1. INTRODUCTION

*The adolescent girl still remains a young plant that neither gets light nor water. She remains the flower that could have blossomed but didn’t ...*

- Kamala Bhasin from “Our Daughters”

Nutrition is the science of foods, the nutrients and other substances therein, their action, interaction and balance in relationship to health and disease; the process by which the organisms ingests, digests, absorbs, transports and utilizes nutrients and dispose off their end products. In addition, nutrition may be concerned with social, economic, cultural and psychological implications of food and eating.

Thus, nutrition is the ultimate balance-sheet of all the processes by which the human system utilizes food for providing energy for growth, maintenance and also for other specific needs.

The human being requires more than 48 different nutrients for its well being. Nutrients are the essential chemicals in food that the body needs for normal functioning and good health and that must come from the diet. Thus, nutritional health is, simply obtaining all the nutrients in amount needed to support body processes.

Effective health promotion requires an understanding of the numerous ways in which nutrition relates to human needs. When nutritional status is good, the harmonious result is indicated by the characteristics usually associated with good health. Thus, good nutrition is essential for good health and important for physical growth and development, good body composition and mental development. People’s nutritional state can protect them from or predispose them towards chronic disease. Thus, nutrition is both a preventive and therapeutic science (Carroll and Karen, 2001).

Good nutrition also enables one to 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 (Gopalan, 2003).

Good nutrition is easily achieved by eating the right kinds of food and eating them in the right proportions. Diet plays an important role in the maintenance of good health and stamina and in the prevention and cure of disease. Good health thus can be preserved and promoted only by the right kind of food and on the vice-versa wrong kind of food is an invitation to disease.

Malnutrition is one of the most devastating problems worldwide. Malnutrition denotes impairment of health arising either from deficiency or excess or imbalance of nutrients in the body. It is an ecological problem. It is the end result of multiple overlapping and interacting factors, physical, biological, social and cultural environment and economic (Beegum, 2001). Malnutrition in one or more of its various forms frequently characterizes emergency situations, both natural and manmade. When the nutritional needs of the population – or population subgroup are not completely met, some form of malnutrition soon emerges, usually among the most helpless or vulnerable individuals. The results are underweight children, anaemic mothers, marasmic babies, scurvy, beri beri, pellagra, vitamin A deficiency blindness and other deficiency syndromes (WHO, 2000).

Poor nutrition starts before birth and generally continues into adolescence and adult life and can span generations. Chronically malnourished girls are more likely to remain undernourished during adolescence and adulthood and when pregnant are more likely to deliver low birth weight babies. Epidemiological evidence from both developing and industrialized countries suggest a link between foetal undernutrition and increased risks of impaired growth and chronic diseases. Thus, nutrition challenges continue throughout life cycle particularly for girls and women.

So, it is imperative to prevent malnutrition at every stage of the lifecycle. Investing in nutrition, throughout the lifecycle will have both short-

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term and long-term benefits of economic and social significance, including large savings in healthcare, increased educability and intellectual capacity and increased adult productivity.

Thus, nutrition and physical growth are integrally related and optimal nutrition is a requisite for achieving full growth potential. The period of gradual transition from childhood to adulthood that normally begins with the onset of signs of puberty, is characterized by important psychological and social changes, not only physiological change. Adolescents are far from being a homogenous group, in terms of development, maturity and lifestyle. Even for a given place and age, there is a great deal of diversity depending on personal and environment factors (WHO, 2005).

Adolescence is a unique intervention point in the lifecycle for a number of reasons. Early adolescence after the first year of life is the second critical period of rapid physical growth and changes in body composition, physiology and endocrine. Rapid growth and changes heighten their nutritional requirements and risks of under nutrition. Adolescence also offers the last opportunity to intervene and recover growth faltered in childhood and also support growth spurt and skeletal development (Public Health at a Glance, 2003).

Throughout the adolescent years, a women’s body is still changing and growing. Full physical stature may not have been attained and teens are more likely to be underweight than are young women. This demand for tissue growth keeps nutrient needs during adolescents very high.

Thus, adolescence is marked as a period of growth spurt and maturation, the extent of physical growth is not determined by genetic, hereditary factors alone but also on availability of adequate nutrition, micronutrients in the diet and access to health services. Adolescents makeup roughly 20 per cent of the total world population.
Inappropriate dietary intakes during adolescence can have several consequences. Iron deficiency and anaemia is the main problem of adolescents worldwide. The high prevalence of chronic energy and micronutrient deficiencies of today’s adolescent girls are directly linked to the quality of the next generation (Nurul et al., 2010). Like in any other age group, poor nutrition is usually the result of dietary inadequacies often combined with unhealthy lifestyles or infections, which further compromise nutritional status. Protein, iron and calcium are important for growth spurt and skeletal development in adolescence. The requirement of some of the nutrients is as high as, or higher in adolescents than in any other age groups and therefore, many micronutrients including vitamin A, thiamine, riboflavin, niacin, folic acid, vitamin B₁₂, vitamin C and iodine reach levels required by adults. So improving their nutrition, before they enter pregnancy (and delaying it) could help to reduce maternal and infant mortality, and contribute to break the vicious cycle of intergenerational malnutrition, poverty and even chronic diseases.

Although adolescent marriage is a cognizable offence in India, it is still a common practice in many parts of the country. In the Indian subcontinent, early marriage and pregnancy is more common in traditional rural communities compared to the rate in cities (Mehta et al., 2000). In India, although the legal age at marriage is 18 for females and 21 for males, early marriage continues to be the norm (by age 15 as many as 26 per cent of females are married). By the age of 18, this figure rises to 54 per cent. Most reproduction in India occurs soon after marriage, so the low age at marriage automatically links to early onset of sexual activity and thereby fertility (Gupta, 2003).

Pregnancy is a sequence of events that begins with fertilization, proceeds to implantation, embryonic and foetal development and normally ends with birth about 38 weeks later or 40 weeks after the last menstrual period (Tortora and Deriekson, 2009). Pregnancy is a time of tremendous physiological changes and these changes demand healthful dietary and lifestyle choices. Adequate nutrition before and during pregnancy has greater potential
for long term health impact than it does at any other time. So, a plentiful nourishing diet is important throughout pregnancy to provide the nutrients needed to support foetal development without depriving the mother’s nutrients (Janice and Melinda, 2005).

Pregnancy in teenage is coming up as one of the most important social and public health problems all over the world with a varying prevalence rate. Adolescent pregnancy is pregnancy occurring in women aged 19 years or still younger (Kohler et al., 2008). About 16 million girls aged 15 to 19 give birth every year. Worldwide one in 10 babies is born to an adolescent mother (Making Pregnancy Safer, 2008). It is estimated that 25 per cent of women have their first child before the age of 20. Early pregnancy is a problem worldwide in high, middle or low income populations alike. Although there are adolescent mothers in all societies, there are huge regional differences. In some societies, early marriage and traditional gender roles are important. In some sub-Saharan African countries, early pregnancy is often seen as a blessing because it is a proof of the young woman’s fertility. Most teenage pregnancies in the developed world appear to be unplanned (Teenage Pregnancy, Wikipedia). Almost 95 per cent of adolescent mothers live in developing countries. There are also high rates in Asian countries like Bangladesh and India. There may be large differences among countries in the proportion of girls bearing a child before the age of 20 (Bongaarts and Cohen, 2000).

In recent years, the incidence of adolescent pregnancy and childbirth is increasing due to the early onset of puberty, the declining age of menarche and early sexual activity in developed and in many developing countries. Educational levels strongly influence adolescent child bearing. Adolescents’ poor information about reproduction, sexual activity and access to contraceptive services contribute to adolescent pregnancy. Social customs, poverty and ignorance make early marriage a common feature in India (Kumar et al., 2007).
Adolescents who become pregnant are subjected to greater nutritional risk than adult women. Adolescent mothers bear a double burden, one involving their own growth and development and another involving the intrauterine growth and development of their offspring (Ventura and Freedman, 2003). So, inadequate nutrition during pregnancy is an even more marked problem among teenagers in developing countries.

Adolescents need additional energy intake during pregnancy. In general, pregnant adolescents should not consume less than 2000 calories / day and in many cases, higher intakes are needed. Protein needs increase during pregnancy. Adequate protein intake is required to support continued growth and development in both the foetus and the young pregnant adolescent. Pregnancy increases the need for iron in the diet, as the developing foetus draws enough iron from the mother to last it through the first five or six months after birth. Folic acid is of special concern as it is essential for a healthy baby and helps in the development of the foetal brain and spine.

Calcium intake is also important because young woman have not reached their peak bone mass and inadequate calcium intake may increase the risk of osteoporosis developing later in life (www.betterhealth.vic.gov.au). Due to the increased nutritional requirements, pregnancy is a critical period for meeting the body’s demand for macro and micronutrients. It is estimated that recommended intakes of 14 of the 21 essential micronutrients increase during pregnancy (Allen, 2006). So, additional food supplementation during pregnancy is needed to improve the nutritional status and birth weight of the infant.

Many pregnant teens are subject to nutritional deficiency from poor eating habits common in adolescence including attempts to loose weight through dieting, skipping meals, food faddism, snacking and consumption of fast food (Pena et al., 2003). Anaemia is more common among adolescents than elder women. Chronic moderate maternal under nutrition and anaemia
during pregnancy are associated with adverse pregnancy outcome like abortions, premature delivery, still birth, intra uterine death, low birth weight infants, high perinatal mortality, neonatal mortality and infant mortality. Teenage pregnancy is also associated with high risk of pregnancy induced hypertension and preeclampsia. Acharya et al. (2010) observed that teenagers were at increased risk of maternal anaemia, pre-term birth, still birth, foetal distress and spontaneous abortion.

Pregnant teenagers face many of the same obstetric issues as women in their 20s and 30s. For mothers between 15 and 19, along with age, additional risk may be associated with socio-economic factors. These risks increase greatly as maternal age decreases with adolescents under 16 facing four times the risk of maternal death as women over 20. Thus, teenagers who give birth have an increased risk of poor pregnancy outcomes (Ventura et al., 2001).

Thus, complications of pregnancy and childbirth are the leading cause of mortality among women between the ages of 15 and 19 in many areas and these complications of pregnancy result in the death of an estimated 70,000 teen girls in developing countries each year (Mayor, 2004).

Repeat teen pregnancies are at higher risk for poor birth outcomes compared to repeat pregnancies in women in their 20s. Age at first birth, shorter pregnancy intervals and cultural factors influence the risk of subsequent pregnancy. These data are therefore a reminder that intervention is needed during the first teen pregnancy to reduce second and subsequent pregnancies.

Low educational expectations have been pinpointed as a risk factor. Early child bearing lowers the educational attainment of young women. Seventy per cent of teen mothers drop out of high school. Making pregnancy the primary reason, young women drop out easily (Alan Guttmacher Institute, 2000). Teen mothers are also less likely to attend college than women who delay child bearing. Thus, adolescent pregnancy is known to adversely affect the educational and occupational status. The loss of education also results in
poorer achievement in the job market, resulting in a socio-economic disadvantage for these young women and their children, which can lead to inadequate nutrition, medical care and poverty.

In this respect, the education of girls is the most important factor, because it empowers them to decide their own lives and it enables them to develop planning behaviour. Thus, better education has two opposing effects, it postpones marriage and also makes the adolescent less dependent on parental influences. On the other hand, in the long run, it may stimulate planning behaviour, contraception and prevention of unwanted pregnancies.

Infants born to teens are two to six times more likely to have low birth weight than those born to mothers aged 20 or older. Infants born to teenage mothers are at higher risk of complications of pre-maturity accidental trauma and poisoning, minor acute infections, lack of immunization or vaccinations and developmental delays. Infants of adolescents may be at higher risk for some congenital malformations, although the risk may not only be related to maternal age but rather to less access to prenatal care and reproductive counseling.

Early motherhood can affect the physical and psychosocial development of the infant. The occurrence of the developmental disabilities and behavioural issues is increased in children born to teen mothers (Hofferth et al., 2002). Studies also show that the children of teen parents are at higher risk of educational failures than those who are born to older parents. Thus, the children of teen parents have lower cognitive skills, lower grades and more behavioural referrals than those who have older parents (The Centre for Development and Population (CEDPA), 2001).

Improving nutritional habits during pregnancy may also improve the birth outcomes and develop positive eating habits in the adolescents, as pregnancy represents an ideal time for health promotion activities. Many adolescents will be motivated to eat better for the sake of their foetus.
However, adolescents often lack adequate knowledge of exactly what is needed nutritionally or precisely how to find out (Lenders et al., 2000). So, all pregnant adolescents need nutrition education and individualized guidance.

The challenge to nutrition educator is to achieve a behavioural change in teenagers by creating interest in nutrition and in the benefits derived from sound eating practices. Nutrition education should also take place in the home. It can also be promoted by the innovative use of settings as physicians, community and family planning clinics, libraries and classrooms.

Various measures have been undertaken through government or private organization to improve the nutritional status of the expectant women (Vijayaraghavan et al., 2000). Family planning clinics continue to play an important role in the prevention of adolescent pregnancy and child bearing.

Many models of adolescent pregnancy-prevention programs exist. Most successful programs include multiple and varied approaches to the problem and include contraception information, contraceptive availability, sexuality education and school completion strategies. Parents, schools, religious institutions, physicians, social and government agencies and adolescents all have roles in successful prevention programs.

In India, adolescent friendly health services have emerged under the Pan American Health Organization and WHO consultation. A commendable step in setting up Adolescent Friendly Health Services was first undertaken by the Safdarjung hospital in New Delhi that is providing a wide range of services such as clinical, mental health services, nutrition and reproductive health counseling, growth and monitoring development and immunization (Safdarjung Hospital Adolescent Health Network (SHAHN), 2005).

Although a variety of strategies has been developed by many different agencies, a few have been acutely studied to assess effectiveness (Miller, 2000). Many programs have never been evaluated for effectiveness or have not
been studied with high academic standards because of limitations on funding, small numbers of subjects, or poor study design. Others have been fairly well studied and seem to be beneficial, or show no change in adolescent pregnancy rates.

So, strong government interventions are needed to reduce the tragedy of maternal deaths in India. Special efforts are needed to focus attention on providing antenatal care to all pregnant women, promote efficient management systems whereby complicated pregnancies are attended through referral system with good transportation network. The intervention programmes are also needed to focus on improvements in the socio-economic status of adolescents, improvements in emergency obstetric care, training of traditional birth attendants, **nutrition programme for young girls and education and mobilization** of the community (Balasubramanian, 2000).

It was found that even in developed world, a number of women, especially adolescents do not receive proper care. Siddharata *et al.* (2008) in a study showed that teenage pregnancy is associated with low birth weight babies. Perkocha *et al.* (1995) found less low birth weight infants after comprehensive antenatal care. A number of studies revealed the relation of weight gain during pregnancy in adolescents and birth weight of the infants. Nutritional advice and supplementation for adolescents have been advocated. The diet and dietary supplementation for undernourished women should be considered as it produces healthy children and also help in the promotion of maternal health.

The present study was carried out in Malappuram District of Kerala, where majority of the population are Muslims and early marriage is a common practice (Census India, 2001). Moreover, Malappuram tops the list of districts where girls get married before they reach the age of 20 (Manorama Daily, 2008). Pregnancy soon after marriage is considered desirable in this region.
Thus the increasing incidence of adolescent pregnancy paves the way to the conduct of this study.

Hence, this investigation was undertaken to study the nutritional status and pregnancy outcome of the adolescents in terms of their new born and the impact of nutritional interventions. The following were the specific objectives.

- Study the socio-economic details of the pregnant adolescents
- Identify the nutritional and health problems and assess the nutritional status of the pregnant adolescents and their neonates
- Carry out nutrition interventions namely, nutrition education and supplementation based on the identified problems and
- Evaluate the impact of the interventions on the pregnant adolescents and their neonates.

It is hoped that the study will gain insight into the consequences of early child bearing on teen parents and their children and society as a whole and assess the burden of risk in adolescent pregnancy to change for a better future.