

**A STUDY TO ESTIMATE THE PREVALENCE OF
POSTNATAL ANAEMIA AND ASSESS THE
POSTNATAL SERVICES AMONG LACTATING
MOTHERS IN A RURAL AREA OF TAMILNADU**

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CERTIFICATE

This is to certify that the dissertation on '**A study to estimate the prevalence of postnatal anaemia and assess the postnatal services among lactating mothers in a rural area of Tamilnadu**' is a bonafide work carried out by **Dr. R. GEETHA**, post-graduate student in Institute of Community Medicine, Madras Medical College, Chennai-3 during 2008-2011, under my guidance and supervision in partial fulfillment of the requirement laid down by The Tamilnadu Dr.M.G.R. Medical University, M.D. Community medicine, Branch-XV Degree examination to be held in April 2011.

Dr.J. Mohanasundaram,
M.D., DNB, Ph.D.,
Dean,
Madras Medical College,
Chennai – 600 003

Dr.K.Jayakumar,
M.B.B.S., DPH., DIH
Director
Institute of Community Medicine,
Madras Medical College,
Chennai – 600 003.

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LIST OF ABBREVIATIONS

WHO	:	World Health Organisation
Hb	:	Haemoglobin
NFHS	:	National Family Health Survey
ICMR	:	Indian Council for Medical Research
AN	:	Antenatal
PN	:	Postnatal
MPHW	:	Multi Purpose Health Worker
GIRFHW	:	Gandhigram Institute of Rural Health and Family Welfare trust
IFA	:	Iron and Folic Acid
VHN	:	Village Health Nurse
ANM	:	Auxillary Nurse Midwife
ICDS	:	Integrated Child Development Services
PHC	:	Primary Health Centre
RCH	:	Reproductive and Child Health
NRR	:	Net Reproduction Rate
CSSM	:	Child Survival and Safe Motherhood
SPSS	:	Statistical Package for Social Sciences

DEFINITIONS OF TERMS USED

- IFA tablets : It means the tablets given under the National Anaemia Control Programme which contains 100 mg of elemental iron and 500 mcg of folic acid.
- Exclusive breastfeeding : Feeding the baby only with breast milk not even water except for the medicinal preparation
- Adequate nutrition : Means if milk/ Curd and vegetables are taken daily, green leaves, egg and non-vegetarian food taken more than once in a week. For a vegetarian pulses should be taken daily.
- Birth order : No. of children a mother has at present
- Birth interval : The interval between two births.
- Family planning advice : Counselling on the contraceptive methods.
- Postpartum care : The clinical examination of the postnatal mother and the advices given to her on self care, nutrition, exclusive breast feeding and family planning.

Excessive Menstrual Bleeding: Bleeding during menstruation for more than 5 days with passage of clots and changing 3 or more pads per day.

Lactating Mother : Mother who is breast feeding her child.

Abortion : Expulsion of the products of conception before 28 weeks of pregnancy.

Deworming during

AN Period : Treating the AN mothers with one tablet of Albendazole 400 mg during the second trimester of pregnancy for intestinal worms.

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INTRODUCTION

Anaemia is the most common nutritional deficiency disorder in the world. WHO has estimated that the prevalence of anaemia in developed and developing countries in pregnant women is 14 percent and 51 percent respectively and 65-75 percent in India¹. About one third of the global population are anaemic².

Prevalence of anaemia in all the groups is higher in India as compared to other developing countries¹. Prevalence of anaemia in South Asian countries is among the highest in the world. WHO estimates that even among the South Asian countries, India has the highest prevalence of anaemia. What is even more important is that about half of the global maternal deaths due to anaemia occur in South Asian countries; India contributes to about 80% of the maternal deaths due to anaemia in South Asia³. It is obvious that India's contribution both to the prevalence of anaemia and maternal deaths due to anaemia is higher than warranted by the size of its population.

Worried about the high prevalence of anaemia in the country, five major surveys (National Family Health Survey II⁴ and III⁵, District Level Household Survey II⁶, Indian Council of Medical Research Micronutrient Survey⁷ and Micronutrient Survey conducted by the National Nutrition Monitoring Bureau⁸ (NNMB) were undertaken to estimate the prevalence of anaemia in the country. All these showed that over 70 percent of preschool children were anaemic.

NNMB, DLHS and ICMR surveys showed that over 70 percent of pregnant women and adolescent girls in the country were anaemic. This shows that anaemia begins in childhood, worsens during adolescence in girls, gets aggravated during pregnancy and continues through the postnatal period. NFHS 2 and 3 reported lower prevalence of anaemia in women and pregnant women as compared to DLHS, NNMB and ICMR Micronutrient surveys. This appears to be due to the use of Haemocue method for Hb estimation. Studies in India have shown that as compared to the classical cyanmethaemoglobin method, Haemocue overestimates Hb levels⁹⁻¹³.

FACTORS RESPONSIBLE FOR HIGH PREVALENCE OF ANAEMIA:

Studies carried out in India and elsewhere have shown that iron deficiency is the major cause of anaemia followed by folate deficiency. In recent years the contribution of B12 deficiency has been highlighted¹⁴. In India, the prevalence of anaemia is high because of (i) low dietary intake, poor iron (less than 20 mg/day) and folic acid intake (less than 70 microgram/day); (ii) poor bioavailability of iron (3-4% only) in phytate and fibre-rich Indian diet; and (iii) chronic blood loss due to infection such as malaria and hookworm infestations^{7,8}.

Data from NNMB surveys¹⁵ showed that iron and folic acid intake in the country in all age groups was very low. There has not been any increase in iron intake over the last three decades in any group. The apparent reduction in

iron intake in the NNMB surveys 2000-01 and beyond was due to the finding that only 50% of the iron in Indian diet is absorbable. Poor iron stores at birth¹⁶, low iron content of breast milk and low dietary iron intake through infancy and childhood results in high prevalence of anaemia in childhood^{16,17}. Anaemia gets aggravated by increased requirements during adolescence, pregnancy and lactation⁶.

POSTNATAL CARE

The care of the women does not end with the delivery of the child. Postpartum care is one of the essential component of maternal and child health programme, but unfortunately it is often neglected. The coverage level is 5% to 35% at global level. The timely intervention during the postpartum period can prevent the deaths of both the mother and the neonate and can reduce the long term complications¹⁸.

Postnatal care aims at ensuring the mothers to establish good lactation and motivating them to accept contraceptive methods. Atleast 3 visits are recommended for each postnatal mother within two weeks of delivery. The postpartum checkup and counselling regarding family planning, child care, breast feeding has to be improved for effective services. Better postnatal services and education helps in reduction of infant mortality, under five mortality and other maternal morbidities¹⁹.

Promotion of Maternal and Child Health has been one of the most important objectives of the family welfare programme. In Minimum needs programme (1974-79), CSSM(1992-93) and RCH programme(1997), the integration of maternal health, child health, nutrition services and family planning services were made. The important elements of RCH programme includes provision of An care, encouragement of institutional deliveries, provision of postnatal care and management of reproductive tract infections⁴.

OBJECTIVES

1. To estimate the prevalence of anaemia in lactating mothers within six months of delivery.
2. To find out the factors associated with anaemia in these mothers.
3. To assess the postnatal services provided to them.

JUSTIFICATION

1. Anaemia is one of the serious public health problems. In developing countries, like India, it is not only a health problem, but also a social and economic problem. National programmes to prevent anaemia in pregnant and lactating mothers have been implemented since 1972, with the hope of reducing its prevalence, but unfortunately there is no satisfactory result so far. So studies are needed to find out the reasons for failure to control anaemia.
2. Anaemia during postnatal period is given much less importance as compared to antenatal anaemia. With the stress of child birth, the iron status further decreases after delivery. To replenish the iron stores and to meet the increased demands, the National Nutritional Anaemia Control Programme recommends the supplementation of IFA tablets even to lactating mothers and IUCD acceptors. But the coverage is not satisfactory and indicators for IFA supplementation in postnatal period is not available. Since even mild anaemia can reduce the work capacity, women's health should be given importance even after delivery, so that she can effectively take care of her family.
3. Since the prevalence of anaemia in all age groups is more in rural area as compared to urban area⁵ which might be due to low level of literacy,

socioeconomic status and awareness, a rural area in Thiruvallur district of Tamilnadu was selected for the study.

4. Better postpartum care goes a long way in preventing the immediate and remote health problems in a mother like postpartum haemorrhage, puerperal sepsis, postpartum eclampsia, mastitis, anaemia etc., and also in a neonate. This helps to reduce the maternal death and infant death rate to a considerable extent.
5. RCH recommends at least three postnatal checkups to a mother within two weeks of delivery. But the coverage is only 5 – 35% only¹⁸.
6. Proper education and counselling of mothers regarding family planning, personal hygiene, child care and nutrition plays an important role for achievement of maternal and child health goal.
7. Finally, there are many studies on anaemia in pregnancy but there is a paucity of studies on postnatal anaemia. This urged me to do a study on the prevalence of anaemia in postnatal mothers who might become pregnant in future and contribute to antenatal anaemia.

REVIEW OF LITERATURE

Anaemia is a reduction in either the volume of red blood cells or the concentration of Hb in a sample of venous or capillary blood when compared with similar values from a reference population²¹.

WHO defined nutritional anaemia as, "a condition in which the Hb content of blood is lower than normal as a result of deficiency of one or more essential nutrients, regardless of the cause of such deficiency"²⁰. Among the various causes of anaemia, the most frequent cause is iron deficiency. Iron deficiency is probably the most common nutrition disorder in the world²² and is a serious public health problem given its impact on psychological, physical development, behaviour and work performance.

IRON

Sources^{23,24}

There are two types of iron, haem and non haem iron. Haem iron is a constituent of Hb and myoglobin and is present in meat, fish and in blood products. Non haem iron is found in all foods of plant origin in varying degrees. Besides the food, the diet may also contain exogenous iron originating from the soil, dust, water or cooking vessels.

Absorption^{23,24}

The absorption of dietary iron is influenced by the amount and chemical form of the iron, the consumption of factors enhancing or inhibiting iron absorption and the health and iron status of the individual. Iron is not absorbed from the stomach. The maximum absorption occurs from the duodenum. Iron status of the body determines the amount of iron that is absorbed. Iron absorption is increased with decreased iron stores, increased erythropoietic activity and during pregnancy. The factors like ascorbic acid, meat, poultry, fish and low pH enhance non haem iron absorption. Factors like phytates and tannins inhibit non-haem iron absorption.

Iron requirements²⁵

A dietary intake of iron is needed to replace, iron lost in the stools and urine, during menstruation in women. The total iron loss for menstruating women is about 1.25 mg/day. Although menstruation related iron losses are reduced to nil during pregnancy, additional iron of approximately 1000 mg is needed over the entire pregnancy for the fetus, placenta and the increased maternal blood volume. During lactation, absence of menstrual blood loss is partially offset by the secretion of 0.3 mg iron per day in breast milk. A woman's mean requirement during the first six months of lactation is estimated to be about 1.3 mg of iron per day. Dietary iron absorption for adult men,

children and adolescent boys is 3%, for adult woman, lactating woman and adolescent girl is 5%, and for pregnant woman 8%.

DEFINITION OF ANAEMIA:

A WHO expert group proposed that “ anaemia (or) iron deficiency should be considered to exist” when the haemoglobin is below the following levels.

WHO criteria for diagnosis of anaemia ^{4,23,25}

Age / Sex	Hb gm/dl
Children	
6 months-6 years	<11 gm / dl
6 years – 14 years	<12 gm / dl
Adult males	<13 gm / dl
Adult females	
Non pregnant	<12 gm / dl
Pregnant	<11 gm / dl

The anaemia is further divided into mild, moderate and severe on the basis of the Hb levels^{23,25}

Anaemia status	Hb level
Severe	<7 gm/dl
Moderate	7 to 9.9 gm/dl
Mild	
For pregnant	10 – 10.9 gm/dl
For non- pregnant	10 – 11.9 gm/dl

WHO criteria for iron deficiency anaemia to be considered as a public health problem is as follows ⁶¹

Hb level	Problem of anaemia Considered to be of		Low magnitude
	High magnitude	Moderate magnitude	
Mild/moderate anaemia (7-11.9gm/dl)	>40%	10 – 39%	1 – 9%
Severe anaemia(<7g	>10%	1 – 9%	0.1 – 0.9%

Effects of iron deficiency^{22,26}

The consequences of iron deficiency anaemia are:

In pregnancy:

Increased maternal morbidity and mortality

Increased foetal morbidity and mortality

Increased risk of low birth weight.

In postpartum period and adults:

Significant impairment of work capacity

Decreased resistance to fatigue.

In infants and children:

Impaired motor development and coordination

Impaired language development

Psychological and behavioural effects like inattention, fatigue etc.

Decreased physical activity.

Others:

Defects in the cell mediated immunity and increased susceptibility to infection.

Causes of anaemia^{27,28}

1. Inadequate dietary intake, cereal based diet.
2. Decreased absorption
3. Worm infestation
4. Low birth weight
5. Chronic infections
6. Physiological blood loss
7. Increased demands as in pregnancy and lactation.

Factors that influence the prevalence of anaemia²⁹

1. Socioeconomic status
2. Dietary patterns
3. Poor hygiene and nutrition
4. Degree of urbanisation
5. Educational background
6. Accessibility to health care facility
7. Prevalence of recurrent infections
8. Worm infestation.

Clinical features of anaemia²⁸

- Pallor of the skin and conjunctiva.
- Palpitation, fatigue and shortness of breath
- Decreased exercise tolerance
- Koilonychia, glossitis, stomatitis and mucosal webs.

Since the signs and symptoms are non specific and it is influenced by various variables, laboratory tests should be used to diagnose anaemia and to determine its severity.

Assessment of iron status³⁰

Anaemia is the late manifestation of iron deficiency. Three stages of iron deficiency have been described.

First stage : decreased storage of iron without any detectable abnormalities.

Second stage : iron stores have exhausted, but anaemia has not occurred. This stage is widely prevalent in India.

Third stage : iron deficiency with a decrease in Hb concentration.

Laboratory tests for detection of anaemia³⁰

- a. Single measure :
 1. Haemoglobin
 2. Serum ferritin
 3. Erythrocyte protoporphyrin
 4. Serum transferrin receptor

- b. Double measure :
 1. Serum ferritin and haemoglobin
 2. Serum transferrin receptor & haemoglobin
 3. Serum transferrin receptor and serum-ferritin.

All the tests have some limitations. However the cost effective test is to use Hb values at field levels⁴. The principle in determination of Hb is to convert the Hb to one of its compounds, the concentration of which is determined by matching the colour with a known standard colorimeter^{31,32}

The laboratory technique in common use are:

- a. Cynmethaemoglobin
- b. Oxyhaemoglobin
- c. Alkaline haematin method.

Cynmethaemoglobin method has become the popular of the three because it measures practically all haemoglobins except sulfhaemoglobin and the standard used remain stable for a long time. The details of estimation of Hb is given in Appendix:1

GLOBAL STUDIES:

According to WHO regional health report, iron deficiency is more common in women than in men. Among the six WHO regions South East Asia has the highest prevalence of anaemia in all age groups³³.

In a study conducted at Mali by Diallo et.al, the incidence of iron deficiency anaemia was 36.8% and was significantly higher in young mothers³⁴

Simmons et.al conducted a study at Jamaica which showed 61.6% pregnant women had Hb level <11 gm/dl and 58.7% of lactating women had Hb level <12 gm/dl.³⁵

Msolla M.J. et.al in their study found that 95% of the pregnant women were anaemic and are suffering from iron, folate and vitamin B12 deficiencies.³⁶ At coastal Kenya, a study was conducted which showed that the prevalence of anaemia was 75.6% and that of severe anaemia was 9.8% among all parities.³⁷

Bermejo et.al found that the iron deficiency anaemia prevalence was 47.5% among women in child bearing age.³⁸ Ramirez-mateose et.al showed that anaemia and iron deficiency were seen in 37% and 48% of women respectively inspite of good sociodemographic and nutritional conditions³⁹.

A study by N.Meda, S. Cousens estimated that the prevalence of anaemia was 59% in all women, 71% among pregnant women and 64% among those who are breast feeding. They also found that among the pregnant women, the prevalence of anaemia during the first trimester was comparable to that of non-pregnant non-breast feeding women⁴⁰.

Glazner M.A. et. Al in their study stated that since the quarter of women were affected by anaemia after delivery, the routine Hb measurement after delivery should not be neglected. They also found an increase in incidence of

anaemia from 15% of women in hospital at 0-13 days to 25% at home upto 8 weeks.⁴¹

Thomson et.al showed that 41.5% of the women were found to be anaemic and mild anaemia affects the large proportion of pregnant women in Namibia⁴²

Briese V. et.al in their study found that the prevalence of anaemia in puerperium increased from 33.78% in 1986 to 49.46% in 1992 and they stressed on general iron supplementation during pregnancy and puerperium⁴³

Bergsjo P et.al estimated that 74.5% of pregnant women were below 11 gm/dl and 7% were below 7 gm/dl.⁴⁴

INDIAN STUDIES ON PREVALENCE OF ANAEMIA

The National Family Health Survey II⁴ conducted in Andhra Pradesh in 1998 showed that 49.7% of pregnant women, 56.4% of non pregnant breast feeding women and 50.4% of non pregnant non breast feeding women were anaemic. Anaemia prevalence decreases as education and standard of living increases.

In NFHS-III conducted during 2005-06⁵, the prevalence of anaemia among pregnant women was 58% and among ever-married women was 56%. There was an increase in the prevalence rate when compared to NFHS-II.

A study on prevalence of anaemia in pregnant and lactating women in India by Agarwal et.al⁴⁵ of Healthcare and Research Association for Adolescents Noida and Nutrition foundation of India, New Delhi said that the prevalence as well as the severity of anaemia was significantly higher in their study as compared to NFHS II. They said that the difference would be due to the haemocue method of Hb estimation which gives higher estimates of Hb.

Dr. Sadia Khan & Sobia Nawaz⁴⁶ of Rawalpindi General Hospital conducted a study there and found that 87.5% of anaemia was due to iron deficiency in 25-30 yrs age group. 83.7% of them belonged to lower socioeconomic class. 52.5% were multigravida and 67.5% were moderately anaemic.

A study was conducted at Ahmedabad, by Mrudla K. Lala et.al which showed that the anaemia, low socioeconomic status, short birth interval, maternal age are the significant risk factors for low birth weight.⁴⁷

Prof. Sandeep Roy carried out a study in three districts of West Bengal and observed that anaemia varied from 66% to 95.38% with an average of 85.98%⁴⁸

A Multicentric study by the Indian Council of Medical Research has shown that 17% of pregnant women have Hb value less than 9 gm/dl even to start with²⁵

R.K.Sharma et.al⁴⁹ showed in their study that highest incidence of low birth weight was observed in mothers having Hb level 6 gm/dl and it was found to be decreased when the Hb levels improved.

STUDIES ON IFA SUPPLEMENTATION AND CONSUMPTION

A study by Nietfeld et al. stated that in pregnancy, the regeneration of Hb takes time than in the postnatal period. Though normal Hb concentration is reached after 8 weeks of therapy, continuation of therapy is indicated after delivery. The treatment of postnatal anaemia must be continued for 6-8 weeks after normalisation of Hb concentration⁵⁰

A study by Rohit V. Bhatt says that due to poor nutrition, menstrual blood loss, infection and increased demand of iron in pregnancy, an average Indian woman enters her first pregnancy with inadequate or poor iron stores. Only 50% of pregnant women receive antenatal care and large majority are denied of medicinal iron. Even in those who seek AN care, the supply of iron tablets is erratic, irregular and inadequate. The main problem in Indian women is inadequate iron stores, lack of supply of medicinal iron and poor compliance in consuming iron tablets.⁵¹

In a survey by GIRHFW 93% of women had full antenatal package of services, 95.7% received IFA tablets, 84.3% took one tablet of IFA regularly, 6.6% took two tablets regularly⁵².

73% of pregnant women received IFA tablets during their pregnancy and this ratio increases as the literacy of women increases. This finding was given by Padam Singh et al. in his study. They also mention that the IFA coverage level for Tamilnadu is 93.7%⁵³.

A Multicentric study by ICMR found that in 38% of women who had consumed the tablets regularly for more than 90 days during the last trimester, Hb levels were less than 10 gm/dl and in nearly 20% less than 9 gm/dl at the end of pregnancy²⁵

Schwab J et al. in their study showed that to achieve optimum iron stores, the daily supply of 100 mg iron will be necessary during pregnancy from the 16th week until delivery. In mild to moderate anaemias, postpartum treatment for 10-18 weeks will be necessary until the exhausted deposits have been replenished⁵⁴.

Allen L.H et al. in their article said that even for women who enter pregnancy with reasonable iron stores, iron supplementation improves iron stores during pregnancy and for a considerable period of time postpartum⁵⁵. A study by Roy et al. at Calcutta found that around 47% of pregnant women were not consuming IFA tablets⁴⁸.

STUDIES ON POSTPARTUM CARE:

Fiechartt AE et al. concluded in his study that women in the postpartum period needs advice regarding self care and child care. Also they recommend postpartum education for all mothers⁵⁶.

Piestella et al. recommended early timing of postpartum visit. Coordinated postpartum maternal and infant visits increased the postpartum psychosocial and environmental services⁵⁷.

According to NFHS III only 36.8% of mothers received postnatal care from a doctor/nurse/VHN/ANM/other health personnel within 2 days of delivery for their last birth⁵.

In GIRHFW survey only 15.5% of women had postpartum checkup within 2 weeks. In NFHS, it was found that only 50% mothers had received advice on breast feeding. In GIRHFW survey, 29% of women had received advice on breast feeding from health personnel, 77% were given exclusive breast feeding upto 4 months.

Manpret kumar et al. found in their study that pregnancies which are closely spaced are associated with increase health risks to the mother and the child. Also they found that 90.7% of mothers were anaemic⁵⁸.

Lazoic N et al. found that pregnant women with a two year interval between deliveries showed anaemia to a greater extent during pregnancy⁵⁹.

In Birmingham survey, 70% of mothers had one or more symptoms during their postnatal period like backache, extreme tiredness and lack of sleep. Glazner et al.⁴¹ also reported a progressive increase in ill health over the first six months postpartum.

Pragati Chabra et al. in their study found that only 14% were using contraceptives in the first month which increased to 38% at six months and 42% at twelve months. They concluded that this may be due to using family planning methods six months after delivery or when menstrual cycle resumes which ever is earlier⁶⁰.

MATERIALS AND METHOD

STUDY DESIGN

It is a community based cross sectional study.

STUDY AREA

Padianallur primary health centre area of Thiruvallur district.

STUDY POPULATION:

Inclusion criteria:

All lactating mothers within six months of delivery at the time of study and who were willing to participate in the study.

Exclusion criteria:

1. All lactating mothers more than six months of delivery at the time of study.
2. Lactating mothers who were within six months of delivery but were not willing to participate.
3. Lactating mothers within six months of delivery but who were not available even after three visits.
4. Mothers within six months of delivery but were not breast feeding.

STUDY PERIOD

April 2010 - October 2010.

SAMPLE SIZE

As per the NFHS, the prevalence of postnatal anaemia was 56.2% and it is considered for sample size calculation at 95% confidence interval (Z= 1.96) and the limit of accuracy kept at 10% of the prevalence.

$$N = \frac{Z^2 \times pq}{D^2}$$

$$N = \frac{1.96 \times 1.96 \times 56.2 \times 43.8}{5.62 \times 5.62}$$

$$N = 299.$$

Where N = the sample size; p= prevalence ; q= (1-p); D=limit of accuracy. The sample size as rounded off to 300 informants.

INSTRUMENTS USED:

Two instruments were used for the study. They are

1. Questionnaire
2. Digital photometer for Hb estimation.

The questionnaire used was a , pre-tested, standardised, semi-structured questionnaire developed with the help of the guide and by referring the NFHS 3 womens' questionnaire and the rapid assessment survey questionnaire conducted by the GIRHFW. It was prepared both in English and Tamil.

Digital photometer was used for estimating the Hb. One week of training on how to measure Hb with this instrument was obtained at the Clinical pathology lab, Govt. General Hospital, Chennai with the kind oral permission of the Vice Principal and the Head of Department of Pathology, Madras Medical College.

Pilot study was conducted at Budur primary health centre area on 30 mothers delivered within six months. The data was collected with the help of the questionnaire and the blood collected for Hb estimation at the end of the interview. Necessary modifications were made in the questionnaire after the pilot study and the final questionnaire was prepared which consists of the following details. A copy of the questionnaire is enclosed in ANNEXURE 3.

1. Socio demographic factors like age, education, occupation, socioeconomic status.
2. Details of the marital status and child birth : Age at marriage, age at first child birth, birth order, birth interval, age of the last

child, number of conceptions, deliveries, abortion, type of delivery and place of delivery.

3. History on intake of IFA tablets during antenatal and postnatal period, Hb estimation and deworming during the antenatal period.
4. History on nutrition during postnatal period.
5. History on menstrual bleeding
6. History on the postpartum components: Postpartum checkup, advice on personal hygiene, nutrition, family planning, child care and immunisation and exclusive breast feeding
7. Hb estimation by the digital photometer.

Sampling procedure:

Padianallur area was selected by lottery method from the 41 PHCs in Thiruvallur district of Tamilnadu. The list of postnatal mothers who have delivered within six months at the time of study was prepared from the registers maintained by the ICDS workers and the Village Health Nurses. There were 598 mothers. These mothers constitute the sample frame and continuous number were assigned to these mothers. Out of 598 mothers, 330 were selected by simple random technique using the table of random numbers, considering a

non-responsive rate of 10% (300+30). Then these mothers were interviewed and blood samples collected for each mother till the required sample size of 300 mothers was obtained.

DATA COLLECTION

After getting written permission from the Director, Institute of Community medicine, Chennai, The Director of Public Health and Preventive Medicine, Chennai and the Deputy Director of Health Services, Thiruvallur District, the data was collected with the help of the Medical Officer, Village Health Nurse, ICDS workers of the Padianallur PHC.

METHOD OF COLECTING DATA:

At the beginning of the interview, the purpose of the study was explained to each mother clearly and an informed consent obtained. To get the true facts and figures and to avoid hesitation in answering by the mothers, the interview was conducted in the absence of the ICDS workers and the VHN. At the end of the interview, again after getting oral consent, the left middle finger was cleaned with spirit cotton, and a small prick made with a sterile needle (24 inch size). After wiping the first drop of blood which may contain some tissue fluid, 20 microlitre of blood was drawn with a fixed 20 microlitre pipette (micropipette) with a disposable plastic tip. Blood is then put into a test tube

containing 5 ml of Drabkin's fluid, mixed thoroughly and closed with a rubber cork. The tube was labelled correctly and kept.

The above procedure was carried out after adopting personal protective measure (glove). Separate sterile needle and micropipette tips were used for each mother and disposed safely after the procedure according to the biomedical waste management rules.

Health education regarding anaemia and its consequences and the importance of intake of iron rich diet and IFA tablets during antenatal as well as after delivery was stressed to the mother and the family members.

All the samples collected for that day was brought to the PHC for Hb estimation which was done by myself on the same day using the digital photometer which I purchased for the purpose of my study. The method of Hb estimation is enclosed in Appendix -1.

On the next day, the results were informed to the concerned mothers through the ICDS workers and those mothers found anaemic were recommended for appropriate management.

Every 50th sample was cross-checked at Govt. General Hospital, Chennai for the reliability and accuracy. Revisits were made to find those mothers who were missing during the first visit.

If the test is performed with 1 – 2 hrs or on the same day, the results will be very accurate. So in order to get accurate results and to avoid the time lag between collection of sample and testing, the technique was done by myself after adequate training in Hb estimation by cyanmethemoglobin method .



Digital Photometer



Micro pipette



Drabkin's solution



Hemoglobin standard solution



Instruments for Hb estimation



Method of sample collection

DATA ANALYSIS:

Data entry was done in excel software and analysis was done using SPSS package. The Prevalence is expressed in percentage and the associated factors is tested for significance using the chi-square test.

RESULTS

The selected Primary health centre, Padianallur has a population of 58,564. It has 20 ICDS centres. The crude birth rate is 18.4 per 1000 population. Three hundred mothers within six months of delivery were interviewed for the purpose of estimating the prevalence of anaemia, its associated factors and for assessing the provision of postnatal services.

The results were discussed in the following manner.

A. General characteristics of the study population

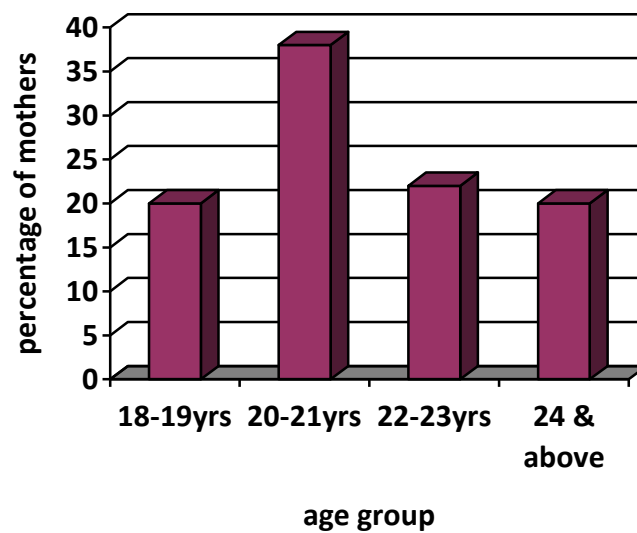
1. Age Distribution

38% of mothers were in the age group of 20-21 yrs and 20% were in teenage group.

TABLE-1
AGE DISTRIBUTION

Age group(Years)	No.of Mothers	Percentage
18-19	61	20
20-21	115	38
22-23	65	22
24 and above	59	20
Total	300	100

FIGURE 1
AGE DISTRIBUTION



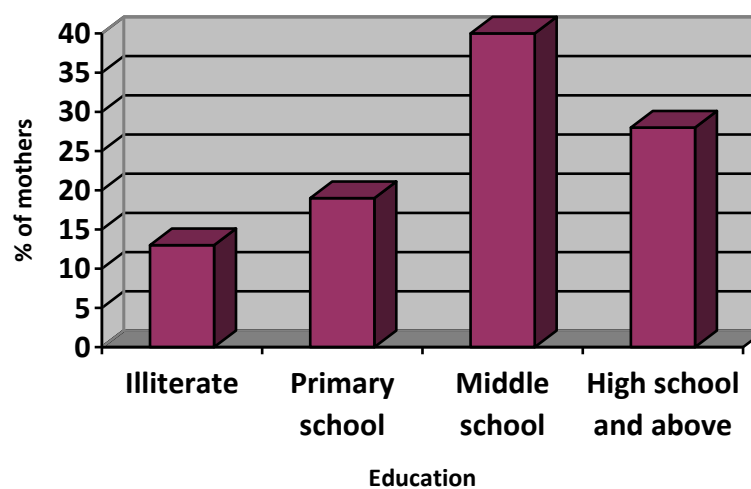
2. Education

The literacy rate of the study population was 87%. Only 13% were illiterates.

TABLE-2
EDUCATIONAL STATUS

Education	No.of mothers	Percentage
Illiterate	40	13
Primary school	56	19
Middle school	120	40
High school and above	84	28
Total	300	100

FIGURE 2
EDUCATIONAL STATUS



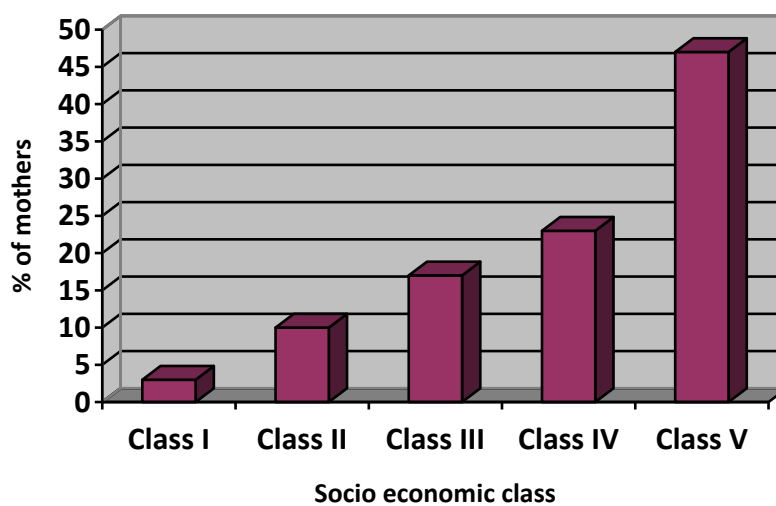
3. Socio economic status

According to the modified Prasad's scale , majority of the study population (68%) belonged to low socio economic status.

TABLE-3
SOCIO ECONOMIC STATUS

Class	No. of mothers	Percentage
I-Upper	10	3
II-Upper middle	29	10
III-Lower middle	51	17
IV-Upper lower	69	23
V-Lower	141	47
Total	300	100

FIGURE 3
SOCIO ECONOMIC CLASS



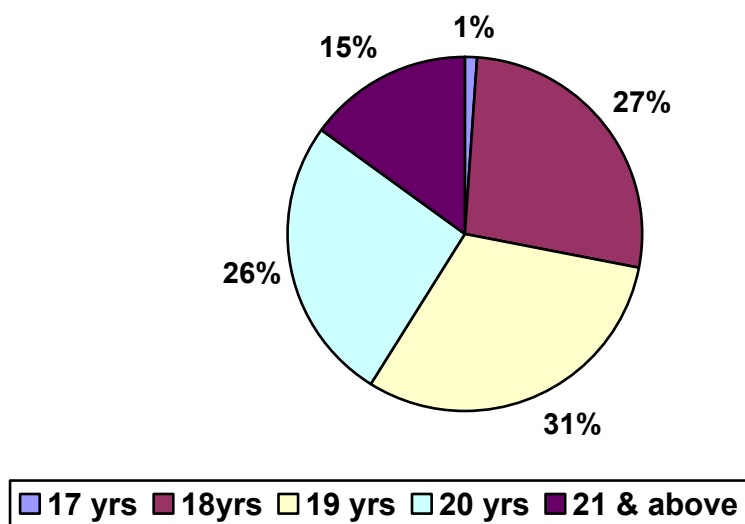
4. Age at marriage

Out of 300 mothers in the study population, 178 (59%) of them got married before the age of 20. The remaining 122(41%) mothers got married at or after 20 years of age.

TABLE – 4
AGE AT MARRIAGE

Age at marriage	No. of mothers	Percentage
17 years	4	1
18 years	81	27
19 years	93	31
20 years	78	26
21 & above	44	15
Total	300	100

FIGURE - 4
AGE AT MARRIAGE



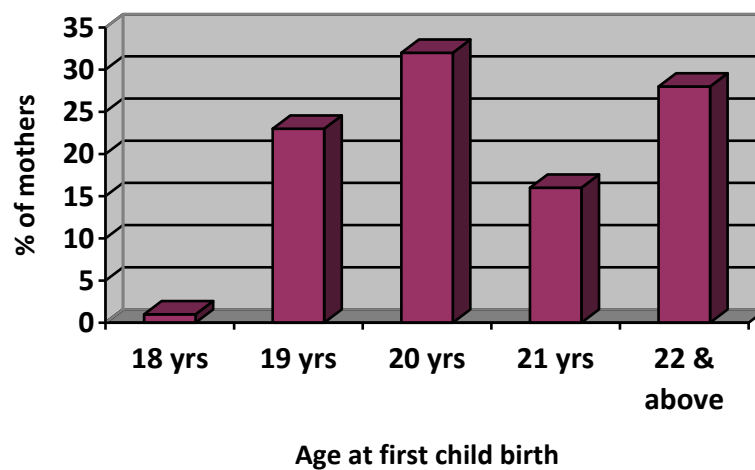
5. Age at first child birth

33% of the study mothers gave birth to their first child before 20 years of age. The remaining 67% of mothers gave birth to their first child at or after 20 years.

TABLE-5
AGE AT FIRST CHILD BIRTH

Age at first child birth	No.of mothers	Percentage
18	3	1
19	68	23
20	97	32
21	49	16
22 and above	83	28
Total	300	100

FIGURE-5
AGE AT FIRST CHILD BIRTH



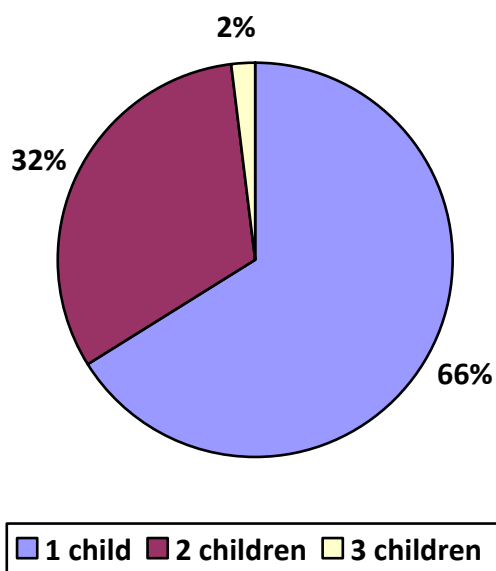
6. Birth Order

66% of mothers had one child, 32% mothers had 2 children and 2% mothers had 3 children.

TABLE-6
BIRTH ORDER

No.of children	No.of mother	Percentage
1	199	66
2	95	32
3	6	2
Total	300	100

FIGURE-6
BIRTH ORDER



2% of the mothers in the study population have more than 2 children.

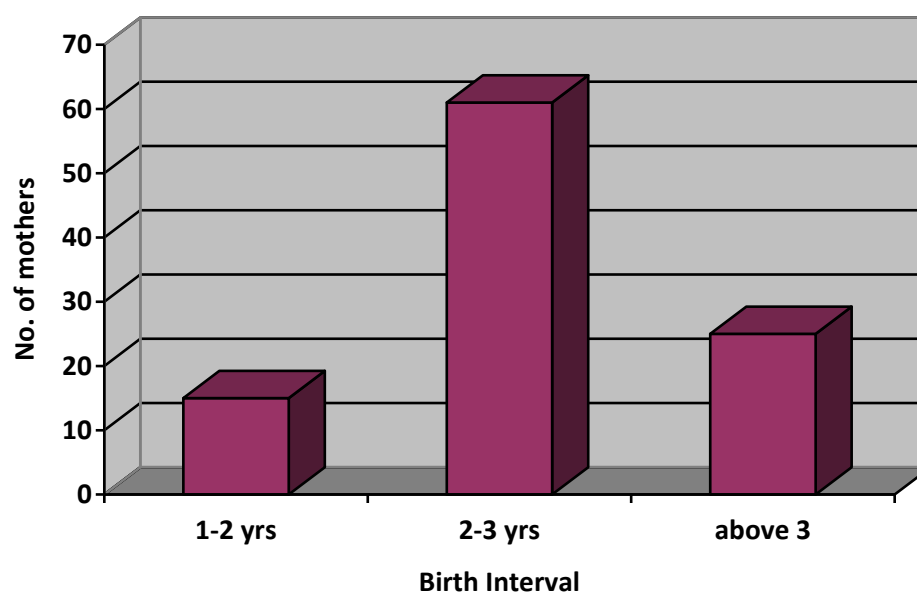
7. Birth Interval

Out of the 101 mothers who have more than one child, 76% of mothers had given birth to their next child within 3 years from their previous child birth.

TABLE - 7
BIRTH INTERVAL

Birth Interval in Years	No.of mothers	Percentage
1 – 2 yrs	15	15%
2 – 3 yrs	61	61%
> 3 yrs	25	24%
Total	101	100%

FIGURE - 7
BIRTH INTERVAL



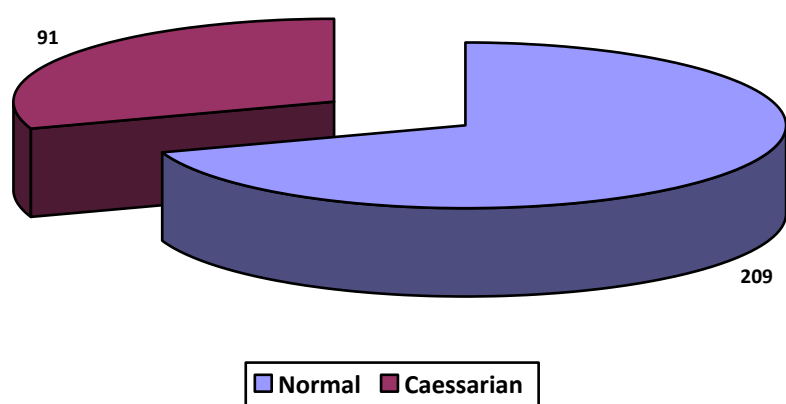
8. Type of delivery

Out of the 300 mothers, 209 (70%) delivered normally through vaginal route and the remaining 91(30%) mothers delivered through caessarian section.

TABLE- 8
TYPE OF DELIVERY

Type of Delivery	No.of mothers	Percentage
Normal	209	70%
Caessarian	91	30%
Total	300	100%

FIGURE - 8
TYPE OF DELIVERY



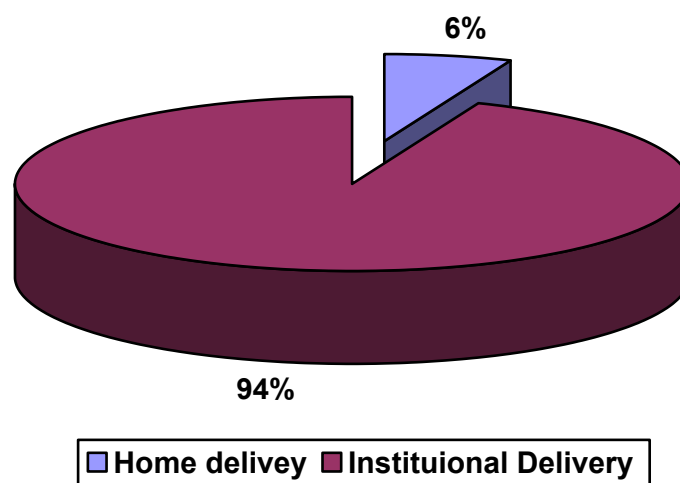
9. Place of Delivery

94% of the mothers in study population had institutional delivery and only 6% had delivered at home.

TABLE – 9
PLACE OF DELIVERY

Place of delivery	No.of mothers	Percentage (%)
Home	19	6.33
Govt.Hospital	80	26.67
Primary Health Centre	186	62
Private Hospital	15	5
Total	300	100

FIGURE-9
PLACE OF DELIVERY

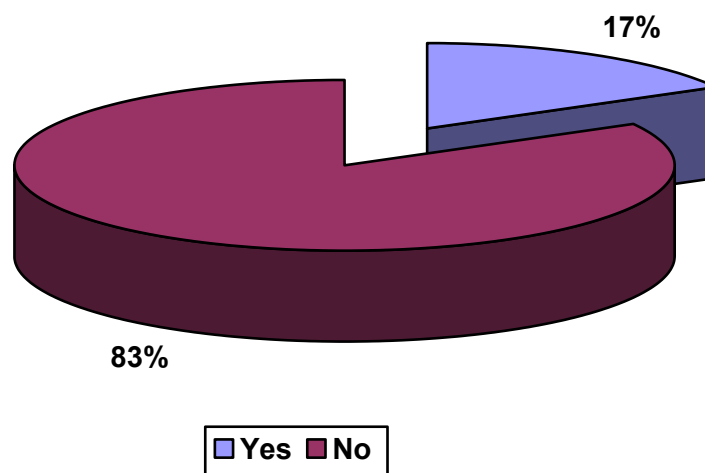


10. Abortion

17 % of the study mothers have experienced abortion atleast once before this child birth.

FIGURE- 10

ABORTION



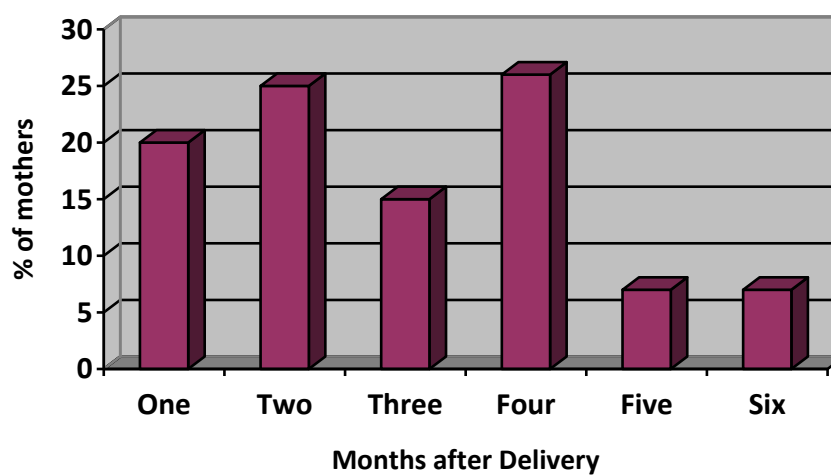
11. No. of months after delivery

86% of the study mothers were within four months of delivery .

TABLE –10
NO. OF MONTHS AFTER DELIVERY

No.of months after delivery	No.of mothers	Percentage (%)
One	60	20
Two	75	25
Three	45	15
Four	80	26
Five	20	7
Six	20	7
Total	300	100

FIGURE –11
MONTHS AFTER DELIVERY



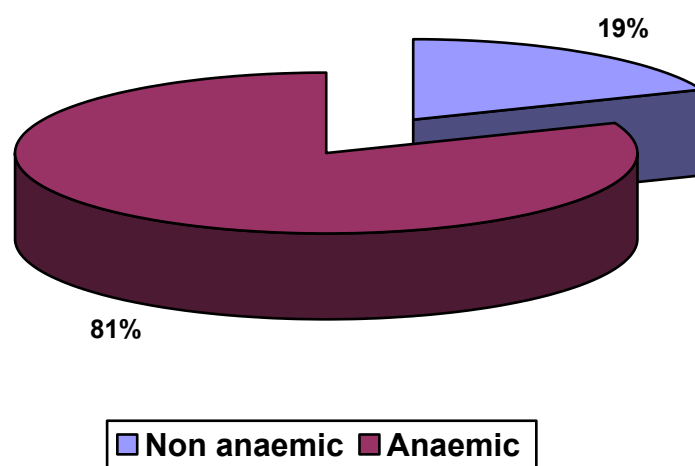
B. Anaemia : Prevalence and related factors

1. Prevalence of anaemia in lactating mothers

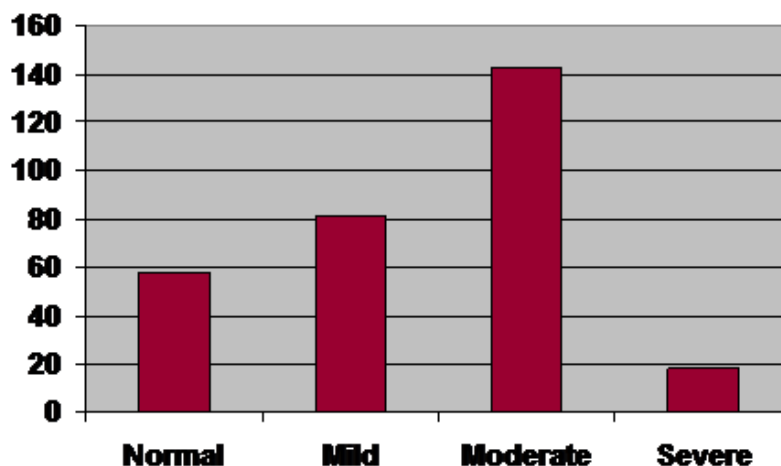
Among the 300 mothers, only 58(19%) had normal Hb value (≥ 12 gm/dl). The remaining 242 (81%) mothers were found to be anaemic.

FIGURE-12

PREVALENCE OF POSTNATAL ANAEMIA



According to the WHO classification of anaemia based on Hb level, among the 242 (81%) mothers who were anaemic, 81(34%) had mild anaemia, 143(59%) had moderate anaemia and 18 (7%) of them had severe anaemia.

FIGURE-13**PREVALENCE OF ANAEMIA BASED ON WHO CLASSIFICATION****2. IFA consumption during pregnancy and anaemia after delivery**

98% of mothers had consumed IFA tablets during their antenatal period. Only 2% had not consumed the tablets. Of the 98% who had consumed, 53% had consumed less than 90 tablets only. The remaining 47% had consumed more than 90 tablets but less than 200 tablets. No mother in the study population had taken the full therapeutic dose of 200 tablets during their antenatal period.

Of the 98% who had consumed IFA tablets 80% were anaemic after delivery and the rest 20 % were not anaemic. Of the 80% who were anaemic after consuming IFA tablets 59% had taken inadequate tablets i.e., <90 tablets. The 7 (2%) of mothers who had not consumed the IFA tablets during their antenatal period had not taken the tablets even after their delivery.

TABLE -11**IFA CONSUMPTION DURING PREGNANCY AND ANAEMIA AFTER DELIVERY**

No. of tablets	Not anaemic	Anaemic	Total
<90	18	138	156
>=90	40	97	137
Total	58	235	293

Chi-square = 14.326 df= 1 p=<0.001 Highly significant

IFA consumption during postnatal period and anaemia

Only 188(62.6%) mothers had consumed IFA after their delivery. But no one had consumed the recommended 100 tablets . 158 mothers had consumed less than 30 tablets and the remaining 30 mothers had consumed 30-60 tablets. Among those who had consumed the tablets only 26% had normal Hb level . Among those who had not consumed the tablets only 8% had normal Hb level after delivery.

TABLE 12**INTAKE OF IFA TABLETS AFTER DELIVERY AND ANAEMIA AFTER DELIVERY**

IFA intake after delivery	Anaemic	Not Anaemic	Total
Yes	140	48	188
No	102	10	112
Total	242	58	300

Chi-square = 12.61 df: 1 p=<0.001 Highly significant

TABLE - 13

**COMPARISON BETWEEN IFA CONSUMPTION DURING
ANTENATAL AND POSTNATAL PERIOD AND
ANAEMIA AFTER DELIVERY**

IFA intake	Anaemic	Not anaemic	Total
AN only	95	10	105
AN & PN period	140	48	188
Total	235	58	293

Chi-square = 11.33 df: 1 p=<0.001 Highly significant

Intake of IFA tablets both during and after delivery significantly improves the Hb level after delivery. This is stressed in a study by Allen LH et al. who said that even for women who enter pregnancy with reasonable iron stores, iron supplements improves the iron stores during pregnancy and for a considerable time postpartum⁵⁵

3. Socioeconomic class and anaemia

According to the Modified Prasad Scale, out of the 300 mothers studied, 141 belonged to class V, 69 belonged to class IV, 51 belonged to class III, 29 belonged to class II and only 10 mothers belonged to class I.

TABLE -14
SOCIOECONOMIC STATUS AND ANAEMIA

Socio-economic class	Anaemic	Not anaemic	Total
I	10	0	10
II	16	13	29
III	48	3	51
IV	40	29	69
V	138	13	141
Total	252	48	300

Chi-square = 109.281 df = 4 p=<0.001 Highly significant

4. Educational status and anaemia

In the study, the prevalence of anaemia is more among illiterate mothers than among literate mothers. 85% of the illiterates were anaemic. Only 15% of the literates had anaemia.

TABLE -15
EDUCATION AND ANAEMIA

Education	Anaemic	Not anaemic	Total
Illiterate	34	6	40
Literate	208	52	260
Total	242	58	300

Chi-square 200 df : 1 p= <.0.001 Highly significant

6. Age at first child birth and anaemia

In the study population 96% Of mothers < 20 yrs were anaemic and 76% of mothers ≥ 20 yrs were anaemic.

TABLE 16

AGE AT FIRST CHILD BIRTH AND ANAEMIA

Age	Anaemic	Not anaemic	Total
<20 yrs	68	3	71
≥ 20 yrs	174	55	229
Total	242	58	300

Chi-square=15.63 df: 1 p=<0.001 Highly significant

7. No. of months after delivery and anaemia

In this study it is evident that the prevalence of anaemia is 95% among those 5 – 6 months after delivery than during the first four months of delivery.

TABLE - 17

NO. OF MONTHS AFTER DELIVERY AND ANAEMIA

Months after delivery	Anaemic	Not anaemic	Total
Upto 4 months	204	56	260
After 4 months	38	2	40
Total	242	58	300

Chi-square = 198.31 df: 1 p=<0.001 Highly significant

8. Birth order and anaemia

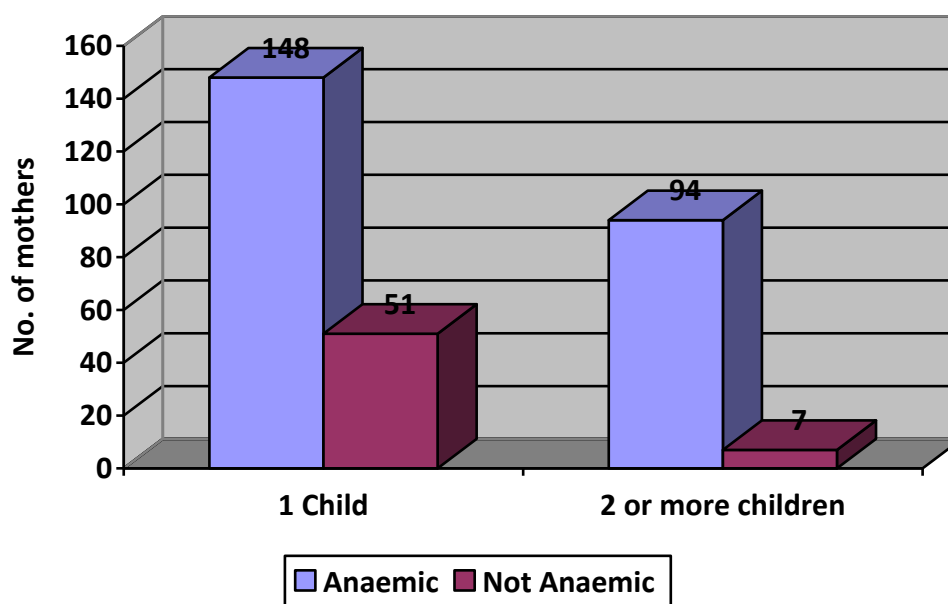
100% of study mothers having 3 or more children were anaemic, 86% of mothers having 2 children were anaemic and only 79% of mothers with one child were anaemic.

TABLE 18
BIRTH ORDER AND ANAEMIA

No. of children	Anaemic	Not anaemic	Total
1	148	51	199
2 or more	94	7	101

Chi-square = 33.67 df: 1 $p > 0.001$ Highly significant

FIGURE-14
BIRTH ORDER AND ANAEMIA



9. Birth interval and anaemia

In the study population, out of the 76 mothers whose birth interval was <3 yrs, 57% were anaemic. Of the 25 mothers whose birth interval was >3 yrs, only 20% were found to be anaemic.

TABLE - 19

BIRTH INTERVAL AND ANAEMIA

Birth interval	Anaemic	Not anaemic	Total
< 3 yrs	43	33	76
> 3 yrs	5	20	25
Total	48	53	101

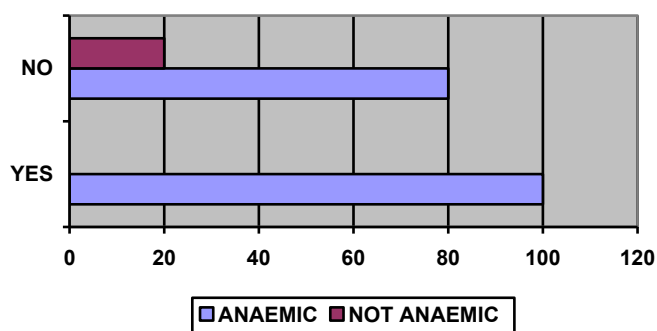
Chi-square= 10.18 df = 1 p= <0.01 Significant

10. Abortion and anaemia

All the mothers who experienced abortion at least once before this child birth had anaemia.

FIGURE-15

ABORTION AND ANAEMIA



Hence abortion has additional effect on depletion of iron stores.

11. Excessive menstrual bleeding and anaemia

In the study population 38 mothers had excessive menstrual bleeding at any point of time and all were found to be anaemic. Nobody had normal Hb level.

TABLE -20

EXCESSIVE MENSTRUAL BLEEDING AND ANAEMIA

Excessive bleeding	Anaemic	Not anaemic	Total
Yes	38	0	38
No	204	58	262

Chi-square = 10.59 df: 1 p= <0.01 Significant

12. Deworming during AN period and anaemia

Only 70 mothers have been dewormed during their antenatal period, only 69% had anaemia. Of the remaining 195 mothers who had not been dewormed, 85% had anaemia.

TABLE -21

DEWORMING AND ANAEMIA

Deworming	Anaemic	Not Anaemic	Total
Yes	48	22	70
No	166	29	195
Total	214	51	265

Chi-square = 9.21 df: 1 p= 0.01 Significant

13. Place of delivery and anaemia

94% of mothers in the study population delivered at any one of the institutions like Govt. hospital, Primary health centre or a private hospital. Only 6% of mothers had home delivery.

TABLE -22

PLACE OF DELIVERY AND ANAEMIA

Place of delivery	Anaemic	Not anaemic	Total
Home	19	0	19
Institution	223	58	281
Total	242	58	300

Chi-Square = 4.96 df: 1 p= <0.05 Significant

14. NUTRITION AND ANAEMIA

Milk or curd is consumed by almost all the mothers daily and iron rich food like green vegetables and pulses are taken more than once in a week by most of the mothers. Among those who have not taken adequate nutrition 100% were found to be anaemic. But only 79% of those taking adequate nutrition were anaemic. This may be due to their poor bio-availability.

TABLE-23
NUTRITION AND ANAEMIA

Intake of nutrition	Anaemic	Not anaemic	Total
Adequate	217	58	275
Inadequate	25	0	25
Total	242	58	300

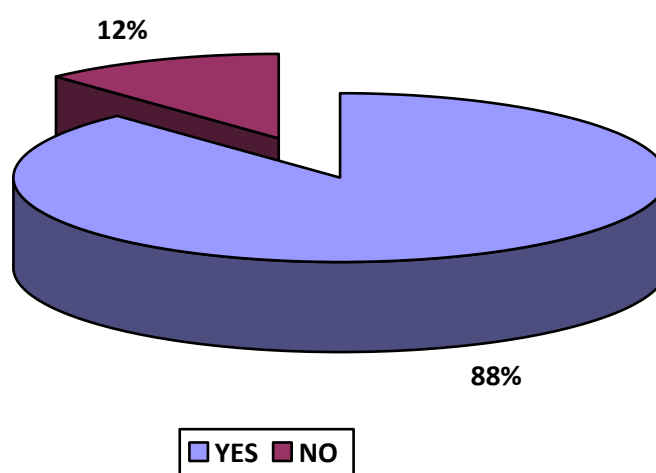
Chi-square = 6.536 df = 2 p=0.011 Significant

8. POST NATAL SERVICES

1. Post partum care at the Institution

Out of the 281 mothers who delivered at any one institution, 88% of them received at least one postpartum check up of abdomen, breast and perineum at the institution within 2 days of delivery.

FIGURE 16
INSTITUTIONAL POSTPARTUM CARE

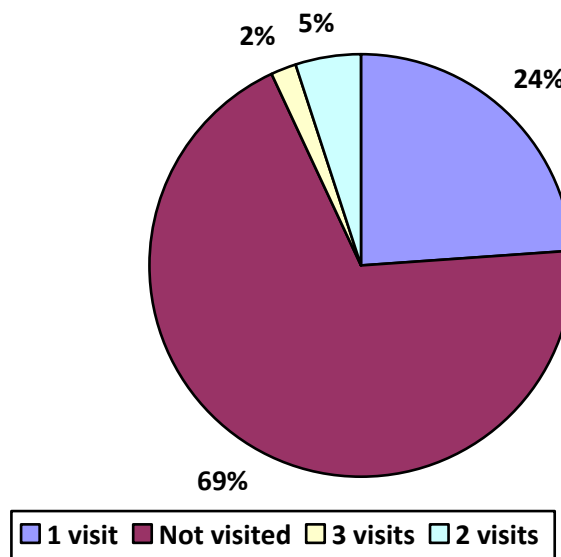


2. No. of house visits by the health worker within two weeks of delivery.

Only 2% of mothers had received three postnatal visits at home by the health worker. 69% of mothers did not receive any postnatal visit by the health worker. 24% of mothers were visited once and 5% of them were visited twice .

FIGURE 17

NO. OF POSTNATAL VISITS BY THE HEALTH WORKER



3. Postnatal advice

TABLE - 24

PERCENTAGE OF POSTNATAL ADVICES RECEIVED

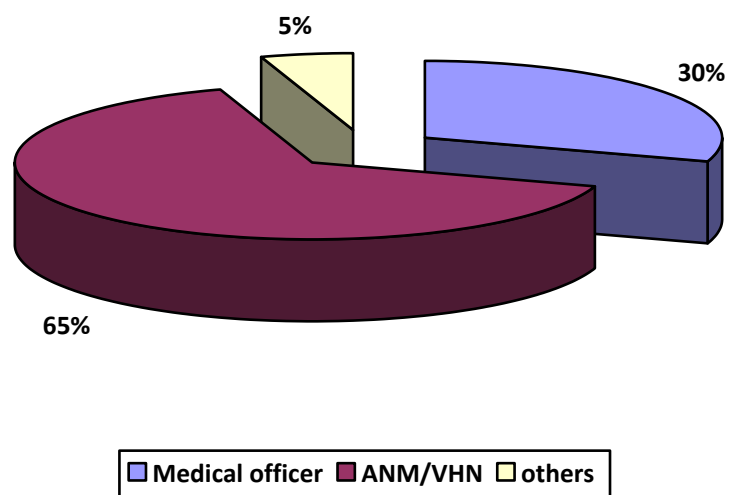
ADVICE ON	YES	NO
Personal hygiene	19%	81%
Nutrition	40%	60%
Family planing	37%	63%
Child care and immunisation	94%	6%
Exclusive breast feeding	14%	86%

In the study population advice on child care and immunisation was given to almost all, but advice on family planning was given only to 37% of mothers and most of them were mothers who had 2 or more children. Only 40% mothers received advice on nutrition. Advice on exclusive breast feeding and personal hygiene was only 14% and 19% respectively.

4. Person from whom the postpartum care received.

From this study it was found that 30% of mothers received the postpartum care from medical officers, 65% from the ANM/VHN and 5% from others like relatives .

FIGURE 18
PERSON BY WHOM POSTPARTUM CARE GIVEN



DISCUSSION

This study is a community based cross sectional descriptive study done at Padianallur primary health centre area of Thiruvallur district in Tamilnadu in the year 2010. The aim of the study is to estimate the prevalence of postnatal anaemia, to find the various factors associated with it and to assess the postnatal services given to the mothers. The study population includes lactating mothers within six months of their delivery. Postnatal care is very poor and is often neglected by both the mother and the health care givers in the community and less importance is given to screen and treat postnatal anaemia. So to stress the increased prevalence of postnatal anaemia and to relate the associated factors this study was conducted.

Prevalence of postnatal anaemia:

In my study, I found that anaemia is prevalent in 81% of the lactating mothers who are within six months of delivery. So the problem of anaemia in these mothers is to be considered as a public health problem of high magnitude according to the WHO criteria⁶¹

The prevalence is very high when compared to the NFHS 2 and 3. In NFHS 2 it was found that 50.8% of non-pregnant breast feeding women were anaemic and in NFHS 3 only 56.2% of ever-married women were anaemic. According to the Nutrition foundation of India reports the prevalence of

anaemia among lactating women was 62% in Madras and Bombay, 83% in Calcutta and 51% in Baroda ⁶². The high prevalence in the study population may be due to various reasons like poor postnatal care and failure to take the recommended iron supplementation after delivery.

IFA consumption during antenatal and postnatal period and anaemia:

In the study it was found that 98% of mothers had consumed IFA tablets during their antenatal period but only 63% had taken the tablets after delivery. Of the 98% who had consumed the tablets antenatally, 47% had taken >90 tablets. This finding is far better than the finding in NFHS 3 which says that only 22.3% of mothers consumed >90 tablets when they were pregnant with their last child . There are no studies on IFA consumption during postnatal period to compare with.

In my study I found that 9.5% of mothers who had taken IFA only during their pregnancy had normal Hb levels whereas 25.5% of mothers who had taken the tablets during both antenatal and postnatal period had normal Hb level. So iron supplementation both during and after delivery significantly improves the Hb level in the postnatal period. This is stressed in a study by Allen LH et al. which said that even for women who enter pregnancy with reasonable iron stores, iron supplementation improves the iron stores during pregnancy and for a considerable time postpartum ⁵⁵. In another study by Nietfeld et al. ⁵⁰ it is said that continuation of iron therapy is indicated even

after delivery and the treatment of postnatal anaemia must be continued for 6-8 weeks after normalisation of Hb level.

In the study it was found that the major reasons for not taking IFA tablets during postnatal period was that they have not been provided with the tablets and because of unpleasant taste and nausea. In a multicentric study by the ICMR in 1992, it was found that the compliance of IFA was unsatisfactory in a considerable proportion of cases.

Socioeconomic class and anaemia:

In my study postnatal anaemia is mostly prevalent (84.7%) in women belonging to low socioeconomic class. In a study conducted by Dr. Sadia Khan and Sobia Nawaz at Rawalpindi General Hospital they found that 83.7% of anaemic mothers belonged to the lower socioeconomic class. The high prevalence in low socioeconomic class may be due to inadequate nutrition, lack of awareness of the problem due to poor literacy .

Literacy and anaemia:

In my study I found that anaemia is more among the illiterates (85%) than among the literates (80%). This finding is similar to the findings of NFHS 3 which also shows 60.2% prevalence among illiterate ever-married women and 46.6% in those who have completed high school and above.

Age at first child and anaemia:

In the study 96% of mothers <20 years were anaemic and 76% of mothers ≥20 years were anaemic. This is similar to the findings in other studies including NFHS where the prevalence of anaemia decreases as the age of the first child increases. Teenage pregnancy and delivery is more prevalent in the study population which may be the cause for high prevalence of postnatal anaemia.

No. of months after delivery and anaemia:

In my study, 95% of mothers who were more than 4 months after their delivery had anaemia whereas 78% of mothers who were within 4 months of delivery were anaemic. The finding coincides well with the study by Glazner et al.⁴¹ which says that the prevalence of anaemia increases as the duration after delivery increases. The increase in prevalence of anaemia in mothers as the months increases may be due to the progressive manifestation of depletion of iron stores during lactation which could have been corrected with the consumption of IFA tablets after delivery.

Birth order and anaemia:

In my study all the mothers having 3 or more children were anaemic, 86% of mothers having 2 children were anaemic and only 79% of mothers with one child were anaemic. Increase in parity leads to

progressive depletion of iron stores unless it is corrected. Parity influences the prevalence of anaemia. Parity four appears to be the cut-off point beyond which severe anaemia is almost 3 times more frequent than women having fewer children²⁵. K. Park in his textbook says anaemia is a common problem in mothers with many children and risks with each pregnancy beyond the third increases significantly.²⁰

Birth interval and anaemia:

In the study , 56.5% of mothers with birth interval <3 yrs were anaemic, whereas only 20% of the mothers whose birth interval was > 3yrs were anaemic. That is, if the birth interval is more than 3 yrs, the prevalence of anaemia will be less. This is similar to the findings of Manpreet Kumar et al. which says that short birth intervals prevent adequate time for restoration of maternal iron reserve depleted in last pregnancy and child birth with consequent increased incidence of anaemia. It also says that pregnancies which are closely related are associated with health risks to the mother and the child. Lazoic N et al. found that pregnant women with a 2 year interval between delivery showed anaemia to a greater extent.

Abortion and anaemia:

All the mothers who experienced abortion at least once before their child birth had anaemia. Hence abortion has additional effect on depletion of iron stores.

Excessive menstrual bleeding and anaemia:

In the study all the mothers having excessive menstrual bleeding at any point of time were anaemic. This finding shows that other than iron deficiency, other factors like blood loss can also lead to anaemia. According to the RCH module for health worker²⁸, physiological blood loss is one among the important causes of anaemia and that holds true in the study population too.

Deworming and anaemia:

In my study those mothers who had been dewormed during their antenatal period were less anaemic than those who had not been dewormed.

Place of delivery and anaemia:

95% of the mothers in my study delivered in any one institution like Govt. hospital, Primary health centre or private hospital. Only 6% of mothers delivered at home. The National socio demographic goal for 2010 which aims at 80% of institutional deliveries is reached in the study population.

This finding is also better than the NFHS 3 where the % of institutional birth in India is only 40.8% and in rural it is only 31.1%.

Nutrition and anaemia:

In the study, all the mothers who took inadequate nutrition were anaemic.

Ramirez-mateose et al.³⁹ in their study showed that anaemia and iron deficiency were seen in 37% of women and 48% of women respectively in spite of good socio demographic and nutritional conditions. The finding of my study goes with the finding of this study ,i.e. in spite of good nutrition 78.9% of the mothers had anaemia.

Postpartum care:

In my study 88% of the mothers had been given postpartum care at the institution within 2 days of delivery. But only 2% of the mothers received all the recommended three postnatal house visits by the health worker within 2 weeks of delivery. 69% of mothers were not visited by any health workers, 24% had one visit and 5% had two visits. 30% of mothers received the care from medical officers, 65% from the ANM/VHN and 5% from others. Advice on child care and immunisation was given to 94%, on nutrition to 40%, on personal hygiene to 19%, on family planning to 37% and on exclusive breastfeeding to only 14%.

According to RCH Programme, all the mothers delivered at the institution should receive a careful postpartum check up within 2 hrs of delivery to prevent postpartum complications like haemorrhage, eclampsia and puerperal sepsis. As per the NFHS 3 the percentage of mothers who received postpartum care by the health personnel within two days of delivery for their last child birth is 36.8. So the finding in the study population is better than the NFHS. According to the RCH, every mother should receive at least 3 home visits by the health worker within two weeks of delivery, i.e., on the 3rd day, 7th day and 14th day. If the baby is a low birth weight baby, 3 more additional visits should be made on the 21st, 28th and 45th day. This recommendation was not fulfilled in the study population where only 2% got all the three visits.

In a study by Fiercharadt AE et al. it is said that women in the postpartum period need advice regarding self care and baby care. Also they recommend postpartum education for all women⁵⁶. Since puerperal sepsis contributes to 12.5% of maternal deaths²⁰ advice on personal hygiene should be given to all mothers. In NFHS 50% of mothers received advice on breast feeding and in GIRHFW survey only 29% received advice on breast feeding from health personnel.

Hence better postnatal services are needed to reduce both the maternal and infant morbidities and mortalities.

SUMMARY

This study is community based cross sectional descriptive study done at Padianallur primary health centre area of Thiruvallur district, with an objective to estimate the prevalence of anaemia in nursing mothers within six months of delivery and to assess the postnatal services provided to them.

Majority of the mothers belonged to 20 -21 yrs age group, 13% were illiterate and 47% belonged to the low socioeconomic class. Teenage pregnancy was seen in 33% of the study population with more number of deliveries before the mother crosses 20 years of age. Most of the mothers were primipara. Among those who had more than one child, the birth interval was < 3 yrs in majority of them. 94% of deliveries occurred at institutions which seems good and most of the deliveries have occurred at PHCs.

In the study population 81% had anaemia (<12 gm/dl). Among them 34% had mild anaemia, 59% had moderate anaemia and 7% had severe anaemia according to the WHO classification. 97.6% of mothers had consumed IFA tablets during their AN period. Only 47% of mothers had consumed > 90 tablets and the remaining 53% had consumed < 90 tablets only. 62% of mothers had consumed IFA during their postnatal period but the dosage taken was inadequate.

The prevalence of anaemia during postnatal period was significantly related to their socio economic status, education, age at marriage, place of delivery, deworming during antenatal period, birth order and interval and with

the presence of excessive menstrual bleeding. The prevalence of anaemia is more in mothers who have experienced abortion at least once.

The stress of child birth and poor consumption of nutritious food worsens the Hb level still after delivery. Inadequate nutrition and anaemia are significantly related in this study and 100% of those who have not taken adequate nutritious diet had anaemia.

The postpartum check up which is to be given at the place of delivery was given to 83% of the mothers but the recommended three house visits within 2 weeks of delivery has not been given to majority of the mothers in the study population. Post partum check up is very essential to prevent immediate and remote complications after delivery but the achievement is very unsatisfactory.

Post natal advices were given to the mothers at the institution during their check up. 30% of mothers received advice from medical officers, 65% from ANM/VHN, and 5% from others. 94% of mothers received advice on child care and immunisation whereas only 14% on exclusive breast feeding and 37% on family planning. 40% were given advice on nutrition and 17% on personal hygiene.

Hence, better Postnatal care and services, health education on nutrition, child care, immunisation and family planning helps to reduce the prevalence of anaemia, maternal mortality rate and also infant mortality rate.

LIMITATIONS OF THE STUDY

- A. Among the various factors contributing to anaemia, IFA consumption, education, socioeconomic status, birth interval, birth order, age at marriage and first child birth, menstrual bleeding, abortion and place of delivery were studied. There are still other factors like chronic infections, bleeding disorders etc. which were not studied . History on religion and occupation has not been included and its association with postnatal anemia has not been studied.
- B. Nutrition and anaemia had not been studied in detail and needs further studies.
- C. Postnatal services assessment had not been assessed completely. It needs a detailed study.

RECOMMENDATIONS

1. The supply of IFA tablets and the compliance of the mothers to these tablets have to be improved because most of the mothers are not being provided with the recommended dose of IFA tablets after delivery.
2. The MPHWS should be monitored regularly for the house visits she/he gives to the postnatal mothers and reviewed at the weekly review meeting.
3. Deworming of the antenatal mothers should be given importance, since worm infestation is one of the common hidden cause of anaemia in our country.
4. Ensuring if the anaemic antenatal and postnatal mothers get the full therapeutic dose of IFA.
5. All the postnatal mothers should also be screened for anaemia like the antenatal women and can be treated with intravenous iron injections, so that we don't need to worry about the compliance factor.
6. All the health personnel should be motivated to spend more time in counselling and guiding the mothers after delivery.
7. Awareness on the temporary methods of contraception should also be created among mothers who have given birth to their first child so as to increase the birth interval.

ANNEXURE 1

HAEMOGLOBIN ESTIMATION BY COLORIMETRIC METHOD

Principle

The blood sample collected is diluted in Drabkin's fluid which hemolysis the red blood cells. The haemoglobin is converted to methemoglobin by the potassium ferri cyanide and then methemoglobin reacts with the potassium cyanide to form cyanmethemoglobin complex. When this fluid is examined in a spectrophotometer using 540 nm filter, the absorbance is directly proportionate to the amount of haemoglobin present in it. This gives the most accurate Hb estimation.

Contents

The contents of Drabkin's fluid are

Potassium ferricyanide - 200 mg

Potassium cyanide - 50 mg

Water - 1 litre

Method

1. Draw capillary blood from the finger tip using 20 microlitre micropipette.

2. Add this 20 microlitre of blood into a test tube containing 5 ml Drabkin's fluid.
3. Stopper the tube with a rubber cork and invert it to mix the contents.
4. Then allow the sample to stand for at least 10 minutes at room temperature to ensure completion of the reaction.
5. The solution is then ready to be compared with the standard and reagent blank in a spectrophotometer.
6. Switch on the instrument and put the 540 nm filter in its slot provided in the machine.
7. Display will show some transmission value. This instrument will convert any transmission value to 0.00 ABS.
8. Place the cuvette containing the Blank or distilled water and press the key "ZERO" and the display will show 0.00.
9. Then place the cuvette containing the standard solution provided with the kit and the display will show the ABS. Note it down say for ex. 0.24
10. Now place the cuvette containing the test solution (unknown) and the display will show the ABS of that solution, say for ex. 0.21.
11. In this way we can take readings of different solutions.

Method of calculation

Hb concentration (gm/dl) = AT/AS X dilution factor/1000 X conc.of standard

AT = Absorbance of the test solution, say for ex. 0.21

AS = Absorbance of the standard i.e., 0.24

Dilution factor : 251 is the dilution factor when 20 microlitre of blood is mixed with 5 ml of drabkin's fluid.

Concentration of the standard = 60 mg/dl (will be given on the standard solution bottle which we use for this test)

If the ABS of the test solution is 0.21, the the Hb concentration of that solution can be calculated as follows:

$$\begin{aligned} \text{Hb in gm/dl} &= 0.21/0.24 \times 251/1000 \times 60 \\ &= 13.17 \text{ gm/dl.} \end{aligned}$$

ANNEXURE 2

SOCIO ECONOMIC CLASS- MODIFIED B.G. PRASAD'S CLASSIFICATION

The calculation as per Modified Prasad's classification was done as follows:

Calculation of correction factor (CF):

June 2010 AICIPI (All India Consumer Price Index) value = 547

$$\begin{aligned}\text{So, CF} &= (\text{AICPI} \times 4.93)/100 \\ &= (547 \times 4.93)/100 \\ &= 26.96 \quad \text{So, CF} = 26.96\end{aligned}$$

The calculation as per Modified Prasad's classification was done using the following formula = Per capita monthly income of 1961 as suggested by B.G.Prasad x CF

Per capita monthly income of 1961 was:

Class I	Rs 100 & above	Upper class
Class II	Rs 99 – 50	Upper middle
Class III	Rs 49 -30	Lower middle
Class IV	Rs 29 – 15	Upper lower
Class V	Below Rs 15	Lower

So, multiplying this by the CF (26.96) we get Socio Economic classification as

Class	Per capita monthly income
Class I	Rs. 2696 & above
Class II	Rs.1348 to 2695
Class III	Rs.809 to 1347
Class IV	Rs.405 to 808
Class V	Below Rs.405

ANNEXURE-III
QUESTIONNAIRE

**A STUDY ON PREVALENCE OF POST NATAL ANAEMIA AND
ASSESSMENT OF POST NATAL SERVICES**

1. Serial no. :
2. Age(yrs) :
3. Education :
 - a. Illiterate
 - b. Primary school
 - c. Middle school
 - d. High school
 - e. Post high school/diploma
 - f. Graduate/post graduate
 - g. Profess
4. Per capita income and socioeconomic class:
 - 5.1. Age at marriage(Yrs) :
 - 5.2. Age at first child birth(Yrs):
 - 5.3. Birth order(No. of children):
 - 5.4. Age of this child(months):
 - 5.5. Birth interval(No. of yrs from previous child):
 - 5.6.1. No. of conceptions:
 - 5.6.2. No. of deliveries:
 - 5.6.3. No. of live births:
 - 5.6.4. No. of abortions:

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 - B. $B\mu\otimes\xi''\text{£}\hat{O}\hat{I}$
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 - D. $E^-|\emptyset\}\text{''}\text{£}\hat{O}\hat{I}$
 - E. $\div\text{©}\hat{A}|\emptyset\}\text{''}\text{£}\hat{O}\hat{I}$
4. $u\hat{U}\{\xi^\circ \hat{A}_j\text{©}\delta\hat{U} \text{©}\hat{O}\hat{O}\text{®} \setminus -P |\emptyset\}\text{''} :$
 - 5.1 $v_j\text{©}nzv\beta \div\text{£}\delta x u[P\hat{I}\beta \hat{A}^-x (BskP\hat{I}\hat{A})$
 - 5.2 $\neg u\hat{A} S\zeta\phi\emptyset u \text{©}\acute{\phi}u \div\text{£}\delta x u[P\hat{I}\beta \hat{A}^-x (BskP\hat{I}\hat{A}) :$
 - 5.3 $u\emptyset\div\text{£}\delta x\hat{O}\hat{I} S\zeta\phi\emptyset u u[P\hat{D}US Gzu\emptyset\hat{U}^- \delta\hat{A}x S\zeta\phi\emptyset u?$
 - 5.4 $u\emptyset\div\text{£}\delta x\hat{O}\hat{I} S\zeta\phi\emptyset u^\circ\beta \hat{A}^-x (\text{©}\delta u[P\hat{I}\hat{A}) :$
 - 5.5 $u\emptyset\div\text{£}\delta x\hat{O}\hat{I} S\zeta\phi\emptyset uUS Cu\emptyset S \neg\beta! \text{©}\acute{\phi}u S\zeta\phi\emptyset uUS\text{®} E\hat{O}\hat{I} C\emptyset h\hat{o}\hat{A}\hat{I} :$
 - 5.6.1 $\}\{P\hat{O} Cx\hat{A}\emptyset\mu Gzu\emptyset\hat{U} \neg\emptyset\acute{O} P_j zu\uparrow\zeta x\hat{O}\hat{I}^\circ P\hat{O}?$
 - 5.6.2 $u[P\hat{D}US Cx\hat{A}\emptyset\mu Gzu\emptyset\hat{U} \text{©}\mu\hat{A}\text{®} (7 \text{©}\delta u P^\circ\text{£}zv\emptyset S \text{©}\acute{O}S) \{\emptyset h\hat{o}\text{£}\hat{O}\hat{O}\hat{O}\hat{I}u\delta?$
 - 5.6.3 $u[P\hat{D}US E^\circ, h\beta E\hat{O}\hat{I} S\zeta\phi\emptyset uP\hat{O} Gzu\emptyset\hat{U}?$
 - 5.6.4 $u[P\hat{D}US Cx\hat{A}\emptyset\mu Gzu\emptyset\hat{U} \neg\emptyset\acute{O} P_j UP\emptyset\}\text{''}! H\emptyset\text{£}mk\hat{O}\hat{I}x?$
 - 5.6.5 $u\emptyset\div\text{£}\delta x H\emptyset\text{£}mh \text{©}\mu\hat{A}\text{®} _P''\text{©}\mu\hat{A}\text{©}\delta? A\hat{A}\}\text{''}x A\hat{O}\emptyset\hat{A}]Qa\emptyset \setminus \text{©}\mu\hat{A}\text{©}\delta?$
 - 5.6.6 $\text{©}\mu\hat{A}\text{®} G[S \{h\phi ux?$
- 6.1 $u\emptyset\div\text{£}\delta\emptyset u^- P^\circ\text{£}P\delta\}\text{''}zv\beta \div\text{£}\delta x C_j\text{®}!a\setminus zx \text{©}\delta zv\emptyset\mu P\emptyset\hat{I} Em\hat{o}P\delta sj^\circ P\hat{I}\delta?$
 - A. $B\text{®}$
 - B. $C\hat{A}\emptyset\}\text{''}$
- 6.2 $B\text{®} G\hat{U}\hat{A} Gzu\emptyset\hat{U} \text{©}\delta zv\emptyset\mu P\hat{O}?$
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6.3 $u\emptyset \div \text{£}\delta x \text{OÍ} \text{P}^\circ \text{£P}\delta \gg z\nu\beta \div \text{£}\delta x \text{C}\mu zu \div \text{£}\delta \emptyset \text{PUP}\delta \text{Ú} \text{C}\mu zu \text{£}\eta \div \text{£}\delta u\emptyset \text{Ú} \div \text{£}\delta \emptyset \text{P}\delta \text{OÍ} \text{£mhu}\delta$?

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6.5 $C\phi u \text{P}^\circ \text{£P}\delta \gg z\nu\beta \div \text{£}\delta x u[\text{P}\delta \text{U}\text{S} \text{Sh}\emptyset \text{§a}] \text{©}, \phi x \text{ÁÇ}[\text{P}^\circ \text{£mhu}\delta]$?

- A. B° B. $C\text{À}\emptyset \gg$ C. $\emptyset u \eta \text{À}\text{À}\emptyset \gg$

6.6 $u\emptyset \div \text{£}\delta \emptyset u \text{¯} \div \text{£}\delta \text{ÖP}\delta \gg z\nu\emptyset \text{S} \text{¤}\beta \text{!} u[\text{P}\delta \text{U}\text{S} \text{C}, \text{®} \text{!} a \setminus z x \text{©}\delta z\nu\emptyset \mu \text{P}\delta \text{O} \text{ÁÇ}[\text{P}^\circ \text{£mhu}\delta]$?

- A. B° B. $C\text{À}\emptyset \gg$

6.7 $u\emptyset \div \text{£}\delta \emptyset u \text{¯} \div \text{£}\delta \text{ÖP}\delta \gg z\nu\emptyset \text{S} \text{¤}\beta \text{!} \text{]}[\text{P}\delta \text{O} \text{C}, \text{®} \text{!} a \setminus z x \text{©}\delta z\nu\emptyset \mu \text{P}\delta \text{O} \text{Em}\delta \text{P}\delta \text{sj}^\circ \text{PÍ}\delta$?

- A. B° B. $C\text{À}\emptyset \gg$

6.8 $B^\circ \text{G}\text{Ú}\text{À} \text{Gzu}\emptyset \text{Ú} \text{©}\delta z\nu\emptyset \mu \text{P}\delta \text{O}?$

- A. < 30 B. $30 - 59$ C. $60 - 99$ D. ≥ 100

6.9 $C\text{À}\emptyset \gg \text{G}\text{Ú}\text{À} \text{Em}\delta \text{P}\delta \text{OÍ}\delta \text{ouu}\emptyset \text{S} \text{G}\beta \text{Ú} \text{P}\delta \mu \eta [\text{P}\delta \text{O}?$

- A. $\text{Á}, \text{®}\text{£zu}\text{P}\delta u \text{¯} \text{ø}\text{Á}$ B. $\text{E}\text{©mh}\text{À}$
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E. $\div \text{Á}\text{Ö} \text{H} \div u\text{Ý}^\circ \text{P}\delta \mu \eta^\circ$

7. $\text{RÍPsh En}\text{À} \text{Á}\emptyset \text{PP}\delta \text{Í} \text{Gzu}\emptyset \text{Ú} \{ \delta \text{mP}\delta \text{U}\text{S} \text{C}\emptyset \text{h}^\circ \text{À} \text{Em}\delta \text{P}\delta \text{O}\text{O}\text{Á}^\circ \text{P}\delta \text{O}?$
($\text{S}\text{O}^\circ \text{!} : \text{v}\text{Ú}^\circ - 1$; $\text{Á}\delta \mu z\nu\emptyset \text{S} \text{J}, \neg \emptyset \text{ÓUS} \div \text{£}\delta \text{À} - 2$; $\text{G}^\circ \div \text{£}\delta u\delta \text{Áx} - 3$;
 $\text{G}^\circ \div \text{£}\delta x^a \text{À}\emptyset \gg - 4$)

1. $\text{£}\delta \text{À} \text{A}\text{À} \gg x u^\circ$:
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8. $u[P\delta US G\ddot{o}\xi\delta\hat{E}u\delta\acute{A}x A\acute{I}\ddot{A}US AvP\textcircled{\delta}\acute{U} Ev\mu\ddot{\div}\xi\delta US \textcircled{\delta}u\hat{A}h\delta^{\circ}\beta$
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9.2 $B\textcircled{\delta} G\hat{U}\hat{A} \neg\delta\mu\delta\hat{A} \div\xi\delta P\delta\gg \mu\beta P\acute{A}\hat{U}\ddot{I} A\hat{I}UP\ddot{\xi}mhx?$

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9.3 $\mu\acute{A}\textcircled{\delta} \{h\phi x 2 \acute{A}\delta\mu zv\textcircled{\delta}S\textcircled{\delta} Gzu\theta\acute{U} \neg\theta\acute{O} _P\delta u\delta\mu\ddot{\xi} \xi o\textcircled{\delta}i^{\circ}P\acute{I}\delta\hat{A} \hat{A}mk$
 $P\acute{A}\hat{U}\ddot{I} A\hat{I}UP\ddot{\xi}mhx.$

A. $J, \neg\theta\acute{O}$

B. $C, \neg\theta\acute{O}$

C. $-\beta\textcircled{\delta} \neg\theta\acute{O}$

9.4 $\div\xi\delta P\delta\gg P\acute{A}\hat{U}\ddot{\xi} \mu\beta \div\xi\delta x u[P\delta US R\acute{I}Psh G\theta\acute{A}\delta\textcircled{\delta}\hat{A}\gg\delta\textcircled{\delta} A\hat{I}UP\ddot{\xi}mhx?$

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BIBLIOGRAPHY

1. DeMayer EM, Tegman A. Prevalence of anaemia in the world. World health organisation Qtly 1998; 38: 302-16
2. WHO 2004. Micronutrient deficiency: Battling iron deficiency anaemia: the challenge. Available from: <http://www.who.int/nut/ida.htm>.
3. Ezzati M, Lopez AD, Dogers A, Vander HS, Murray C. Selected major risk factor and global and regional burden of disease. Lancet 2002; 360: 1347-60.
4. IIPS National Family Health Survey 1998-99 (NFHS – 2): Available from: <http://www.nfhsindia.org/india2.html>.
5. IIPS National Family Health Survey 2005-06 (NFHS-3): Available from <http://mohfw.nic.in/nfhsfactsheet.htm>.
6. DLHS on RCH. Nutritional status of children and prevalence of anaemia among children, adolescent girls and pregnant women 2000-04. Available from: http://www.rchindia.org/nr_india.htm 2006
7. Toteja GS, Singh P. Micronutrient profile of Indian population. New Delhi: Indian Council of Medical Research; 2004.

8. National Nutrition Monitoring Bureau (NNMB). 2002. NNMB Micro Nutrient Survey. Hyderabad: National Institute of Nutrition.
9. Bhaskaran P, Balakrishna N, Radhakrishna KV, Krishnaswamy K. Validation of haemoglobin estimation using Hemocue. *Indian J Pediatr* 2003; 70; 25-8.
10. Kapoor SK, Kapil U, Dwivedi SN, Anand K, Pathak P, Singh P. Comparison of Hemocue method with cyanmethaemoglobin method for estimation of haemoglobin. *Indian Pediatr* 2002; 39 : 743-6.
11. Kapil U, Tandon M, Pathak P, Dwivedi SN. Comparison of haemoglobin values obtained by Hemocue and Sahli's methods. *Indian J Public Health* 2002; 46: 28-30.
12. Mohanram M, Ramana Rao GV, Sastry JG. A comparative study on prevalence of anaemia in women in women by cyanmethemoglobin and hemocue methods. *Indian J Community Med* 2002; 27: 58-61.
13. Saxena R, Malik R. Comparison of hemocue method with the cyanmethemoglobin method for estimation of haemoglobin. *Indian Pediatr* 2003; 40:917.
14. Yajnik CS, Deshpande SS, Jackson AA, Refsum H, Rao S, Fisher DJ, et al. Vitamin B12 and folate concentrations during pregnancy and insulin resistance in the offspring: the Pune Maternal Nutrition Study. *Diabetologica* 2008; 51: 29-38.

15. National Nutrition Monitoring Bureau (NNMB). 1975-2006. NNMB Reports. National Institute of Nutrition, Hyderabad. Available from: <http://www.numbindia.org/downloads.html>.
16. Kilbridge J, Bakea TG, Parapia LA, Khoury SA, Shugaidef SW, Jerwood D. Anaemia during pregnancy as a risk factor for iron deficiency anaemia in infancy: a case control study in Jordan. *Int J Epidemiol* 1999; 28: 461-8.
17. Kapur D, Agarwal KN, Sharma S, Kela K, Kaur I. Iron status of children aged 9-36 months in an urban slum. Integrated Child Development Services project in Delhi. *Indian Pediatr* 2002; 139: 136-44.
18. World health report 1998. Life in the 21st century; A vision for all, WHO Geneva : 154-57.
19. Course material for postgraduate Diploma in Maternal and Child health, IGNOU, Maternal health unit 14-25 : 68-70.
20. K Park. Park's textbook of preventive and social medicine. 20th edition, 2009.
21. Brett J. Cassens, The national medical series for independent study, preventive medicine and public health, second edition: 150-51.

22. Oxford Textbook of public health, vol 1 & 3, 3rd edition: 160-61, 1381-82.
23. E.M. Damaeyer, Prevention and controlling IDA through PHC care. A guide for health administrators and programme managers : WHO, 1989.
24. Martin East Wood, Principles of human nutrition, first edition, 1997: 255-61.
25. HP Sachdev, Nutrition in children, Developing countries concern, 1st edition 1994: 493-499, 220-230.
26. Mudaliar and Menon's clinical obstetrics, 9th edition, 1997: 120-26.
27. O.P. Ghai, Essential Preventive Medicine, a clinical and applied orientation, 1999: 163-167.
28. Nutrition anaemia; training module on RCH for health workers: 40-49.
29. Lokeshwar, Mamta Manglani, Clinical manifestation and management of IDA, IAP Journal of Practical Paediatrics, Oct-Dec. 1998, Vol 6. No.4: 351-59.
30. Health education in SE Asia. A quarterly official publication of IUPHE – SEARB, Jan 2000; Vol XV; No.1: 47-51.

31. Sir John V Darie, SM Lewis, Practical haematology, 18th edition, 1995: 50-54.
32. Manual of basic technique for health laboratory, WHO, 1980: 371-74.
33. Regional health report 1998, focus on women, WHO, SEAR region; health of women in South East Asia, a life span perspective : 7-17.
34. Diallo D, Tehernia G. Role of iron deficiency anaemia in pregnant women in Mali; Rev. Fr. Gynecol obstet. Mar.1995; 90(3) : 142-47.
35. Simmons WK, Jutsum PJ; A survey of the anaemia status of preschool children, pregnant and lactating women in Jamaica. Am. J. Clin. Nutrition, Feb 1982: 35(2): 319-26.
36. Msolla MJ. Prevalence of anaemia in pregnant women during the last trimester, International Journal of food sciences and nutrition. July 1997; 48(4): 265-70.
37. Shulmman CE et al. Malaria is an important cause of anaemia in primigravida, coastal Kenya; Transactions of the Royal Society of Tropical Medicine and Hygiene, Sep-Oct 1996, 90(5): 535-39.
38. Bermejo B et al. Prevalence of iron deficiency in the female working population in the reproductive age. Revista clinica Espanola. Jul.1996; 196(7): 446-50.

39. Ramirez – Matoose; Anaemia and iron deficiency in 490 mexican pregnant women; *Revista de investigation clinica*, Mar-Apr 1998, 50(2): 119-26.
40. N. Meda, S. Cousens. Anaemia among women of reproductive age group in Burkino faso, *world health forum*, volume 17, No:4, 1996: 369-72.
41. Glazener MA et al. postnatal maternal mortlity, extent, causes, prevention and treatment. *British Journal Obs. And Gynaecology*, Apr 1995, Vol.102: 282-87.
42. Thomson J, Anaemia in pregnant women in eastern caprivi, Namibia. *South African medical journal*; Nov 1997; 87(11): 1544-47.
43. Briese V, Falker V; Anaemia in puerperium- a retrospective analysis; *zentralbl Gynacol* 1994; 116(5): 280-4.
44. Bergsjo P, Seha AM; Hemoglobin concentration in pregnant women; *acta obstetrician et gynecologica scandinavica*, Mar 1996; 75(3): 241-44.
45. K.N. Agarwal, D.K. Agarwal et al. Prevalence of anaemia in pregnant and lactating women in India, *Indian J. Med Res* 124, Aug 2006; 173-84.

46. Dr. Sadia Khan, Dr. Sobia Nawaz and Dr. M.Arshad Hussain – Anaemia in postnatal patients; Determinants of severity and type at Rawalpindi General Hospital – Professional Med J Jun 2007, 14(2): 360-64.
47. Mrudula K.Lala et al. Comparitive study of under five deaths and family planning status in a district, Ahmedabad. Indian Journal of Community medicine, Vol.XXV, No.3, Jul- Sep 2000: 130-135.
48. Prof. Sandip Roy; Editorials, Prevention of malnutrition, JIMA Sep 2000, Vol. 98, No. 9: 548-56.
49. R.K.Sharma et al. A study of effect of maternal nutrition in incidence of low birth weight. Indian Journal of Community medicine, Apr-Jun 1999, Vol XXIV, No.23, Vol. 2: 64-67.
50. Nietfeld C, Iron therapy of anaemia in pregnancy and puerperium. Fortcher Med, Sep 1981, 10: 99(34): 1370-72.
51. Rohit V. Bhatt, Iron and Indian women, The journal of obstetrics and gynaecology of India, Apr 1999, Vol 49, No.2:27-31.
52. Rapid assessment survey reports 1998; By Gandhigram Institute of rural health and family welfare trust at Chengalpat district.
53. Padamsingh et al. Antenatal care of pregnant women in India. Indian journal of community medicine, Jul-Sep 2000, Vol XXV, No.3: 112-15.

54. Schwab J, Goltner E, Iron therapy and haemoglobin regeneration in pregnancy and postpartum anaemias; Oct 1997, 181(5): 363-7.
55. Allen LH, Anaemia and iron deficiency, effects on pregnancy outcome; Am J of clinical nutrition, May 2000, 71(5):1280S-4S.
56. Fiehardt AE et al. The needs of postpartum women. Curatonis Feb.1994, 17(1): 15-21.
57. Pistella CY et al. Community postpartum care needs assessment and systems development for low income families, J Health Soc. Policy;
58. Manpreet kumar et al. Maternal outcome in relation to spacing < 2 yrs and 2 – 4 yrs. The journal of obst. And Gynaec. Of India; Apr 2000; Vol 50; No.2: 54-56.
59. Lazoic N, The importance of time intervals between child birth and anaemia in pregnancy. Nov – Dec 1996, 124(11-12): 307-10.
60. Pragati Chabra et al. Lactation amenorrhoea and its determinants in women in an urban resettlement colony, Indian journal of community medicine, Jul-Sep 2000, Vol XXV; No.3 : 108-11.
61. UPDATE, Nutrition research summaries ; 1999; volumr 4 ; Issue I.