CHAPTER 2

REVIEW OF LITERATURE

Review of literature is a key step in the research process. It is an essential step for the development of the research project. It refers to an extensive and systematic examination of publications relevant to the project. It helps to develop an insight into and directs the researcher to develop a plan. (Basavantappa, 1998). A survey of the literature in connection with the present study thus includes, studies concerning knowledge and practices of antenatal mothers with regard to prevention and management of anaemia during pregnancy. The literature reviewed has been discussed under the following headings:

1) Awareness regarding antenatal care.
2) Anaemia during pregnancy.
3) Relationship between selected variables with regards to prevention and management of anaemia during pregnancy.
4) Health education in relation to prevention and management of anaemia during pregnancy.

2.1 AWARENESS REGARDING ANTENATAL CARE

Antenatal care is the root of the tree of preventive medicine; the social aspect is the soil in which it grows. After conception, antenatal care is important for the health of the mother and optimal development of the foetus, as well as for preventing / minimizing the complications of pregnancy, labour, postpartum and neonatal periods. The birth of a child is a happy event for every family. Every expectant mother needs appropriate antenatal care at the right time and at the right place. The primary aim of antenatal care is to achieve a healthy mother and a healthy baby at the end of the pregnancy. The aim should be to:

a) Provide antenatal care for all women;

b) To promote and maintain the health of the mother during pregnancy;

c) To identify high risk pregnancies and provide special care for those mothers;
d) To give prophylactic iron and folic acid tablets. Two tablets a day for 100 days, diagnose anaemia clinically and treat with Iron Folic Acid tablets, 3 tablets a day for 100 days, dietary supplementation with high energy, iron, protein foods for under nourished women, which could lead to increased birth weight;

e) Immunization of pregnant women to avoid tetanus;

f) Deworming with membendazole (during the 2nd the and 3rd trimester);

g) Care at birth ensuring the 5 cleans. 5 cleans are: clean surface, clean hands, clean razor blade, clean cord tie, and clean cord stump (no applicant);

h) Post-natal care including advice and services for limiting and spacing births;

i) Early detection of complications such as, clinical examination to detect anaemia, bleeding (indicating Antepartum Haemorrhage or Postpartum Haemorrhage), weight gain of more than 5 kg in a month or systolic BP more than 140 mm Hg; fever –39°C and above after delivery, prolonged labour. Emergency care for those who need it;

j) Educational advice on good health, child bearing and child rearing care. To teach the mother elements of childcare, nutritional personal hygiene, adequate rest, avoid heavy work, journey, etc. Antenatal care is preventive and promotive health care. Health during pregnancy depends on health before pregnancy (Myles M.F 1968).

A women’s access to health services is vital. Because a women has the responsibility of caring for the health of her entire family, her knowledge of nutrition and health is important, both for herself and the health of the family. During pregnancy health plays a triple role that is for the mother herself, the foetus and the family; hence in relation to health, the health care delivery system is of utmost importance.

Ideally the mother should attend the antenatal clinic at least once a month during the first seven months; twice a month during the next two months and there after once a week, if everything is normal. A high proportion of mothers in India are from the lower socio-economic group and many of them are working women. Attendance at the antenatal clinic may mean loss of daily wages. Consequently, it is difficult for them to attend the antenatal clinic so often. In these cases, a minimum of
four visits covering the entire period of pregnancy is adequate; 1st visit before the 3rd month, 2nd visit during the 6th month, 3rd visit during the 8th month and 4th visit during the 9th month. Antenatal care brings safety in childbirth to mother and to her baby. Number of checkups provided is a standard of 5 times for normal pregnancy; at 10th week, 18th week, 32nd week, 36th week. However women developing high risk pregnancy should get at least 10 times or more check ups at 10th week, 18th week, 24th week, 28th week, 39th week, and 41st week or till she is admitted into high risk Pregnancy ward. (Myles 1968).

A woman’s own perception of pregnancy and her health status are major factors that will influence her health decision making. These health perceptions not only reflect her cultural background, but also her role and status within the family and community. In many traditional societies, one of the most important roles of a woman is to produce children. Giving birth to a child is viewed as a rite of passage, a chance for a woman to prove her fertility and improve her status within the community. Pregnant women are expected to carry on with their daily activities the same way as they would in a non-pregnant state and often the side effects of pregnancy are de-emphasized. In addition, the community may look unfavourably on women who complain about symptoms associated with pregnancy. Thus, health problems associated with nutritional anaemia may not be recognised or may be ignored. (W.H.O/M.C.H., 1990).

National child survival and safe motherhood programme, plan and implement Maternal Child Health (hereafter, MCH) services prepared by the Ministry of Health and Family Welfare, Government of India, New Delhi 1992 stated one case study. Taiji Bai came for her first antenatal visit during the 7th month of pregnancy. On enquiry it was found that Taiji was 29 years old, having five full-term normal deliveries and the last delivery was eighteen months, back. This time she said she was feeling tired for the last two months, feeling breathless and could not perform routine house hold work which she could before, she had developed swelling of the feet during the last one month. The Auxiliary Nurse Midwife (hereafter, ANM) found her pale and she asked her to get admitted. Taiji did not get admitted because her husband did not take her as there was nobody at home to look after the children, Taiji also said that she had five normal deliveries at home, there was no check-up done.
Three days later, when the ANM visited her, she had gone into labour and delivered at home by an untrained dai. After the delivery of the baby, there was severe bleeding and part of the placenta was still inside. So the dai told her to go to hospital. Before any transportation was organised Taiji died at home.’

Taiji went to visit a private practitioner in the village at the seventh month, she was found to be anaemic therefore he advised iron and B complex tablets. But Taiji did not consume it due to it not being purchased. Who are the decision makers in this case? What was the role of health personnel? How will you prevent this death? It is important that antenatal care by appropriate health personnel be given at the right time. Also women and family members should be made aware of the importance of antenatal care. It is done through IEC (Information, Education, and Communication). That is, to provide correct information, adequate health education and appropriate communication in relation to antenatal care at all the levels in health care sector.

According to a study done by Murali I. and Kataria M. (1980) on perception regarding need for antenatal care among rural and urban women in Delhi, the views of women, regarding the need for antenatal care, their knowledge of the purpose of antenatal care and an examination of whether the women’s knowledge and personal factors are related, concluded that awareness of the need for antenatal care is higher among urban women than rural women. Education and age were also positively correlated with increased awareness of antenatal care. However, the analysis of women’s knowledge of antenatal services indicates that knowledge of services offered and knowledge of the purpose of the services was incomplete and inadequate. It was concluded that there is a need to provide health education not only to women in need of antenatal services, but because of their low status in this society, also to the men and elderly women who play an important role in the health decision making.

It is estimated that about 30 percent of the world’s population are anaemic. Pregnant women and young children are the most affected, especially in the developing countries. Women, particularly when pregnant, are more prone than men to developing iron deficiency anaemia. Many other problems also occur during pregnancy such as pregnancy induced hypertension, tuberculosis, heart disease,
infection, minor problems such as gastritis, headache, pain in the legs, loss of appetite, giddiness, etc. All these problems are revealed when she is examined in the antenatal clinic. In addition to this she is advised regarding diet, consumption of supplementary drugs, personal hygiene, avoidance of bad health habits and importance of regular follow up. If antenatal care is taken properly under the supervision of health personnel, it leads to a healthy mother and a healthy child.

2.2 ANAEMIA DURING PREGNANCY

Anaemia is one of the most frequently observed nutritional deficiency diseases in the world. It is especially prevalent in women in the reproductive age group particularly during pregnancy where it is often a contributory cause of maternal death.

Anaemia is a disorder characterised by a blood haemoglobin concentration lower than the defined normal level, and is usually associated with a decrease in the circulating mass of red blood cells. This may result from decreased generation of red blood cells, or from their premature destruction or from loss through chronic blood loss or haemorrhage.

One common etiological classification of anaemia identifies three main causative groups of anaemia – nutritional, marrow disease and haemolytic. Nutritional anaemia is by far the most common type of anaemia world wide, and mainly includes iron, folate and B₁₂ deficiencies. Iron deficiency anaemia is itself caused by insufficient dietary intake of iron, chronic gastro – intestinal tract bleeding especially from hookworm, malabsorption conditions, and infection. Other significant causes of anaemia that vary in their significance from country to country include malaria, and congenital haemolytic diseases. (W.H.O/M.C.H., 1990).

Nutritional anaemia is a serious public health problem. Although anaemia is widespread in the country, it especially affects women in the reproductive age group and young children. In developing countries, prevalence rates in pregnant women are commonly in the range of 40 to 60 percent. Around half of those with anaemia are suffering from iron deficiency anaemia. However, many more are likely to be iron
deficient; i.e. having deficient body iron stores, but without frank anaemia, the latter are therefore considered to be at risk of iron deficiency anaemia.

Anaemia can affect psychological and physical behaviour. Even mild forms influence the sense of well being, lessen resistance to fatigue, aggravate other disorders and affect work capacity. For pregnant women, anaemia can result in severe morbidity and reduces the resistance to blood loss with the result that death may result from the blood loss associated with normal delivery. (W.H.O./M.C.H./M.S.M, 1992).

The overall cause of anaemia other than the nutrient deficiencies which are manifested in low haemoglobin concentration is an imbalance between the absorption of nutrient factors and the body’s needs. Such an imbalance can arise in a number of ways; by low nutrient intake, by poor absorption and utilisation; by increased nutrient losses and/or demands. Apart from nutritional deficiency of iron and folic acid, there are other important causes of anaemia, malaria, bacterial infections, blood loss from obstetric causes (following delivery, abortion or ectopic pregnancy) and from intestinal parasites such as hookworms. In the medical causes of anaemia, socio-economic factor plays a very important role.

During pregnancy, growth of the foetus and placenta, and the larger amount of circulating blood in the expectant mother, leads to an increase in the demand for nutrients, especially iron and folic acid. The total iron needed during the whole of pregnancy is estimated at about 1000 mg. The daily requirements for iron, as well as folate, are six times greater for a woman in the last trimester of pregnancy than for a non-pregnant woman. This need cannot be met by diet alone, but is derived at least partly from maternal reserves. In a well-nourished woman about half the total requirement of iron may come from iron stores. When these reserves are already low due to malnutrition and/or frequent pregnancies, anaemia occurs. It has been estimated that even when food intake is adequate it may take two years to replenish the body’s iron stores after a pregnancy. The early stages of anaemia in pregnancy are often symptomless. However, as the haemoglobin concentration falls, oxygen supply to vital organs decline and the expectant mother begins to complain of general weakness, tiredness, dizziness and headaches. Pallor of the skin and mucous membranes, as well as the nail beds and tongue, may not become noticeable until the haemoglobin drops to 7g/dl. (W.H.O./M.C.H./M.S.M/1992)
Table No.1

Haemoglobin indicative of anaemia in populations living at sea level

<table>
<thead>
<tr>
<th>Age / sex group</th>
<th>Haemoglobin level (g/dl)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Children 6 months - 5 years</td>
<td>&lt;11</td>
</tr>
<tr>
<td>Children 6 years – 14 years</td>
<td>&lt;12</td>
</tr>
<tr>
<td>Adult males</td>
<td>&lt;13</td>
</tr>
<tr>
<td>Adult females (non-pregnant)</td>
<td>&lt;12</td>
</tr>
<tr>
<td>Adult females (pregnant)</td>
<td>&lt;11</td>
</tr>
</tbody>
</table>

(Nutritional anaemia: report of a WHO Scientific Group)

The haemoglobin concentration over time remains much more stable in women, in whom the lower limit of normal is considered to be 12gms. of haemoglobin. An exception occurs during pregnancy, when haemoglobin concentration decreases concurrently with a large, expansion in blood volume. Although anaemia is often expressed as ‘mild’, ‘moderate’ and ‘severe’, the haemoglobin values at which the division into these three categories are made vary and are arbitrary. Anaemia is considered to be mild, moderate or severe when the haemoglobin concentrations are above 80 percent, between 80 and 60 percent or less than 60 percent of the cut-off levels, respectively; practically speaking, given the relatively small differences between age / sex groups, one can diagnose mild anaemia when the haemoglobin concentration is above 10 g/dl but below the cut-off level, moderate anaemia when the concentration is between 7 and 10 g/dl and severe anaemia when it is below 7 g/dl. (Demayer., Dallman, Gurney, Hamburg, Sood and Shrikantia, 1989).

In a study conducted at Zaire in Nov.-Dec. 1991 to find out severe anaemia in pregnancy a problem of primigravidae in rural Zaire, haemoglobin levels were measured in 2950 pregnant women attending antenatal clinics in Kimpeses, Bas Zaire;
72 percent were suffering from moderate anaemia (Hb 7-11 g/dl) and 3-7 percent from severe anaemia (Hb less than 7g/dl) at their first visit, before receiving any haematinics or anti-malarial prophylaxis. The fall in haemoglobin early in the second trimester was greatest in primigravidae.

In a developing country, Libya, an epidemiological study was conducted regarding the signs and symptoms of pregnant Liberian women. The purposes of the study were:

1) To assess the prevalence of anaemia in Liberian women, during the last trimester of pregnancy when latent, deficiencies are more suitable to become clinically manifest,
2) Symptoms that are related to low haemoglobin; and
3) Determine the sensitivity and specificity of symptoms commonly associated with anaemia.

The results indicated that the prevalence of anaemia was 79.8 percent women who had headache as a symptom, had significantly lower mean haemoglobin values than woman who did not have this symptom. The status of women with and without symptoms was not statistically different. The sensitivity of headache as an indicator of anaemia and low haemoglobin values was 83 percent but the specificity of this symptom was low 27 percent. The utility of signs and symptoms as indicators is discussed in relation to the economic means of lesser - developed societies and their cultural practices. (Jackson, 1992).

Anaemia is a major health hazard in developing countries. A study conducted in India, describes the distribution of haemoglobin and plasma ferritin levels in rural and tribal pregnant women who attended the rural clinics of the institute. They measured haemoglobin (Hb) by fingerprick capillary blood samples from 413 antenatal cases from rural and tribal areas between April 1986 to April 1988. Based on Hb levels 96 percent of cases were anaemic (<11.0g/dl), 53 percent of cases had moderate anaemia (Hb 8.1 to 10 g/dl) and 3 percent had severe anaemia (Hb <8g/dl). The Hb levels in tribal women were significantly lower (P<0.01) than in the non-tribal cases. (Joshi, Donde, Maitra and Gokral, 1989).
In 1981 information collected through surveys on changes in haemoglobin levels during different periods of gestation in urban and rural pregnant women from low income groups was undertaken and it indicated that anaemia often antedates pregnancy. There is a slow and gradual fall in haemoglobin level during pregnancy. The lowest mean haemoglobin level was seen between 24 - 32 weeks of pregnancy. In the third trimester there was a slow rise in mean haemoglobin level till term. The prevalence of anaemia in pregnancy continues to be high especially among low-income groups. The reported prevalence rates range from 40-50 percent in urban areas, 50-70 percent in rural areas and almost 90 percent in rural areas where hookworm infestation is endemic. (Ramlakashmi, Mahavapeddi, and Sumyakar 1981).

This indicates that a large proportion of women in India have subnormal health status. These women are likely to suffer from leg pains, lassitude, weakness, dizziness and a number of non-specific symptoms. It is estimated that half the pregnant women in the world have a haemoglobin level of low to moderate. Even among the much better nourished population of the developed countries nearly one in every five pregnant women is anaemic. (W.H.O./M.C.R/MSM, 92).

**Consequences Of Anaemia In Pregnancy**

Most of the studies indicate that a fall in maternal haemoglobin below 11g/dl is associated with a significant rise in perinatal mortality rate. There is usually a two to three-fold increase in perinatal mortality rate when maternal haemoglobin levels fall below 8g/dl and eight-to-ten fold increase when maternal haemoglobin levels fall below 5g/dl. (Gopalan and Kaur, 1989).

A study conducted at Shree Sayaji General Hospital, Baroda in the department of obstetrics and gynaecology, investigated 140 pregnant or recently delivered women with severe anaemia and found severe anaemia (Hb up to 6.5g/dl) in pregnancy correlates directly with raised maternal and perinatal morbidity and mortality. Anaemia is seen to be directly related to foetal outcome in the form of preterm delivery and Intrauterine Growth Retardation (hereafter, IUGR). Birth weight of the baby had a direct relation with severity of anaemia. Severe anaemia and associated
malnutrition frequently predisposes to toxaemia of pregnancy and growth retardation and its attendant morbidity and mortality. Maternal anaemia causing intrauterine hypoxia and placental insufficiency are the main cause of preterm delivery and intrauterine growth retardation babies. Among the cases in this study, there were 16 cases that expired. The incidence of maternal mortality amongst the severely anaemic mothers was 11.4 per cent. (Pandya and Hazra, 1993).

Another study conducted in department of obstetrics and gynaecology, Gandhi Medical College, Bhopal, on one hundred and twenty four pregnant cases in their third trimester admitted in the hospital between March 1990 to Feb.1991 found that there were hundred cases of anaemia with haemoglobin 10 g/dl or less, and twenty five with haemoglobin more than 10 g/dl which served as controls. Anaemia cases were classified in to mild (Hb 8.1 – 10.0 g/dl) moderate (6.1 – 8.0 g/dl) and severe (6.0 and less g/dl) grades. In an attempt to correlate multiple variables affecting outcome, it was seen that severity of anaemia, poor antenatal care, improper spacing and low socio-economic status were found to be important contributory factors to poor foetal outcome. Incidence of preterm deliveries; still births and low foetal birth weight increased with severity of anaemia and fall in socio-economic status. Incidence of stillbirth was high in preterm deliveries than in term deliveries, only one case of congenital malformation (anencephaly) was detected. The mean foetal weight decreased from higher to low socio-economic group and mild to severe grade of anaemia. In this study it was observed that the factors viz. lower socio-economic status, frequent pregnancies and severity of anaemia; related to nutritional status of the mother in turn correlates with low birth weight of the new born. (Ragnekar, Darbari, 1993).

The international conference on population and development held in 1994 in Cairo was a major landmark in the realm of women's health. It was said that a significant number of women in the developing world fall easy victims to anaemia due to iron and folate deficiencies. Studies carried out at the National Institute for Nutrition, on pregnant women belonging to lower socio-economic group showed that prevalence of anaemia was between 50 to 90 percent in the third trimester of pregnancy. In spite of the implementation of National anaemia prophylaxis programme, under which, iron and folic acid tablets are distributed free of cost to
pregnant and lactating women and preschoolers, the prevalence of anaemia has remained unaltered over the past three decades. It was said that anaemia (Hb<11g/dl) in pregnancy was associated with a significant rise in perinatal mortality rate. There are usually two to three folds increased in perinatal mortality rate when the maternal haemoglobin falls below 8g/dl and eight to ten folds increased when maternal haemoglobin falls below 5 g/dl. A significant fall in birth weight due to increase in prematurity rate and IUGR has been reported to occur when maternal haemoglobin level falls below 8g/dl. The association between anaemia and urinary tract infection and low birth weight babies is well documented. Anaemic pregnant women are prone to urinary tract infections. Therefore it is a vicious cycle (Ramlakshmi, 1981). Prevalence of several maternal risk factors which are associated with low birth weight and increased perinatal mortality such as twins, antepartum haemorrhage and maternal under nutrition are higher among anaemic women. It is therefore possible, that co- existing obstetric problems contribute atleast in part, to the adverse obstetric outcome reported among anaemic women. Anaemic women should therefore, be treated as a high risk obstetric group.

The following study shows the effect of severity of anaemia on the humoral immunity. It was conducted in the department of obstetrics and gynaecology, University Hospital, Banaras Hindu University in collaboration with the University Grant Commission (UGC) Immunodiagnostic Training and Research Centre, Department of Pathology, Institute of Medical Sciences, Banaras Hindu University. The Study included 195 randomly selected patients attending the antenatal clinic during the period between April 1987 to Feb 1988; and socio-economically matched non-pregnant controls selected from the attendants of the patients. Any woman giving a history of infection, major or minor within the past 3 months of the study was excluded.

The pregnant women were divided into two main groups depending upon the presence or absence of anaemia. Anaemia in pregnant women was defined as Hb <11.0 g/dl and in non-pregnant women as Hb< 12.0 g/dl (WHO, 1974). The pregnant women were divided into two groups; Group A consisted of 110 pregnant and non
pregnant women with Hb >11 g/dl and Group B consisted of 185 women. These categories were made depending upon the degree of anaemia:

(i) Hb levels 11.8 g/dl.
(ii) Hb levels 8.5 g/dl.
(iii) Hb< 5.1 g/dl.

The present study clearly shows that mild anaemia (Hb 11.8 g/dl has no effect (p >0.05) on the serum immunoglobin levels. In moderate anaemia (Hb 8.5 g/dl there is lowering of the serum IgA / IGA levels (P<.001) In severe anaemia (Hb <5 g/dl) there is significant lowering of all the immunoglobulin levels (IgG, IgA, PGN) resulting in significant suppression of humoral immunity, which in turn could be a potent cause for infant mortality and morbidity in our country. Foetal growth retardation was associated with a significant reduction in the transfer of IgA from the mother to the foetus. (Matah, Jaiswal and Gupta, 1989).

Immune depression due to anaemia and consequent increased morbidity due to infection, especially urinary tract infection, might be some of the factors responsible for low birth weight in anaemic women. Screening for and effectively treating and educating anaemic women might therefore result in improved foetal and maternal prognosis. (Gopalan and Suminder Kaur, 1989).

The key role that haemoglobin plays in transporting oxygen to tissues accounts for the diminished work capacity and physical performance of persons with a diminished concentration of haemoglobin. Iron is essential for foetal growth, brain function, muscle activity and protection from infection. Folic acid and B12 are essential for cell growth and rapidly growing tissues like the foetus or growing children.

Severe anaemia (Hb < 7 g/dl) during pregnancy causes decompensation of the heart due to dual stress of anoxia as well as increased cardiac output to satisfy the increased demand. The extra stress of increased volume and anoxia results in cardiac failure. Most of the deaths due to anaemia are encountered either during early part of the third trimester or during labour and in the immediate post - partum period when uterine contraction and retraction of uterus increase the load on the heart, severe
anaemia and associated malnutrition frequently predisposes to toxemia and growth retardation with its relative morbidity and mortality.

The pathophysiology of pre-eclampsia is somehow related to physiological changes of pregnancy. Normal physiological adaptation to pregnancy includes an increase in blood plasma volume, vasodilatation, decreased systematic vascular resistance, elevated cardiac output and decreased colloid pressure. In pre-eclampsia there is a decrease in circulating plasma volume resulting in haemo-concentration and an increase in maternal haematocrit. These changes often lead to decrease in oxygen perfusion by destroying red blood cells, thereby decreasing maternal oxygen carrying capacity. (Krishna and Raman, 1989).

Due to under nourishment of the mother, the baby is at an increased risk of being premature with low birth weight and developmental irregularities. There is an incidence of anaemia among the pregnant women which has a significant impact on the health and has major consequences on the morbidity / mortality in pregnant women and on growth and intellectual development on children. Intrauterine nutrition is highly important for the growth of the central nervous system and kidneys of the foetus, which mature during the latter part of the pregnancy. Therefore nutritional deficiencies before birth can never be wholly reversed after birth.

Anaemia, haemorrhage, eclampsia, infections, abortions and similar complications of obstructed labour account for over 80 percent of maternal deaths in most developing countries. But these deaths represent only a small proportion of the total morbidity attributed to the same causes. For every maternal death, there are many more women in whom, after childbirth, disabilities develop which impair their general health and production in their economic activity (WHO, 1987). (Fleming, 1987).

Living conditions and the pattern of childbearing in most areas of developing countries lead to high rates of maternal morbidity. Although maternal morbidity is particularly high in rural areas, in some respects, however the quality of life in urban slums is worse than in rural areas, partially because of poor hygiene, sanitation and over crowding. As fuel and transport costs are often higher in urban areas, there is less
money available for food. Consequently, urban dwellers may eat less and suffer more from under nutrition and malnutrition leading to increased mortality and morbidity in pregnant women and also in infants.

Antenatal care is very important for mothers because antenatal care aims at maintaining the good health of the mother during pregnancy which will enable her to produce a healthy normal infant and remain healthy herself.

Health education to mothers, families and groups of mothers in order to overcome their fears and suspicions regarding health care and nutrition of the mother during pregnancy and postpartum period needs to be undertaken with a supervised and planned health information unit for better foetal and maternal outcome. (Pandya and Hazra, 1993).

The major causes of maternal mortality are anaemia, hypertensive disorders of pregnancy, ante and post-natal haemorrhage, puerperal sepsis, obstructed labour and unsafe abortions. Except for haemorrhage, which can occur without warning signs the other causes can be identified and treated effectively or can be prevented. (C.S.S.M. review, 1994).

The study was conducted in a sub-divisional hospital of eastern Himalayan region, among 5,273 pregnant women over a period of 8 years. There were 29 deaths, the maternal mortality rate was 55 per 10,000; septic abortion was encountered in number of cases among them. Direct obstetric cause was responsible in 72.41 percent of cases and indirect cause in 27.59 percent cases. Sepsis, both puerperal and post puerperal, resulted in 24.14 percent followed by postpartum haemorrhage in 20.69 percent. Two of these cases were associated with inversion of the uterus. Pre-eclampsia caused 10.34 percent and eclampsia 6.9 percent of the deaths. Among the indirect causes severe anaemia and pulmonary tuberculosis accounted for 10.34 percent and 6.0 percent, respectively. Infective hepatitis was the cause in 6.9 percent cases. Only 17 percent of the cases were booked and the rest were unbooked. Majority of the cases (62.07 %) belonged to the age group of 20-30 years, primi gravida constituted 41.38 percent of the cases. (Ray, 1992).
The Safe Motherhood Programme aims at reducing the maternal mortality ratio to 2 or less per 1000 deliveries by the end of the decade, by early identification and appropriate treatment of women with maternal complications and obstetric emergencies. It can be accessible by retraining medical and paramedical personnel. Health education is a powerful tool for identifying the early signs and symptoms related to complications arising during pregnancies. (C.S.S.M. review, 1994).

Iron deficiency anaemia accounts for as high as 90 percent of all anaemias in pregnancy. It is common in pregnancy; because diet alone cannot replace the normal gestational iron losses. During pregnancy, the ability to absorb ingested iron is increased, but the amount of iron absorbed is dependent on body iron stores, rate of erythropoiesis and use of iron supplements. Iron is needed during pregnancy for foetal development, manufacture of the increased maternal red blood cells mass in the increased circulating blood volume, and placental development. The woman who has iron deficiency anaemia during pregnancy may be asymptomatic; however, she is at an increased risk of developing pregnancy induced hypertension, infections, fatigue and postpartum haemorrhage. Her foetus is at an increased risk of prematurity, 1000 gm birth weight, still birth, anaemic neonate and neonatal death.

The basic etiology of iron deficiency is an imbalance between the amount of iron absorbed and the amount of iron lost; the supply of iron to the bone marrow for normal erythropoiesis is thereby impaired. Increased losses are associated with blood losses in menstruation as well as pathological losses including those associated with parasitic infestations. At certain periods of life, such as during the rapid growth of the young child or pregnancy, increased rate of iron utilization of the body rather those losses from the body may increase the amount of iron that must be absorbed to maintain the iron balance. In the physiological sense therefore, three groups of people are particularly vulnerable to iron deficiency, the young child (6-18 months), menstruating women and pregnant women. In the pathological sense, all persons subject to chronic blood loss are prone to develop iron deficiency anaemia.

Iron loss is increased in individuals harbouring parasites such as hookworm and trichuries. Heavy infestations are seen particularly in rural areas. Isotopic studies of blood loss in infested patients are given below in table 2:

-40-
Table 2
Faecal blood loss in intestinal parasitic infestation.

<table>
<thead>
<tr>
<th>Parasite</th>
<th>Faecal blood loss per parasite (per day)</th>
<th>Per 1000 egg.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Necator Americans</td>
<td>0.02-0.07 ml</td>
<td>2.1</td>
</tr>
<tr>
<td>Ancylostoma duodenale</td>
<td>0.14-0.26</td>
<td>4.4</td>
</tr>
<tr>
<td>Trichuris trichiura</td>
<td>0.005</td>
<td>0.5</td>
</tr>
</tbody>
</table>

(Lagrisi, 1967).

Many other factors also predispose to anaemia such as early marriages, teenage pregnancies, poor socio-economic status, educational status, dietary pattern, dietary distribution pattern, more attention given to male rather than women in the family, cultural factors, food taboos, type of work and heavy workload during pregnancy.

Multiple pregnancies increase the iron demand by two folds. Women with recurring pregnancy, within two years following the last delivery, need more iron to replenish deficient iron reserve. Iron is an integral part of the body. Because the body has no way of excreting iron, both functional and storage iron are regulated through absorption. The amount of iron necessary to meet the body’s needs for maintenance of haemoglobin to maintain adequate levels of storage iron and to allow for a normal rate of growth. (Guthrie, 1991).

God has given a special gift to women i.e. “Pregnancy”, she should enjoy this experience in a graceful manner. But due to anaemia she is not able to enjoy this important experience in her life. She is irritated as she faces the symptoms and signs of anaemia. The clinical features depend on the degree of anaemia more than anything else. Majority of pregnant mothers do not suffer symptoms initially and the entity is detected accidentally during examination. Lassitude and a feeling of exhaustion or weakness may be the earliest manifestations. Some of the vague symptoms including lack of energy, fatigability, reduced powers of concentration and sleeplessness are complained of by pregnant mothers. It may be due to more demand of iron, B₁₂ and
folic acid also. As anaemia becomes more severe, the pregnant mothers may experience disturbances in respiratory, cardiovascular, renal, neuromuscular and gastrointestinal functions such as exertional dyspnoea, palpitation, headache, fainting, tinnitus, lack of mental concentration, anorexia, nausea, flatulence, peripheral oedema, and spoon shaped nails, severe pallor and glossitis with red, swollen, smooth tender tongue. Therefore appropriate accessibility is required to overcome these problems. (Dutta D C, 1981).

Growth of a foetus is affected by genetic, maternal and environmental factors. Intrauterine growth retardation and low birth weight are major public health problems in developing countries. There is a definite negative effect of tobacco chewing by the mothers on the birth weight of the baby (Krishna K, 1978, Verma R.C, 1983, WHO, 1992), very often history of tobacco chewing is negative inspite of use of tobacco preparations for cleaning of the teeth. The habit of cleaning teeth with tobacco is very common in rural and periurban areas in developing countries. A study was therefore undertaken to find out relationship between the birth weight of the babies delivered to 'mishri' users and non-users. A prospective study was carried out from January 1992 to January 1993 in a group of 281 apparently healthy pregnant women. Sixty three (22.5 percent) were users of 'mishri' (a tobacco containing powder for cleaning teeth). Age, occupation, education, economic status and caloric - protein intake of users and non-users of 'mishri' were considered. A statistically significant difference between mean birth weights of babies born to mothers from these two groups was observed. This study was carried out at the antenatal clinic at Kamla Nehru Hospital, Pune and Shintre Hospital Pune city. In rural areas, use of 'mishri' is even more common, thus in the ecological setting in which prevalence of low birth weight is around 25 to 30 percent, the contribution by 'mishri' users could be considerable. Motivation of all the pregnant mothers who are currently using 'mishri' and converting them into non tobacco users will go a long way in preventing ill-effects of tobacco on the growing foetus, including low birth weight. (Prathinidhi and Ghatel, 1995).
rural obstetric population. 125 pregnant women were interviewed at their initial antenatal visit regarding attitudes, and behaviour in relation to pica practices.

The prevalence of anaemia was determined. Chi-square audit tests were used when appropriate. Pica was found in 18 (14.4 percent) patients. There were no significant differences between patients with a pica and those with none with respect to age, race and weight, substances ingested included white and red dirt, ice, cornstarch, laundry starch, soap ashes, chalk, paint and burnt-matches; characteristics of patients with pica included cravings (33 percent); pica before pregnancy (56.6 percent), childhood pica (33.3 percent), and the presence of other household members with pica (56.6 percent). This study data suggest that pica is frequently associated with similar practices during childhood and non-pregnant states. These patients also may be at risk for lead toxicity or environmental toxin exposures which are potential factors leading to anaemia. (Smulian, Gupte and Sigman, 1995).

Although health habits influence foetal growth and health status of pregnant women; dietary habits, taboos, cultural beliefs and practices, and cooking practices are very important. The nutritional and health status of the woman, both in adolescence as well as during pregnancy are important indicators of complications during pregnancy, child birth such as low birth weight and neonatal morbidity.

Compared to the diet of non-pregnant and non-lactating women, pregnant women require more diet, both, qualitatively and quantitatively. During pregnancy, women undergo certain physiological changes. Right from conception till delivery, there is a demand for additional nutrients in the form of food. The growing foetus in the womb draws its nutrients from maternal blood. Child bearing imposes a great strain and it is important that the mother-to-be leads a healthy life throughout pregnancy. One of the major factors that promote health and well being both of the mother and baby in the womb, is wholesome and nourishing food. (Gopalan, 1962).

The joint working conference of IUNS, UNICEF and ICMR in October 1977 fixed the priority of nutrition among women. Every pregnant woman dreams of giving birth to a chubby, healthy infant. The foetus solely depends upon the mother for its nourishment. Its nutritional needs gradually increase as pregnancy progresses.
Weighing just about 15gms around the 12th week, the foetus develops into a fully grown baby of about 3,200gms by the 40th week. The mother has to supply through her blood stream, all nutrients needed for this growing foetus. Several bodily changes take place during pregnancy. A healthy and well fed expectant mother puts on 10-12 kg. of weight during pregnancy. She is to store enough nutrients in her body to meet her own needs and those of the foetus. When the mothers diet is not nutritionally adequate she cannot transfer the required nutrients to the foetus. The foetus then tries to draw its nourishment from the mother's body reserves. This can affect the mother's health; if she is already malnourished then both mother and infant will be affected. (Health for all, 1981).

Several studies have been undertaken in developing countries like India, to define the effect of low dietary intake and maternal under nutrition on pregnancy outcome. Studies from all the developing countries indicate that the socio-economic gradient in dietary intake and maternal nutritional status affect the outcome of pregnancy.

Studies from India have shown that women from the upper income group consumed 2000 to 2500 Kcal per day during pregnancy. In this group pregnant women do not perform hard physical labour during pregnancy and work activity shows a reduction during pregnancy. The pre-pregnancy weight in this population group ranges between 45-55 kg and mean pregnancy weight gain is about 11 kilograms. The mean birth weight of infants is 3 kg. These findings are similar to those reported from women in developed countries.

Dietary intake of low income group urban women in India ranges from 1200-1600 Kcal per day. There is no increase in dietary intake during pregnancy. However pregnant women continue to look after the household and other activities and remain moderately active throughout pregnancy. These women weigh an average 43 kg. prior to pregnancy and gain 6 kg during pregnancy. The mean birth weight of the infant is 2.7 kg. There is no obvious deterioration in material nutritional status during Pregnancy. (Khanum and Umapathy, 1976).
In rural India, dietary intakes of women from the low income group are initially similar to the dietary intake of urban women. However rural women have to spend more energy in household work, they have to fetch drinking water from sources which may be one to two kilometres away from home, gather and bring firewood from the forest miles away. Most rural women from the low income group also help their husband in agricultural activities, especially during weeding, replanting and harvesting seasons. These women gain about 5 kg during pregnancy and the mean birth weight of their infant is 2.7 kg. (Sibert, Jadhav and Inbaraji, 1978).

A study was conducted at the Regional Medical College, Manipur, Imphal on assessment of nutritional status of Manipuri Expectant Mothers through selected haematological parameters, 99 pregnant women in different trimesters of pregnancy were selected for the study. This group belonged to a distinct ethnic group having characteristics Mongoloid features. Of the 99 pregnant women selected for the study 21 belonged to the hills and 78 to the valley. Their age, height and weight are measured. Out of these women, 24 were in the first trimester, 33 were in the second trimester and 42 in the third trimester of pregnancy. None of them took any regular supplements of iron, calcium or vitamins, very few mothers were taking occasionally supplements. They were also listed Hb, iron and total protein in all 99 pregnant women and it was trimester wise was checked. (Devi, Singh, Devi, Singh, and Singh, 1980).

Dietary consumption pattern has a definite role in the development of specific malnutrition. Anaemia during pregnancy has been claimed to be a result of deficiency of specific haemopoitic substances. Most of the reports are based on serological studies. In the chain of multiple aetiology, influence of dietary consumption pattern in anaemia in pregnancy can not be ruled out. There are scanty numbers of studies on this aspect of the important problem. (Yusuf, Mathan and Baker, 1973).

The study was carried out during a one year period in the field practice villages of the department of Preventive and Social Medicine, Banaras Hindu University, Varanasi, by a fortnightly house to house visit, 232 pregnant women were enumerated from four villages. Haemoglobin examination was carried out. Pregnant women with haemoglobin level less than 10 g/dl at any time of examination was
considered anaemic. A one day diet survey by 24 hours food recall method was carried out for all the 232 pregnant women. Approximate principles and different nutrients consumed by the women were calculated from the result of the diet survey using the tables of nutritive value of foods. Haemoglobin examination revealed that 74 percent of the 232 pregnant women had anaemia Hb < 10 g/dl. Of the 232 pregnant women included in the study 105 belonged to vegetarian families and 127 to non-vegetarian families. There was observed no appreciable difference in the prevalence of anaemia amongst the vegetarian (73.33 percent) and non-vegetarian (76.83 percent) pregnant women. Nutrients derived from non-vegetarian diet are considered to be of higher biological value. Absence or extremely low intake of animal protein in the diet is a major contributory factor in nutritional anaemia. This study also observed an inverse relationship of the prevalence of anaemia with daily dietary protein intake. A positive significant correlation between the protein intake and haemoglobin level of pregnant women was observed. In the multiple aetiology of anaemia in pregnancy, the role of protein is not well understood. But protein deficiency contributes to the causation of anaemia by some actions like:

a) interference with the absorption of iron from the intestine;
b) retarding haemoglobin synthesis, and
c) arresting maturation of erythrocytes. (Luwang and Gupta, 1980)

The foetus solely depends upon the mother for its nourishment. Its nutritional needs gradually increase as pregnancy progresses, weighing just about 15gms around the 12th week. The foetus develops into a fully grown baby of about 3,200gms by the 40th week. Mother has to supply, through her blood stream, all nutrients needed for this growing foetus. A healthy and well fed expectant mother puts on 10-12 kg of weight during pregnancy. Weight gain is as follows:
Table 3
Analysis of the weight gain in pregnancy

<table>
<thead>
<tr>
<th>Particulars</th>
<th>Up to 10 weeks (in gms)</th>
<th>20 weeks (in gms)</th>
<th>30 weeks (in gms)</th>
<th>40 weeks (in gms)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Foetus, Placenta and liquor</td>
<td>55</td>
<td>720</td>
<td>2530</td>
<td>4750</td>
</tr>
<tr>
<td>Uterus and breast blood</td>
<td>170</td>
<td>765</td>
<td>1170</td>
<td>1300</td>
</tr>
<tr>
<td>Extra cellular water</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>1200</td>
</tr>
<tr>
<td>Fat</td>
<td>325</td>
<td>1915</td>
<td>3500</td>
<td>4000</td>
</tr>
<tr>
<td>Total Gain</td>
<td>650</td>
<td>4000</td>
<td>8500</td>
<td>12500</td>
</tr>
</tbody>
</table>

(Chandra, and Agrawal, Swasth Hind, Jan. 1985, p, 8)

Scientists have recommended that a pregnant woman needs to have daily intake of 300-400 calories of energy above the normal requirements. One can obtain this additional energy by adding cereals, oils, sugar or jaggery. Protein is required for body building. Iron and the B-vitamins, folic acid (part of B-complex vitamin group) are required for the blood formation and calcium for the bones. An extra 15-20gms, of protein daily will be adequate for proper growth of the foetus. It will be well and good if animal foods such as eggs, meat, fish and milk are consumed. The nutrition has direct relation with still birth rate. (Chandra and Agrawal, 1986).

The recommended dietary intake of nutrients during pregnancy is given in table no. 4.
Table 4
Diet for Pregnant Women Sample Diet (in grams).

<table>
<thead>
<tr>
<th>Food Stuffs</th>
<th>Sedentary work</th>
<th>Moderate work</th>
<th>Heavy work</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Veg</td>
<td>Non-veg</td>
<td>Veg</td>
</tr>
<tr>
<td>Cereals</td>
<td>350</td>
<td>350</td>
<td>400</td>
</tr>
<tr>
<td>Pulses</td>
<td>60</td>
<td>45</td>
<td>70</td>
</tr>
<tr>
<td>Green Leafy Vegetables</td>
<td>150</td>
<td>150</td>
<td>150</td>
</tr>
<tr>
<td>Other Vegetables</td>
<td>75</td>
<td>75</td>
<td>75</td>
</tr>
<tr>
<td>Roots and Tubers</td>
<td>50</td>
<td>50</td>
<td>75</td>
</tr>
<tr>
<td>Fruits</td>
<td>30</td>
<td>30</td>
<td>30</td>
</tr>
<tr>
<td>Milk</td>
<td>325</td>
<td>225</td>
<td>325</td>
</tr>
<tr>
<td>Fats and oils</td>
<td>30</td>
<td>35</td>
<td>35</td>
</tr>
<tr>
<td>Sugar and Jaggery</td>
<td>40</td>
<td>40</td>
<td>40</td>
</tr>
<tr>
<td>Meat / Fish</td>
<td>-</td>
<td>30</td>
<td>-</td>
</tr>
<tr>
<td>Egg</td>
<td>-</td>
<td>30</td>
<td>-</td>
</tr>
<tr>
<td>Groundnuts</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

* An additional 25 g of fats and oils can be included in the diet in place of ground nuts. (Davidson, Passmore and Forwarded by Lord, 1991)

This diet provides slightly higher amounts of protein, calories, minerals and vitamins than required for normal women. It can be given to a pregnant woman in the second and third trimester of pregnancy when there is extra demand for these nutrients because of the developing foetus. It is very important that dietary practices and cooking methods be appropriate. Then adequate body requirement will be fulfilled. Cooking involves one of the following processes wet methods of treatment like boiling and steaming and dry methods of treatment like frying, roasting and baking. The wet methods of cooking leads to comparatively greater losses than the dry methods. Ordinary cooking causes little loss of protein, fat and carbohydrates in cereals, pulses and meat. In vegetables, however, there may be some protein loss on boiling in water, particularly when salt is used in cooking and the cooking water
discarded. If the water is thrown away, there is considerable loss of minerals and salts especially of sodium, potassium and chlorine due to leaching. It is therefore advisable either to use the minimum amount of water or to utilise the cooking water in either soups or gravies. It is not advisable to peel and cut the vegetables long before they are ready for boiling, some of the vegetables are just steamed. Certain amounts and minerals of vitamins are lost even during preliminary treatment of washing prior to cooking. It is a common practice for the housewife to wash rice three or four times with large amounts of water before cooking. This way minerals and vitamins are lost. After cutting green vegetable housewives wash the vegetables which lead to a loss of vitamins and minerals. Therefore it is necessary to have information, about how to cook the food.

Also with regard to Vitamin C, which is water-soluble, is also easily oxidized and lost in boiling water and also during the interval between cooking and actual consumption. Therefore it may be preferable to cook leafy vegetables with a lid on, minimum exposure to air and in the minimum quantity of water. It is desirable to include some raw fruits or vegetables in the diet as a source of vitamin C. Milk is a poor source of vitamin C, and vitamin C is the single most important enhancer of iron absorption. Excessive and prolonged heating should be avoided. Cooking habits involving prolonged boiling of food with spices ultimately destroys folic acid. Food hygiene is very important. Vegetables and other foodstuffs need to be cleaned properly before cooking; vessels for cooking should be kept clean. Hand washing is a simple but very essential activity in the cooking procedure as well as in activities of daily living.

The use of iron knives for slicing vegetables and use of cast iron pans for frying has been shown to contribute to iron content of the diet, though the extent to which such iron is physiologically available is not known. Cooking is one of the most important and agreeable arts of the human being. Cooking effectively removes most pathogenic organisms from food, but if the person is unclean and has poor personal hygiene habits then the result can be the reverse. Therefore health education is very important to improve health and cooking practices. This can ultimately lead to anaemic free condition during pregnancy period. (Gopalan and Sashti 1987)
Food taboos: Food taboos definitely affect pregnant women’s health status. Some of the food taboos and its consequences are shown in Table 5.

<table>
<thead>
<tr>
<th>Taboos</th>
<th>Consequences</th>
</tr>
</thead>
<tbody>
<tr>
<td>If the mother eats more food during pregnancy, the child will get</td>
<td>This shows their ignorance regarding the anatomy of human body, thus leading to poor nutritional status.</td>
</tr>
<tr>
<td>crushed in the womb.</td>
<td></td>
</tr>
<tr>
<td>The pregnant woman gets green diarrhoea if she eats green leafy</td>
<td>These women are thus deprived of green leaves, which contribute to the iron content in a vegetarian diet.</td>
</tr>
<tr>
<td>vegetables, and these leaves gets stuck inside the intestines of the</td>
<td></td>
</tr>
<tr>
<td>child.</td>
<td></td>
</tr>
<tr>
<td>Eating peanuts makes the placenta red and the child gets a white</td>
<td>Protein needed for the formation of haemoglobin is there by lost.</td>
</tr>
<tr>
<td>layer on his body.</td>
<td></td>
</tr>
<tr>
<td>Consumption of banana and ghee causes the baby to stick in the uterus.</td>
<td>The women are deprived of calcium and energy.</td>
</tr>
<tr>
<td>Curds, butter milk, lemon and citrus fruits lead to edema and</td>
<td>Women become deficient in protein and vitamins, which are essential for blood formation.</td>
</tr>
<tr>
<td>arthritis.</td>
<td></td>
</tr>
<tr>
<td>Non-vegetarian food is hot.</td>
<td>Women are forced to eat a vegetarian diet, which might be deficient in iron content.</td>
</tr>
<tr>
<td>Pregnant women should not eat pulses as they cause gases in the</td>
<td>Thus her diet remains deficient in protein.</td>
</tr>
<tr>
<td>stomach.</td>
<td></td>
</tr>
</tbody>
</table>

(Source – Compiled by CHETNA, Ahmedabad)

Therefore health personnel have to conduct nutritional educational programme, which lead to improved health condition of the antenatal mothers.

A case study from South India collected data on how pregnant women in South India perceived essential body processes during their pregnancy and on their
health concerns. A purposive sample of 200 rural poor families in North Kanara and 82 families in South Kanara was selected for the survey. Women with their children were interviewed. Three questions were asked. "For the health of the baby, is it better for a woman to eat a greater amount of food, the same amount of food or less food?" and "If less food is consumed during pregnancy, will the baby be large or small?"

The majority of the respondents in both areas expressed a preference for a small baby and thought that during pregnancy women should eat less or the same amount of food as if they were not pregnant. The majority of respondents also felt it was advisable to eat less or the same amount of food when pregnant, rather than increasing food intake. Most of the women associated eating less, with a concurrent effect on baby size; more than 50 percent of the women in each region, believed that eating less resulted in a big baby though not necessarily a healthy one, while others believed that eating less resulted in a smaller baby. Bigger babies were thought to result in a more difficult delivery. Other factors influencing the dietary behaviour of pregnant women were the quantity and quality of food consumed.

Food taboos associated with pregnancy and the quality of a woman's usual diet also contributed to the incidence of anaemia in the pregnant women. (Nichter and Nichter, 1983)

There are some food avoidances which tend to damage women's health. A study was conducted in Tamilnadu on food avoidance of pregnant women. 1,200 women were interviewed. Although many types of foods were avoided during pregnancy, the most important of these were fruits and grains particularly papaya and sesame, which are believed to be capable of inducing an abortion. Concerns about painful birth or disease and malformations in the baby were comparatively less important factors in food avoidance. It was found that temporary food avoidance of pregnant women was dominated by the fear of abortion. The study shows that their ignorance and fear lead to anaemia during pregnancy. (Ferro-Luzi, 1980).

Some of the other faulty food habits dangerous to health of women and foetus are excessive consumption of coffee, tea or only one food such as rice, dal, etc. Tannins, coffins which are present in tea and coffee, are also iron absorption
inhibitors. A study conducted on coffee consumption as a factor in iron deficiency anaemia among pregnant women and their infants in Costa Rica and the influence of coffee consumption on haematological and trace element status was studied in two groups of pregnant, low income Costa Rican women: Coffee drinkers (>450 ml, n = 22) and non coffee drinkers (0 ml, n = 26). Groups had similar income, education, prenatal case, age parity, weight, height, pregnancy weight gain, perinatal iron supplementation, energy, protein, iron and vitamin C intake and infant sex and gestational age. Maternal haemoglobin and hematocrit at 8 month gestation, cord blood and Hb and hematocrit, infant birth weight and Hb and Hct at 1 month of age and breast milk concentration were significantly lower in the coffee group than in the non-coffee group. The association of coffee with infant Hb and Hct was independent of maternal iron status and birth weight. Maternal coffee intake may contribute to maternal and infant anaemia. Improved food habits, food hygiene, cooking and dietary practices are essential. Therefore to provide health education, information should be communicated with pregnant mothers constantly. (Muzoz, Keen, Kathrym and Dase, 1964).

A balanced and iron rich diet is not the only approach to overcome the problem of anaemia. Anaemia during pregnancy is a multifactoral problem. It is public health problem. Alongwith diet, supplementary drugs are very essential. Oral iron is the method of choice prophylaxis and treatment of iron deficiency. All pregnant women should be given 60 mg of elemental iron and 500 ug of folic acid for 100 days during pregnancy as a prophylaxis measure. Demaeyer, E.M. 1989 had prepared guidelines for health administrators and programme managers (WHO). He mentioned that in developing countries where laboratory testing is organisationally and financially difficult, the most cost-effective approach to treat iron deficiency anaemia is to provide iron supplement drugs. There were some approaches like supplementation with medicinal iron, education including modification of diet, control of infection and fortification of staple foods with iron. These strategies for planning and implementing anaemia control programme are outlined. (Demaeyer, 1989).

All pregnant women whose haemoglobin is below 8 g/dl should be considered as risk category. Anaemic pregnant women with haemoglobin level less than 8 g/dl should be given special care during pregnancy to improve haemoglobin by oral
perinatal iron therapy depending on the period of gestation. Severely anaemic pregnant women should be hospitalised. (Ramalakshmi, 1981).

A study was undertaken to:

a) Determine the amount of iron to be used for the treatment of anaemia during pregnancy;

b) To determine whether folic acid and/or vitamin B₁₂ should also be given and at what levels; and

c) To determine in which form the iron should be given to pregnant women in India.

Eight hundred women in the first 24 weeks of pregnancy were included for the prophylactic trial. The women were then placed in one of four treatment groups; placebo; 3 mg elemental iron; 30 mg elemental iron plus 500 µg of folic acid daily; or 30 mg elemental iron, 500 µg folic acid and 2 mg of vitamin B₁₂ daily. The tablets were provided at one week intervals and women were instructed regarding administration.

The findings indicate that a daily supplement of 30 mg of iron given from the 24th week of pregnancy is sufficient not only to maintain haemoglobin levels above 10 g/dl, but also to raise haemoglobin levels in many pregnant women. Simultaneous administration of folic acid and vitamin B₁₂ seems to bring about no significant improvements in haemoglobin status. In subjects who showed a fall in haemoglobin levels, attempts were made to determine the cause. It is suggested that daily supplements of 30 mg elemental iron be given to all women during the last 100 days of their pregnancy. (Iyengar; et al 1970)

The Government of India has started a national programme to prevent and control nutritional anaemia. Iron and folic acid tablets are distributed to target groups comprising women and preschool aged children through health centres and anganwadi. Studies conducted to evaluate this programme have identified certain bottlenecks in the right implementation of the programme. It was found that health personnel and patients both were not sincere therefore only health education is the most powerful tool to overcome such problems. (Ramalakshmi, 1981).
An effective, manifold approach to the management of anaemia in pregnancy in developing countries must include:

a) fortification of common food stuffs with iron to increase dietary intake of iron and improve haemoglobin status

b) early detection of all pregnant women

c) oral iron folate prophylactic therapy for all non anaemic pregnant women [haemoglobin more than 11g/dl.]

d) iron, folate, oral medication at the maximum tolerable dose throughout pregnancy for women with haemoglobin between 8 to 10 g/dl.

e) parental iron therapy for women with haemoglobin level between 9 to 8 g/dl.

f) hospitalization management haemoglobin less than 5 g/dl,

g) effective obstetric management

h) improvement in health care delivery system and health education to promote utilisation of available care.

It is protocol for prevention and management of anaemia during pregnancy (Ramlakshmi 1981).

A cross-sectional study was conducted among the pregnant women in three administrative divisions of West Bengal to undertake a rapid assessment regarding the magnitude of the problem of anaemia in pregnancy and also to study care seeking behaviour for the same. The findings revealed that the occurrence of anaemia in these three divisions were very high; to the extent of 86.39 percent and popularly known as 'Rakta Sunyata' or 'Rakta lplata' to the common people. As per WHO guidelines 40 percent prevalence could be considered as public health problem of a very large magnitude. Caregivers prescribed iron supplementation only in 70 percent of registered pregnant women when 100 percent coverage of pregnant women with iron folic acid tablet is our national goal. Amongst this group 72.2 percent were partially consuming these tablets. Main reason for irregular consumption were factors such as pregnant women were taking rest 2 hours at daytime; inability to purchase iron tablets or they were not given iron tablets. It was suggested that health workers provide regular supply and provide information, communication and educational activities. (Ray, Mallick, Kumar and Biswas, 2000).
Regarding anaemia, the Government of India initiated the National Nutritional Anaemia prophylaxis programme under which pregnant women are provided with daily supplementation of 60 mg. elements iron and 0.5 mg. folic acid for 100 days during pregnancy. These findings suggested that 60 mg. iron is inadequate as it does not replete body iron stores in depleted women, and 120 mg. is a good compromise dose giving an adequate response without too many side effects. (Reldaiah, Prasnna, Ramachandran, Nath and Sood, 1989).

Along with iron supplementation, nutritional education is very important to overcome the problem. Some of the difficulties faced in the treatment with supplementary drugs were that many pregnant women in India and Thailand believe that taking iron and vitamin tablets will cause them to have big babies. Among the Malay in Indonesia, pregnant women avoid medicines believed to be hot. Hot substances are thought to cause the womb to become uncomfortably hot and are likely to induce abortion, overheating is considered dangerous.

Side effects of treatment regimes are also often associated with noncompliance. In fact the side-effects of taking iron are the most frequently suggested explanations for non-compliance with iron regimes (Affietal 1966, Charoenlarpetal 1988, Kuizon et al 1983, Demaeyer 1989, Gove et al 1987). However with the exception of side-effects, these issues have not been fully explored.

The oral administration of iron can cause gastrointestinal side-effects in some individuals such as epigastric discomfort, nausea, vomiting, constipation and diarrhoea. The frequency of these side-effects is directly related to the dose of iron, certain formulation’s are better than the slow-release preparations. Now a day a combined tablet is given to pregnant women. Therefore constant motivation and community participation are required. Motivating pregnant women through health talk is very essential. (WHO/ MCH/1990).
2.3 RELATIONSHIP OF SELECTED VARIABLES WITH REGARD TO PREVENTION AND MANAGEMENT OF ANAEMIA DURING PREGNANCY

In the prevention and management of anaemia during pregnancy, there are some selected variables, which correlate with each other; they are:

(1) The pregnant mother and

(2) Her foetus variables such as age of mother, education, occupation, income, parity, gestational age, weight of mother and new born, haemoglobin status during antenatal period and post natal period. It has been recognised that anaemia is a major nutritional problem in pregnancy in poorer segments of the population in developing countries; studies conducted in India indicate that maternal anaemia is associated with increased maternal morbidity and mortality. Association between maternal anaemia and low birth weight, prematurity and perinatal mortality has been documented by many studies in India. (Prema, 1983).

In India, teenage marriage is the rule and in rural areas early teenage pregnancies are common. The mean birth weight of infants born to girls below the age of 16 years was lower. The perinatal and neonatal mortality rate among infants born to girls under 16 years both in urban and rural areas was higher. The mortality rates were lowest among infants born to women between 20 – 29 years. Elderly pregnant women had more chances of anaemia, malnutrition and low birth weight. (Annual Report, 1980)

Lower maternal body weight, lower pregnancy weight gain, and higher prevalence of anaemia and possibly pregnancy induced hypertension are common among girls who conceived before they were 16. The mean birth weight of infants born to these girls were comparable to those born to primi para in rural low income groups, except in the severely under nourished girls. The mean birth weight was lower and the proportion of infants weighing less than 2.5 kg at birth was significantly higher among infants born to girls who were severely under nourished during childhood.

The two strongest influences on birth weight are mother's pre-pregnancy weight and her weight gain during pregnancy. (Rosso, Saliras, Ahumada, Vial and
Several reports have shown that non-obese women, who gained less than the recommended weight, tend to have lighter infants. The effect of weight gain during pregnancy is even more pronounced in women who are underweight such women often deliver low birth weight infants who are at particular risk in the neonatal period.

A comparison of the haematological status of pregnant women of two socio-economic classes were made before and after giving the women similar haematiniotherapy, eighty-eight middle class women and eighty-eight lower class women attending an antenatal clinic from their first trimester to full term pregnancy were included in the study. Blood samples were drawn during the first and last antenatal visits from each subject. Both classes of women were divided into two groups. One group from each class was treated daily with oral ferrous fumarate (130 mg elemental iron) and the other group from each class was treated with ferrous salts (13 mg) plus 2.5 mg oral folic acid daily. It was found that the lower class pregnant women had significantly lower haemoglobin and nutrient values than the middle class women, which lead to low birth weight or anaemic newborns. (Molina 1974)

In developing countries, anaemia is associated with dietary inadequacies and intestinal parasites. Treatment trials in developing countries have been problematic because of local circumstances e.g. illiteracy, low income and high-rate of non-cooperation.

A longitudinal study of 212 pregnant women for a period of one year was conducted in a rural area of Uttar Pradesh. Effect of socio-economic factors was recorded on weight gain in pregnancy in three different trimesters. Significant increase in weight gain in pregnancy was observed in pregnant women belonging to social class I and II. High caste women also showed significant increase in weight gain during pregnancy than the women of backward and scheduled caste. Anaemia was found to be prevalent in 77.5 percent of women. Since majority of the women belonged to social class IV and V, this study highlights the importance of raising the overall socio-economic status of families to improve the health status of women as a whole. (Bhardwaj, Badrul, Hasan, Zeheer and Bano, 1996).
A study was done to find out impact of nutritional counselling and supplements on the maternal nutrition of rural pregnant women and their neonates. Sixty six young women from low and lower middle income groups selected from 8 villages of Ludhiana district in the first trimester of pregnancy were divided equally into experimental (E) and control (C) groups, out of these only 60 subjects reached term. Folifer and calcium tablets were supplied to E group from second trimester till delivery along with regular medical supervision and nutrition education about additional nutritional needs. Intakes of all the nutrients were less than the recommended dietary allowances in the E and C groups during the third trimester. However, the requirement of iron, calcium, folic acid, vitamin B\textsubscript{12}, Vitamin D and ascorbic acid were met in group E due to supplementation. The Fe, Ca and Cu levels were significantly improved in group E. The relationships between maternal and cord blood levels of Fe, Ca and Cu were also significantly higher in group E. It was concluded that regular medical supervision, supplementation and nutritional education significantly improved the nutrition of pregnant women and their neonates. (Sachdev Manna, 1994).

Maternal nutrition and growth of the foetus have a close association. A study was conducted to find out the birth weight of new borns with relation to the maternal variable. Five hundred and thirty two women and their off springs comprised the sample of this study. Mothers delivering their babies at the Nehru Hospital were subjected to measurement and documentation of height, weight and weight height product index (WHPI), and their age parity and haemoglobin estimation. For the new born the birth weight (BW) and period of gestation (POG) were noted. The correlation of WHPI to BW was positive. The POG and BW shows a positive correlation \( r = 0.61 \). The correlation to maternal age and BW was \( r = 0.76 \) as the birth weight went down in the higher age group. The period of gestation to birth weight relation shows a highly positive correlation \( r = 1 \). Parity is known to influence the birth weight. (Biswa, Uppal, Biswas, Shobha, Karmarkar and Dhalla, 1984).

Maternal risk factors for low birth weight have been determined by few other workers. Due to wide variations, factors operating in one region may not be applicable in other parts of India. Also defining maternal factors which can be assessed by history and simple clinical examination will help the peripheral health
worker to refer high risk cases. The study was conducted on maternal risk factors and low birth weight. Mothers of 837 live newborns from one teaching hospital, two urban hospitals and 3 rural maternity and child welfare centres, all in Udupi Taluka were studied from August 1985 to June 1986, to determine the maternal factors in this area, responsible for low birth weight babies.

Age, educational status, antenatal care, birth order, birth interval, weight, height and haemoglobin level were some of the factors subjected to detailed statistical analysis. Cut off levels for birth interval, weight, height, and haemoglobin were determined, based on the frequency distribution, below which these constituted risk factors, WHO defines anaemia in pregnancy as haemoglobin less than 11 g/dl. Other workers have used cut off levels of 8 g/dl below which haemoglobin level was a risk for Low Birth Weight (hereafter, LBW). In this study 11 g/dl was taken at all levels, based on the frequency distribution. Only 54.6 percent mothers had haemoglobin level less than 11 g/dl as compared to high levels of 81 percent in Bihar and 87 percent in Uttar Pradesh as reported by Agarwal et al (1987). The odd’s ratio for LBW was small in these mothers. The most important factors for LBW in this region were mothers who had received no antenatal care, teenage pregnancy, mothers weight less than 45 Kg. and illiteracy of mothers. It was concluded that there was a need to identify risk factors for each community; peripheral workers can then be trained to identify high risk mothers based on history and simple physical examination and institute remedial measures. (Krishna and Chakldar 1989).

2.4 HEALTH EDUCATION RELATED TO PREVENTION AND MANAGEMENT OF ANAEMIA

Successful outcome of pregnancy depends on the harmony of the foetus with its mother and on the harmony of the mother with her midwife. Therefore nursing personnel play a key role in bringing down the incidence of anaemia during pregnancy and reducing Maternal Mortality Rate (hereafter, MMR) and the related pre-disposing causation of anaemia during pregnancy. This is done through health education. Health Education is the most appropriate tool, which can be used any time, any where.
The key role that haemoglobin plays in transporting oxygen to tissues accounts for the diminished work capacity and physical performance of pregnant women with a diminished concentration of haemoglobin, which leads to increased maternal and foetal morbidity and mortality, and an increased risk of low birth weight. The basic approach to the prevention and control of anaemia during pregnancy as health education women must be convinced about the importance of iron and folic acid for their health and the health of their unborn child. Since vitamin C enhances iron absorption in the body, mother can take fresh fruits and vegetables along with their regular food, e.g. Guava, Lemon, Cabbage, and Tomato, etc. Avoiding consumption of too much tea and coffee as it contains tannin and coffin that inhibits the absorption of iron in the body and most important, women must be convinced about taking supplementary drugs properly, as well as having regular check-up. (IGNOU HS1P2, Applied Health Sciences, 1994).

Thus health education is essential to improve the utilisation of existing facilities in reducing maternal anaemia and improving the obstetric outcome. Prevention of anaemia in pregnancy is a feasible proposition, provided there is a regular supply of Iron Folic Acid (IFA), Information, Education and Communication (IEC) activities should be geared up in the following areas at the community level:

a) Providing information regarding the magnitude of the problem of anaemia in pregnancy and its ill effect on mother and child
b) Imparting knowledge on correct advice on IFA tablets.
c) Correct advice on iron rich food
d) Need for rest, sleep and avoiding heavy work and extra meals during pregnancy.
e) Participation of community leader, family members, husband and caregivers as well as private practitioners on key issues related to anaemia in pregnancy.


Poverty, ignorance, non-availability and/or failure to utilise available medical facilities have been shown to be associated with maternal anaemia on the one hand and maternal and perinatal morbidity and mortality on the other, though the
association is not casual. Health education to improve utilization of available facilities and improvement in health care delivery system to cater to the needy, right at their doorsteps might thus go a long way in reducing adverse obstetric outcome associated with maternal anaemia. (Ramchandran, 1981).

Four hundred and thirty five pregnant women attending the antenatal clinic at the University of Benin Teaching hospital were investigated. The ages of the women ranged from 16-52 years with an average haemoglobin level of 10.52 g/dl. The prevalence rate of anaemia among these antenatal was 20.7 percent and 2.8 percent had severe anaemia. This showed that anaemia is still a problem. Mothers in the age groups 16-19 years and 30-39 years constituted higher percentages of anaemic cases compared to other age groups. The percentages of the pregnant women who were anaemic were also higher in social classes IV and V contributing 27.6 percent and 21.9 percent respectively. One hundred and eight (49.4%) of the pregnant women booked for antenatal care during the 3rd trimester and the percentage of anaemia was highest in this group 54 (28.4%). About half of the mothers who were para 5 + were anaemic. Nutrition education components of antenatal care should be intensified. Therefore health education is an important function in the antenatal clinic. (Ogbeide, Wagbatsoma and Orhue, 1971).

A study was conducted to find out maternal and infant nutritional practices in the rural areas, Ninety Mother-Child units were randomly chosen from a birth registrar in Bay Laguna and the mothers were interviewed, 27 percent were found to practice certain food avoidances because of the perceived effects of these foods on the foetus and the mother herself. The majority of women however, had no particular food preferences nor did they discriminate during pregnancy and most take vitamins, vegetables and fruits to make their infant healthy. The findings revealed that many aspects of rural life nutrition could be used with promotion of maternal and child care. Among these were adherences to breast feeding and timing of introducing supplementary feeding; it is stressed that health personnel need to play a key role in introducing changes in the communities. (Cruze, 1946).

The types of food avoided by pregnant women in Nigeria and the reasons for the aversion to these foods were investigated. Sixty pregnant women with similar
socioeconomic backgrounds requesting antenatal care at Enuwa Maternity Centre were randomly selected and assigned to an experimental and a control group. The intent was to ascertain whether regular nutritional counselling could be helpful in modifying some of the food aversions held by pregnant women.

It was reported that unwillingness to consume certain foods was based on concern for the mother's health. Such foods as milk and cowpeas were avoided for fear of being too heavy or to avoid having a big baby. Certain fruits were avoided because they are believed to cause gastrointestinal problems and nausea. Many of these foods provide all of the key nutrients (Calcium, Vitamin A, Iron, Folic acid, Vitamin C) needed by pregnant women. It was concluded that motivating the mothers and alleviating their fears about certain foods and by reassuring them about the advantages of milk, cowpeas, and other foods the women's food aversions could be changed. It is recommended that health workers should be more understanding of mother's beliefs, knowledge, and practices regarding locally available foods so as to be able to counsel women to improve their nutritional status. It is clearly indicated that providing appropriate information and educating the pregnant mothers is very essential. And it should be done by the nursing personnel because they are with the clients. (Ojofeitimi et al., 1982).

Prevention and treatment of anaemia in women: oral supplementation with iron, parental administration, diet and fortification, paper presented at the International nutritional anaemia consultative group workshop on maternal nutritional anaemia, Geneva, Switzerland, reviewed some of the studies carried out in India on the prevalence of anaemia and on nutritional supplementation and food fortification trials; improvement of diet, iron supplementation, iron fortification of foods and the eradication of hookworm was included in the studies.

In India many issues hinder attempts to improve dietary patterns. Not only are there regional differences in food intake, but increases in dietary iron intake also require augmentation of the total food intake, which means need to improve dietary habits.
Although several supervised and a few unsupervised iron supplementation trails have been carried out in India, there still is a need to improve the existing anaemia control programme or to develop new strategies for supplementation. Several vehicles for iron fortification have been tried and found successful in many countries. However in India, the only vehicle which has been suitable for fortification has been common salt. A review of a trial of an iron fortified salt is presented. It concluded that for the control of nutritional anaemia in developing countries, multiple strategies are needed. (Sood, 1998).

If multiple strategies are required to reduce nutritional anaemia, then health education is a key point to reduce anaemia during pregnancy. Health education is not only something for the people to hear, it is something for the people to see and if possible do, promoting health in a group in a health education set up is an effective technique. An additional technique which is useful and specific to the children or adult is to solicit their participation in the contest of the health education programme. An interest evolves participation that can be increased to presentation of material in collaboration with the nurse. (Park; et al 1985)

Anaemia is one of the most frequently observed nutritional deficiency diseases in the world today. It is especially prevalent in women of the reproductive age group particularly during pregnancy when it is often a contributory factor of maternal death. Keeping this message in mind we should impart health information to pregnant mothers earnestly. They may then become alert about their antenatal care. Health information should be provided to individuals, groups and to the mass. This leads to improved health condition of pregnant mothers.

The major changes in behaviour that are needed, centre on concentrate on the compliance of eating habits and measures for infection control, including better personal hygiene responsibilities that are in many societies assigned primarily to women. Therefore we have to take the opportunity to provide the health information in relation to prevention and management of anaemia during pregnancy.

Education messages are unlikely to succeed unless they take account of the real motivations of the target group, that is; pregnant women, rather than simply
bombarding them with ready made messages. Education massages need to be
developed where they exist, help them draw up the anaemia control strategy,
including health and nutrition promotion that they themselves can carry out with
support from service providers. (Pizurki 1987).

All the above literature reveals the magnitude of the problem of anaemia
during pregnancy, and the studies were of a great help for developing the present
study and the tool. The review helped the investigator to understand the problem in a
clearer perspective.