2. REVIEW OF LITERATURE

The literature pertaining to the study on the “Impact of Nutritional Interventions on Pregnant Adolescents from Malappuram District, Kerala”, is presented under the following heads:

A. Nutrition and health
B. Importance of nutrition in adolescence
C. Scenario on adolescent pregnancy
D. Causes of adolescent pregnancy
E. Effect of adolescent pregnancy on the mother and child
F. Strategy for nutritional interventions and prevention of adolescent pregnancy

A. NUTRITION AND HEALTH

“He who takes food in proper measures lives a long life, and lives without disease, gets strength and alertness of mind. Moreover, his children are born healthy and without any deformity or disease”

(Cited from Mahabharata)

We live in a world with rapidly changing elements – our environment, food supply, population and scientific knowledge. Within different environments, our bodies, personalities, needs and goals change. These constant changes of life must be in some kind of positive balance to produce healthy living.

Gopalan (2003) states that nutrition is an integral component of health and wellbeing 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.
Carroll and Karen (2001) opine that nutrition is the science of food and its relation to people. The science of nutrition is based on the chemical constituents of foods called nutrients, which function to provide fuel, support tissue growth and maintenance and regulate body processes.

Kathy (2008) calls attention to the fact that an individual’s nutritional status reflects the degree to which physiologic needs for nutrients are being met. Thus, nutrient intake depends on actual food consumption which is influenced by factors such as economic situation, eating behaviour, emotional climate, cultural influences, effects of various diseases on appetite and the ability to consume and absorb adequate nutrients.

According to WHO (2006) adequate nutrition of any individual is determined by factors like the adequate availability of food in terms of quantity as well as quality and also on the ability to digest, absorb and utilize the food which can be hampered by infection and by metabolic disorders.

According to Kathleen and Sylvia (2008) when adequate nutrients are consumed to support the body’s daily needs and any increased metabolic demands, the person moves into an optimal nutritional status. This status promotes growth and development, maintains general health, protect them from or predispose them towards chronic disease.

As per Vijayalakshmi and Amirthaveni (2001), good nutrition is the fundamental requirement for positive health, functional efficiency and productivity. Nutrition science, thus, provides abundant evidence on the importance of nutrition, not only in promoting proper physical growth and development but also ensures adequate immunocompetence, cognitive development and work capacity.

The World Health Organization defines health as a “state of complete physical, mental and social wellbeing and not merely the absence of disease or infirmity”. The World Health Organization also states that the diets people eat,
in all their cultural variety, define to a large extent people’s health, growth and development (Anura, 2001).

As far as Staci (2005) is concerned, good nutrition is thus essential to good health throughout life, beginning with prenatal life and extending through old age. A lifetime of good nutrition is evidenced by a well developed body, the ideal weight for body composition and height and good muscle development.

Bamji et al. (2003) opine that nutrition during early childhood is of paramount importance because it is a foundation of life time health, strength and intellectual vitality.

Iyengar (2002) states that the nutritional requirements of the healthy child vary widely according to their age, sex, weight and rate of growth as well as environmental factors. Deficient intake of nutrients signals the start of nutrition related disorders in adulthood.

So, Srilakshmi (2004) emphasizes that proper nutrition at the growing stages of life not only helps to promote health but also prevent the occurrence of deficiency diseases and other health hazards. Ingesting too much or too little of a nutrient can interfere with health and wellbeing. Thus, malnutrition occurs when body cells receive too much or too little of one or more nutrients.

Nancy (2003) expresses malnutrition as a state in which, a prolonged lack of one or more nutrients retards physical development, or causes the appearance of specific clinical conditions. Thus, malnutrition includes under nutrition, which may be related to an individual’s inability to obtain foods that contain essential nutrients, failure to consume essential nutrients, body’s inability to use the nutrients, disease condition that increase the body’s need for nutrients and a disease process that causes nutrients to be excreted too rapidly from the body.
Paul et al. (2004) emphasize that malnourished children grow at a slower rate than adequately nourished ones and they are prone to infections and are more likely to have mental and developmental problems.

As per Donna (2004) malnutrition adversely affects lung structure, elasticity and function, respiratory muscle mass, strength and endurance, lung immune defense mechanisms and control of breathing.

Sri Lakshmi (2009) states that the direct effects of undernutrition are occurrence of frank and subclinical nutritional deficiency diseases. The indirect effects are a high morbidity and mortality among young children, retarded physical and mental growth, lowered vitality leading to lowered productivity and reduced life expectancy. Undernutrition predisposes to infection and infection predisposes to undernutrition. The high rate of maternal mortality, still births and low birth weight are all associated with undernutrition.

Wahlqvist et al. (2003) underline the consequences of undernutrition which includes death, disability and stunted mental and physical growth. She further warns that poor nutrition often commences in utero and in many cases extends into adolescence and adult life. Females in particular are affected by life long poor nutrition. Evidence from epidemiological studies from both developing and industrialized countries suggests a casual relationship between foetal undernutrition and increased risks of impaired growth and various adult chronic diseases (Figure I).
Anjali (2004) states that malnutrition is an outcome of infection, illness, inadequate or inappropriate feeding and caring practices. She carries the idea that every girl child is a potential mother, so her care in terms of diet, health and hygiene should begin right from her birth, because a rachitic girl grown up and married may have difficult labour due to her contracted pelvis and hence jeopardize the chance of a healthy baby.
According to Robert (2008), the causes of malnutrition open up a can of worms causing horrendous effects on the human population. Out of the 15 million childhood deaths from malnutrition, about half of these deaths are caused by protein-energy malnutrition. It has also been found that undernourished babies have smaller and fewer brain cells. There is also evidence that the mental development of infants younger than six months of age is particularly vulnerable to the effects of malnutrition. Some nutritional deficiencies may cause permanent impairment of CNS in young infants.

Shobha (2001) opines that undernutrition continues to be the major nutritional problem especially in rural populations which is an important determinant of health and an important outcome of ill health. Thus, even though heredity determines much of individual growth patterns and genetic potential, malnutrition can delay or prevent individuals from achieving that potential.

On the other hand, over nutrition, which is an excessive intake of nutrients, is another form of malnutrition. As per Bandini and Flynn (2003) harmful overnutrition can also occur in persons who use excessive amounts of nutrient supplements over time, producing damaging tissue effects.

According to Gema (2005), over nutrition is the chronic consumption of more than is necessary for good health. Specially over nutrition is the regular consumption of excess calories, fats, saturated fats or cholesterol all of which increase risk for chronic disease like heart disease, cancer, stroke, diabetes, hypertension and the metabolic syndrome. These conditions may also result in poor clinical outcome with increased morbidity and mortality.

According to International Assessment of Agricultural Knowledge, Science and Technology for Development (IAASTD) (2006) these chronic diseases account for nearly half of the global burden of disease, with the burden growing fastest in low and middle income countries. More sedentary, urbanized lifestyles are also expected to contribute to the trend.
US Department of Health and Human Services (USDHHS) (2000) supports the fact that several of the leading causes of death, including cardiovascular disease, cerebro vascular disease, diabetes and some types of cancer have a strong link with the type and amount of food consumed.

Thus, nutrition plays an important role in human growth and development throughout life. Infancy and childhood are important times for nutrition and growth. Goyle (2001) points out that during this period, the child should be provided good nutrition and protected from childhood diseases and infections.

As per Morgan and Dickerson (2003) adolescence is an anabolic phase of life and warrants increased nutrient requirement for unit body. And during adulthood nutrients are required for the purpose of energy, for replacement of worn out tissues and maintenance of body functions.

Sari and Judith (2009), stress that nutrition once again plays an important role in later life, when prevention of chronic disease and system degeneration becomes a major priority. Thus, the needs for many nutrients change at different stages of life. If the essential nutrients are not present to support growth, permanent damage to tissues and organs can occur.

B. IMPORTANCE OF NUTRITION IN ADOLESCENCE

Jamie Stang (2008) regards adolescence as one of the most exciting yet challenging periods in human development, generally thought of as a period of tremendous physiological, psychological and cognitive transformation during which a child becomes a young adult. Adolescents are tomorrow’s adults and 80 per cent of them live in developing countries. India has one of the fastest growing youth populations in the world.

According the Bhakta (2002), of the world’s 6.1 billion population in 2000, over one billion people (19.1 per cent) belonged to the age group 10-19. The Asian region comprises 712 million people in this age group. In the world,
as a whole the number of persons in the age group 10-19 will continue to grow reaching 1,253 million by the year 2025. In 2000, there were 554 million adolescents living in the world, of which 48.5 per cent were females. Over three fifths (62 per cent) of these adolescents belong to Asia. According to United Nations medium variant projections, the world adolescent population will increase by 40 million, to 594 million by 2010 while in Asia it will increase by 17 million to 358 million by 2010. There are about 105 million adolescent girls in the age group 10-19 in India.

Candan et al. (2010) state that adolescence is a transitional stage of physical and mental development, involving biological, social and psychological changes occurring between 10-19 years of age as the World Health Organization suggested.

Afework et al. (2009) put forth the fact that it is also an intense anabolic period when requirements for all nutrients increase. During adolescence, 20 per cent of final adult height and 50 per cent of adult weight are obtained, bone mass increases of 45 per cent and dramatic bone remodeling occur and soft tissues, organs and even red blood cell mass increase in size. Even in a given culture adolescents are not a homogenous group with wide variations in development, maturity and lifestyle.

Morgon and Dickerson (2003) considers adolescence as another period characterized by rapid increase in height, weight, hormonal changes resulting in sexual maturation and causing wide swings of emotion. In addition, it is an anabolic phase of life and warrants increased nutrient requirement for unit body weight.

Priya et al. (2009) emphasize that adolescence is a particularly unique dynamic period in life because it is the “second and last growth spurt” in the life of human beings. The adolescence is considered vulnerable nutritionally, as there is an increased demand for nutrients related to the dramatic increase in physical growth and development, change in food habits affecting both nutrient
intake and meals and special nutrient needs associated with participation in sports, development of eating disorders and other situations common to adolescents.

WHO (2006) suggests that adolescence present a window of opportunity to prepare nutritionally for a healthy adult life. Some nutritional problems originating earlier in life can potentially be corrected in addition to addressing current ones. It may also be a timely period to shape and consolidate healthy eating and lifestyle behaviour, thereby preventing or postponing the onset of nutrition related chronic diseases in adulthood.

Thus, if adolescents are well nourished, they can make optimal use of their skills, talents and energies today and be healthy and responsible citizens and parents of healthy babies tomorrow. To accomplish such a task and in order to break the intergenerational cycle of malnutrition, a special focus for overcoming adolescent malnutrition is needed.

According to Caballero (2001) the diet of adolescents is important. Nutritional status can have an immediate impact on the health of adolescents, contributing to obesity, susceptibility to illness and general health. Also, there is increasing evidence that adult susceptibility to disease is associated with nutrition in childhood and adolescence.

As far as Spear (2002) is concerned, adolescence is an important time for gains in height as well as weight. While both muscle and fat increase, the requirement of energy as well as protein increases considerably during this period. Energy and protein needs correlate more closely with the growth pattern than with the chronological age. Thus, the energy requirements of adolescents are designed to maintain health, promote optimal growth and maturation and support a desirable level of physical activity.

WHO (2006) opines that protein requirements vary with degree of physical maturation. When protein intake is inadequate alternations in growth
and development are seen. In the still-growing adolescents insufficient protein intake will result in delayed or stunted increases in height and weight. Impaired immune response and susceptibility to infection may also be seen. Therefore, if energy intake is limited, dietary protein may be used to meet energy needs and be unavailable for synthesis of new tissues or tissue repair which may result in reduction of growth rate and muscle mass.

As per Montogomery (2003) maternal carbohydrate intake can influence weight gain and pregnancy outcomes. Sufficient energy is a primary dietary requirement of pregnancy. If energy needs are not met, available protein, vitamins and minerals cannot be used effectively for various metabolic functions.

Energy requirements are greater for pregnant adolescents than for their non-pregnant peers. According to Paul (2007) the kilo calories in energy must be sufficient to provide for increased metabolic workload and extra proteins needed for tissue building. Current recommendations suggest that pregnant women should increase their average energy intake by 300 calories per day during the second and third trimesters of pregnancy.

According to Mary and Juli (2000) protein needs increase during pregnancy. Adequate protein intake is required to support continued growth and development in both the foetus and the young pregnant adolescents. This increased requirement provides for rapid growth of the foetus, enlargement of uterus mammary glands and placenta, increased maternal blood volume, formation of amniotic fluid and storage reserve. A careful dietary assessment can determine the protein intake of a pregnant adolescent. The quality of protein as well as adequacy of energy intake should be considered. If energy intake is limited, dietary protein may be used to meet energy needs and be unavailable for synthesis of new tissues or for tissue repair resulting in reduction of growth rate and muscle mass. About two-thirds of total proteins
should be of high biologic quality such as eggs, milk, meat or other animal sources.

Minerals play a crucial role in adolescent nutrition. According to Beard (2000) iron requirements peak during adolescence due to rapid growth with sharp increase in lean body mass, blood volume and red cell mass which increases iron needs for myoglobin in muscles and haemoglobin in blood.

Spear (2004) calls attention to the fact that the rapid growth and significant increase in lean body mass reduces their circulating iron leading to physiologic anemia of growth. Iron deficiency may impair the immune response and decrease resistance to infection. He further adds that iron deficiency anaemia can also affect cognitive functioning and short term memory.

Brabin et al. (2001) feel that iron requirements in adolescence are greater in developing countries because of infectious diseases and parasitic infections that can cause iron loss and because of low bio-availability of iron form diets.

Mary and Jamie (2000) report that dietary calcium has been identified as a nutrient of great potential concern for adolescents. The adolescent years are a window of opportunity to influence lifelong bone health.

Lytle (2002) points out that because of the accelerated muscular, skeletal and endocrine development, calcium needs are greater during puberty and adolescence. At the peak of the growth spurt, the daily deposition of calcium can be twice that of the average deposition during the rest of the adolescent period. Infact 45 per cent of the skeletal mass is added during adolescence. Thus, bone mineral content must be maximized during puberty to prevent osteoporosis in later life.

WHO (2006) states that low calcium intake in early life may account for as much as 50 per cent of the difference in hip fracture rates in post
menopausal years. As per Weaver et al. (2000), consumption of calcium rich products with every meal goes a long way towards ensuring that requirements are met for calcium and many other nutrients like phosphorus, magnesium and vitamin D needed for bone health.

According to Sazawal et al. (2001) zinc is associated with more than 100 specific enzymes and is vital for protein formation and gene expression. Zinc is important in adolescence because of its role in growth and sexual maturation. It is also an essential trace element that plays fundamental roles in cell division and maturation and in the growth and function of many organ system including neurological system. Males who are zinc deficient experience growth failure and delayed sexual development.

WHO (2005) reports that iodine is important during adolescence due to the high growth velocity. The deficiency results in learning disability and lowered achievement.

The requirements for vitamins are also increased during adolescence. Adolescents vitamin needs are also associated with the degree of maturity rather than the chronological age because of demands of growth. Russell (2001) explains that besides being important for normal vision, vitamin A plays a vital role in reproduction, growth and immune function. The low intake of fruits, vegetables, milk and dairy products by adolescents contributes to their less than optimal intake of vitamin A.

As far as Subar et al. (2000) is concerned both vitamin E and C are important nutrients during adolescent growth and development. Vitamin E is well known for its antioxidant properties which become increasingly important as body mass expands during adolescence. Vitamin C is involved in the synthesis of collagen and other connective tissue. For this reason, vitamin C is an important nutrient during adolescent growth and development.
Adolescents have increased requirements for folate during puberty. Spear (2002) reports that folate plays an integral role in DNA, RNA and protein synthesis. Adequate intakes of folate prior to pregnancy can also reduce the incidence of spina bifida and other congenital anomalies and may reduce the risk of Down syndrome among offspring. National data suggests that many adolescents do not consume adequate amounts of folate. Also because of higher energy demands, more thiamine, riboflavin and niacin are necessary for the release of energy from carbohydrates.

Mary and Jamie (2000) stress that the total nutrient needs are higher during adolescence than any other time in the lifecycle as nutrition and physical growth are integrally related. So, optimal nutrition is a requisite for achieving full growth potential.

Thus, the nutrient needs for both males and females increase sharply during adolescence. The nutrient needs parallel the rate of growth, with the greatest nutrient demands occurring during the peak velocity of growth.

C. SCENARIO ON ADOLESCENT PREGNANCY

Bratati et al. (2009) hold the idea that health, in addition to its biomedical determinants, is influenced by many social and cultural factors. This influence is often negative with a resultant increase in the number of social hazards which finally aggravate the already poor health status of the developing societies. One such social hazard of serious consequences on the nation as a whole is pregnancy in an adolescent girl, who herself is yet to attain her full growth potential.

According to Ekachai et al. (2010) teenage or adolescent period of females is the transitional stage of physical and mental development between childhood and adulthood. But pregnancy is a period of great psychological stress for the woman as she is nurturing a growing foetus in her body. Foetal development is accompanied by many physiological, biochemical and
hormonal changes occurring in the maternal body which influence the needs for nutrients and the efficiency with which the body uses them.

UNICEF (2008) opines teenage pregnancy, as a teenage girl, usually within the ages of 13-19, becoming pregnant. The term in everyday speech usually refers to girls who have not reached legal adulthood, which varies across the world, who become pregnant. Thus, teenage pregnancies, encompassing conceptions by girls aged 19 or younger, are a worldwide phenomenon.

According to UNICEF (2001) and the Alan Guttmacher Institute (2000) more than 15 million girls, aged 15 to 19 years old, give birth each year representing 11% of all births worldwide. There are 65 births for every 1000 females aged 15-19 years (worldwide average). More than 90 per cent of these births occur to women in developing countries. There are, however, wide regional variations.

According to Treffers (2003), the highest rate of teenage pregnancy in the world is 143 per 1000 in girls aged 15-19 is in sub-Saharan Africa. Women in Africa, in general, get married at much earlier ages than women elsewhere leading to earlier pregnancies.

According to United Nations Populations Fund (UNFPA, 2003), the teenage birth rate in United States was 53 births per 1000 women aged 15-19 in 2002, the highest in the developed world. If all pregnancies including those that end in abortion or miscarriages are taken into account, the total rate in 2000 was 75.4 pregnancies per 1000 girls. Strasburger (2007) opines that over 80 per cent of teenage pregnancies in the U.S are unintended, approximately one third end in abortion, one third end in spontaneous miscarriage and one third will continue their pregnancy and keep their baby.

As per Wikipedia (the free encyclopedia) the UK has one of the highest teenage birth rates in Europe with a rate of 26.4 teenage births per 1000 women
aged 15-19 in 2006, down from 27.9 births in 2001. The UK also has a higher rate of abortion than most European countries.

Wikipedia, the free encyclopedia, states that 10 per cent of British teen mothers are married and adolescent pregnancy is viewed as a matter of concern by both the British government and the British press.

According to UNICEF (2001), in some countries such as Italy and Spain, the low rate of adolescent pregnancy (six births per 1000 women aged 15-19 in 2002 in both countries) may be attributed to traditional values and social stigmatization. These two countries also have the low abortion rates and their teenage pregnancy rates are among the lowest in Europe.

Dryburgh (2002) opines that the Canadian teenage birth rate in 2002 was 16 per 1000 and the teenage pregnancy rate was 33.9. According to data from Statistics Canada, the Canadian teenager pregnancy rate has trended towards a steady decline for both younger (15-17) and older (18-19) teens in the period between 1992-2002.

WHO (2007) reported that 8-15 per cent of adolescent girls have had a child by the age of 15 in Bangladesh, Cameroon, Liberia, Malawi, Mali, Niger in Nigeria. More recent data show different levels of adolescents already pregnant or as mothers by the age of 15 like four per cent in Mali, 16 per cent in Bangladesh, 17 per cent in Liberia. In the Eastern Mediterranean region as in Bahrain, 18-20 per cent of mothers get pregnant between the ages of 11-15 years, in Oman 16-18 per cent of women had their first pregnancy under 15 years of age.

According to WHO (2003), in Kuwait, 40.5 per cent of all women giving birth in the hospital were less than 16 years old. The average age at first pregnancy in Saudi Arabia is estimated to be 16 years. Nath and Garg (2008) opine that about 30 per cent of India’s population is in the adolescent age group
of 10-19 years. They represent a resource for the future whose potential can either be wasted or nurtured in a positive manner.

The Centre for Development and Population Activities (CEDPA, 2001) states that there are an estimated 105 million adolescent girls in the age group 10-19 years in India. In India, early marriage for girls receives religion and social sanction. Despite laws raising the legal age of marriage to 18 for girls, there are strong cultural pressures on parents to marry their daughters early. Thus, there are over 10 million pregnant adolescents and adolescent mothers in India, with one in six girls age 13-19 beginning child bearing. Bratati et al. (2009) stresses that in our country, teenage pregnancies after marriage, in contrast to unwed pregnancies in developed countries, have social approval but have an adverse impact on maternal mortality and perinatal morbidity.

Thus, Mehta et al. (2000), comment that in the Indian subcontinent, premarital sex is uncommon, but early marriage sometimes means adolescent pregnancy. The rate of early marriage is higher in rural regions than it is in urbanized areas. Fertility rates in South Asia range from 71 to 119 births per 100 women aged 15-19. Thirty per cent of all induced abortions are performed on women who are under 20 in India.

According to India Country Profile (2008) at national level, the latest survey indicated that approximately four per cent of women aged 15-19 were reported to be currently pregnant with their first child. Higher prevalence was found among women in rural areas. By age, highest rate of teenage pregnancy is found in the age group of 18 to 19. By subregional level, data in 2005/06 indicated that the teenage pregnancy rate varied from 0.8 per cent in Jammu to 5.7 per cent in Bihar and Kerala with 2.9 per cent.

Other parts of Asia have shown a trend towards increasing age at marriage for both sexes. In South Korea and Singapore, marriage before age 20 has all but disappeared and the rates of adolescent child bearing are low at four to eight per 1000. The rate of early marriage and pregnancy has decreased
sharply in Indonesia and Malaysia, however, it remains high in comparison to the rest of Asia (Wikipedia).

Sylvia (2009) reveals that pregnancy during early adolescence were thought to represent special risks, such as preterm labour, urinary tract infections, anemia, pre-eclampsia, high rate of caesarean section, preterm birth and low birth weight infants resulting in increased mortality and morbidity of the mother and child.

Mayor (2004) calls attention to the fact that teenage pregnancies are considered problematic because complications from pregnancy and childbirth are the leading causes of death in teenage girls aging between 15 and 19 years in developing countries. It is estimated that 70,000 female adolescents die each year because they are pregnant before they are physically mature enough for successful motherhood.

Langille (2007), therefore warns that pregnancies and births during adolescence are considered risky and the teenage birth rate is deemed as indicator of reproductive health politics. For that reason in many countries, teenage pregnancy has become labeled alongside cancer, obesity, diabetes or cardiovascular disease, a major public problem.

Therefore, teenage pregnancies are listed among the most important public health problems of the 21st century.

D. CAUSES OF ADOLESCENT PREGNANCY

Marriages and pregnancies during teenage life stage were common in historical times. Even today, early marriages, soon after menarche, are frequent in many developing countries and in traditional societies. Singh (2000) carry the fact that in some societies, early marriage and traditional gender roles are important factors in the rate of teenage pregnancy. In the Indian subcontinent early marriage and pregnancy is more common in traditional rural communities compared to the rate in cities.
A range of social, cultural, biological and service delivery factors contribute to the high levels of adolescent pregnancy and childbirth.

Bellies et al. (2006) is of the opinion that the incidence of teenage pregnancy is increasing due to early onset of puberty. The age of menarche has fallen substantially across all developed countries. Chen et al. (2007) feel that improved living conditions, infection control and an improvement of nutrition induced a so-called secular trend resulting in a reduction of female puberty onset. This means that reproductive competence has reached dramatically earlier. Furthermore, Clavel (2002) opines that the improved living condition and the sufficient food supply caused an increase in the rate of ovulatory cycles soon after menarche. Therefore, the probability of pregnancies during teenage increased in all developed countries. In developing countries also this is observable.

Nancy et al. (2003) states that the older teens become, the more likely they are to become sexually active and consequently to become pregnant. This age effect is due to both the physical and social changes of adolescence. Both pubertal development and testosterone levels have been found to be significantly associated with transition to sexual activity. Age also brings with it new social expectations that influence a teen’s likelihood of sexual activity.

Gupta (2003), observes that in a number of countries age at marriage is an important factor determining the age at which the first pregnancy occurs. Marriage generally occurs earlier in developing than in developed regions. The age at marriage varies in different parts of India, according to different social customs and ethnic and religious groups. In rural areas, early marriage is perpetuated by traditional beliefs regarding preserving a girl’s chastity and family needs to reduce expenditure.

Alan Guttmacher Institute (2000), states that while the average age at first marriage is rising among younger cohorts in most countries, it is still under 19 years in less developed parts of the world. About half of adolescent girls in
many countries of sub-Saharan Africa are either married or have entered a formal union by the age of 18, with 20-40 per cent of those in Latin America, and the Caribbean entering a union, where as in North Africa and the Middle East, the proportion is 30 per cent or less.

Demographic and Health Surveys (DHS) of WHO (2007) show that the proportion of young women aged 18 who are married varies considerably from country to country. Across Asia, the likelihood of early marriage is quite variable, 73 per cent of adolescent girls in Bangladesh are married by the age of 18 (90 per cent of all married women) as are 40 per cent of all women aged 15-19 in India. A high proportion of these married adolescents are believed to commence child bearing (58 per cent in India), but a substantial number of pregnancies go unreported due to the high rate of deliveries at home and not in institutions.

As per Wikipedia studies indicated that an important contributing factor is an age discrepancy between the teenage girl and the man who impregnates her. Teenage girls with older partners are more likely to become pregnant than those with partners closer in age.

Tamkins (2004) points out that women exposed to abuse, domestic violence and family strife in childhood are more likely to become pregnant as teenagers and the risk of becoming pregnant as a teenager increases with the number of adverse childhood experience. According to a 2004 study, one third of teenage pregnancies could be prevented by eliminating exposure to abuse, violence and family strife.

According to Anda et al. (2001) studies have found that boys raised in homes with a battered mother, or who experience physical violence directly, were significantly more likely to impregnate a girl. Ellis et al. (2003) comment that studies have also found that girls whose fathers left the family early in their lives had the highest rates of early sexual activity and adolescent pregnancy.
Joseph et al. (2008) reveal that adolescent may lack knowledge of or access to conventional methods of preventing pregnancy as they may be too embarrassed or frightened to seek such information. More than 80 per cent of teen pregnancies are unintended. Over half of unintended pregnancies were to women not using contraceptives. In some cases, contraception is used but proves to be inadequate. Inexperienced adolescents may use condoms incorrectly or forget to use oral contraceptives. Contraceptive failure rates are higher for teenagers than for older users.

WHO (2004) opines that low educational expectations have been pinpointed as a risk factor. Women with some secondary schooling, however, are less likely to give birth during adolescence. The effect of education in the development of modern adolescence has postponed the age of marriage.

Goonewardena and Deeyagaha (2005) opine that the likelihood of teenage pregnancy and childbearing seemed to be associated with the level of education. The majority of the teenage girls are unaware of the process of conception and dangers of unplanned pregnancy before the onset of pregnancy. In Srilanka, one-third of young adults age 16-24 did not know the duration of a normal pregnancy.

Waszak et al. (2003) report that education could play a significant role in developing self-confidence, increasing age at first sexual intercourse and delaying marriage. The level of education of the woman is an important determinant in terms of the care seeing during pregnancy. Adolescents with higher levels of education receive more care.

Shrestha (2002) emphasizes that the low involvement of teenage girls in decision making also contributed to early pregnancy. Most adolescent marriage (80 per cent) were arranged by parents without the girls consent.

Sharma et al. (2002) found that a higher proportion of adolescent pregnant women (67 per cent) were found to be part of an extended family, of
which just over half (51 per cent) claimed that the authority over conception remains with their husband in spite of the teenagers desire to make their own decision. In addition Ganatra and Hirve (2002) state that teenage girls are also less likely to visit the health service clinics without their husband’s permission. A significant proportion of teenagers had a low uptake of antenatal care compared to adult mothers. Socio-economic deprivation remains significantly important reflecting differential access to health services among teenage mothers. Another reason for low uptake of antenatal care facilities by pregnant teenagers is lack of physical and mental maturity.

Banerjee (2007) stresses that across countries and cultures, women have been victims to social pressure and are often in a position to neither regulate their pregnancy nor make decisions regarding their reproductive performance. Husbands and mothers-in-law are the primary decision makers.

According to UNICEF (2001) poverty is associated with increased rates of teenage pregnancy. Economically poor countries such as Niger and Bangladesh have far more teenage mothers compared with economically rich countries such as Switzerland and Japan. In the developed world, adolescent mothers are more likely to have been brought up in a less advantageous social environment and in a low socio-economic status household. High adolescent pregnancy rates occur in the poorer and more deprived sectors of developed nations.

Kirby (2001) reveals that children of parents with low occupation and income are more likely to have sex at an early age, not use contraception consistently and become pregnant or cause a pregnancy. The causes of this finding are unclear, however, it may be a result of parents of higher socio-economic status placing a greater emphasis on having more resources to support their children’s long-term educational and career goals, efforts which would be restricted by early child bearing.
E. EFFECT OF ADOLESCENT PREGNANCY ON THE MOTHER AND CHILD

Mary and Jamie (2000) opine that the phenomenal growth that occurs in adolescence creates increased demands for energy and nutrients. But adolescents are exposed to under nutrition as well as obesity. For many adolescents, inadequate quality and quantity of food are the prime determinants of nutrition problem. The lifestyle and eating behaviours, along with underlying psychosocial factors are particularly important threats to adequate nutrition.

WHO (2005) reports that with the epidemiological and nutritional transition coupled with globalization of economics, nutritional problems of industrialized countries became increasingly prevalent in low and middle income countries. Obesity, diabetes and hypertension are present in wealthy, middle income and poor groups. So it is recognized that the extremes of over nutrition and under nutrition are often times concurrent problems in adolescent populations.

According to WHO (2006) deficiencies can be found in poor societies because of poverty and in better off groups because of poor eating patterns. Past malnutrition or low body nutrient stores may have consequences during adolescence or further increase chronic disease risk later on in adulthood.

The conceptual framework is shown in Figure II, illustrates the major nutritional issues in adolescence. This model which is adopted from UNICEF 1990 (WHO, 2005) is deemed relevant for adolescents, irrespective of geographic area or income level, although the magnitude of problems and priority issues may differ from one country to another and even within countries.

As per Siddhartha et al. (2008) teenage pregnancy is an important public health problem worldwide as it often occurs in the context of poor social
support. Early pregnancy exposes mother and child to risk owing to potential competition for dietary energy and nutrients.

CONCEPTUAL FRAMEWORK OF NUTRITIONAL PROBLEMS AND CASUAL FACTORS IN ADOLESCENCE (WHO, 2005)

FIGURE II

Guiterrez and King (2000) opine that adolescents often enter pregnancy with reduced nutritional stores and hence are at increased risk of nutritional deficiencies which may be due to unsatisfactory eating habits inadequate intake as a result of poor access to food. According to Mary and Jillian (2000), pregnant teenagers have food preferences and eating behaviours similar to
those of non-pregnant teenagers and tend to eat what is readily available, affordable and appealing.

Kathleen and Sylvia (2008) stress that pregnancy and childbirth among adolescents carries more risk than in adult women and the resulting complications are attributable to both biology and the social environment. Thus, teenage pregnancy continues to be considered as one of the major health problems and is also associated with significant medical and nutritional risk (Figure III).
Pregnancy in Adolescence

PATHOPHYSIOLOGY AND CARE MANAGEMENT ALGORITHM

FIGURE III

(Algorithm content developed by John Anderson and Sanford, C. Garner, 2000)
(Kathleen and Sylvia, 2008)
Dreyfuss et al. (2000) feel that anaemia, whether or not the primary cause is iron deficiency, is generally recognized as the greatest nutritional problem among adolescents and diet is likely a major factor. Anaemia can be associated with other nutrient deficiencies (folic acid, vitamin A and B\textsubscript{12}) as well as with infectious diseases and intestinal parasitic infestations.

Gawarikar et al. (2002) state that during adolescent period, the risk of iron deficiency and anaemia among boys and girls appears to be more due to growth spurt and in girls it remains as such during their reproductive life. Anaemia has a serious negative impact on growth and development during adolescent and decreases the ability to concentrate and learn. Iron deficiency was shown to be associated with impaired cognitive process in adolescents as suggested by improved performance following supplementation in South-East Asia.

Studies by Brabin et al. (2001) showed that anaemia was found to be common in teenage mothers. In addition, anemia in adolescence may also impair the immune response thus making them more prone to infections. Iron deficiency anaemia occurs in approximately 11 per cent of adolescents during the first and 16 per cent during the second trimester of pregnancy.

Irene (2000) put forth the fact that iron deficiency anaemia in pregnancy may increase perinatal morbidity and occurrence of maternal complications. The dietary iron absorption increased by about 50 per cent during the second and third trimester of pregnancy. The diets of pregnant adolescents, however, are frequently low in iron. Iron deficiency anaemia in the first and second trimester has been associated with a two-to-three fold increased risk of prematurity and low birth weight. Maternal anaemia and low iron stores thus have been associated with decreased infant iron stores particularly at 4-6 months of age and infants of anaemic mothers are more likely to develop anaemia by 12 month of age.
Kalaivani (2009) opines that maternal anaemia is associated with poor intrauterine growth and increased risk of preterm births and low birth weight rates, still birth, neonatal infection and maternal mortality. Anaemia in adolescent pregnancy may also be associated with a higher risk of hypertension and heart disease in the offspring of anaemic mothers. This in turn results in higher perinatal morbidity and mortality and higher infant mortality rate.

Kidanto et al. (2009) in a study revealed that the risk of preterm delivery and LBW increased in proportion to the severity of maternal anaemia. Malviya (2003) in a study among pregnant adolescents showed a haemoglobin concentration less than nine g/dl which contributed to higher frequency of premature labour and lower birth weight of babies.

Black (2001) opines that iron deficiency, resulting in anaemia is highly prevalent in women in developing countries as increased iron requirements in pregnancy are not often met by changes in the diet or absorption. About 1/3rd of Indian women were found to be suffering from moderate to severe iron deficiency according to NFHS (2000).

Mahajan et al. (2008) revealed the anthropometric parameters measured in severely anaemic mothers to be significantly low in pre-post pregnancy weight and a significant decrease in maternal fundal height and abdominal circumference. The anthropometric measurements of the neonates born to severely anaemic mothers showed a significant reduction in ponderal index, birth weight and placental weight.

Thus, anaemia in pregnancy is a condition with effects that may be deleterious to the mother and foetus. So, Vasanthamani and Durga (2009) suggest that since anaemia is more commonly prevalent among adolescents, should gain more importance as they are the most crucial segment of the population whose wellbeing influences the future generation.
Mary and Juli (2000) stress that diets of adolescents are often limited to folate which may be due to the skipping of breakfast and limited consumption of fruits and vegetables in their diet. Folate, essential for nucleic acid synthesis is required in greater amounts in pregnancy for maternal and foetal tissue growth and red blood cell formation. A deficiency of this in pregnancy may result in extra uterine growth retardation, congenital anomalies and spontaneous abortion.

Mary et al. (2009) call attention to the fact that epidemiological studies have shown repeatedly that inadequate folate status or atleast folate metabolism can be associated with developmental abnormalities including NTD’s and increased risk for chronic degenerative diseases such as cardiovascular disease, cancer, cognitive dysfunction and osteoporosis.

WHO (2005) observes that because maximum bone mass is acquired during adolescence, calcium deposited during this period determines the risk of osteoporosis in adulthood. Calcium deficiency apparently increases the risk of bone fracture even among adolescents as observed among those not meeting 60 per cent of dietary allowance for calcium. Mary and Juli (2000) also opines that adequate calcium intake is especially important for pregnant adolescents who are still increasing their bone mass. A higher peak bone mass during adolescent years is protective against post menopausal osteoporosis. A lower incidence of preterm delivery and low birth weight was observed in pregnant adolescents randomized to receive 200mg per day supplemental calcium.

Although the risk of vitamin A deficiency declines with age, it frequently extends into adolescence and further into early adulthood. Ahmed et al. (2001) showed that there is a high prevalence of sub-clinical vitamin A deficiency among adolescents. The deficiency is associated with excess mortality. A maternal deficiency of vitamin A can impair foetal growth. Nutrition network (2000) reports that the origins of vitamin A deficiency in childhood can be traced to poor vitamin A status of the mother during
pregnancy and lactation and poor intake of foods rich in either performed vitamin A or carotenoids. Inadequate intake of vitamin A or β-carotene and fat during pregnancy results in deficient stores of the nutrient in the mother and foetus.

According to Carroll and Karen (2001), zinc deficiency has been associated with abnormally long labours and delivery of small and malformed infants.

As per WHO (2006), iodine deficiency during pregnancy has been associated with increased incidence of miscarriages, still births, birth defects and mental retardation and if severe may result in cretinism in the offspring.

According to Klein (2005) pregnant teens are at much higher risk of having serious complications such as pregnancy induced hypertension, toxemia and high blood pressure. Chronic, pre-existing hypertension, pregnancy induced hypertension (PIH) as well as PIH superimposed on chronic hypertension may occur in adolescent pregnancy. Pregnancy induced hypertension is associated with an inadequate expansion of plasma volume, an increase in vascular tone, lower serum-ionized calcium and increased intracellular calcium levels.

WHO (2003) reports hypertensive disorders in pregnancy are a major cause of perinatal mortality and morbidity in adolescent pregnancy. Perinatal mortality rates may be five times higher and neonatal morbidity may be increased by as much as 50 per cent.

Paul (2007) explains that pregnancy induced hypertension also called, toxaemia, is related to protein deficiency in the diet, which may also be poor in calcium and salts. It usually occurs in the first trimester with symptoms of hypertension, excessive oedema and albuminuria. In very severe cases (eclampsia), it shows in the form of convulsions or coma.
Irene (2000) opines that adolescent pregnancy may be complicated by pregnancy-related or diagnosed gestational diabetes (GDM) as well as pre-existing type 1 or type 2 diabetes mellitus. Uncontrolled gestational diabetes is a major cause of perinatal mortality and morbidity.

More than 50 per cent of women with GDM will eventually develop Type 2 DM. Obesity increases the risk of developing this condition. Gestational diabetes and even mild maternal impaired glucose tolerance increase the risk of insulin resistance, diabetes and obesity in the offspring in later life and possibly in future generations.

Nurul et al. (2010) put forth the fact that nutritional deficiencies have far reaching consequences especially in adolescent girls. The prevalence of these deficiencies of today’s adolescent girl is directly linked to the quality of the next generation.

As per Afework et al. (2009), if their nutritional needs are not met, they are likely to give birth to undernourished children, thus, transmitting undernutrition to future generations.

Adolescent mothers experience more pregnancy and delivery problems and have less healthy babies than adult mothers. Martin et al. (2003) opine that teenagers who give birth have an increased risk of poor pregnancy outcomes. Most teenage pregnancies are unplanned and young women often are unaware that they are pregnant and delay entry to prenatal care.

Theresa (2007) states that other risk factors shared by pregnant adolescents in developed and developing countries include poverty, lack of education, poor diet and nutrition, poor school performance and a family history of early childbearing. There are, in addition, inherent biological factors that operate during adolescent pregnancy to impair foetal growth. These factors act even when the mothers receive adequate prenatal care and lives under favourable social and economic circumstances.
Jolly et al. (2000) point out that today in developed countries teenage pregnancies especially among teenager older than 15 years, represent no increased obstetrical problem.

But Demir et al. (2000) emphasize that the situation in developing countries is completely different. Complications from pregnancy and childbirth are frequent and the leading cause of death for adolescent girls between 15 and 19 years in developing countries.

According to Granja et al. (2001) and Smith (2002) there are severe obstetrical risks. Malnutrition leads to reduced growth and shorter stature among teenage girls in developing countries. Beside stature, height, pelvic breadth is often affected by malnutrition leading to a too narrow pelvic inlet. Because of that a vaginal delivery is often impossible. Watcharasernee et al. (2006) add that genital mutilations, fistulas and HIV infections are further problems. Oklahoma (2007) expresses that teenage mothers are less likely to gain adequate weight during their pregnancy, leading to low birth weight, which is associated with infant and childhood disorders and a high rate of infant mortality.

Ventura et al. (2001) report that teenagers who give birth have an increased risk of poor pregnancy outcomes including preterm delivery, low birth weight and small for gestation births. In addition, there is an increased risk of operative delivery, and caesarean section. It has been suggested that the physical maturity of the teenage mothers was the underlying factor.

Prematurity rates have been reported to be higher in teenage mothers than in the older group by many authors. Probable causes for the higher incidence of preterm labour may be anaemia, malnutrition, pregnancy induced hypertension or lack of antenatal care.

Nato (2005) and Isaranurug et al. (2006) point out that teenage mother had a significant higher incidence of low birth weight babies. Low birth weight
babies are more likely to have organs that are not fully developed which can result in complications such as bleeding in the brain, respiratory distress syndrome and intestinal problems. The incidence of still birth one of the neonatal complications also was found to be significantly higher in teenage pregnancies.

WHO (2007) also report an increased incidence of pregnancy induced hypertension and pre eclampsia which is a dangerous medical condition that combines high blood pressure with excess protein in the urine, swelling of a mother’s hands and face and organ damage. Anaemia and intrauterine growth retardation is also found in teen pregnancies.

Sharma et al. (2001) reveal that pregnancy wastage like still birth and abortions was observed much higher among adolescents which may be because of physical immaturity of the adolescent women. This biological immaturity may result in growth restriction of the offspring. It was also shown that immaturity of the uterine or cervical blood supply predispose teenage mothers to sub-clinical infection, an increase in prostaglandin production and a consequent increase in the incidence of preterm delivery.

According to Laloo (2000) in large regions of the world malaria is endemic. There is good evidence that parasitaemia is more common and heavier in pregnant than non-pregnant women and that during pregnancy placental infection occurs. This leads to consequences for both mother and foetus. Nulliparous women including adolescents are more prone to attacks than multiparae.

Granja et al. (2001) stress that malaria is one of the most important cause of maternal mortality in adolescents. In endemic areas malaria is an important cause of anaemia, especially during pregnancy together with nutrition deficiencies.
Hanna (2001) opines that in developed countries teenage pregnancies are socially undesired and also lead to further social disadvantage. Teenage mothers having high drop out rates at school, thus with a low educational level have lower incomes, a worsened living situation and they are often single mums because partnerships at this age are unstable. Because adolescent mothers have less education, they tend to have more children than those who delay child bearing.

Therefore, Spencer (2001) states that a teenage pregnancy is often an indicator of low social status. This situation leads to increased stress during pregnancy and contributes independent of low maternal age, to an adverse pregnancy or birth outcome among teenage mothers. Therefore, the majority of teenage pregnancies in developed countries end with induced abortion.

Reid and Meadows (2007) states that among teenage mothers, an increased risk of postpartum depressions (depressions that starts after delivering a baby) has been reported. This can interfere with taking good care of a new born.

According to WHO (2007) in developing countries maternal mortality is much higher. Adolescents tend to have a higher maternal mortality rate than older women. The risk of dying from pregnancy-related causes is twice as high for women aged 15-19 as for women in their early twenties. For girls aged 10-14 years, the risk of dying may be five times higher than for women in their twenties.

UNICEF (2001) reports a link between the risk of dying during pregnancy and childbirth and the lower social and economic status and lower level of education of adolescents. In addition, less use of health facilities and antenatal and obstetric care has also been linked to high maternal mortality among adolescents. Maternal mortality is higher among adolescents in rural areas, reported rates being upto 4-6 times higher than for poor urban areas.
Donna et al. (2002) conceive an idea that births to adolescents can result in health problems for the neonate including premature births (before 37th week of gestation) and low birth weight (less than 2500g).

According to Lao and Ho (2000) the new born growth restriction is mainly due to increased rates of preterm deliveries which are thought to be predominantly caused by the immature physical maternal development. In order to have a successful passage through the relatively narrow bony pelvis, in very young mothers, the delivery has to take place earlier than in older counterparts. This earlier delivery of very young teenage mothers may result in higher incidence of low weight new borns.

In a study by Kumar et al. (2007) neonatal morbidities like incidence of birth ‘asphyxia’, respiratory distress syndrome and neonatal hyperbilirubinemia were significantly more in the teenage group. Chang et al. (2003) has reported increased incidence of foetal death.

AlRamahi and Saleh (2006) report that neonatal mortality was also found to be almost three times more common in babies born to teenage mothers. Kalanda et al. (2006) reveal that an infant’s risk of death during the first year is 30 per cent higher if born to a young mother than to an adult. In Nepal, the death rate of new born to a teenage mother was 73 per cent higher than for new born of older mothers.

According to Singh and Darroch (2000) the offspring of adolescent mothers may be at higher nutritional risk because of size and nutrient stores at birth, but also of breast feeding and child care practices. As per Klein (2005) the children of adolescent mothers do not fare as well as those of adult mothers. As they grow, they tend to suffer poorer health than do the children of women who were in the age of 20 or 21 when their first child was born.

American Academy of Pediatrics (2001) reports that early motherhood can affect the psychosocial development of the infant. The occurrence of
developmental disabilities and behavioral issues is increased in children born to
teen mothers.

According to www.cpeip.fsu.edu, poor academic performance in the
children of teenage mothers has also been noted. Negative effects on the
cognitive development of children born to adolescent mothers are evident.
Poverty, inadequate social support, mother’s lack of education, mother’s
cognitive immaturity and greater maternal stress have all been suggested as
possible factors contributing to poor social and educational outcomes for the
children of teen mothers.

Teenage pregnancy is thus seen to be a serious problem, giving rise to
many complications.

F. STRATEGY FOR NUTRITIONAL INTERVENTIONS AND
PREVENTION OF ADOLESCENT PREGNANCY

Eating patterns are frequently irregular in adolescents which is a
common factor of nutritional risk irrespective of the area. As per Shubhangna
et al. (2009) in India, poor nutrition, early child bearing and reproductive
health complications compound the difficulties of adolescent physical
development. Most girls are not adequately aware of their increased nutritional
need for growth resulting in girls that are underweight and of short stature.
Adolescent girls face more problems than boys, largely due to socio-cultural
factors. Even in developing countries some of the dietary patterns like meal
skipping, snacking, irregular meals, wide use of fast food, appear quite
common among adolescents.

According to WHO (2005) adolescence represents a window of
opportunity to prepare for healthy adulthood. Healthy eating and lifestyle
behaviour should be promoted and practiced, thereby preventing or postponing
the onset of nutrition-related chronic diseases in adulthood. Under nourished
adolescents would require further nutrition interventions, besides proper
healthcare, to improve their health and nutrition status. While it is important to improve nutrition of both girls and boys, girls demand more attention because of their reproductive role.

British Medical Association (2003) states that early intervention and targeted intervention are valuable approaches in all aspects of adolescent health. Health education offers some potential benefits to improve adolescent’s nutrition. Nutrition education, thus helps to achieve a behavioural change in teenagers by creating interest in nutrition and in the benefits derived from sound eating practices.

According to WHO (2005), the strategy for nutrition intervention in adolescence suggests components of promotion, prevention and treatment. Thus, promoting adequate nutrition with adolescents means enhancing control of adolescents over their food and food resources and improving their access to appropriate nutrition services in addition to strengthening food-related skills and encouraging healthy eating and lifestyle. Prevention focuses on a specific condition like malnutrition and specific micronutrient deficiencies. Treatment includes health care services to deal with nutritional aspects of diseases in adolescents in an appropriate manner.

As per Bhatia (2001) school-based nutrition interventions also provide the most effective and efficient way. Schools provide a setting to introduce nutrition information, technologies to the community and also interventions such as nutritional screening, providing micronutrient supplements, ensuring consumption and nutrition behaviour development and school feeding programmes. He further suggests that in populations where many adolescents are not in school, school outreach programme have been found effective. Vocational schools and other community-based institutions such as youth groups can also be involved in addition to using the media. Adolescents may also be reached through work-site programmes in certain case.
WHO (2005) reports that nutrition promotion and education helps to encourage healthy eating and physical activity, strengthen self-esteem as a means of resisting adverse environmental influences on eating and dieting practices, contribute to preventing obesity and disordered eating through these attitudes and behaviour. Behaviour change through communication is a multi-level tool for promoting and sustaining the desired behaviour in individuals and communities by providing important information about food and by promoting a particular brand.

According to Delisle et al. (2001), an intensive social marketing strategy is essential for behaviour change. Social marketing has been shown to be effective in promoting consumption of carotene-rich foods and significantly reducing vitamin A deficiency.

Creed-Kanashiro et al. (2000) suggest iron deficiency and anaemia need to be controlled and prevented, particularly in girls and ahead of pregnancy as much as possible. Iron deficiency is the predominant cause of anaemia and correcting it is an investment in adult productive and reproduction lives. They suggest interventions for IDA and other micronutrient deficiencies in adolescents by promotion of consumption of micro-nutrient-rich foods through home gardening, provision of food through community kitchens or poultry farming.

Kanani and Poojara (2000) stress the importance of the provision of iron and folic acid supplements to adolescent girls through schools or thorough community out reach programme. Shah and Gupta (2000) point out that a weekly iron supplement was as effective in improving iron status as a daily supplement on adolescents in Indonesia, Srilanka and Nepal. Shobha and Sharda (2003) studied the efficacy of weekly twice iron supplementation in anaemic adolescent girls and found to be as advantageous as daily supplementation, as far as raising the haemoglobin levels were concerned.
WHO (2000) opines that nutritional assessment should be an inherent part of preventive healthcare services to adolescents. This includes anthropometry (weight and height) for assessing under-nutrition and stunting on one hand and obesity on the other and screening for the indicators of malnutrition and the results of the assessment to be used for counseling the adolescents and their families for taking corrective action.

Pregnancy among adolescents is a public health concern. Adolescents may enter pregnancy with poor nutritional status and low nutrient stores. Long et al. (2002) confirms that intervention programmes should focus on nutrition of pregnant adolescents and reduce the risks of pregnancy during adolescence. Nutrition intervention during pregnancy essentially includes nutritional advices, micronutrient supplementation and food supplementation.

As per UNICEF (2001) in developing countries poorer women, adolescent or adult are more likely to be under nourished and food supplementation during pregnancy is seen as a potentially effective intervention. A study in Guatemala showed that a long term food supplementation trial showed that infants derived more benefit when the mother was malnourished.

Thus, WHO (2005) reports that improving adolescent girls nutrition has benefits other than reproduction. The wellbeing and long term nutritional health of women are legitimate goals in themselves. Improving their nutritional status and enhancing their nutrition related skills is therefore likely to have long-range benefits for themselves and their families.

Adolescent pregnancy is a critical issue not only for maternal and newborn health but also for social and economic development. Adolescents continue to remain at risk, thus calling for development and strengthening of need based interventions.
Making Pregnancy Safer (2008) reports that not only do adolescent mothers account for a large and disproportionate share of maternal deaths and disabilities but early motherhood can contribute to problems beyond health-missed education and gainful employment opportunities, low self-esteem and a vicious cycle of poverty, morbidity and poor socio-economic and health outcomes that can have intergenerational effects. So, addressing the problems of adolescent pregnancy requires a multi-pronged approach that incorporates both prevention of pregnancy and care for pregnant adolescents and their newborn.

Kirby (2001) opines that efforts to prevent adolescent pregnancy at both the national and local levels have increased in recent years and there has been increasing evidence that several kinds of programmes may help decrease sexual risk taking and pregnancy among teenagers.

American College of Obstetricians and Gynecologists (2007) reports that educators, youth serving organizations, families and health care professionals have joined together in many communities to help adolescents postpone pregnancy. Adolescent pregnancy prevention programmes often focus on objectives to education and assist adolescents in increasing their ability to abstain from or delay sexual intercourse, to improve adolescents use of and access to family-planning services and to enhance adolescents’ life options by providing alternatives to early pregnancy and child bearing.

US Teenage Pregnancy (2004) states that different kinds of teen pregnancy prevention programmes like knowledge-based programmes focusing on teaching adolescents about their bodies and their normal functions, as well as providing detailed information about contraceptives and prevention of Sexually Transmitted Diseases are offered.

WHO (2007) reports that some countries have developed specialized services within facilities serving all women, particularly with facilities where a large number of adolescents are giving birth or seeking post-abortion care.
These add-on programmes offer antenatal and postpartum care with concerted efforts to improve nutritional status, provide psychosocial support, educate young mothers about breast feeding and infant care and encourage follow-up visits. Many programmes also provide family planning counseling and services for adolescent mothers in an effort to prevent unwanted pregnancy.

Programmes are designed to improve pregnancy outcomes among adolescents based on a multidisciplinary approach in a specialized health care facility. According to Morris (1998), a comprehensive adolescent-focused antenatal care programme at the university of Texas Medical Branch was evaluated using adolescent pregnancy records. Details from the adolescent-focused clinic suggest that the clinic provided general monitoring during the course of pregnancy, with special emphasis on educational, social and nutritional support. The results of the study suggested improved pregnancy outcomes among adolescents who received antenatal care as compared to those who received no care.

Bensussen and Saewye (2001) report that another study in the United States compared the outcomes and cost-effectiveness of comprehensive interdisciplinary adolescent antenatal care clinics. The authors of the study concluded that teen-focused clinic care appears to result in improved outcomes and better continuity of care than traditional adult-centred models of obstetric care and is more cost effective.

Rogers et al. (1998) state that the Resource Mother for Pregnant Teens Program (RMP) in the United States was also based on a multidisciplinary approach providing social support to improve the pregnancy outcomes by modifying the effect of stress and behavioural change such as nutritional habits or smoking and substance abuse. The authors found a significant effect of the programme on preterm birth and suggested a positive role of social support.

WHO (2007) found that in Portugal, a hospital based programme with comprehensive antenatal care emphasizing the specific nutritional and other
health needs demonstrated a positive effect on the outcome of pregnancy in adolescents. The simple intervention resulted in improved foetal growth and decreased need for care in the high risk newborn unit.

Some of the programmes are based on a more integrated and holistic approach including empowerment of girls, emphasis on development of life skills, education and medical concerns.

McNeil (1998) views that the Women’s Centre of Jamaica Foundation (WCJF) is one of the few concerted efforts that have been evaluated and documented to support pregnant as well as parenting adolescents with the objective of motivating and encouraging pregnant and lactating mothers under the age of 16 years to return to school and continue education. The programme also encouraged the participants to delay a second pregnancy until their academic and professional goals were achieved. The effort raised the young mother’s employment potential and provided them an alternative to depending on others for support.

Levitt (2003) emphasises that the Better Life Options (BLO) Programme (BLO) in India has been implemented by the Centre for Development and Population Activities (CEDPA) in India since 1989 in the urban slums of Delhi, rural Madhya Pradesh and rural Gujarat based on a holistic approach in integrating education, livelihood and reproductive health and aims to broaden the life options of adolescent girls aged 12-20 years. The programme offers a combination of life skills including literacy and vocational training support to enter and stay in school, family life education and leadership training. An assessment of the impact of this programme shows that BLO participants had learned a vocational skill and had increased self-esteem and confidence by taking a greater role in decision-making and frequently accessing health-care services for themselves and their children.

Iyengar and Iyengar (2000) reveal that the Reproductive and Child Health Clinic – Action Research and Training for Health Programme (ARTH)
in India was initiated in 1998 as a part of a field health service and surveillance programme in a rural area of Southern Rajasthan India. One of the interventions is to promote safe motherhood by providing maternal and neonatal health services through professionally trained community midwives. The programme also enhances the role of men in the family through community educations, thus contributing to safe motherhood.

Nath and Garg (2008) emphasis that the Indian Scenario has gradually witnessed an emergence of Adolescent Friendly Health Services (AFHCs) run by governmental, private and voluntary health agencies. The Pan American Health Organization and WHO has supported development of AFHCS in the country out of which many are being sustained with government support and the institutions own efforts and encompass provision of reproductive health services, nutritional counseling, sex education and life skill education to adolescent boys and girls.

According to www.whoindia.org, WHO is supporting the government of Tamil Nadu in using Mapping Adolescent Programming and Measurement Framework (MAPM) in developing covered district action plans focusing on adolescents.

Agrawal et al. (2008) explain that The National Institute of Research in Reproductive Health (NIRRH), Mumbai in collaboration with the Municipal Corporation of Mumbai started Adolescent Friendly Health Clinics, under the name, “Jaruti”, for providing specialized reproductive and sexual health services to adolescent boys and girls.

According to Cbhi.hsprod.nic.in, The Family Planning Association of India (FPAI), has set up AFHC as a pilot project under the banner of “Jigyasa” in four districts of Madhya Pradesh.

Pathfinder (1999) reports that in Bangladesh, where marriage tends to occur early, newlywed adolescents have become a priority group for
reproductive health programmes. Pathfinder Bangladesh, through its Rural Service Delivery Program (RSDP), has developed a newly wed program to address the needs of young married girls by delaying of first birth and encouraging small families.

Kitzman et al. (2000) reveals that while prevention of teen pregnancy is a primary goal to improve the health and well-being of teen mothers and children, a secondary goal is to provide the support and assistance services necessary for positive outcomes in the children of teen parents. The focus includes healthy birth outcomes and support in developing positive health behaviours, parenting and life skills. Studies have found that this kind of intervention improves prenatal health, increases intervals between births, reduce child abuse, and neglect and improves school readiness.

Berglas et al. (2003) express that over the past decade, there has been a fundamental shift in the development of adolescent pregnancy prevention programs. Increasingly, education and services that focus on sexuality and reproductive health are now being linked to efforts to strengthening resiliency, the ability of youth to overcome obstacles and build the competencies needed to succeed as adults.

Prevention programs, now have broader scopes and set goals for improving academic, social and vocational skills and prospects. These multifaceted efforts encourage youth to develop connections with their community and have high expectations for their futures so that they are motivated to delay pregnancy and child bearing until adulthood.