COVERAGE OF IRON FOLIC ACID, PREVALENCE OF ANEMIA AMONG PREGNANT MOTHERS DURING THIRD TRIMESTER OF PREGNANCY, DHENKANAL DISTRICT, ORISSA, INDIA 2004.

By

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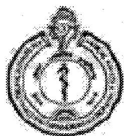
(MAE- FETP Scholar 2003-2005)

Dissertation project submitted in partial fulfillment of the requirements for the degree of Master of Applied Epidemiology (M.A.E) of



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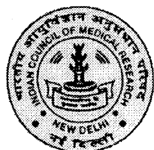

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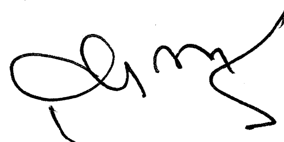
April 2005

CERTIFICATION

This is to certify that this dissertation entitled "Coverage of Iron Folic acid and Prevalence of Anemia, among pregnant mothers during third trimester of pregnancy, Dhenkanal District, Orissa, India 2004" submitted by Dr Amitav Das in partial fulfillment of the requirements for the degree of Master of Applied Epidemiology is the original work done by him and has not been submitted earlier by him in part or whole for any other (Publication or degree) purpose.



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1. Abstract:

Background: To minimize maternal and infant mortality rate during pregnancy the iron prophylaxis program in India is going on and according to this program, the female health worker gives one hundred iron and folic acid tablets for iron supplementation during pregnancy. National Institute of Epidemiology, Chennai, India with collaboration of TEPHINET, Communicable Disease Control and Prevention Atlanta USA initiated an endeavor to do a cluster survey to estimate the proportion of consumption, prevalence of anemia among pregnant women and the factors affecting the consumption and prevalence of anemia in Dhenkanal district Orissa state India.

Objective:

- To estimate the coverage of Iron and Folic Acid tablets in the Anemia Prophylaxis Program Dhenkanal District.
- To estimate the prevalence of iron deficiency anemia among pregnant women during third trimester of pregnancy and identify factor associated with it in 2004.

Methods: I conducted a cluster survey through out the Dhenkanl district, Orissa, India. I estimated cluster size 12 and number of cluster 38 and total sample size of 456. Primary sampling unit was the sub-center comprising 5000 to 12000 population. We adopted Systematic Probability Proportional Size Sampling method to select the 38 sub-centers out of total 165 sub-centers in the district. We chose 12 pregnant mothers from the register of the health worker female by simple random sampling method. We collected data using semi-structured questionnaires and estimated hemoglobin level by cyan meth hemoglobin method. We examined stool samples for prevalence of hookworm.

Result: Percentage of full coverage of iron folic acid tablet was 88.6% (95% confidence interval 85% - 91%), full consumption of Iron folic acid tablet or syrup was 83.8% with 95% confidence interval of 79% to 87.5%. The chance of partial consumption was 2.4 times higher among the mothers with education level below class seventh, 36 times higher among the mothers who had a negative attitude, 10 times higher among the mothers who were partially covered and 8 times higher who had not been advised by female health worker.

Prevalence of anemia as a whole was 62.5% with (95% confidence interval 58% to 67%), mild anemia was 30% with 95% confidence interval 25.9% to 34.5%, moderate anemia was 29.6%

with 95% confidence interval 25.3% to 33.8% and severely anemia was 3.1% with 95% Confidence Interval 1.8% to 5.2%. The chance of the pregnant being anemic was 2.4 times who had not passed seventh standard, 3 times among the mothers who consumed partially, 11 times higher who had hookworm infestation.

Conclusion: Although coverage of iron folic acid tablet among pregnant mothers was high, prevalence of anemia was still high. This higher prevalence of anemia might be due to low iron folic acid tablet consumption and worm infestation. Information education and communication might help to decrease the prevalence of anemia among them. The advice of female health worker plays greater role than that of a doctor for consumption of iron folic acid tablets. More female health workers might be recruited in the periphery level and no female health worker post in the sub-centers should remain vacant. The pregnant mothers might be given mebendazole tablets just after the first trimester of pregnancy during the first antenatal check up.

2.Introduction:

Iron deficiency anemia is now a global problem; Iron deficiency is the most common and widespread nutritional disorder in the world (5). It is the only nutrient deficiency, which is also significantly prevalent in virtually all industrialized nations. Using anemia as an indirect indicator it can be estimated that, most preschool children and pregnant women in non-industrialized countries, and at least 30-40% in industrialized countries, are iron deficient (6,7). Nearly half of the pregnant women in the world are estimated to be anemic (6,7). Nearly half of the pregnant women in the world are estimated to be anemic.
Anemia is associated with high incidence of premature birth, Post partum hemorrhage, puerperal sepsis and thromboembolic phenomena in mothers; Iron and Folic acid prevent nutrition stress in the expectant mothers. Anemia leads to insufficient store in fetus, which leads to lack of body mass and blood volume in the first year of life. Anemia during pregnancy is associated with adverse outcomes (premature delivery, low birth weight and fetal death) (2,3). Iron deficiency in childbearing women increases maternal mortality (7), prenatal and perinatal mortality and prematurity (8,9). Anemia is directly responsible for 20% maternal deaths and is an associated cause in another 20% in developing countries.

Despite the fact that most of the anemia seen in pregnancy is largely preventable and easily treatable if detected in time, anemia still continues to be a common cause of maternal mortality and morbidity. So Government of India initiated the National Anemia Prophylaxis Program of Iron and Folic Acid distribution to all pregnant women in 1970 and again modified it on 1992. Available data from hospital records and information from community-based surveys on prevalence and adverse consequences of anemia in pregnancy have remained essentially unaltered over the past three decades. In National Family Health Survey 2, it was observed that 63% of pregnant women are suffering from Iron deficiency anemia. In India, Iron and Folic Acid (IFA) deficiency anemia is found in 25 to 50% of pregnant mothers attending hospitals (WHO 1972). Many pregnant women have Iron deficiency without anemia. (Srikanta, S.G. 1983) About 50 to 60% of women in India belonging to low socio economic groups and are anemic in the last

trimester of pregnancy. (Indian Council for Medical Research 1977). In India 20% to 40% maternal deaths are attributable to anemia WHO (1982). The non-delivery of the supplement, poor compliance and program related obstacles constitute the major problems in different parts of the country. The female health worker gives the iron folic acid tablet to the pregnant mothers after registration and this registration data is communicated to the higher levels. But from the records it is difficult to estimate whether the coverage is full or partial, whether the pregnant mother receives full course of iron folic acid tablet or not it is a question mark.

According to National Family Health Survey (NFHS 2 – 1998-99) 58% of all pregnant mothers in Orissa mothers received iron and folic acid supplementations during pregnancy.

National Institute of Epidemiology, Chennai, India with collaboration of TEPHINET, Communicable Disease Control and Prevention Atlanta USA initiated an endeavor to do a cluster survey to estimate the proportion of full coverage from the registered pregnant mothers, percentage of consumption, prevalence of anemia among pregnant women during third trimester of pregnancy and the factors affecting the consumption and prevalence of anemia in Dhenkanal district Orissa state India, so that the intervention activity of Maternal and Child Health (MCH) program may be strengthened. If current methods are inadequate, alternative methods like food fortification or other cost effective methods to reduce prevalence of anemia in pregnant mothers may be considered. In this study it had also been tried to asses the attitude towards the consumption of iron folic acid and the prevalence of hookworm infestation among the pregnant mothers in the district as the attitude may affect the consumption and the hookworm infestation may be a cause of anemia among them.

3.Objectives:

- To estimate the coverage of Iron and Folic Acid, among pregnant mothers in the Anemia Prophylaxis Program Dhenkanal District, Orissa state.
- To estimate prevalence of iron deficiency anemia among pregnant women during third trimester of pregnancy and identify factor associated with it in 2004.

4. Literature review:

4.1.Introduction:

In a community mothers and children comprise approximately seventy percent of the population of the developing countries. In India women of the child bearing age that is 15 to 44 years constitute 19 percent and children under 15 years of age about 40 percent and total of 59 percent of the total population. Mothers and children not only constitute a large group in the society but also they are a vulnerable group or special risk group. The risk among the mothers is during child bearing and risk among the infant and children is intra uterine growth, development and survival. Out of all the deaths 50 percent death occurs among the children below 5 years. In developed counties maternal mortality rate is 30 per 100,000 live births and in developed countries it is 480 per 100,000 live births (1). It shows that maternal, infant and child mortality rate constitute a large part of the total deaths in the developing countries and the cause of the death among this group is preventable. Anemia is associated with high incidence of premature birth, Post partum hemorrhage, puerperal sepsis and thromboembolic phenomena in mothers; Iron and Folic acid prevent nutrition stress in the expectant mothers. Anemia leads to insufficient store in fetus, which leads to lack of body mass and blood volume in the first year of life. Anemia during pregnancy is associated with adverse outcomes (premature delivery, low birth weight and fetal death) (2,3). Complications of low birth weight include lung and breathing problems, anemia, brain abnormalities, behavioral problems, difficulty maintaining normal body temperature, and feeding problems, which are the important causes of maternal mortality (4). Iron deficiency in childbearing women increases maternal mortality (7), prenatal and perinatal mortality and prematurity (8,9). Anemia is directly responsible for 20% maternal deaths and is an associated cause in another 20% in

developing countries. Favorable pregnancy outcomes occur 30-45% less often in anemic mothers, and their infants have less than one half of normal iron reserves (11). Thus it is imperative to be able to not only manage a case of anemia but also implement measures for its prevention. Despite the fact that most of the anemia seen in pregnancy is largely preventable and easily treatable if detected in time, anemia still continues to be a common cause of maternal mortality and morbidity in India. Distribution of Iron and folic acid (IFA) tablets from fourth month onwards will help in preventing anemia. Government of India has introduced the provision of Iron and folic acid tablets for all the pregnant mothers as an integral part in the Maternal and Child Health program during 1991 and Reproductive and Child Health programs for the adolescent girls, expectant and lactating mothers with the objective to provide Iron and Folic Acid tablets to reduce the prevalence of anemia during pregnancy, which will lead to decrease the maternal mortality and increase the birth weight of the baby, by which the infant mortality rate will be reduced. This program has been introduced a long ago and it is one of the primary job of the health worker female in the country. The success of the program and the betterment of the individuals depend on the acceptance and attitude of the beneficiaries towards the program.

4.2.Historical Backgrounds:

In the ancient days the Greeks knew anemia as muscle weakness. In India, especially in the state of Orissa to reduce iron deficiency anemia, to increase the iron concentration in the blood, the lactating mothers just after delivery were given warm water to drink and the water was made hot by putting a red-hot iron rod in to a water can. The idea behind this was to increase the intake of iron salts. In the sixteenth century the sign and symptoms of anemia came to lime light. In the nineteenth century it was known about the constituents of blood, about red blood cells and its chemical composition. In this Nineteenth century Hoppe- Seylers who showed that the blood pigment or hemoglobin that is composed of hematin and the hematin contains heam that is iron and protein discovered the Hemoglobin. When different programs for the betterment of health of the population came in to practice, this iron supplementation to pregnant mothers was the first and foremost supplementation program.

4.3. Global scenario:

4.3.1. Prevalence of iron deficiency anemia:

Iron deficiency is the most common and widespread nutritional disorder in the world (5). As well as affecting a large number of children and women in non-industrialized countries, it is the only nutrient deficiency, which is also significantly prevalent in virtually all industrialized nations. There are no current global figures for iron deficiency, but using anemia as an indirect indicator it can be estimated that, most preschool children and pregnant women in non-industrialized countries, and at least 30-40% in industrialized countries, are iron deficient (6,7). Nearly half of the pregnant women in the world are estimated to be anemic: 52% in non-industrialized - as compared with 23% in industrialized – countries (6,7). Anemia is particularly prominent in south Asia. In India, for example, up to 88% of pregnant and 74% of non-pregnant women are affected. Throughout Africa, about 50% of pregnant and 40% of non-pregnant women are anemic. West Africa is the most affected, and southern Africa the least. In Latin America and the Caribbean, prevalence of anemia in pregnant and non-pregnant women is about 40% and 30% respectively. The highest levels are in the Caribbean, reaching 60% in pregnant women on some islands (6,7). In Kenya prevalence of moderate anemia is 54% while 70% of pregnant mothers in Kenya are anemic. Based on a 1998 national survey, anemia prevalence is widespread in Zambia particularly in young children (6-18 months) and pregnant women. The survey documented prevalence rates of 65% among children (of which 14.5% were severely anemic) and 46.9% among pregnant women (21)In most industrialized countries the prevalence of anemia among pregnant mothers is around 20%.

4.3.2. Prevention and control:

Food fortification with Iron: Iron fortification is the most common strategy currently used to control iron deficiency anemia in developed countries. General iron fortification programs are considered to be 93% effective in the long term, and this should be carried out until there is significant improvement in diet of entire populations or food fortification is achieved. Sweden has implemented iron supplementation and fortification of many food items for many years so that a relatively low prevalence of iron deficiency anemia is there in the country. In Indonesia, in May 2001, the Ministry of Industry and Trade issued Decree Number 153/2001 on the Mandatory Application of the National Standard of Indonesia (SNI) for fortified wheat flour. Both imported wheat flour and domestically produced wheat flour must follow this Standard of Indonesia and according to it, the wheat flour must be fortified with 50-ppm iron, 30-ppm zinc, 2.5-ppm thiamin, 4-ppm riboflavin, and 2-ppm folic acid.

Iron Supplementation: Supplementation programs for pregnant mothers are carried out in both developed as well as developing countries, though the iron supplementation programs are considered 70% effective in the short term. Various delivery systems and modalities, under conditions of varied efficiency, reach a wide range of target groups. Small controlled studies of supplementation have been shown to be particularly successful, and a few large-scale supplementation programs clearly demonstrating positive biological impact are reported from some developing countries. Countries should identify specific problems and constraints limiting the effectiveness of supplementation programs and those key elements responsible for successes and failures. Supplementation is most often used to treat existing iron deficiency anemia. It should also be considered as a preventive public health measure to control iron deficiency in populations at high risk of iron deficiency and anemia. Supplementation programs, especially for pregnant women, operate in developed as well as in developing countries. Most of the countries of the world have policy statements and directives regarding iron supplementation of pregnant mothers, but most of these directives are not fulfilled (29).

Control of Hookworm infestation: In Zambia the prevalence of hookworm is 9.4% (21). Routine de-worming has been recommended as a cost effective strategy to control anemia, especially in areas where hookworm infestation is heavily endemic (22). Information Education and Communication, personal hygiene and adequate sanitation is most important for the control of worm infestation. Where hookworm infestation is endemic and in areas identified as endemic for intestinal parasites, a single dose of 500 mg mebendazole at the earliest antenatal visit after first trimester should be provided (21).

4.4.Southeastern region:

Anemia is prominent in south Asian countries. In India prevalence of anemia is high but the prevalence is low in countries like Thailand. In the southeastern region a lot of people suffer from iron deficiency anemia predominantly affecting pregnant mothers. The prevalence of anemia is about 74% among pregnant mothers, which ranges from 13.4% in Thailand to 87% in India according to 4th report of the world nutrition situation (28). In a number of countries iron supplementation is the usual practice for prevention of anemia.

4.5.India:

4.5.1. Prevalence of anemia:

According to Iron deficiency Anemia, Assessment, Prevention and Control, A guide for programme managers, the prevalence of anemia in India is up to 88% of pregnant and 74% of non pregnant women.

According to (Seshadri, 1998), anemia affects an estimated 50% of the population.

According to Indian Council for Medical Research (ICMR) (1977), ICMR bulletin, December 1977 50 to 60 percent of women belonging to low socio economical groups are anemic in the last trimester of pregnancy.

In India, Iron and Folic Acid (IFA) deficiency anemia is found in 25 to 50% of pregnant mothers attending hospitals (WHO 1972).

In India Folic Acid deficiency anemia is found in 25 to 50% of pregnant mothers attending hospitals. World Health Organization 1972, WHO Chronicle 26 (4) 160. Many subjects have Iron deficiency without anemia (Srikanta, S.G. 1983, Proceed Nutritional Society of India No 28 P 7.). Many subjects have Iron deficiency without anemia. (Srikanta, S.G. 1983)

In India 20 to 40% maternal deaths are attributable to anemia WHO (1982), World Health Statistics Qrly 35: 52.

In National Family Health Survey-2 (NFHS-2) in 1998-1999 there was a study of prevalence of anemia among pregnant mothers and the coverage of Iron and folic acid tablets during the antenatal period in all the states of India.

According to NFHS-2 (1998-1999), 49.7 percent pregnant mothers in India suffer from iron deficiency anemia out of which, 21.8% had mild, 25.4 % had moderate and 2.5 % had severe anemia. From all the states of India, the eastern and north eastern states had higher prevalence of anemia, 69.7 % in Assam, 63.3% in Meghalaya, 63.4 % in Bihar and 63% in Orissa. In Kerala the prevalence of anemia is lowest, 23%, Manipur 29%, Goa 36% and Nagaland 38%.

4.5.2. Causes of anemia:

The cause of anemia among pregnant mothers is same in both industrialized and non-industrialized countries of the world. Although many causes of anemia have been agreed that nutritional deficiency due to low bioavailability of dietary iron accounts for majority of cases (26). The phytates and tannins present in diet suppress iron absorption to a significant extent (27). During pregnancy substantial amounts of iron are deposited in the placenta and fetus during pregnancy. This results in an increased need of 700-850 mg in body iron over the whole pregnancy. Iron absorption is increased during pregnancy and the iron loss due to stoppage of menstruation. Pregnant women still do not absorb sufficient additional iron and the problem of iron deficiency anemia takes place.

Food habits: Consumption of iron-rich foods can reduce the prevalence or severity of anemia, and the absorption of iron from diet can be enhanced (by vitamin-c) or inhibited (by tea or coffee) if particular items are consumed around the time that a meal is taken. Women who take fruits at least ones in a week are less likely to be anemic than women who eat fruit less often or not at all. The consumption of green leafy vegetables does not appear to have protective effect against anemia. Women who regularly consumes green leafy vegetables but not fruits have the highest prevalence of anemia have been recorded in National Family Health Survey-2.The prevalence of anemia is reported to be higher among the persons consuming vegetarian diet as compared to those consuming a mixed diet that includes animal food.

Worm infestation: The hookworm infestation is most common in India (15,16,17). It is believed that 60-80 percent of population of certain areas of West Bengal, Orissa, Bihar, eastern coast of Tamilnadu and Andhraprdesh are infected with hook worm. In a study done at Gulbarga Karnataka by Vinod Kumar (25) and colleagues demonstrated the prevalence of worm infestation as 86.66%, 68.16% and 82.97% in mild, moderate and severe cases of anemia. For mild degree of anemia during pregnancy, in India it has been recommended to take 100 milligram of mebendazole twice a day for three days. (35)

Socio economic status: The high prevalence of anemia during the third trimester among women suggests that many low-income women have poor iron nutrition both before and during pregnancy (18).

4.5.3. Effect of anemia on pregnant mothers.

According to (Seshadri 1998) anemia may have detrimental effects on the health of women and children, may become an underlying cause of maternal mortality and results in an increased risk of premature delivery and low birth weight

Government of India has given top priority to this iron supplementation in the Maternal and Child Health program. However, it has become increasingly evident that the main target group for supplementation to prevent iron deficiency is women of childbearing age

(in addition to infants older than 6 months, preschool children, and adolescent girls). This target group is not limited to pregnant women, who are often accessible only through the health system and late in pregnancy. One problem is that all of these groups are often difficult to contact through the health services. Therefore, efforts have been concentrated on supplementation programmes for women of childbearing age. If women enter pregnancy with adequate iron reserves, iron supplements provided during pregnancy will be more efficient at improving the iron status of the mother and of the fetus. As a result, the risk of maternal anaemia at delivery and of anaemia in early infancy will be reduced.

Pregnancy: Iron deficiency in childbearing women increases maternal mortality (7), prenatal and perinatal infant loss, and prematurity (8,9). Forty percent of all maternal perinatal deaths are linked to anaemia. Favourable pregnancy outcomes occur 30-45% less often in anaemic mothers, and their infants have less than one-half of normal iron reserves (11).

Such infants require more iron than is supplied by breast milk, at an earlier age, than do infants of normal birth weight (19). Moreover, if pregnancy-induced iron deficiency is not corrected, women and their infants suffer all the consequences as cognitive development, decrease in resistance to infection.

4.5.4. Prevention and control:

Iron supplementation: According to Indian Council for Medical Research (1989) a vegetarian diet contains 18-22 mg of iron, which represents 58% of recommended 40-60 mg of iron during pregnancy. So iron supplementation has been started since 1970.

Dr Chitra stiphense has sited in her study that it is the cost effective method to reduce the prevalence of anemia. 69% of pregnant women reported receiving iron supplements during the current pregnancy, with slightly less than a third purchasing iron from the private sector, and slightly more than a third receiving them free of charge from the government health services. Adequate dosage of iron per pregnancy was a problem with only 16.7% of pregnant women reporting consumption of >100 tablets. The impact of increased consumption of iron was evident in the mean hemoglobin of women: among

women consuming <100 tablets, mean Hb = 10.24 gram/dL. In contrast, among women consuming >100 tablets, mean Hb = 12.30 gram/dL ($p<0.009$). When questioned about reasons for not consuming iron supplements during their current pregnancy, only 3.5% of women spontaneously cited gastrointestinal or other side effects of the tablets (23).

The impact of the Government's Reproductive and Child Health Program, which distributes iron tablets to pregnant women at no charge, has been limited due to poor supply and distribution of supplements. The latter is believed to be due to a lack of effective contact between most pregnant women and health service personnel (Shah U., 1984). However, the lack of awareness on the part of the community and the lack of motivation among the government peripheral health worker may also play a major role (24).

Food diversification: Though the female health workers are giving iron and folic acid supplementation, the pregnant mothers need some changes in food habits, which may give an addition al benefit for improving the iron level and reduction of anemia. Women who take fruits at least ones in a week are less likely to be anemic than women who eat fruit less often or not at all. . Women who regularly consumes green leafy vegetables but not fruits have the highest prevalence of anemia have been recorded in National Family Health Survey-2. The prevalence of anemia is reported to be higher among the persons consuming vegetarian diet as compared to those consuming a mixed diet that includes animal food (36a). So Information Education and Communication is required to promote the food diversification and to take fruits like banana that is rich in iron and easily available in the Indian villages regularly and to take mixed diet.

4.5.5. Programs for Iron prophylaxis:

The National Nutritional Anaemia Control programme, started in 1970 and revised in 1991, aims at significantly decreasing the prevalence and incidence of anaemia among women in reproductive age group, especially pregnant & lactating women and pre-school children.

The programme focuses on the following strategies:

- Promotion of regular consumption of foods rich in iron.
- Provision of iron and folate supplements in the form of tablets (folifer) to the high-risk groups.
- Identification and treatment of severely anaemic cases.

The programme is implemented through the network of Primary Health Centres and Sub-centres. The beneficiaries and the doses are:

- Pregnant and lactating women: 100 mg of elemental Iron and 500 micro grams folic acid for 100 days after first trimester of pregnancy.
- Intra Uterine contraceptive Device users: 100 mg of elemental Iron and 500 micro grams folic acid for 100 days.
- Children aged 1-5 years: 20 mg of elemental iron and 100 micro grams of folic acid for 100 days every year.

In case of women suffering from severe anaemia (haemoglobin < 7 grams/dl), therapeutic dose of one adult tablet of iron is to be given twice daily for a minimum of 100 days. Functionaries of Integrated Child Development Scheme (ICDS) assist in the distribution of tablets to children and mothers in areas where this Integrated Child Development Scheme is in operation and also impart education to mothers on prevention of nutritional anaemia. Department of Food, Ministry of Food and Civil Supplies is responsible for promoting production of iron rich foods.

In addition to provision of Iron and folate supplements, the programme envisages to promote consumption of foods rich in Iron. The other objective was to identify and treat severely anaemic cases. An Indian Council for Medical Research evaluation in 11 states (1985-86) revealed low coverage as well as poor impact of the programme on prevalence of anaemia. (20)

According to Indian pediatrics 1999, 36: 727-728 Child and Maternal Health in rural areas in Chandigarh (30),

- Health status of the community is not dependent upon the availability of the health institutions and medical professionals, but also upon the socio economic profile, utilization and awareness level.
- Infectious diseases like diarrhea is responsible for 16.7% deaths, respiratory diseases 13%, vaccine preventable diseases 25% deaths among infants in India.
- 72.9% women are aware of iron and folic acid tablets.
- 95.8% utilized antenatal care from health workers.
- 80.8% mothers in second and third trimester of pregnancy were consuming iron and folic acid tablets. Nine out of ten (87.5%) of expectant women in their third trimester suffer from anaemia. Recent analysis of different food stuffs has shown that the iron content is very low thereby indicating that anaemia is primarily due to inadequate consumption of dietary iron rather than the poor absorption iron as believed earlier. Poor quality of environment and un-hygienic habits make the community vulnerable to diseases such as malaria and hookworm infestation which further aggravates this situation. About 269 million Indians are estimated to suffer from anaemia and nearly 55,000 maternal deaths are attributed directly or indirectly to Iron deficiency (20).

Coverage of iron and folic acid tablets among pregnant mothers in the Maternal and Child Health program is the highest in Kerala, 95.2%, in Goa 94.75, in Manipur it is 50%, in Meghalaya it is 49.5%, in Assam it is 55%, in Orissa it is 67.6% and in Bihar it is only 24.1%

Table-1. Antenatal care indicators by state in India: (National Family Health Survey-2, India, 1998-1999) (36)

State	Percentage that received at least one antenatal check up	Percentage given iron and folic acid tablet or syrup	Percentage that received supply of Iron and folic acid tablets or syrup for more than 3 months
India	65.4	57.6	47.5
Uttar pradesh	34.6	32.4	20.6
Bihar	36.3	24.1	19.8
Orissa	79.5	67.6	62.2
West Bengal	90.0	71.6	56.4
Goa	99.0	94.7	87.8
Kerala	98.8	95.2	88.6
Tamilnadu	98.5	93.2	84.1

5.6. State Scenario (Orissa):

According to National Family Health Survey-2 (1998-1999) the prevalence is 60.5%, out of which 26.8% are mild, 33% are moderate and 0.7% is severe. Prevalence of anemia in rural women is higher 64% than the urban women 55%. From this study 69.3% of urban pregnant mothers and 67.4% rural pregnant mothers were given iron and folic acid tablets or syrup. Out of the mothers received iron and folic acid tablets, 94.0% urban and 91.8% rural pregnant mothers received the tablets for more than 3 months. After the National Family Health Survey -2 there is no other studies for the coverage of this Iron prophylaxis program in Orissa.

5.7. District scenario (Dhenkanal district):

No such study has been done in the district. An endeavor has been accomplished by National Institute of Epidemiology, Chennai for the study of coverage of the Iron prophylaxis program and prevalence of anemia in the Dhenkanal district.

5.8. Summary:

The prevalence of iron deficiency anemia among pregnant mothers in India is very high and it has major public health significance, as the prevalence of anemia is more than 40 according to the WHO classification. The prevalence is more due to wrong dietary habits, poor nutrition, low iron storage, increased demand of iron, malaria and worm infestation. Iron deficiency anemia increases the mortality and morbidity of mother and infants both directly and indirectly. To decrease the mortality and morbidity all the industrialized and non-industrialized countries have taken necessary steps as food diversification, iron supplementation, food fortification and prevention of worm infestation. The industrialized countries have adopted food fortification program which is ideal and which is more efficient in the long run. Government of India has taken steps that are iron supplementation since 1970 for the prevention of iron deficiency anemia among pregnant mothers; it has been modified on 1991 and included the adolescent girls and children. Adolescent girls have been included for this iron supplementation to increase their iron store before they become mothers. It has been found from different studies that the coverage and consumption of iron and folic acid tablets by the beneficiaries is less in India. There are no adequate studies in relation to coverage and consumption of iron and folic acid tablets and the causes of this low coverage by the beneficiaries.

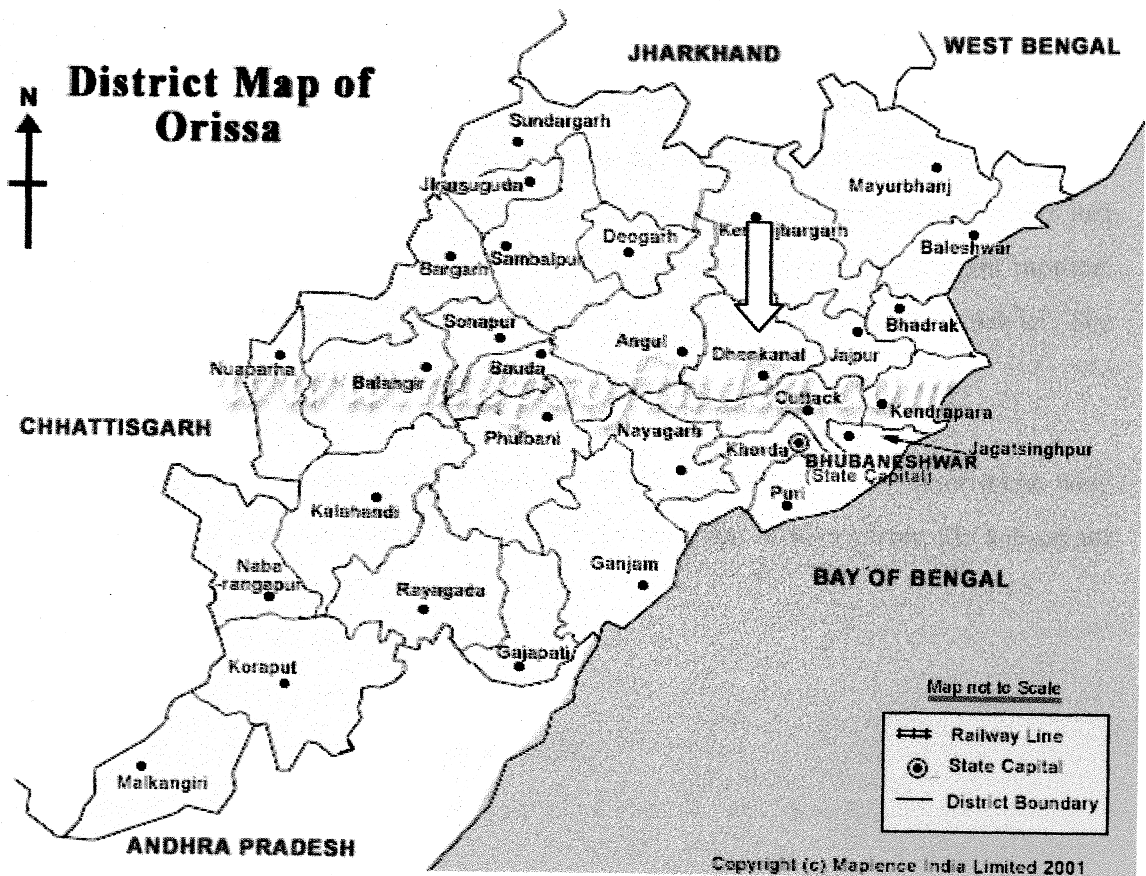
We did a cluster survey of pregnant mothers in third trimester of pregnancy and in this study an attempt has been taken to assess the prevalence of iron deficiency anemia among pregnant mothers during third trimester of pregnancy, the coverage of iron and folic acid tablet among them, the prevalence of hook worm infestation among pregnant mothers and the behavior and attitude towards the consumption and the factors associated with consumption and factors associated with anemia among pregnant mothers in Dhenkanal district.

5. Methodology:

5.1. Study area:

Entire Dhenkanal district was taken as the study area. The sub-centers under the block Primary Health Centers was taken as Primary sample units. Dhenkanal district is a combination of hilly and plain areas with a large river flowing in it. The population ranges from scheduled tribes those remain in the hilly areas to the people remaining in the plain areas. The socio economical status ranges from low earning farmers to high earning population involved in business and service. The cultural background ranges from culture of the scheduled tribes in the forest to advanced city culture.

Figure 1: The district map of Orissa showing the Dhenkanal district (Arrow), the study area, Dhenkanal, Orissa, India, 2004.



5.2. Study population:

We included all pregnant mothers during third trimester of pregnancy; residing in Dhenkanal district, in 2004 and registered in the record of the female health worker. The study populations were registered during 1st June 2004 to 31st August 2004.

5.3. Study Design:

It was a cluster survey of pregnant mothers during third trimester of pregnancy conducted in Dhenkanal district.

5.4. Study sample:

Target population: According to the National Family Health Survey (2) during 1998-99, the coverage of IFA tablets in the state of Orissa was 68% and the prevalence of anemia among pregnant mothers in the state of Orissa was 60.5%. Target population was all the pregnant mothers continuing third trimester of pregnancy during the month of November 2004 in Dhenkanal district. The female health workers register the pregnant mothers just after the first trimester of pregnancy. Our target populations were the pregnant mothers registered during the month of June, July and August 2004, through out the district. The size of target population was estimated as 4975.

Clusters of pregnant mothers in third trimester of pregnancy from sub-center areas were the study samples. They were selected from all the pregnant mothers from the sub-center areas of Dhenkanal district.

5.5.Sample size:

For estimation of the sample size we calculated the target population, rate of homogenicity and the design effect.

Cluster size: We selected a cluster size 12 on the basis of an estimated daily workload.

Rate of homogenicity: Rate of homogenicity was taken as 0.02, what is demographic variable.

Design effect:

Rate of homogenicity (Roh) = (Design effect – 1) / (Cluster size – 1).

0.02 = (Design effect – 1) / (12 – 1).

Design effect = 1.22.

Total responses needed (sample size):

$$\text{Total responses needed} = \frac{1.96^2 \text{ X P (100 – P) X Design effect}}{\text{Precission}^2}$$

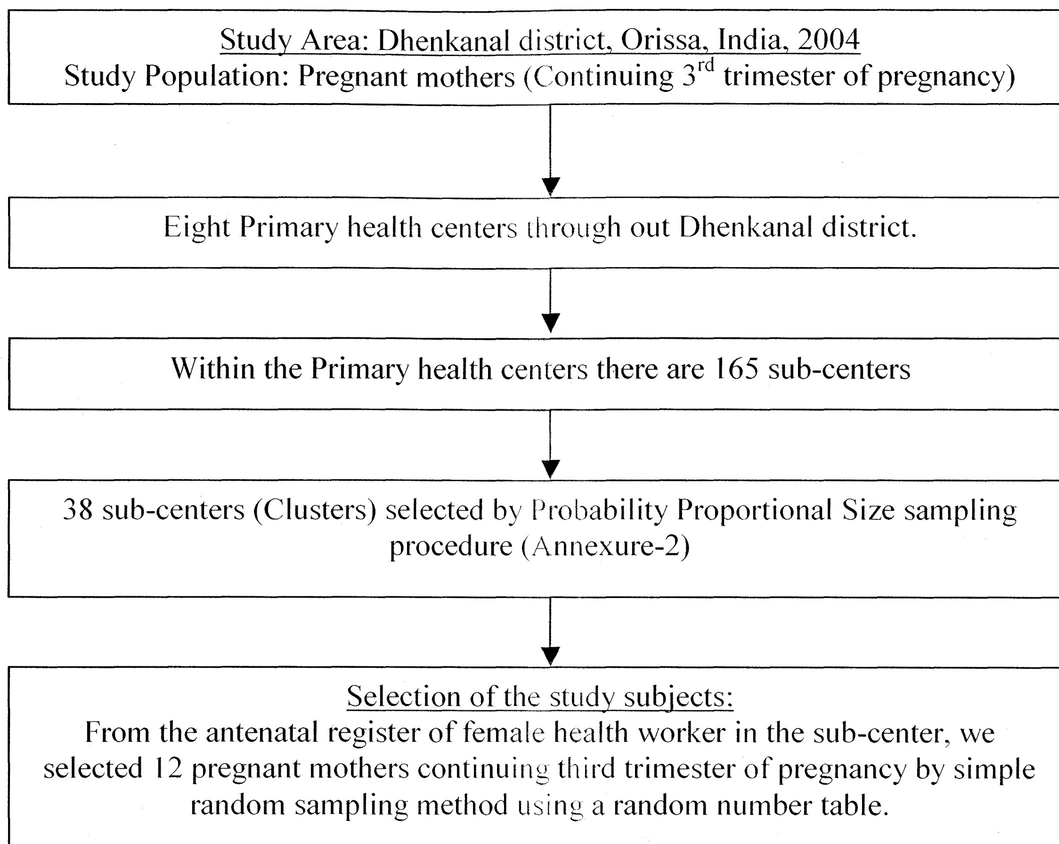
Total responses needed = $(1.96^2 \text{ X } 60 \text{ X } 40\text{X } 1.22) / 5^2 = 450$.

Using the right size soft ware, we rounded the target population at 5000 and the base line prevalence at 60%, the cluster size set at 12, the confidence coefficient at 95%, the alpha error at 5%, then we got the clusters needed 38 and total responses as 456.

Table: 2 Sample size and cluster size:

Target population	5000
Cluster size	12
Total respondents needed	456
Clusters needed	38
Estimated proportion	60%
Confidence coefficient	95%
Alpha error	5%
Rate of homogeneity	0.02
Design effect	1.22

Figure: 2 The flow diagram of the multi stage sampling procedure.



5.6. Sampling procedure:

Multi stage sampling procedure was adopted to select the study population. Clusters were selected by Probability Proportional Size sampling procedure, and then the study population was selected by simple random sampling method from the antenatal register of the female health worker.

5.6.a. Selection of clusters:

In the Dhenkanal district there are 1247 villages, 165 sub-centers; 9 Primary Health care units, which are designated as either Primary Health Center or Community Health Centers according to health care facilities. There are 8 Primary Health Center or Community Health Center areas in the Dhenkanal district, as one CHC is situated in one PHC area and it is the up gradation of one hospital. Each PHC area consists of 20 to 23

sub-centers and each sub-center area consists of 4 to 8 villages and population of each sub-center is 5,000 to 9,000. The pregnant mothers within 3rd trimester in the sub-center area were taken as a cluster. The name of all the sub-centers was written systematically by primary health care unit.

Primary sample units:

Using a Probability proportional to size method, we chose 38 clusters (38 sub-centers) as primary sampling units out of total 165 sub-centers in the district (Annexure-2). The name of all the 165 sub-centers and the population of pregnant mothers within third trimester of pregnancy were written serially by primary health care unit.

We collected the number of pregnant mothers with the third trimester of pregnancy registered in different sub-centers from the Primary Health Center and Sectors during the month of June, July and August 2004, as the pregnant mothers are registered after third month of pregnancy. The pregnant mother who was registered during the month of June 2004 would have ninth month of pregnancy during the month of November and the mother registered during the month of September 2004might have been completed sixth month of pregnancy during the month of November 2004. So the pregnant mothers registered during the month of June, July and August had attended third trimester of pregnancy during the month of November 2004.

At the first step, we prepared a cumulative list of all the clusters (sub-centers) with the population size of pregnant mothers in third trimester of pregnancy. At the end of the table the last cumulative population was 4975, the total target population.

At the second step, we sampled clusters from a random start between one and the sample interval.

We divided the total population (4975) by the number of clusters (38) to get the sampling interval (130). We selected a random number (14) between one and the sampling interval, we searched the cumulative population, to find out where the random number lied and that sub-center was selected as the first cluster. We added the sampling interval to that

number and searched again the cumulative population to see where the new number lied. We selected this sub-center as the second cluster. We repeated this method until the 38 clusters had been selected.

5.6.b. Choice of Study subjects:

In each sub-center the female health worker has an antenatal register that contains the name and numbers of pregnant mothers. We selected at random twelve study subjects from all the pregnant mothers continuing third trimester of pregnancy or registered during the month of June, July and August 2004, in the register using a random number table.

5.7. Definition of subjects to be studied:

The study populations are pregnant mothers in third trimester of pregnancy. They have been categorized according to these definitions.

Coverage of iron folic acid tablets:

- **Full coverage:** The pregnant woman who has received Iron Folic Acid tablets or Iron Folic Acid liquid according to the prescribed dose (supplied by health worker female or bought from market) for 100 days or more.

- **Partial coverage:** The pregnant woman who has not received any iron folic acid tablets or less than 100 tablets or who has not bought any tablet or syrup or who has bought tablet or syrup for less than 100 days and nil coverage comes within the partial coverage that some body had received 30 or less than 30 tablets.

Anemia:

According to the World Health Organization classification for anemia the cut off line for hemoglobin level was 11gm/dl. 10.9 gm/dl or below was considered as anemia. We subdivided the anemia in to mild, moderate and severe according to the World Health Organisation classification of the hemoglobin level; 10-10.9 gm/dl was mild, 7-9.9 gm/dl

was moderate and less than 7 gm/dl was considered as severe anemia among the pregnant mothers. According to CDC Paediatrics and Pregnancy, Nutritional Surdeillance System PNSS Health Indicators, the cut off line for anemia in pregnant mothers in first and third trimester of pregnacy is 11 gm/ dl.

Table: 3 Criteria assessing magnitude of anemia WHO 1996,2001.

		Anemia and severity level (Hemoglobin in gram percentage)			
Sex / Other	Age	Anemia	Mild	Moderate	Severe
Both	6 months- 59.99 months	<11.0	10.0-10.9	7.0-9.0	<7.0
Both	5- 11.99 years	<11.5	10.5-11.4	7.5-10.4	<7.5
Female (non pregnant)	>12 years	<12.0	11-11.9	8-10.9	<8
Female (pregnant)	>12 years	<11.0	10.0-10.9	7-9.9	<7.0
Male	12-13.99 year	<12.0	11.0-11.9	8-11.9	<8.0
Male	>14 years	<13.0	12.0-12.9	9.0-11	<9.0

Consumption of iron folic acid:

- **Full consumption:** Pregnant mother whoever consumed minimum 90 tablets or Iron Folic Acid syrup according to prescribed dose for minimum 90 days was considered as an iron folic acid covered pregnant mother.
- **Partial consumption:** Less than 90 Iron Folic Acid tablets consumption or consumption of tablets or syrup for less than 90 days was considered as Partial consumption.

(Not all the mothers who received the recommended three-month supply of tablets or syrup. Among births to mothers who received Iron Folic acid during pregnancy, for 83% mothers received at least a three-month supply and for 81% mothers consumed all the supplements that were given to them. Differentials by background characteristics in the

proportion that received at least a three month supply and the proportion that consumed the supply received are similar, except by religion.) (36a).

Basing on these survey results from the National Family Health Survey-2 (1998-1999) we took the cut off point for consumption of Iron folic acid; 90 tablets or three months as full consumption and less than 90 tablets as partial consumption.

Age group: As the median age group was 23, we rounded it of and selected the cut off point of age group as 25 years. Below the 25 years they may be designed younger age group and more than 25 years we may call older age group.

Poverty: The families below poverty line, in Orissa state have been supplied with below poverty line cards (BPL card) by the revenue department Government of Orissa according to their per capita income, land and housing condition. If the pregnant mother had the card with her then she was below poverty line and if she had no card she was without poverty.

Advice of doctors: Doctor may or might not be gynecology specialists. Here the advice of the doctor had been taken in to account if they had gone to the doctor or any hospital for an antenatal check up or consultation regarding any problem related to pregnancy and advice. It did not include the visit of a doctor for some other diseases during pregnancy, which was not related to pregnancy. Here the prescription of the doctor was looked for.

Attitude or Idea about the consumption of Iron folic acid tablets:

- **Negative attitude:** In the community the pregnant mothers have many disbelieves about the consumption of iron folic acid. Symptoms as weakness, head reeling or headache, nausia, hyper acidity muscle cramps normally occurs during pregnancy. The pregnant women think that these symptoms may due to the consumption of the iron folic acid tablet. Some of the pregnant women think that their fetus may become large and will create problem during delivery. Some women do not like to

swallow the tablets. If they had this type of attitude towards consumption of the tablets then it was designated as negative attitude.

- **Positive attitude or positive idea:** Some of the pregnant mothers know about the benefit of the iron supplementation and they have a positive attitude to consume the tablets.

Education: The cut off point for education level was attendance of seventh standard.

Hookworm infestation: Two laboratory technicians examined each stool sample microscopically and if both of them got ova of hookworm in the stool sample it was taken as positive.

Gravida: The number of the total pregnancies, here the stillbirth and abortion had been taken in to account. The cut off point for gravida had been taken as less than and equal to two as the mean and median for gravida is two. It also suggests the two-child norm of India. So the cut off level is two.

5.8. Ethical Issue:

We submitted the protocol for approval by the ethical committee of the National Institute of Epidemiology Chennai. The ethical committee approved the proposal and we started the project works. All the study participants provided informed consent in front of a witness who also signed on it (Annexure-1).

5.9. Data collection method:

Training of the staffs:

There is one female health worker and four anganwadi workers in each sub-center. We trained the female health workers; and the four-anganwadi workers from the selected 38 sub-centers about the objective of the study, study procedures and their responsibilities

for this study. Along with them we identified either a leady health visitor or a health supervisor of a nearby sector or a block extension educator of nearby primary health center and trained them for the smooth management of the study.

The field workers were not informed about the assessment of the coverage of the iron and folic acid tablets and details about the questionnaires, which were to be used for report collection to avoid the bias among the pregnant women. They were informed about one objective that is collection of blood sample for hemoglobin estimation and examination of stool sample for worm infestation. During the training we fixed the date of data collection in the sub-centers and the program for those days.

There was a fixed group, which included two laboratory technicians, one health supervisor, one male health worker and either the primary investigator or the co-investigator for data collection, blood sample collection and laboratory examination of stool sample for hook worm infestation. We trained the health supervisor and the male health worker about the data collection and details about the questionnaires.

Field work:

During the training the pregnant mothers were selected and informed of the date of blood sample collection and when and where they had to come. We went to their doorsteps to interview them. We searched for empty rappers of the iron folic acid tablets to conform the consumption and looked for the prescription of the doctors if they have visited during the pregnancy during the interview. Blood sample was collected at the doorstep. In the field the laboratory technician did the stool sample examination for hookworm. (Annexure3, Figure 4, 5).

Study instruments:

We designed questionnaire and pre tested in three nearby sub-centers. Then we did necessary corrections and used in the field for data collection (Annexure 1).

Justification of individual questions in the questionnaire:

We used name, age, address, and identity number for identification of the study person. We put the question for the class she has passed to know the level of education. We asked

for below poverty line card to know about poverty. The revenue department of the state Government issues the card considering the landed property, housing condition, income per year per capita income. We included questions to know the details about the existing and total number of pregnancies. We included the detailed questions about the iron folic acid tablet or syrup to determine the coverage and consumption. Other questions were about the role of the female health worker and doctors during the pregnancy. Questions for detail ideas were included as a number of women have the idea that the baby may grow more if they take iron folic acid tablets and there will be problem during delivery and some tells that the iron folic acid tablets makes the stool black and that may create problem; some mothers do not consume these because they do not know the benefit.

Data Collection:

All the data were collected in the presence of the primary investigator or co investigator. Using questionnaires we collected following data.

1. Proportion of study populations, to whom the female health worker distributed Iron Folic Acid Tablets to how many mothers?
2. Proportion of study populations that consumed the iron folic acid tablets or liquid for minimum 80 days, which will be considered as effective coverage.
3. Reported cause for non-consumption if applicable.
4. Knowledge and attitude of the pregnant mothers about the Iron Folic Acid tablets.
5. The pregnant mothers were asked for night blindness and we collected the information whether they take the help of others to walk at night.

5.10. Laboratory methods:

We collected two-milliliter blood from each pregnant mother by separate disposable syringes and put of in to two EDTA sprayed vacuum tubes of one milliliter each. We sent one set of samples to an ISO certified laboratory, Dr Lal's Laboratory* New Delhi for hemoglobin estimation using cyan met hemoglobin method and another set to Regional

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* Name of the laboratory

Medical Research Center (ICMR), Bhubaneswar for hemoglobin estimation using the same process and for quality assurance on the next day morning.

5.11. Data analysis:

Data analysis was done by Epi Info 2002, Epi Info 6.4 (CDC, Atlanta, GA, USA). For the coverage of iron folic acid among the registered pregnant mothers, the percentage of full coverage, partial coverage was estimated. We calculated the design effect, taking the number of full coverage in each cluster and then calculated the prevalence rate and 95% confidence interval from Epi info 6.4. We did an single table or univariate analysis for the risk factors for coverage and after getting the odd's ratio we could know the association between the risk factors and the coverage. Then a multivariate analysis by logistic regression method was accomplished to control the confounding and effect modifiers for the assessment of the associated risk factors for coverage of iron folic acid tablets. The adjusted odd's ratio was calculated and the association between the coverage and factors for coverage was determined. Like this, prevalence of anemia among the pregnant mothers, percentage of consumption, and the associated factors for them was determined.

6. Results:

6.1. General inferences obtained from the Research project.

6.1.a. Frequency of gravida among pregnant mothers in Dhenkanal district Orissa, 2004

We calculated the percentage of pregnant mothers according to gravida.

Table 4: Percentage of the pregnant mothers according to gravida, Dhenkanal district, Orissa 2004. (n-456).

Gravida	No of pregnant mothers out of 456	Percentage	95% confidence limits
Gravida 1	187	41%	36.5%- 45.7%
Gravida 2	143	31.4%	27.2%- 35.9%
Gravida 3	77	16.9%	13.6%- 20.7%
Gravida 4	37	8.1%	5.9%- 11.1%
Gravida 5	8	1.8%	0.8%- 3.6%
Gravida 6	3	0.7%	0.2%- 2.1%
Gravida 8	1	0.2%	0%- 1.4%

The mean gravida is two and the median is also two. The table depicts that the percentage of first gravida is highest 40% and the percentage decreases as the gravida increases.

6.1.b. Pregnant mothers below Poverty line in Dhenkanal district Orissa.

Poverty has been assessed by the below poverty line card (BPL Card) issued by the revenue department, Government of Orissa. Out of 456, 293 pregnant mothers that was 64.3% (95% confidence limits 59.6% - 68.6%) were below poverty line.

6.1.c. Education of the Pregnant mothers in Dhenkanal district Orissa.

In the research project, for education of the pregnant mothers the cut off line was attendance of seventh standard. Out of 456, 322 pregnant mothers 70.6% (95% confidence limits 66.2% - 74.7%) in Dhenkanal district had attended seventh standard.

6.1.d. Pregnant mothers who have negative attitudes for consumption of iron folic acid tablet or syrup in Dhenkanal district Orissa.

Out of 456, 60 pregnant mothers, 13.2% (10.3% - 16.7%) had negative attitude about consumption of iron and folic acid in Dhenkanal district, Orissa 2004.

Four pregnant mothers complained head reeling after taking the iron folic acid tablet. Five mothers told that they do not want to shallow tablets, they need some iron folic acid syrup. Three complained of pain abdomen after taking the iron folic acid tablets. Twelve pregnant mothers simply told that they forgot to take the tablets and they lost those and for this reason they have not taken the tablets. Six told us that there is no benefit of taking the tablets. The rest took it casually and answered they are reluctant to take any medicine. In fact four mothers in laws of the pregnant women enquired, whether the child may become bigger if any body take the tablets.

6.1.e. Pregnant mothers who consulted doctors for check up of fetal well-being and advice (antenatal check up) in Dhenkanal district Orissa.

Out of 456 pregnant mothers, 357 which was 78.3% (95% confidence limit 74.2% to 81.9%) went to doctors for antenatal check up and advice.

6.1.f. Advice to the pregnant mothers by health worker female in Dhenkanal district Orissa.

Female health worker did the health check up, check up for fetal well-being and gave different advices during the antenatal period to 95.6% pregnant mothers (95% confidence limit 93.2%-97.2%).

6.1.g. Hookworm infestation of pregnant mothers in Dhenkanal district Orissa.

Out of 375 stool samples, 91 were positive for hookworm infestation. The prevalence of hookworm infestation among the pregnant mothers was 24.3% (95% confidence limits of 20.1%- 29%).

6.2. Estimation of the coverage of Iron and Folic Acid tablets, in the Anemia Prophylaxis Program in Dhenkanal District.

6.2 a. Coverage of Iron folic acid tablet or syrup:

Out of 456 pregnant mothers, 404 that is 88.6% (95% confidence interval of 85.3% to 91.2%) were fully covered and 52 out of 456 that is 11.4% with (95% confidence interval of 8.7% to 14.8%) were covered partially taking the calculated design effect for coverage of iron folic acid tablet in this cluster survey as 0.96. Out of the partial coverage, 15 out of 456 that is 3.3% (95% confidence interval 1.9%-5.5%) there was no coverage of iron folic acid tablets

When we take the prevalence of coverage of iron and folic acid according to different factors we get the following results.

Table: 5 Prevalence of coverage of iron folic acid tablets among pregnant women according to different risk factors, Dhenkanal, Orissa, 2004. (Univariate analysis)

Characteristics	Prevalence among exposed			Prevalence among unexposed			Prevalence ratio	95% confidence interval
	No	Total	%	No	Total	%		
Pregnant mother's education level is below class seven	23	134	17%	29	322	9%	1.9	1.1-3.1
Higher age group of the pregnant mother (>25 years)	17	137	12%	35	319	11%	1.1	0.6-1.9
Gravida > 2	15	125	12%	37	331	17.2%	1.1	0.6-1.9
Partial consumption of Iron folic acid tablets (<90 tablets)	32	74	43%	20	382	5%	8	5-14
Doctor did not give any advice to the pregnant mother	18	99	18%	34	357	9.5%	1.9	1.1-3.2
Pregnant mother had negative attitude or idea for consumption of iron folic acid tablets	22	60	37%	30	396	7.6%	4.8	3-8
Pregnant mother below poverty line (She has Below Poverty Line card)	36	293	12%	16	163	10%	1.2	0.7-2.1
Pregnant mother who was not advised by female health worker	13	20	65%	39	436	9%	7.3	4.7-11.3

Coverage according to different factors:

Coverage stratified by education of the mother: The chance of partial coverage with IFA tablets among pregnant mothers with educational level below seventh class was 1.9 times higher than that of educated pregnant mothers.

Coverage stratified by age group of the pregnant mothers: The pregnant mothers who were of older age group had same chance of being partially covered, than the younger age group pregnant mothers.

Coverage stratified by gravida with cut off value gravida two: The chance of partial coverage of the pregnant mothers with more than two gravida was the same as that of the pregnant mothers less than and equal to two gravida.

Coverage stratified by consumption: The chance of partial coverage of the pregnant mothers who consumed less than 80 iron folic acid tablets partially was eight times more than that of the pregnant mother who consumed fully.

Coverage stratified by advice of the doctor: The chance of being covered partially among the pregnant mothers who were not advised by the doctors was 1.9 times more than that of the mothers who were advised by the doctors.

Coverage stratified by the attitude or idea of the pregnant mother about consumption of iron folic acid tablet: The chance of partially coverage of iron folic acid tablets was four times greater among the pregnant mothers who had positive attitude.

Coverage stratified by poverty (who had below poverty line card): The pregnant mothers who were below poverty line had 1.2 times more chance of being partially covered than that of the pregnant mothers above the poverty line.

Multivariate analysis, by logistic regression method for association of the factors with partial coverage of iron folic acid tablets: (Table 6)

A multi variate analysis was done by logistic regression method taking all the risk factors in to account and the adjusted odd's ratio was calculated.

Table: 6 Multivariate analyses by logistic regression method for the factors associated with partial coverage of IFA tablets, Dhenkanl district, Orissa, 2004:

Factors associated with partial coverage	Univariate odd's ratio (95% confidence interval)	P-value	Adjusted Odd's ratio (95% confidence interval)	P-value
Pregnant mother's education level is below class seven	2.1 (1.22-3.8)	0.01	1.2 (0.5-2.7)	0.6
Higher age group of the pregnant mother (>25 years)	2 (1.2-3.4)	0.0068	0.7 (0.3-2)	0.5
Gravida > 2	1.08 (0.6-2)	0.8	0.6 (0.2-1.6)	0.3
Partial consumption of iron folic acid <90 tablets	13.8 (7.2-26.2)	0.0000	**9.4 (3.8-22.9)**	**0.0000**
Doctor did not give any advice to the pregnant mother	2.1 (1.1-4)	0.02	1.2 (0.5-2.8)	0.6
Pregnant mother, who had negative attitude or idea for consumption of iron folic acid tablets	7.1 (3.7-13.4)	0.000	1.2 (0.5-3.1)	0.7
Pregnant mother below poverty line (She has Below Poverty Line card)	1.3 (0.7-2.4)	0.4	0.9 (0.4-2)	0.8
Who has not been advised by female health worker	18.9 (7.1-50.1)	0.000	**6.3 (2-20)**	**0.002**

Inference:

We inferred that there is association between the consumption of iron folic acid tablets; the advice of the female health worker with the coverage of iron folic acid tablet or syrup. The consumption may increase the demand and the coverage may increase due to more consumption. Partial consumption has 12 times more risk for partial coverage than that of full consumption. The pregnant mothers who have been advised by the female health worker have six times more chance of being covered partially.

6.3.Prevalence of anemia among pregnant women with third trimester of pregnancy in Dhenkanal district, Orissa.

Prevalence of anemia in total study population:

Prevalence of anemia among pregnant mothers in third trimester of pregnancy is 62.5% with 95% confidence limit 57.9% to 66.9%. Prevalence of non-anemia is 37.5% with 95% confidence limit 33.1% to 42.1%. The design effect was calculated as1.38 for estimation of prevalence of anemia in this cluster survey.

When the criteria assessing magnitude of anemia WHO 1996,2001 was taken in to consideration, we got the following prevalence of anemia.

Table: 7 Prevalence of mild, moderate and severe anemia among pregnant mothers during third trimester of pregnancy Dhenkanal district Orissa, 2004.

Anemia	Criteria for anemia Hemoglobin gm/dl	Prevalence of anemia
No anemia	11 or more	37.5%
Mild anemia	10.0-10.9	30.0%
Moderate anemia	7-9.9	29.6%
Severe anemia	<7.0	3.1%

Different factors might be associated with the prevalence of anemia. Those are consumption of iron and folic acid tablet or syrup, education of the pregnant mothers, number of pregnancies or gravida, attitude for consumption of iron folic acid tablets, poverty[2], doctor's advice, advice of the health worker female, education level, poverty of the pregnant mother and hookworm infestation.

[2] Poverty- Study population who has Below Poverty Line card (BPL Card), issued by the Revenue department, Government of Orissa state.

Table: 8. Prevalence of anemia among pregnant mothers during third trimester of pregnancy according to risk factors, Dhenkanal district Orissa, 2004. (Univariate analysis)

Characteristics	Prevalence among exposed			Prevalence among unexposed			Prevalence ratio	95% confidence interval
	No	Total	%	No	Total	%		
Partial consumption of iron folic acid tablets (<90 tablets)	63	74	85	222	382	58	1.5	1.3-1.7
Higher age group of the pregnant mother (>25 years)	103	137	75	182	319	57	1.3	1.1-1.5
Gravida > 2	102	125	82	183	331	55.3	1.5	1.3-1.7
Female health worker did not advise the pregnant mother for consumption of iron folic acid tablets	19	20	95	266	436	61	1.5	1.4-1.8
Doctor did not give any advice to the pregnant mother	48	60	80	237	396	60	1.3	1.1-1.6
Pregnant mother had negative attitude or idea for consumption of iron folic acid tablets	75	99	75	210	357	59	1.3	1.1-1.5
Pregnant mother below poverty line (She has Below Poverty Line card)	201	293	69	84	163	51	1.3	1.1-1.6
Pregnant mother's education level is below class seven	111	134	83	174	322	54	1.5	1.3-1.7
Hookworm infestation is positive	85	91	93	152	284	53	1.7	1.5-2

Prevalence of anemia according to different factors. (Table-8)

Prevalence of anemia according to consumption of iron folic acid tablet: The pregnant mothers who consumed the iron folic acid tablets partially had 1.5 times more chance of being anemic as compared to the pregnant mothers who consumed fully.

Prevalence of anemia according to the age group of the pregnant mother: The pregnant mothers who were more than 25 years old had 1.3 times more chance to be anemic than those who were less than 25 years.

Prevalence of anemia according to gravida of the pregnant mother: The pregnant mothers who were more than two gravida had 1.5 times more chance to be anemic than those who were of less than or equal to two gravida.

Prevalence of anemia according to advice from the health worker female: The pregnant mothers who were not advised by the female health worker had 1.5 times more chance to be anemic than those who were advised.

Prevalence of anemia according to pregnant mothers advised by the doctors: The pregnant mothers who were not advised by the doctors had 1.3 times more chance to be anemic than those who were advised.

Prevalence of anemia according to negative attitude for consumption of iron and folic acid tablets or syrup of the pregnant mother: The pregnant mothers who had negative attitude for consumption of IFA tablet had 1.3 times more chance to be anemic than those who had positive ideas.

Prevalence of anemia according to poverty of the pregnant mother: The pregnant mothers who were below poverty line had 1.3 times more chance to be anemic than those without poverty.

Prevalence of anemia according to the education of the pregnant mother: The pregnant mothers below seventh standard had 1.5 times more chance to be anemic than those who had attended class seventh.

Prevalence of anemia according to hookworm infestation: The pregnant mothers with hookworm infestation had 1.7 times more chance to be anemic than those who had no hookworm infestation.

Then to determine the association of different risk factors with the prevalence of anemia a multi variate analysis was done by logistic regression method.

6.3. Multivariate analysis, logistic regression for the factors associated with anemia: (Table 13)

A multivariate analysis was done taking all these variables in to account and adjusted odd's ratio was calculated, .

Table 9. Multivariate analysis by logistic regression method for factors associated with prevalence of anemia, Dhenkanal district, Orissa, 2004.

Factors associated with prevalence of anemia	Univariate Odd's ratio (95% confidence interval)	P-value	Adjusted Odd's ratio (95% confidence interval	P-value
Partial consumption of iron folic acid tablets (<90 tablets)	4.1 (2.1-8)	0.0001	**2.7 (1.1-6.5)**	**0.025**
Higher age group of the pregnant mother (>25 years)	2.3 (1.5-3.6)	0.0002	1.3 (0.7-2.3)	0.4
Gravida > 2	3.6 (2.2-5.9)	0.001	**1.9 (1-3.8)**	**0.048**
Female health worker did not advise the pregnant mother for consumption of iron folic acid tablets	12.1 (1.6-91.5)	0.002	6.3 (0.7-54)	0.09
Pregnant mother had negative attitude or idea for consumption of iron folic acid tablets	2.7 (1.4-5.2)	0.002	1 (0.4-2.4)	0.953
Doctor did not give any advice to the pregnant mother	2.2 (1.3-3.6)	0.002	1.3 (0.7-2.4)	0.4
Pregnant mother below poverty line (She has Below Poverty Line card)	2.1 (1.4-3.04)	0.0003	1.3 (0.8-2.1)	0.21
Pregnant mother's education level is below class seven	4.1 (2.5-6.8)	0.0000	**2.3 (1.3-4)**	**0.004**
Hookworm infestation is positive	12.2 (5.2-29.1)	0.000	**10.1 (4.2-24.2)**	**0.000**

Inference:

When we did a multivariate analysis it is found that the adjusted odd's ratio for consumption of iron folic acid tablets or syrup, education and worm infestation are more than two and the p-values are less than 0.05. So these three factors, consumption of iron folic acid tablets or syrup, education of the pregnant mother and worm infestation have significant association with anemia of the pregnant mothers in Dhenkanal district Orissa.
The pregnant mothers with who consume the iron folic acid tablets partially have two times more risk of being anemic than who consume full. The uneducated pregnant mother have 2.3 times more risk to become anemic than the pregnant woman who has attended class seventh. The pregnant mother with hookworm infestation during pregnancy has ten times more risk to be anemic than the pregnant woman without hookworm infestation.

As prevalence of anemia depends on the consumption of iron folic acid we have estimated the percentage of consumption of iron and folic acid tablets or syrup by the pregnant mothers.

6.4. Consumption of Iron folic acid tablet or syrup by the pregnant mothers:

Out of 456 pregnant mothers 382 that was 84% (95% confidence interval of 79.2% to 87.5%) reported that they consumed the iron folic acid tablets fully and 74 mothers, which was 16.2% with (95% confidence interval of 13% to 20%) reported that they had consumed partially taking the design effect 1.39 as calculated for the consumption of iron folic acid tablets in this cluster survey.
The consumption of iron folic acid tablets might be associated with age group, education level, poverty, gravida of the pregnant mother and attitude for consumption of the tablets.

Table: 7. Prevalence of consumption of iron folic acid tablets among pregnant mothers according to different risk factors, Dhenkanal District, Orissa, 2004. (Univariate analysis)

Characteristics	Prevalence among exposed			Prevalence among unexposed			Prevalence ratio	95% confidence interval
	No	Total	%	No	Total	%		
Pregnant mother's education level is below class seven	41	134	30%	33	322	10%	3	1.9-4.5
Higher age group of the pregnant mother (>25 years)	32	137	23	42	319	13	1.8	1.2-2.7
Gravida > 2	32	125	45.6	42	331	12.7	2.01	1.3-3
Female health worker did not advise the pregnant mother for consumption of iron folic acid tablets	16	20	80	58	436	13	6	4.3-8.3
Doctor did not give any advice to the pregnant mother	28	99	28	46	357	13	2.2	1.4-3.3
Pregnant mother had negative attitude or idea for consumption of iron folic acid tablets	46	60	76	28	396	7	10.8	7.4-16
Partial coverage of iron folic acid	32	52	61	42	404	10	6	4-8.4
Pregnant mother below poverty line (She has Below Poverty Line card)	55	293	19	19	163	12	1.6	1-2.6

Consumption of Iron folic acid tablet according to different factors:

Consumption according to education level of the pregnant mother: The pregnant mothers with education below seventh standard had three times chance of partial consumption of iron folic acid than the pregnant mothers who have attended class seventh.

Consumption according to age group: The pregnant mothers above 25 years of age had 1.8 times more chance for partial consumption of iron folic acid tablets than the pregnant mothers below 25 years.

Consumption according to gravida: The chance of consumption of iron folic acid tablets partially by the pregnant mothers who were more than two gravida was 2 times higher than the pregnant mothers who were two gravida or less than that.

Consumption according to advice of the female health worker: The chance of consuming the iron folic acid tablets partially by the pregnant mothers who had not been advised by the female health worker was six times higher than that of the pregnant mothers who had been advised by the female health worker.

Consumption according to advice of the doctor: The chance of partial consumption of iron and folic acid tablets by the pregnant mothers who were not advised by the doctors was 2.2 times higher than that of pregnant mothers, advised by the doctors.

Consumption according to attitude of consumption of iron folic acid tablets: The chance of partial consumption of iron and folic acid tablets by the pregnant mothers who had negative attitude for consumption of iron and folic acid tablets was 10.8 times higher than that of pregnant mothers who had positive attitude.

Consumption according to coverage of iron folic acid tablets: The chance of partial consumption of iron and folic acid tablets by the pregnant mothers who were partially covered with iron and folic acid tablets was six times higher than that of pregnant mothers who were covered fully.

Consumption according to poverty: The chance of partial consumption of iron and folic acid tablets by the pregnant mothers with poverty was 1.6 times higher than that of pregnant mothers without poverty.

Multivariate analysis, logistic regression for the factors associated with consumption of iron folic acid tablets:

A multivariate analysis was done taking all the factors in to account. The adjusted odd's ratios were calculated.

Table: 8 Multivariate analyses by logistic regression method for factors associated with consumption, Dhenkanal district, Orissa 2004.

Factors associated with partial consumption of IFA tablets (<90 tablets)	Univariate odd's ratio (95% confidence interval)	P-value	Adjusted Odd's ratio (95% confidence interval)	P-value
Pregnant mother's education level is below class seven	3.8 (2.3-6.5)	0.0001	2.2 (1-4.9)	0.056
Higher age group >25 years	2 (1.2-3.4)	0.0068	1.5 (0.6-3.6)	0.386
Gravida > 2	2.4 (1.4-3.9)	0.0009	2 (0.82-5.1)	0.142
Female health worker did not advise the pregnant mother for consumption of iron folic acid tablets	26 (8.4-80.7)	0.0000	**7.5 (1.5-37)**	**0.013**
Doctor did not give any advice to the pregnant mother	2.7 (1.6-4.6)	0.0002	1.4 (0.6-3.3)	0.45
Pregnant mother had negative attitude or idea for consumption of iron folic acid tablets	43.2 (21.22-87.9)	0.0000	**38.9 (16.5-91.7)**	**0.0000**
Partial coverage of iron folic acid tablets.	13.8 (7.2-26.2)	0.0000	**10.2 (4-25.8)**	**0.0000**
Pregnant mother below poverty line (She has Below Poverty Line card)	1.8 (1-3.1)	0.05	0.7 (0.3-1.7)	0.46

Inference:

From this table it is concluded that advice of the health worker female for consumption of iron folic acid tablets, coverage of iron folic acid tablets and idea of the pregnant mothers about consumption of iron folic acid tablets have association with consumption of iron folic acid by the pregnant mothers. The pregnant mother who has negative attitude for consumption of iron folic acid tablets has 38.9 times more chance for partial consumption of iron folic acid tablets than the pregnant mother with positive attitude for consumption. Pregnant mothers with partial coverage have 10 times more chance for partial consumption of iron folic acid tablets than the fully covered pregnant mothers. Though in the calculation of odd's ratio the advice of doctor was significant, after the calculation of adjusted odd's ratio it became insignificant.

7. Discussion:

7.1. General information:

7.1.1. Education:

The estimated education level of the pregnant mothers in Dhenkanal district is one percent more as estimated in the provisional census of India during 2001 that was 69%. The education level of the pregnant mother is associated with prevalence of anemia. The prevalence of anemia is more among the uneducated pregnant mothers. The cause may be that the uneducated pregnant mothers have less idea about anemia, effect and consequence of anemia, effect of anemia on both the mother and fetus. They have more negative attitude about the consumption of Iron folic acid tablets. They have food fads and they are lack of personal hygiene. The uneducated pregnant mothers are usually from very low economical status. Their nutrition status is very poor and with this low nutritional status and partial or no consumption of iron supplementation their hemoglobin level is very low and they have the high prevalence of anemia during pregnancy.

To overcome this the female health worker, the anganwadi worker and the doctor of the local primary health units may be advised to go for health education, Information education and communication (IEC) about personal hygiene, food fads, food diversification and stress upon the nutrition of the pregnant mother apart from the iron supplementation. The female health worker may be advised to discuss the benefits and mild side effects of the iron folic acid tablets and the advantages of the tablets during her health check up. The adolescent girls before their marriage might be included with the pregnant mothers for IEC and community participations. During pregnancy the female health workers are advised to give more stress over uneducated pregnant women.

7.1.2. Poverty:

The burden of poverty estimated in this survey is Poverty plays an important role in the society not only for the prevalence of anemia but also all the health problems and health programs. The pregnant mothers with poverty might have low nutritional status and low iron storage. During pregnancy again there is more iron demand by the fetus. Along with this low nutritional status, there is low education status, low personal hygiene in the poor families. They have a lot of food fads, lot of disbelief due to lack of education. These make again the nutritional status lower and there is increase in the prevalence of anemia among them. Usually the poor families do not have latrines and they are habituated with open-air defecation that increases the risk of hookworm infestation, which is a major associated factor for anemia.

Proper information education communication and proper advice, proper community participation, periodic de worming may improve the consumption of iron folic acid tablets and it may decrease the prevalence of anemia.

7.1.3. Negative attitude for consumption of iron folic acid tablets:

A few pregnant mothers complained of head reeling after taking the iron folic acid tablet. Five mothers told that they do not want to shallow tablets, they need some iron folic acid syrup. Three complained of pain abdomen after taking the iron folic acid tablets. After these mild symptoms they discontinued the consumption of iron folic acid tablets. Some pregnant mothers simply told that they forgot to take the tablets and they lost those and

for this reason they have not taken the tablets. Two asked about the benefit of taking the tablets. The rest took it casually and answered they are reluctant to take any medicine. In fact, mother in law of one pregnant woman enquired, whether the child might become bigger if any body take the tablets. This type of questions come in the community and the female health worker should answer them properly and these might be reduced after information education and communication, proper advice during the antenatal check ups by the female health worker or the local doctor.

7.1.4. Health seeking behavior of the pregnant mothers:

The health seeking behavior of the pregnant mothers in Dhenkanal district is increasing as it has been estimated 75% in comparison to 56% during 1998- 1999 according to the National Family Health Survey 2 (1998-1999). The cause of visiting the doctor was included in the questionnaire to exclude the visiting of a doctor for complications of pregnancy. The doctor has the major role in the community for reduction of prevalence of anemia. The doctor acts as a team leader in the health care unit and as the health seeking behavior is increasing, he can take the responsibility of a healthier community.

7.1.5. Advice by the female health worker:

The health worker female did antenatal check up of 95% of pregnant mothers, which should be 100%. During the antenatal check up she can anticipate any complication during pregnancy, severe anemia and can refer them in time for further treatment. Due to proper antenatal check up the anemia can be treated in an early stage and also it can be corrected. As she is the grass root level worker and she keeps all the health programs at the door step, she takes care of the women, that is both antenatal and post natal care and also care of the baby, the women in the community obeys her advice. In this research it was found that the prevalence of anemia depends on the advice of the female health worker. When there is no advice from the female health worker there is eight times more chance for partial consumption of iron folic acid tablets and six times more chance for partial coverage of iron folic acid tablets. As the female health worker is a key person in the health team, her good work situation, training for health education and information education communication and good community participation is our motto.

7.1.7. Hookworm infestation:

The prevalence of hookworm infestation is very high, 24%. [5]One out of 456 pregnant mothers only was advised to test her stool though 78% pregnant mothers went to doctors for antenatal check ups and advice. As it is very difficult to provide safe latrine and it is very difficult to stop open-air defecation in the community level therapeutic measures might be used for control of worm infestation during pregnancy along with the health education by the female health worker. Periodic de worming can be done in the endemic areas. Where hookworm infestation is endemic provision of a single dose of 500 mg mebendazole at the earliest antenatal visit after first trimester (21) may help in reduction of prevalence of anemia.

7.2.Coverage of iron folic acid tablets:

The estimated coverage of iron folic acid tablet in Dhenkanal district is more than 80% in comparison to that of 68% during 1998-1999 according to National Family Health Survey-2. The coverage of iron and folic acid tablets in the community of Dhenkanal district Orissa has been increased within these six years. It was found that the percentage of coverage of educated pregnant mothers was higher than that of uneducated pregnant mothers. The pregnant mothers who had a positive attitude towards the consumption the percentage of coverage was more. Though the coverage is good it is not 100%. It may be due to lack of attitude of the pregnant mothers for consumption of the iron tablets. If it is possible for supply of iron folic acid syrup, then the coverage may reach 100%.

7.3. Consumption of iron folic acid tablets:

Consumption of iron folic acid is 82% only though the coverage is more than it. Mostly it is associated with education of the pregnant mother, coverage, advice of the female health worker, and positive attitude of the beneficiary. In this context it was found that the consumption decreased with increase of gravida and age. It may be due to carelessness and lack of awareness for the pregnancy. The consumption might be good in

[5] All the prescriptions of the doctors were checked up.

the first and second gravida because the pregnant women have awareness and apprehension about the pregnancy. The consumption depends mostly on the positive attitude or positive idea of the pregnant mother, then it depends on the coverage, then it depends on the advice of the health worker. Here the advice of doctor was also a factor for consumption. During the calculation of odd's ratio the association between the doctor's advice and consumption was significant but after the adjusted odd's ratio when calculated it became insignificant. It shows that though the advice of doctor is important for the consumption of iron folic acid tablets or prevalence of anemia, the advice of health worker has more importance. So the advice of the health worker may be used not only for this consumption of iron folic acid tablets but also different health programs for the community.

7.4. Prevalence of anemia among the pregnant mothers in third trimester of pregnancy:

The result shows that the prevalence of anemia increased according to increase in gravida or number of pregnancies. The prevalence of anemia is high among the poor pregnant women. More over the prevalence of anemia also depends on the absorption of iron in the intestine. There are different factors affecting the absorption of iron. But these are beyond our discussion. Advice of the health worker female affects the consumption of iron folic acid tablets and affects the prevalence of anemia. More stress might be given on them to advise the pregnant mothers about personal hygiene, food diversification, and consumption of iron folic acid tablets. The prevalence of anemia among the pregnant mothers during third trimester of pregnancy is 62.5%. It is very high and necessary steps might be taken to combat this problem as food fortification, control of worm infestation, Information education and communication and regular supervision and monitoring.

We shared this result with the Chief District Medical Officer, Dhenkanal and the Director Health Services, Orissa. The Director Health Services has agreed to suggest the Programme Directors Maternal and Child Health Programme to have meetings arranged every month in the sub-center level for the pregnant mothers and adolescent girls.

8.Conclusion:

The coverage of iron folic acid tablets on pregnant mothers in Dhenkanal district is more or less good. The full consumption of the tablets is more than 80% but it has not been achieved the same level of coverage. Prevalence of anemia among the pregnant mothers during third trimester of pregnancy is very high. The consumption of iron folic acid tablets is associated with the factors like education, attitude or idea of the pregnant mother, advice of the female health worker and coverage of iron folic acid tablets. The advice of the female health worker in the community plays a great role and it is more important than the advice of the doctor for the consumption of iron folic acid tablets. Prevalence of anemia is associated with consumption of iron folic acid tablets, education and hookworm infestation of the pregnant mothers.

9. Recommendation:

9.1. Local Level:

1. Information education and communication for personal hygiene and sanitation. Periodic de worming can be done in the endemic areas.

2. In the primary health care level the doctors are the team leaders as well as physicians. They may be trained to be more inefficient as team leaders, though they might be good physicians. They should develop their motivation capacity in the community level.

3. The adolescent girls, pregnant mothers and their guardians may be advised to participate in the programs. There might be community level meetings to aware these category of people in every one to two months in each sub-center by the anganwadi workers and Child Development Project Officer.

4. The female health worker may be encouraged to take necessary steps for antenatal care, post natal care, IEC for both pregnant mothers and adolescent girls. She may be advised to take care of the pregnant mothers with moderate and severe anemia.

5. The female health worker is advised to encourage all the pregnant mothers to do their stool sample examination for hookworm infestation, by which the female health worker can provide mebendazole tablets (100 mg twice daily for three days), that is available in the sub-center to the pregnant mothers for control of anemia due to hookworm.

6. The female health worker may be advised to clarify the advantages of consumption of the iron folic acid tablets during each antenatal check ups.

7. The doctors, who are the team leaders of the health units, may be advised to encourage the pregnant mothers for hemoglobin estimation and stool sample examination during pregnancy, advise the female health workers for health education and proper advice to pregnant women, to the Block extension educator for IEC.

8. The primary health care unit arranges some village level meetings for the women and the female health worker presides over the meeting. They are advised to include the adolescent girls, and pregnant mothers there and they may stress upon this Iron prophylaxis program in the same meeting during the discussion of other health events.

9.2. Government level.

1. Government may recruit more number of female health workers in the community and the post of the female health worker in the sub-center should not remain vacant.
2. Government may take necessary steps for periodical training programs for the female health workers.
3. Government may take necessary action for hemoglobin level estimation of the pregnant mothers at the doorsteps by the female health worker.

4. Government may take necessary steps for community level meetings and other IEC programs for the pregnant mothers.

5.Government may take necessary steps for de worming programs for the pregnant mothers, which is cost effective.

10. Action taken after the study:

After obtaining the hemoglobin level of the blood samples, we arranged health camps for all the pregnant mothers of those selected sub-centers and we conducted health check ups of the pregnant mothers with the help of a gynecologist. We conducted information education and communication about food diversification for the mild and moderate anemic cases and distributed iron folic acid syrup or capsule according to the patients wish. We did information education and communication and distributed iron injections to the mothers with severe anemia and referred two cases with severe complications to the district hospital to get hospitalized. We supplied mebendazole tablets to the pregnant mothers with hookworm infestation and requested the female health worker and the anganwadi worker to take care of the moderate and severely anemic cases (Annexure3, Figure 6). We discussed with the Chief District Medical Officer Dhenkanal and Director Health Services, Orissa about the results.

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Project Period: January 1997 – August 1998

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36.a. National Family Health Survey –2, India. Page No-291.

Annexure-1

Consent form:

NATIONAL INSTITUTE OF EPIDEMIOLOGY

CONSENT FORM

Date: Individual No: | | | | |

Time:

Village: ____________________

I, Dr Amitav Das, Scholar FETP-MAE, National Institute of Epidemiology, am conducting a research project "Coverage of Iron and Folic Acid on Pregnant mothers and prevalence of iron deficiency anemia among pregnant mothers in Dhenkanal district" as principal investigator. This study is a collaborative effort of National Institute of Epidemiology, Chennai, India and TEPHINET, CDC, Atlanta, Georgia, USA.

Purpose of study: This study is done by the TEPHINET with the help of National Institute of Epidemiology, Chennai to assess the micronutrient malnutrition in the community. The aim is to estimate the prevalence of Iron deficiency anemia among the pregnant mothers in 3rd trimester of pregnancy.

Procedure: If you agree to participate in this study, our health worker female and health supervisor will ask you some questions in relation to food habits and antenatal care for 15 to 20 minutes at your house. This interview will be conducted once a month. A drop of blood sample will be collected for hemoglobin estimation free of cost. This survey may be repeated every month for maximum 3 months.

For each attendance we are happy to remind you by the health worker female through a visit to your house. If you need any more clarifications or more information, please fell free to contact the interviewer or the principal investigator.

Voluntary: Your participation in the study is completely voluntary. You may refuse to participate, choose to end your participation at any time or skip any particular question, you do not wish to answer, no force will be applied and the information you have provided will be kept confidential.

Risk: There will be no physical risk to you by taking part in this study.

Benefits: Your participation in this study may help us to estimate the prevalence of Iron deficiency anemia among the pregnant mothers in third trimester of pregnancy. The laboratory reports must be provided to the respondent free of cost with medical advice.

If you agree to participate in this study please sign / put your thumb impression in the place mentioned.

I have read the above information/the above information has been read to me in my own language. I have had an opportunity to ask questions and the questions that I have asked, have been answered to my satisfaction. I consent voluntarily to participate in this study. I also agree to give my blood sample for estimation of hemoglobin for this study.

I have received a Xerox copy of the consent form

Name of the respondent

Signature/ thumb impression
(Respondent)

Name of the witness

Signature / thumb impression
(Witness)

Signature of the interviewer

Date:________________________

Questionnaires used for data collection:

QUESTIONNAIRES FOR CLUSTER SURVEY OF PREGNANT MOTHERS IN CONTEXT TO COVERAGE OF IRON AND FOLIC ACID, DHENKANAL.

Date: ID No: ________________

Name of the District: Dhenkanal. Block: ________________

Health Sub center: Village: ________________

PHC:

1.Name of the pregnant mother:

Age: ___________________ Weight: __________________ kg.

2.Name of Husband: ____

3.She has Health card: Yes / No

4. Up to which class she has read.____

5.She has BPL (Below Poverty Line) card: Yes / No.

6.LMP: ___________________ EDD: _______________________

7.Duration of Pregnancy: ________ ____________ weeks __________days

8.Date of registration in health worker's record: _________________________________

9.Whether she is consuming IFA tablet / syrup: Yes / No.

10.From where she got IFA tablets / syrup: HW (F)___/ Anganwadi Worker____/ Market______

11.If received IFA tablets from HW (F)/ AWW, for how many days________________

12.Whether she is consuming tablets from HW (F) or AWW / IFA capsules from market / IFA syrup from market / both syrup and capsule bought from market and IFA tablet from the HW (F) / AWW.

13. If she bought the syrup or tablets from market, then for how many days she consumed these. 3 months / more than 3 months / less than 3 months.

14. Total how many days she has consumed the tablets or syrup or both tablet and syrup. (Specify in detail) ____________________________

15.Who advised her to take IFA tablets / syrup: (Give tick mark)

HW (F)_____/ Anganwadi Worker______/ Doctor _______/ any other (specify)_______

16.If a doctor has advised her in which hospital she has been advised: (Give tick mark)

Sector Hospital/ PHC/ O&G specialist in a District or sub divisional hospital/ Private practitioner.

17.Though she has been already advised by a doctor, whether she has been advised again by HW (F) or AWW.

18.Whether she has completed 100 days of IFA tablets / syrup / both: Yes / No.

19. For how many days she has taken the IFA tablets / syrup / both syrup and tablets (specify in days): ____________________________

20.Whether she is taking the IFA tablets or syrup or both regularly: (Give tick mark)

Every day regularly / alternate day regularly / when remembered / keep it as it is.

21.What is the impression of pregnant mothers about IFA tablet: (Give tick mark)

i. It should be taken regularly as it is good for health.
ii. It should be taken regularly as it keeps the baby healthier.
iii. Both of the above are correct.
iv. It should not be taken, as it is not good for health.
v. It should not be taken, as it makes the baby large, so that there is problem during the delivery of the baby.
vi. If she has any other ideas, please mention.

22.If she is supplied with iron folic acid syrup, whether she will be glad and she will be interested to consume it. Yes / No.

23.Whether she has taken prophylaxis dose of chloroquine: Yes / No.

24. How many chloroquin tablets she has taken. __________________

25.What is the dose she took the qhloroquin tablets. _________________

26.Whether blood has been tested for hemoglobin: Yes / No.

If tested what is the hemoglobin level. ___________

27.Whether the HW (F) has explained about the advantage of the tablets: Yes/ No.

28.Whether stool has been tested: Yes/ No.

If tested what abnormality found in the report, please see the reports and specify.

____

29.If there is abnormality in stool, whether she has taken medicine for it: Yes/ No.

30.Whether the HW (F) did antenatal checked her up regularly: Yes/ No.

31.Whether the HW (F) has referred her to any doctor for antenatal check up suspecting any problem during pregnancy: Yes/ No.

32.Whether she is suffering from night blindness. Yes / No.

33.Report of the stool sample examination.

Round worm / Hook worm / H nana./ Nil.

Signature of the interviewer:

Date:

Annexure: 2

Name of the Sub-centers, selected as clusters or primary sampling units, Dhenkanal, Orissa, 2004.

PHC/CHC	SL No	Name of Sub-centers	Population	Population of pregnant mothers				
				June	July	August	Total	Cumulation
Beltikiri	1	Shankarpur	5940	6	15	6	27	27*
	2	Dhirapatna	4426	9	12	10	31	58
	3	Patrabhaga	4398	15	5	5	25	83
	4	Baliamba	6868	6	7	3	16	99
	5	Tarava	5,696	9	14	11	34	133
	6	Chndrasekarprasad	6582	7	8	18	33	166*
	7	Gengutia	6,821	4	5	3	12	178
	8	Balabhadrapur	4,991	6	6	6	18	196
	9	Kankadapala	6,798	4	16	18	38	234
	10	Derasingh	4,893	11	12	6	29	263
	11	Beltikiri	7,820	15	23	15	53	316*
	12	Chaulia	5,901	18	15	10	43	359
	13	Tilapada	5,747	9	11	9	29	388
	14	Koilipangi	6787	10	7	9	26	414*
	15	Banasingh	8,348	16	26	20	62	476
	16	Kankadahada	6689	8	8	7	23	499
	17	Bhapur	6732	16	15	6	37	536*
	18	Bhaliabolakateni	3868	6	5	2	13	549
	19	Kaimati	7,553	14	12	5	31	580
	20	Gobindapur	9435	11	13	6	30	610
	21	Baladiabandha	3821	3	11	2	16	626
	22	Nadiali	4370	2	7	3	12	638
	23	Talabarakot	7816	10	8	8	26	664*
SC Pur	24	Gandia	8804	35	19	11	65	729
	25	Santhapur	4980	12	10	7	29	758
	26	Sorisiapada	5336	11	5	9	25	783
	27	Raitela	4300	17	5	6	28	811*
	28	Sadangi	11848	28	13	29	70	881
	29	Mandar	5745	11	4	12	27	908
	30	Kasipur	5925	13	11	7	31	939*
	31	Khandabandha	6516	7	9	10	26	965
	32	Pingua	4918	9	5	10	24	989

	33	Nihalprasad	8781	17	16	12	45	1034
	34	Laulai	6510	15	10	6	31	1065*
	35	Ratnapur	6485	11	8	6	25	1090
	36	Bega	4148	9	7	4	20	1110
	37	Deogaon	5573	13	10	9	32	1142
	38	Bidharpur	8112	14	15	14	43	1185*
	39	K.madhapur	6220	12	9	6	27	1212
	40	Joranda	6711	14	24	17	55	1267
	41	Neulapoi	5400	7	20	12	39	1306
	42	Karamula	6773	9	16	5	30	1336*
	43	Baisingha	6123	7	18	10	35	1371
	44	Kaluria	6983	10	13	8	31	1402
	45	Khankara	5602	9	10	15	34	1436
Jirala	46	Jirala	4980	4	8	10	22	1458*
MKGola	47	Mathakargola	6065	11	9	10	30	1488
	48	Barua	8585	13	11	16	40	1528
	49	Surapratappur	7066	8	4	12	24	1552
	50	Dayanabili	3770	7	6	8	21	1573
	51	Arakhapatana	4940	6	3	11	20	1593*
	52	Jamunakota	3577	5	6	8	19	1612
	53	G.N.prasad	4988	6	8	11	25	1637
	54	Dhalapada	7154	10	7	15	32	1669
	55	Kingala	7792	9	10	13	32	1701
	56	Ektali	6306	10	12	14	36	1737*
	57	Balibo	7694	11	11	14	36	1773
	58	Mahulapala	7891	14	11	12	37	1768
	59	Marthapur	9254	12	12	17	41	1880*
	60	Goradia	5920	8	8	13	29	1839
Anlaberini	61	Anlaberini	5940	6	13	5	24	1904
	62	Rainarsighpur	4790	6	8	4	18	1922
	63	Kotagara	4834	8	9	5	22	1944
	64	Sogar	5697	10	10	6	26	1970*
	65	Tumusinga	5757	9	11	8	28	1998
	66	Kantioputasahi	5247	9	13	12	34	2032
	67	Kantiokateni	5121	11	8	14	33	2065
	68	Kantapala	5300	10	13	7	30	2095*
	69	Kadua	5936	9	11	8	28	2123
	70	Mahulpala	5439	13	10	12	35	2158
	71	Baisinga	6970	15	14	9	38	2196

	72	Kanpur	6729	16	12	10	38	2234*
	73	Chabilapasi	5859	11	6	12	29	2263
	74	Badasuanlo	8356	14	20	17	51	2314
	75	Guneibili	8849	15	19	20	54	2368*
	76	Ichabatipur	6493	10	12	14	36	2404
	77	Kangeilo	6860	8	14	12	34	2438
	78	Jagannathpur	4855	7	8	6	21	2459
Khajuriakata	79	Khajuriakata	7795	13	10	8	31	2490*
	80	Nua	9165	16	27	19	62	2552
	81	Karanda	6701	12	20	14	46	2598
	82	Chitalpur	5432	12	18	11	41	2639*
	83	Babanadha	5747	16	14	12	42	2681
	84	Bramhanipal	6035	14	12	10	36	2717
	85	Bedapada	5448	9	11	12	32	2749*
	86	Khanditiri	5345	13	14	9	36	2785
	87	Hatura	7022	9	16	14	39	2824
	88	Dudurkote	6362	8	10	11	29	2853
	89	Gulehei	6800	11	14	10	35	2888*
	90	Patala	6771	11	12	8	31	2919
	91	P.P.kota	8233	12	14	13	39	2958
	92	Galapada	7424	6	12	9	27	2985
	93	Saujapada	5218	10	8	9	27	3012*
	94	Khalibarina	4883	4	8	10	22	3034
	95	Hindol	10846	10	9	16	35	3069
	96	Kanasara	5416	5	9	9	23	3092
	97	Rajmohanpur	4516	4	5	6	15	3107
	98	Nuakota	4390	9	7	10	26	3133
	99	Baunsapokhari	4716	7	6	7	20	3153*
	100	Madhapur	4794	7	5	8	20	3173
	101	Rasola	9100	9	25	20	54	3227
	102	Gandanali	7608	11	17	14	42	3269*
	103	Kunua	8113	9	19	16	44	3313
	104	Khalibareni	6199	5	10	8	23	3336
	105	Chatapada	8100	10	21	16	47	3383
Parjang	106	Parjang	5352	3	9	16	28	3411*
	107	Saranga	7983	6	12	11	29	3440
	108	Khairamunda	4485	3	7	8	18	3458
	109	Kantor	8137	8	15	13	36	3494

	110	Kandarasingha	7041	8	12	9	29	3523
	111	Muktapashi	8342	10	15	12	37	3560*
	112	Barihapur	9375	12	20	17	49	3609
	113	Basoi	8182	11	16	14	41	3650
	114	Kumushi	6165	9	11	10	30	3680*
	115	Lodhani	6764	9	14	10	33	3713
	116	Roda	7108	11	14	12	37	3750
	117	Chandapur	4268	2	9	7	18	3768
	118	Patarapada	7232	8	16	15	39	3807*
	119	Saanada	9305	13	18	14	45	3852
	120	Rangathali	5205	7	10	10	27	3879
	121	Kualo	7833	8	11	9	28	3907
	122	Kulei	3587	3	6	4	13	3920*
	123	Kadapada	4347	5	9	5	19	3939
Odapada	124	Kamalanga	3802	5	6	3	14	3953
	125	Manapur	3883	4	10	2	16	3969
	126	Kananati	4202	7	15	5	27	3996
	127	Khadagaprashad	7982	10	18	11	39	4035
	128	Chintamani prasad	4985	8	11	6	25	4060*
	129	Bailo	4231	7	8	2	17	4077
	130	Nimidha	6134	11	18	10	39	4116
	131	Badalu	5011	8	7	5	20	4136
	132	Dhalapur	5005	7	12	4	23	4159
	133	Balaramprasad	4774	9	11	6	26	4185*
	134	Bangarising	4715	10	11	5	26	4211
	135	Odapada	5294	6	12	8	26	4237
	136	Gunadi	4427	7	13	6	26	4263
	137	Baulapur	6796	12	16	7	35	4298
	138	Gadasila	5725	9	17	8	34	4332*
	139	Kandabindha	5377	11	14	9	34	4366
	140	Balarampur	4956	5	9	3	17	4383
	141	Sadasibpur	6598	13	20	10	43	4426
	142	Bisalia	5239	6	10	9	25	4451*
	143	Indipur	6951	10	11	9	30	4481
	144	Ghatipir	6646	12	18	8	38	4519
	145	Kalangi	5437	9	14	4	27	4546
	146	Kotam	4470	5	8	2	15	4561
Birasala	147	Birasal	6824	8	9	13	30	4591*
	148	Maruabili	6088	6	9	12	27	4618

149	Sedasar	5423	8	5	7	20	4638
150	Raibola	4398	5	2	8	15	4653
151	Batagaon	7125	8	11	7	26	4679
152	Balikuma	4104	4	3	6	13	4692
153	Kankadahada	7231	12	10	16	38	4730*
154	Kantapal	5354	7	6	10	23	4753
155	Kantola	3302	5	3	4	12	4765
156	Kerjuli	4272	2	5	9	16	4781
157	Bam	4902	4	4	8	16	4797
158	Mahabir road	6004	11	13	15	39	4836*
159	Chaudapur	4438	4	8	5	17	4853
160	Pangatira	7028	10	7	14	31	4884
161	Gharapalasuni	6341	9	4	12	25	4909
162	Biribili	3841	3	6	5	14	4923
163	Ghagaramundi	4066	4	4	7	15	4938
164	Jhili	4005	6	2	5	13	4951
165	Kargola	4500	5	8	11	24	4975
Total			1536	1840	1599	4975	

The starred commutations represents the corresponding sub-center was selected as a primary sampling unit for cluster survey to estimate the coverage and consumption of iron folic acid and prevalence of anemia and factors associated with them.

Team members

Dr Amitav Das, Principal investigator.

Dr Prasanta Ku Mahapatra, Co Investigator.

Sauri Charan Muduli, Health Supervisor, Interviewer.

Susanta Ku Behera, Interviewer.

Harekrishna Jena, Laboratory technician.

Anil Kumar Sahoo, Laboratory Technician.

Annaexure-3

Figure: 4 Photograph of data collection and blood sample collection at the doorstep Dhenkanal, Orissa 2004.

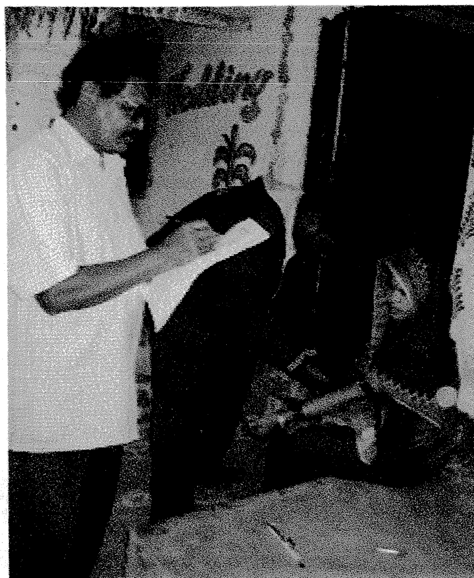

Fig: 5 Stool samples being examined for hook worm infestation in the field, Dhenkanal, Orissa 2004.

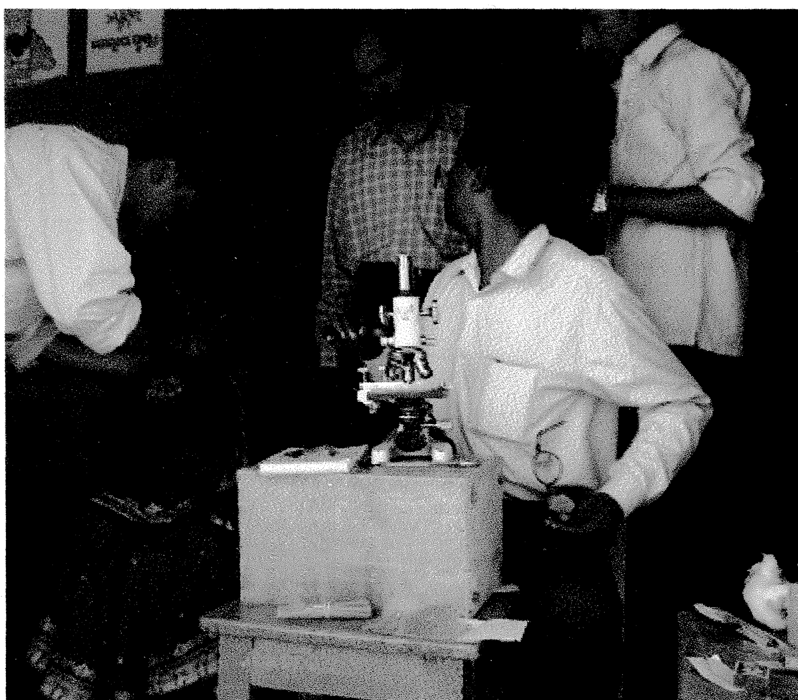

Fig: 6 The health camps we performed after getting the hemoglobin reports of the pregnant mothers in third trimester of pregnancy, Dhenkanal, Orissa 2004.