being overweight, especially in an urban setting.

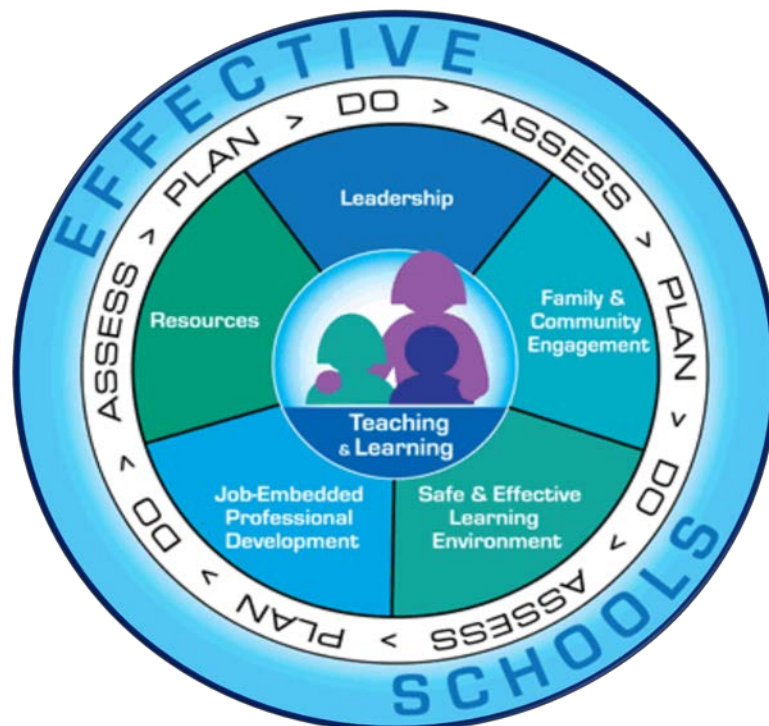
The period of adolescence is characterized by growth spurt and may represent a window of opportunities to shape and consolidate healthy eating and lifestyle behaviours (Sharma, 1998; Ramchandran, 2011). If this

opportunity is exploited for inculcating optimal dietary and physical activity habits, especially under a school setting, both under and overnutrition can be prevented among adults (Delisle and Strychar, 2006).

SCHOOL HEALTH PROGRAM FOR SUSTAINABLE BEHAVIOUR CHANGE

Schools provide a direct contact with large number of children for nearly six hours of a day during the crucial stage of their social, psychological, physical, and intellectual development. If a “healthy school program” focusing on lifestyle, dietary modification as well as physical activity pattern is augmented; the learning’s can be constructed during the formative years of life (Figure 1.1) and can track in to adulthood as healthy preferences (Pate et al., 2006).

Figure 1.1: Components of an effective school system



**DCPS, 2011. Adapted
from: <http://dcps.dc.gov/DCPS/About+DCPS/Strategic+Documents/Effective+Schools+Framework>*

School health programs such as Mind Exercise Nutrition Do (MEND), Know Your Body (KYB), Minnesota Heart Health Program (MHHP) and Children and Adolescent Trial for Cardiovascular Health (CATCH) have used a multi-component approach integrated in the school curriculum, addressing teachers, children, parents and communities for sustainability (Low, 2010).

The school system in India does not lay emphasis on health education or the practical application of health-related knowledge (Shah et al., 2010). Thus the feasibility and sustainability of introducing an integrating a coordinated school health program in Indian school setting needs to be assessed. Moreover, there is also a need to introduce behavior change communication strategies for preventing non-communicable diseases in school settings so as to inculcate healthy habits from childhood.

Nutritional behaviour plays an important role in contributing to malnutrition (Sarbib, 2006). Among the various theories available to introduce behavior change among individuals, the socio-ecological model of behaviour change describes the dynamic interrelations among various personal and environmental factors. It bridges the gap between behavioral theories that focus on small settings and anthropological theories that analyze larger settings (Langille and Rodgers, 2009). School programs like SPARK, LEAP, TAAG, Pathways, Go for health and M-SPAN have used socio-psychological based behaviour change models (Pate et al., 2006) as their operational strategies. Nambiar and Desai, 2008 have stressed on the use of Positive Deviance Approach for behavior change in a school setting of Vadodara; whereas Kanani and Jain, 2010; Mehan and Kohli, 2007 have successfully used different combination of behavior change communication models in school and industrial set of Vadodra, respectively.

Physical activity intervention – Its impact on overall health of children

Physical activity in childhood and adolescence tracks into adulthood and has a preventive effect against cardiovascular diseases, cancers, osteoporosis and diabetes (Toftager et al., 2011). However, the urbanization puts a large number of people into non-conducive environment for undertaking PA (Dewey, 2006).

In spite of the health benefits, 64% of high school students do not meet the recommended levels of PA (CDC, 2012). Nader (2003), states that 61% children do not partake in any organized or non-organized physical activity. Few enumerated factors such as academic commitments, lack of safety and adequate place, unsupportive family obstruct physical activity among children (Kelishadi et al., 2010).

McCambridge et al. (2006) have documented the role of PA in reducing weight, BMI, WC, lowering LDL-C and improving insulin sensitivity. Regular aerobic exercise (Raj et al., 2009) or even in form of a short duration intervention, reduces both systolic and diastolic blood pressure (Lee et al., 2010). Physical activity of moderate to high intensity showed independent association with insulin resistance Stefanov et al. (2012) and continuation for 6 months along with a coordinated school based intervention lowered the hs-CRP (Singhal et al., 2011). Yoga has demonstrated an overall wellbeing both mentally and physically by developing a healthy and balanced life Tummers (2009).

RATIONALE

Growing concern towards the pandemic of dual burden of malnutrition in India (Kasmini, 1997) and dearth of data on school age children from urban areas of western India makes it important to undertake the study.

Innovative use of school system to prevent undesirable lifestyle alterations can train children to become the change agents (Nambiar and Desai, 2012). Schools are recognized as an important setting for imparting health education (Mukoma and Flisher, 2004); building behaviour change strategies (Nambiar and Nithya, 2008) as well as developing health focused interventions within the school setting (Nambiar and Gandhi, 2008).

Indian data on school evaluation based on the guidelines provided by the CDC's CSHA (Components of a Coordinated School Health Programme) is sparse. Studies on health and nutrition components woven in the school curriculum (Low, 2010) are low in this part of the country. Therefore, keeping the above facts in mind the present study was planned with the following objectives.

Broad objective: "To develop, execute and coordinate a multi-strategic healthy school programme "MARG" based on the lifestyle and nutritional status of affluent school children".

Specific objectives:

1. To assess nutritional status of children (8 – 14 yr) studying in the selected schools from Urban Vadodara enrolled under the study.
2. To evaluate the schools based on CDC's Coordinated School Health Approach.
3. To develop, execute and coordinate "MARG" – A Multi-Strategic Healthy School Programme based on Socio-Ecology Model of Behaviour Change.
4. To promote physical activity in one of the selected schools and assess its impact on the nutritional status of children.