Introduction

I. INTRODUCTION

"Children are the most precious possession of mankind, they should be nurtured with utmost nutritional care and affection"

- (Amar Jut, 2000)

Children and their well-being are the basic concern of every nation. Their health is not only an indicator of socio-economic status and standard of living of the country but it also reflects the values and beliefs of the society. A healthy child is happiness to the parents, a thrill to the society and an asset and hope to the nation. The foundation of good health is laid during the early childhood, which is the dynamic period of physical growth and development along with mental, emotional and social changes (Devadas, 2001).

Nutrition is an integral component of health and well being of an individual. Good nutrition enables one to lead a socially and economically active life and it improves the quality of life as evidenced through enhanced nutritional status of the population groups, better work efficiency rate, reduced mortality and morbidity rate by raising the standard of living. Thereby, child nutrition plays a vital role in positive health, functional efficiency and productivity in later stages of life (Gopalan, 2003).

Bamji *et al.* (2003) opines that nutrition during early childhood is of paramount importance because it is a foundation for lifetime health, strength and intellectual vitality. Early childhood is characterized by rapid growth with increased muscle mass, growth of organs, expansion of blood volume and linear increase in the long bones. Children between five and twelve years who usually attend the primary and middle school may not be growing as rapidly as infants or adolescents.

During the school going age, growth is generally slower than in the early stages of life, but body changes occur gradually. First special attention to be given to pre-school child since it is an easy victim of malnutrition. Secondly, the nutrition of this segment of population is the foundation for future health. Thirdly, malnutrition of school children can be a major hurdle to socio-economic development of the nation in the future years (Bhan and Kaur, 2004).

Childhood and adolescence are periods of continuous growth and development. Therefore, children need proper nutritional care to promote and maintain their nutritional and health status. At the same time, the changes in life style, food preferences and food habits also affect their nutrition and health status, not only in the early period of life but also during adulthood and further that of the future generations (NFI, 2000 and Bhaskaram, 2002).

Elizabeth (2002) defines growth as an increase in size of the body leading to physical and mental maturation. Thus, growth during childhood involves not only an increase in size but also a change in the function and body composition, which are reflected in increased nutritional requirements. The nutritional requirements of the healthy child vary widely according to their age, sex, weight and rate of growth as well as environmental factors. Deficit intake of nutrients signals the start of nutrition related disorders in adulthood. Malnourished young adults have decreased overall resistance to diseases and increased disability at work, eventually affecting the overall quality of life (Iyenger, 2002). Goyle (2001) points out that during these periods of childhood and adolescence, the child should be provided with good nutrition and protected from childhood deficiency diseases and infections.

Nutrition is a major environmental influence on physical and mental growth and development in early life. Food habits during infancy influence preference and practices in later life. Good nutrition improves the well-being of children and their

potential learning ability, thus contributing to better school performance. Children and adolescents who learn healthy eating habits are encouraged to be physically active, learn to manage stress, and have the potential for reduced impact of chronic diseases in adulthood. Gopalan (2004) stresses the importance of consuming all the food items in sufficient amount of good quality protein, vitamins, minerals and energy in the diet for acceptable growth to occur in children.

During childhood, energy needs vary widely depending on their BMR, rate of growth and physical activity. A one-year-old child needs about 1000kcal of energy daily, a three-year-old child needs only 300 kcal more. By the age of ten, a child needs about 2000 kcal per day. Childhood and puberty growth demand more protein compared to adults due to the increased demands for muscle formation, skeletal muscle growth etc., like energy needs, total protein needs which increase slightly with age, but when the child's body weight is considered, the protein requirements actually decline gradually (Bhaskaram, 2002).

Mahan and Stamp (2004) opine that calcium and phosphorus are required for bone development. Growing children need relatively more calcium and phosphorus than adults to meet the requirements of growing bones. Bones are poorly calcified at birth. Rapid rate of calcification of bones is noted during childhood to support the weight of the body. Unfortunately many children have calcium and phosphorous intake below the ICMR-RDA of 400-600 mg/day. Low calcium intake, especially if impaired with physical activity, may compromise the development of peak bone mass. The attainment of maximal bone mass is considered the best protection against age-related bone loss and fractures. Women have greater bone losses than men in later life (Whitney and Rolfes, 2002).

Yip (2000) summarize that iron remains a nutrient of special concern. Iron needs increase in girls as they start to menstruate. Any substantial reduction in iron content of RBC and haemoglobin reduces the capacity of oxygen transport to

tissue and it can be regarded as an adverse health outcome. Thus iron deficiency has a definite effect on health.

The need for vitamins of children increases with their age. A balanced diet of nutritious foods meets the vitamins requirements of an individual. Vitamins especially vitamin A is required for proper vision, maintenance of the integrity of epithelial tissues and wide variety of metabolic functions (Sri Lakshmi, 2006).

India has less than 20 per cent of the world's child population. Unfortunately, it has upto 40 per cent of all malnourished children in the world. India, Bangladesh and Pakistan together account for half of all the malnourished children in the world. The problem of malnutrition encompasses a spectrum of deficiency diseases. Of which, the most devastating is the deficiency of one or more of the three micronutrients – Vitamin A, iron and iodine. Together they contribute a great deal of morbidity and ill-health, growth retardation, reduced level of physical and developmental activities in children and lowered productivity in adults (Bamji, 2003 and Rao, 2005).

Iron and Vitamin A deficiency are the two major nutritional health problems affecting the vulnerable groups of the population in many developing countries. The main cause of iron and Vitamin A deficiency diseases are inadequate intake of iron and Vitamin A as well as poor bio availability of these nutrients especially from the vegetarian diet.

More than 30 nutrition surveys conducted throughout the world revealed that there is a positive correlation between inadequate intake of Vitamin A and high prevalence of anemia and also positive correlation between haemoglobin and plasma Vitamin A level. It has been hypothesized that vitamin A allows iron that is trapped in the liver to be released when transferrin synthesis is resumed and also found that even though the intake of iron was adequate, there was high prevalence

of anemia due to the fact that Vitamin A intake was inadequate (Vijaya *et al.*, 2005).

Today, Vitamin A deficiency is considered as one of the most important controllable nutritional problems in India and other developing countries. An estimated 140 million children are Vitamin A deficient (VAD). Every year, between 2,50,000 to 5,00,000 children go blind due to lack of Vitamin A in their diet, which affects their growth, cognitive development and immune system (www. hkl.org/programs/vitamins-a htm). The problem is considered to be of public health significance in 36 countries in South East Asia, the Western Pacific and Africa. Clinical Vitamin A deficiency disease affects atleast 2.80 million school children in over 60 countries and sub clinical Vitamin A Deficiency disease is considered a problem for atleast 25 million school children (Nazni and Vijayakumar, 2006).

Vitamin A deficiency is a major nutritional problem in the world and poses a significant problem in more than 70 countries of the world. One hundred and fifty million children are deficit every year, 10 million children develop xerophthalmia, 50,000 children become permanently blind from xerophthalmia and 1 to 2 million children die (Sommer, 2004). In India, around 60,000 children become nutritionally blind every year. Though there appears to be a decline in the magnitude of xerophthalmia in the country, it still remains an important public health problem (Sivan *et al.*, 2002).

The National Family Health Survey was conducted on anemia among women and young children in 25 states of our nation. The results indicated that anemia prevalence had come down from the 1988-89 survey figures. It was 50.4 per cent in women, 49.7 per cent in pregnant women and 56.3 per cent in lactating women, but it was still high in children i.e., 74.2 per cent. Control of anemia continues to be one of the most challenging public health problems (Rao, 2005).

According to Gopalan (2002) several strategies have been worked out and implemented to control the micronutrients' deficiencies especially the twin problems of Vitamin A Deficiency (VAD) and Iron Deficiency Anaemia (IDA). The key strategies are dietary diversification, supplementation, food fortification, genetic modification, promoting community and home gardens and nutrition education. However, the sustainable solution to reduce the incidence lies in the discovery and the implementation of innovative and affordable ways to improve people's diet. The most important step is ensuring regular and adequate consumption, of Vitamin A rich foods in their daily diet, together with an appropriate intake of protein and energy. The increase in Vitamin A intake should be accompanied by efforts to reduce the prevalence and severity of contributory factors such as diarrhoea, measles, Protein Energy Malnutrition (PEM) and respiratory infections. In order to maintain Vitamin A intake and reduce the body's overall requirements for this nutrient. Even in the presence of these contributory factors, however, increasing Vitamin A intake in order to build up sufficient stores in the liver will effectively prevent nutritional blindness (Edem *et al.,* 2003).

The importance of food based strategies to reduce VAD is stressed by International Agencies and Governments as the single most sustainable alleviation strategy to overcome micronutrient malnutrition, particularly that of Vitamin A. Since inadequate dietary intake of Vitamin A, is the primary cause of the deficiency, many nutritionists consider increasing the dietary sources of Vitamin A to be the most sustainable, logical and long term solution for its prevention (Gnanasundaram, 2001).

Gopalan (2001 and 2002) also suggested that the food based approach is more durable and sustainable than a 'drug based' one and we should look in to our farms and not our pharmacies to solve the vitamin A problem especially in the younger population.

Ramachandran (1993) opined that girl children stand in dire need of better diets, and such better diets are possible even in the context of poverty with minimum inputs. For this, starting from an early age, women should be sufficiently enlightened with adequate nutrition knowledge endowed with self sustaining attitudes and practices and empowered to have access to select Vitamin A, iron and other micronutrient rich foods as habitual diets and this alone can solve malnutrition in the long run.

Rao (2005) suggested to take research efforts to i) re-evaluate the true provitamin A content of foods, ii) identify newer sources of beta-carotene rich foods iii) prepare familiar dishes incorporating carotene rich foods and their acceptance and iv) examine the effect of prolonged consumption of such carotene rich foods by the poorer segment of populations on their vitamin A status (Serum vitamin A level and presence of VAD signs) among growing children for the prevention of VAD.

Food based approaches are the most sustainable and cost effective in enhancing serum retinol status. Besides encouraging the use of environmental sources of carotene, there is a need for promotion of more potent food sources like Red palm oil. Red palm oil is an under exploited, but excellent source of beta carotene, provides 400 microgram of beta carotene per gram of Red palm oil and hence could prove to be an excellent source of beta carotene in human diet, as oil is invariably used as a medium of cooking (Gnanasundaram, 2001).

Red palm oil and Palm kernel oil are derived from the fruits of palm tree. Palm kernel oil, which is produced from the kernel of palm seed, is high in saturated fat and should be avoided, while Red palm oil is produced from the fleshy part of the palm fruits and is also valuable for healthy combination of saturated and unsaturated fats. As an added bonus, Red palm oil contains many phytonutrients such as beta carotene- provitamin A and vitamin E and help to

prevent the occurrence of Cardiovascular Diseases (CVD), Cancer etc. The bioavailability of these vitamins is excellent, as these fat soluble vitamins are embedded in oil medium (Malaysian Palm Oil Information Series, 2005).

Edible grade of Red palm oil can be added to supplementary foods given to school children in the mid-day meal programme. About 3-5 ml of Red palm oil to each child in these feeding programmes can meet the vitamin A requirement fully (Swaminathan, 2002 and Rao, 2005).

Red palm oil has a good mixture of antioxidants and together with its balanced composition of different classes of fatty acids make the oil safe, stable and versatile with many nutritional and health benefits (Chandrasekharan, 2000).

Apart from these nutritional and health benefits, food uses of Red palm oil are equally attractive. It can be used as cooking oil, shortening and margarine. It is resistant to oxidation and therefore has a good shelf life, is suitable for hot climates and possesses properties that are desirable in cakes and other bakery products. Since Red palm oil has many cooking advantages and nutritional and health benefits, it is customary to include Red palm oil in our dietaries (Abraham, 2004).

Food supplement is an attractive and least expensive strategy to reach the quality food for children. With these strategies, it is hopefully expected to enhance micronutrient status and eliminate micronutrient deficiency among the young children and thereby next generation of youngsters will lead a more healthy life and be spared from the devastating effects of degenerative diseases in their old age (Chakravarthy and Ghosh, 2000).

Knowing these nutritional and health aspects of Red palm oil in view, an earnest effort has been taken to tap this source of food in the most meaningful way. Gopalan (1998) has indicated that if Red palm oil is not used for nutritional

upliftment. it will be diverted towards industrial uses such as detergent making. Hence, efforts are needed to popularize Red palm oil and to examine the effect of consumption of Red palm oil by the poorer segments of population especially female population on their Vitamin A status. The present study was designed and carried out with the following objectives:

- Elicit information on socio-economic background and dietary pattern of the selected families in Coimbatore city for identification of commonly prepared South Indian recipes.
- Ascertain acceptability of Red palm oil in selected South Indian recipes and select one recipe for supplementation.
- Select girls in the age group of 4 to 18 years for supplementation studies.
- Evaluate the effect of supplementation of Red palm oil on the nutritional profile of the selected target groups.