Research Project on anemia and pregnancy in India
Report 2011

Comparative analysis of anemia and pregnancy in the population deserved by Deepalaya's health care services in Mewat district: What are the causes of anemia in this area and how can we improve this situation?

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Abstract

Still in 2011, up to 80% of pregnant women in overall India are anemic\(^1\). Anemia is then a major health concern and is mainly responsible of the high maternal mortality rate in India. In fact, anemia is due to lack of iron in blood, which is an essential component to maintain healthy body cells. The needs of iron are increased during pregnancy so how a mother can give birth to a baby in perfect conditions if she’s suffering from this illness? What are the main causes of this widespread disease in India? What are the principal outcomes on baby’s and mother’s health? How is it possible to improve the situation? In this report, we will answer to all these questions. Firstly we have done a review of the basis, the causes and the outcomes of this disease in overall India. In collaboration with Deepalaya’s clinic located in Gusbethi, Mewat district in Haryana, we interviewed 5 women for cases studies in their villages and questioned 30 volunteer women on their life habits, their gynecological history and their knowledge about the problem, to explore the main contributing factors of anemia in villages surrounding this area. We also took data from the Mobile Clinic for 45 women, from the 12 villages available, mainly to see their weight intake and their symptoms during the evolution of their pregnancies. With all these results, we made statistics that we analyzed in order to compare them with stats of all India presented in the review. In this way, it has been possible to see which contributing factors of anemia are mostly present in the Gusbethi’s area and furthermore, to give recommendations to Deepalaya’s organization to improve the situation of this killer disease in the Mewat district. Briefly, a lot of conditions observed in the villages are the sources of this illness and with a better knowledge of the problem and a few changes in habits and life styles of the villagers, anemia’s outcomes on baby’s and mother’s health can be reduced.

Introduction

In 2011, anemia is still one of the most important health concerns in India. Knowing that iron needs are increased by four during pregnancy\(^2\), this illness is, because of large families, one of the most prevalent nutritional deficiencies in India. This problem is more important amongst pregnant women and has more impacts on their health.

According to data of year 2010-2011 in Gusbethi, anemia is the major disease reported in the clinic as it represents 46% of all disease reported. Knowing all the impacts on women’s and baby’s health, this must be one of the Government’s major aims to improve the situation. Basically, the main causes of anemia in India are undernutrition, infections and high fertility rate. Amongst them undernutrition due to iron deficiency is the most important cause of anemia in India. Vegetarianism and insufficient dietary intake contribute to this problem and are associated with poverty and some religious habits. Infection such as malaria, hookworms and parasites are responsible for blood loss and decrease in iron absorption leading to anemia. Again, factors such as low educational level and poverty contribute to inadequate hygiene habits as well as no access to adequate sanitary services such as safe water supply and latrines. A high fertility rate is associated with low birth spacing. According to Indian data, young age at first pregnancy, low educational level and no use of family planning method are factors that are usually associated with high fertility rate. As pregnancy increase the needs for iron, anemia is more likely to persist or worsen.

The consequences of anemia on health are mainly a lower immunity (increased risk of infection), and it causes symptoms such as weakness, fatigue, headache, body pain, dizziness, chestpain, shortness of breath, and others. Anemia has important consequences on pregnancy issue such as, low birth weight, premature delivery, neonatal mortality, increased risk of maternal mortality, and low iron store for the newborn. Knowing this, we wanted to take a look on the living conditions and habits of people living in Gusbethi and its surroundings. This is what we are studying in this research project and what we are going to present in this report. It will be easy

\(^1\) Reference 2- p. 800
\(^2\) Reference 2- p. 539
to see the contributing factors that contribute to a severe anemic status and to give recommendations to Deepalaya to improve the situation.

**PART 1: REVIEW ON ANEMIA IN INDIA**

**BASICS**
Several factors contribute to this condition but the major one is iron deficiency which is mainly a consequence of undernutrition, a type of malnutrition. A low dietary intake of iron, a poor absorption of this iron, blood losses from hookworm and intestinal infections, repeated childbirth or heavy menstruation all lead to iron deficiency, a condition in which iron store in the body is lacking. When body’s iron supply doesn’t meet the needs for production of hemoglobin in adequate amounts to maintain the normal functions of the body, anemia occurs. Anemia can also result from other causes such as malaria or genetic disorders. Some micronutrient deficiencies are also known to be the causes of other type of anemia, like vitamins A, B6 and B12, riboflavin, and folic acid deficiency.

Iron contributes to the formation of hemoglobin in the blood cells that carry oxygen in the body. It also plays a role in brain development and function, regulation of body and muscle activity. It might also have a role in immunity because lack of iron diminishes the number of T-cells and the production of antibodies involved in protection against infections. Thus, iron is needed to maintain good vital functions. Sample of blood is necessary to do the diagnosis of anemia, by measurement of hemoglobin levels that are shown below:

<table>
<thead>
<tr>
<th>Category</th>
<th>Hb (g/dL)- Veinous Blood</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adult males</td>
<td>13</td>
</tr>
<tr>
<td>Adult females, non-pregnant</td>
<td>12</td>
</tr>
<tr>
<td>Adult females, pregnant</td>
<td>11</td>
</tr>
<tr>
<td>Children 6 months to 6 years</td>
<td>11</td>
</tr>
<tr>
<td>Children 6-14 years</td>
<td>12</td>
</tr>
</tbody>
</table>

It has been proposed by a WHO group that <Anemia or deficiency should be considered to exist> when hemoglobin value in the blood sample is below these cut-off points. When the Hb value is lower, it means that the red cells are hypochromic (lighter in color) and that iron is lacking. In our research project, the cut-off point of anemia is 11,0 g/dL for all pregnant woman. In adult-female pregnant, the cut-off point is lower than the one for non-pregnant women because the iron needs are increased during gestation so that, Hb value is normally decreased.

In the body, when there is rapid proliferation of tissue and red cell mass, iron requirements are increased like during pregnancy, childhood and adolescence. The table below shows requirements of iron according to age:

3 Reference 2- p. 539, table 14
Table 2: Iron needs according to different age group:

<table>
<thead>
<tr>
<th>Age Group</th>
<th>Iron in mg that should be absorbed (daily needs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Infants (5-12 months)</td>
<td>0.7</td>
</tr>
<tr>
<td>Children (1-12 years)</td>
<td>1</td>
</tr>
<tr>
<td>Adolescents (13-16 years)</td>
<td>1.8 (males)</td>
</tr>
<tr>
<td></td>
<td>2.4 (females)</td>
</tr>
<tr>
<td>Adults, males</td>
<td>0.9</td>
</tr>
<tr>
<td>Adults, females</td>
<td></td>
</tr>
<tr>
<td>Menstruation</td>
<td>2.8</td>
</tr>
<tr>
<td>Pregnancy, first half</td>
<td>0.8</td>
</tr>
<tr>
<td>Pregnancy, second half</td>
<td>3.5</td>
</tr>
<tr>
<td>Lactation</td>
<td>2.4</td>
</tr>
<tr>
<td>Post-menopause</td>
<td>0.7</td>
</tr>
</tbody>
</table>

As shown in this table, only a small quantity of iron is needed daily because of the recycling process of iron in the body. During the menstruation, a woman needs to take more iron to restore the blood losses. Moreover, because menstruation stops during gestation, if no more blood losses or condition decreasing the quantity of iron in blood occur, requirements are decreased. During pregnancy, as explained in next section, the iron needs are increasing more than 3 folds during the second half compared to the first half. Furthermore, if a woman is breastfeeding in her second half of gestation, she will need a higher amount of iron per day. Indian's recommended dietary intakes in a day are 1000mg/d of calcium and 38mg/d of iron for pregnant woman compared to 400mg/d of calcium and 30mg/d of iron for a non-pregnant woman who do moderate work. Thus a woman will have to get more nutrients from her food and to reduce habits that might worsen the lack of iron in order to avoid anemia. In this way we will show that malnutrition is one of the most contributing factor of anemia.

MALNUTRITION

For nutritional status, India constitutes a dual society, with a small group of well fed inhabitants and a large group of undernourished inhabitants. In fact, anemia is part of this big problem in India: malnutrition. According to a recent FAO reports, about 15 per cent of the world's population suffers from malnutrition, excluding China. South of Asia composes about the third of this population. Undernutrition, a type of malnutrition, is the condition which results from an insufficient food intake over an extended period of time. Its main victims are children under age 15, and those under 5 years old are hit the hardest (nearly 50 per cent of total deaths in developing countries occur among children under 5 years of age as compared to less than 5 per cent in developed countries).

In India, scarcity of food is responsible for malnutrition. On a global basis, malnutrition is a problem of uneven distribution between the countries and within the countries. There are evidences that "there would be very less malnutrition in India today if all the food available could be equitably distributed in accordance with physical

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4 Reference 2- p. 539
5 Reference p. 552
6 Reference p. 565
7 Reference 2- p. 566
The Body Mass Index (BMI) is calculated from the weight and height of a person and is a good indicator of its nutritional status. A BMI under 18.5 kg/m$^2$ usually indicates chronic energy deficiency and is associated with many health problems, including nutrients deficiencies. On the other hand, a person with BMI over 25 is considered to be overweighted and might suffer, for example, from cardiovascular diseases. Presently, in overall India, 35.8% of the population has a BMI<18.5 kg/m$^2$ which is clearly under the recommendations previously given by the OMS. In Haryana State, it represents 25.9% of the population. Social and environmental factors related to this problem are: living in rural areas, illiteracy, being a woman from scheduled caste and scheduled tribe, being a working woman not self employed or being a woman and living in households with low standard of living.

Certainly, lack of food is one of the causes of undernutrition, but not the only one. Very often rich diet is available, people choose food poor in nutrients because of cultural influences which vary a lot from one country to another and from states to states. Examples are given widely in this report. Food habits come from deep psychological beliefs and are associated with love, self image, family type and social prestige. The problem behind these facts is that beliefs imply most of the time vulnerable groups such as infants, toddlers, pregnant women and lactating women. For example, a common belief in India is that if a pregnant woman eats too much, delivery will be more difficult because the baby will become too big. Then according to this belief, a pregnant woman can directly affect her health and the health of her baby. Cooking practices can also play an important role. Peeling vegetables, boiling water and food as much as needed and draining away the rice water after cooking are some examples of good habits. Cooking must always be done with the lid to avoid contamination and loss of nutrients. Leafy vegetables should always be washed before being cut and should not be washed afterward.

In some communities, women have to eat after men so, they usually eat less, quickly and small quantity. Socioeconomic factors are also important in nutrition as poverty, insufficient education, lack of knowledge about nutritive value of food, inadequate sanitation disposals and large family size affect the accessibility to good quantity and quality of food and determine living habits. This might result in low food production that doesn't meet the population's needs. Society services also play a role in providing education and services to improve community living conditions.

According to the world bank data, 87% of pregnant women in India suffer from iron deficiency. About 50% of non-pregnant women and young children are estimated to suffer from anemia. It also increases the mortality rate because 19% of maternal deaths are due to anemia.

**LOW DIETARY INTAKE OF IRON**

<table>
<thead>
<tr>
<th>Category of food</th>
<th>Food products</th>
<th>Iron (mg per 100 g of food)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pulses</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Soya beans</td>
<td></td>
<td>10.4</td>
</tr>
<tr>
<td>Peas dry</td>
<td></td>
<td>7.05</td>
</tr>
<tr>
<td>Horse gram</td>
<td></td>
<td>6.77</td>
</tr>
</tbody>
</table>

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8 Reference 2- p. 566  
9 Reference 8- p. 244-245  
10 Reference 2- p. 566  
11 Reference 2- p. 575  
12 Reference 13- p.5- table 1  
13 Reference 2- p. 800  
14 Reference 2- p. 542-546
Bengal gram 4.6  
Black gram 3.8  
Green gram 3.9  
Red gram 2.7  

Millet  
Jowar 4.1  
Bajra 8  
Ragi 3.9  

Fruits  
Banana 0.5  
Sitaphal 4.31  
Mango 1.3  
Grapes 1.5  

Dry fruits and nuts  
Dates 7.3  
Raisins 7.7  
Almonds 5.09  
Cashew nuts 5.81  
Ground nuts 2.5  

Fish 0.7 to 3  
Meat 2 to 4  
Eggs  
Contain a fare quantity of iron  

The main sources of iron in Indian food are green leafy vegetables (e.g. spinach, cabbage), cereals, legumes, nuts, oilseeds, jaggery and dried fruits (raisins, dates, apricots and others). However, iron contained in these products is not readily available for the body. Its absorption is promoted by the ingestion of poultry, fish, meat, liver which are sources of iron better absorbed by the body. Unfortunately, these sources of iron that originate from animals are not frequently eaten by Indians because many of them are vegetarian. NHFS-3 shows that about the third of men and women never eat meat, chicken or fish as only 7 % of men and women eat these food products daily. Vegetarianism varies from state to state and its prevalence reaches 88% in Haryana, while it is less than 10 % in some other states. Anemia has a lower level in women who eat fruits frequently. Importance of religion is obvious as vegetarianism is given a place of honor in Hindu society. Hindus abhor beef and Muslims pork and many observe fasts on different occasions (ex: Ramadan for Muslims).

In brief, in India, iron deficiency is mostly a consequence of undernutrition which results from many cultural, environmental and social factors such as religion, poverty and socio-economic status. There are many variation in the prevalence of undernutrition and IDA, according to the states, rural vs urban areas, religion, gender, etc. For instance, “surveys in different parts of India indicate about 50-60% of women belonging to low socioeconomic groups are anemic in the last trimester of pregnancy.” However, this problem remains one of the most important in the country. The poor consumption of meat due to religious believes, vegetarianism,
especially amongst Hindus contribute to the low dietary intake of iron.

POOR IRON ABSORPTION
Despite Indian food is a great source of iron, its absorption in the body is inhibited by some components of products in the Indian diet such as phytates in bran and pulses, phosphates in egg yolk, tannin in tea and pulses and oxalates in vegetables. The consumption of these items around the meal time may reduce iron absorption. The intake of iron is also decreased in disorders of jejunum and duodenum, where it is absorbed to then reach the blood stream.

IRON LOSSES
Basal excretion of iron is made through urine, sweat, bile and desquamated surface cells. There is also iron losses through any type of haemorrhages, which can be physiological (e.g., menstruation, childbirth) or pathological (e.g., hookworms, malaria, haemorrhoids, peptic ulcer). Recently in India, widespread use of intrauterine device (IUDs) is known to contribute to iron losses because it increases by 35 up to 146 per cent the monthly blood losses in menstruation. Other family planning methods, such as hormonal contraceptives tablets, help reducing menstrual blood losses from 50% and thus reducing iron loss.

INFECTIONS
Especially amongst young children, infectious diseases such as diarrhea, intestinal parasites, measles, whooping cough, malaria and tuberculosis are all important factors responsible of malnutrition. This process never ends as infection contributes to malnutrition – the lack of iron is increased and the body immunity gets lower which increases risks for other infections. Number of infections episodes such as diarrhea and severe respiratory infections are known to be higher in large family.

1 - Malaria
Risk of contracting malaria depends upon many factors such as time spent outdoors, type of house (nature of the walls, type of construction), race, population mobility, human habits and immunity (newborns are more resistant). Pregnancy, as well as agriculture practice, living in rural areas, sleeping outdoors, no measure of protection (e.g. bed net), low socioeconomic development and no exposure to the parasite (young children and travelers) are favorable factors for malaria infection. Transmission is higher in India from June to November, when temperature is between 20 to 30 deg. C and when humidity is high (after the monsoon). Human installations such as garden pool, irrigation channels and other pooling water also increase malaria. Malaria is still an important health problem in India, as 27 % population lives in areas of high transmission and 58% in low transmission areas. Malaria is of major concern as P. falciparum is associated with many complications, including anemia. Other species, i.e., P. vivax, P. malariae and P. ovale, may also lead to anemia. The parasite follows two cycles, the first is the mosquito phase in which the sporozoites is injected in the human body by the insect bite. Then starts the human cycle in which the parasite reach the liver via the blood stream. At different times, they then return to the blood circulation (they are so called merozoites), causing relapse of the infection. The parasite then enter the red blood cells, this is the erythrocytic cycle manifested by clinical features of malaria. It passes through the stages of trophozoites and schizont. The sexual phase is the next step and implies the mosquito cycle, and so on. Main symptom is paroxysmal fever that happens in three stages, occurring periodically and corresponding to the development of the parasite in the blood:

20 Reference 2- p. 538
21 Reference 2- p.490
22 Reference 2- p. 222
Cold stage in which high fever, headache, nausea, vomiting and chills last for 1-4 hours

Hot stage in which skin is hot and the patient has intense headache with rapid respiration for 2-6 hours

Sweating stage: fever lowers down but intense sweating begins and skin is cold and moist for 2-4 hours

Malaria might lead to enlargement of the spleen and secondary anemia. Moreover, malaria during pregnancy may cause the death of the fetus and premature labor or abortion. Transmission is higher after the monsoon period when insects reproduce a lot. Prevention of malaria include mosquito net and cover the body from mosquito bite with clothes and mosquito repellents. Blood test is essential to demonstrate the parasite in the red cells and make the diagnosis. Treatment include anti-malaria pills.

2 - Parasites and Hook Worms

Access to toilet is still very lacking, especially amongst those who live in urban slums areas and rural environments. 55% of the population of India still do not have access to toilet. Open air defecation is the only option for 74% of population in rural areas. This is an important source of contamination of food from the garden/field.

According to another author, "78% of the people in rural areas use open fields for defecation. This practice has been used since a long time and is considered harmless. Latrines are considered by villagers as an alternative for urban areas where no field is available for defecation."  

Hookworm infection are caused by Ancylostoma duodenale and/or Necator americanus and is very prevalent in India.

The larva living in the soil can penetrate the skin, usually through the feet, and then migrate to the lungs via lymphatic and blood stream. They are then coughed up and swallowed and can reach the small intestine where they become mature and attach themselves to the villi. Open air defecation is an important factor responsible for seeding of the soil by worms as eggs are produced in great quantity in the jejunum and then excreted in the faeces. Larvae of A. duodenale are also infective by ingestion of contaminated food.

Under favorable conditions of temperature (24 to 32 degrees), oxygen pressure, moisture, shade (sunlight kills the larvae) and rainfall, larvae remain viable in the soil and can reach the skin-penetrating stage. Man is the only reservoir of infection and people from 15-25 years old have a higher incidence of infection in endemic areas. The incubation period last as long as the person harbours the parasite.

Risk factors for transmission are indiscriminate defecation, using the same places for defecation, going barefoot, farming, living in sandy soil areas, children playing on the contaminated ground with their hands and without footwear. Malnutrition and inter current infections are predisposing factors for the chronic disabling disease. Thus, personal habits associated with illiteracy, ignorance and low standard of living contributes to the problem. This infection causes chronic blood loss and lead to iron deficiency anemia. Children may suffer from growth and development retardation. The consequences on pregnancy are those of anemia (low weight birth babies, abortion, stillbirths and impaired lactation). This disease also contribute to diminish work efficiency and productivity.

Prevention of this disease is made through installation of sanitary disposal of human excreta to avoid soil pollution and changing farming practices, i.e., not using raw faeces or untreated sewage as fertilizer. Health education in the community plays an important role in promoting the use of sanitary latrines, preventing soil pollution, changing personal habits such as wearing footwear and making use of health facilities for diagnosis and treatment of the infection.

Chemotherapy used with environmental measures help reducing worm burden and transmission. Many effective drugs are available. Management of anemia and other deficiencies, if severe, should be included in the treatment of hookworms infection, and consists in daily iron supplementation.

23 Reference 9-p.12
24 Reference 2- p.598
25 Reference 2- p. 216
Safe drinking water supply plays an important role in prevention of intestinal infectious diseases. "As of 2003, it was estimated that only 30% of India's wastewater was being treated. Much of the rest—amounting to millions of liters each day—find its way into local rivers and streams." Important impacts on human health are to be considered as unsafe disposal of human excreta (e.g. open air defecation) facilitates the transmission of fecal-oral diseases through water contamination. According to a survey, 89% of the population in India has access to safe water but, only 28% has access to adequate sanitation to use it. In this way, even if people have access to safe drinkable water, poor environmental sanitation is one of the main causes of contamination in water that increases diseases transmission. An important source of drinkable water in rural areas of India is called Tube Wells as seen in picture 1.

Tube well is a pipe collecting water from the water-bearing stratum of the soil and it is connected with a mechanic pump at the top. Water automatically flows out when the tube well is activated and is then stored in a covered tank from which people take water. It is supposed to be bacteriological safe and it is cheaper than other water supply. Surroundings 15 m area should be exempt of any pollution e.g. excreta, solid or liquid waste and living animals to avoid contamination. The pump must be functional, cleaned properly and deeply installed by engineers in the soil. The life of the tube well is limited even with good repairs, varying on different factors. Because the tube is not always cleaned properly and pooling water sometimes stays there for a long time, several bacterias and viruses can develop and live in those tube. Washing clothes or animals, dumping waste and personal ablutions must be forbidden and top of the reservoir should always be covered to avoid contamination. In the end, good conditions and utilization of the tube well are essential to get water free from pathogenic agents and harmful chemicals substances, and keep it uncolored and free of odor.

Knowing all possible routes of contamination of a tube well, it is easy to understand that if the tank is removed from the top of the pump, a safer access to get drinkable and soil-purified water would be available. It constitutes a hand-pump working with human power. Nevertheless, this way to obtain water is frequently considered as being really hard because people have to pump it every time they need. Furthermore, if well built and if the area surrounding (at least 15 meters) it is kept away from any sources of contamination, studies have shown marked improvement of bacteriological quality of the water. This would be the safest way to obtain water without any subsequent treatment such as boiling water.

Boiling water is an efficient way to kill pathogenic agents. A rolling boiled time of 10 to 20 minutes is enough to

26 Reference 9- p.13
27 Reference 2- p. 617- Table 1
28 Reference 2- p. 617- Table 1
29 Reference 2- p. 620
get clean drinkable water. The container that is used to refresh water after boiling should be the same as the one where water got boiled. There is no evidence that water will stay bacteriologically safe after a long time so water should be used quickly.

EDUCATION
As mentioned previously, literacy is a major determinant of health. Anemia is mainly a consequence of low educational status in the population because education affects human habits, fertility rate, hygiene, food habits, use of health care services. Educated women usually do not have early pregnancies and have a better access to information on health so that higher literacy rates are associated with low fertility, low maternal and infants mortality rates. People from the villages used to be less educated than people from the city. Currently married non-literate women represent 38.8 % of total population of Haryana compared to 43.4 % in rural areas and currently married women with 10 or more years of schooling represent 25.9 % total vs 19.9 rural.

NORMAL PREGNANCY
During pregnancy, transfer of iron from the mother to the fetus is done by a protein-binding system regulated by the placenta and is supported by increased maternal iron absorption. Maximal iron transfer occurs from 30 weeks of gestation, involving serum transferrin and placental receptors. Their production is regulated to adjust according to maternal iron status, but iron deficiency might affect the capacity of this system to transport adequate amount of iron to the fetus.

Development of the fetus and placenta and expansion of woman’s blood volume create large demand in iron during pregnancy. Increase in blood volume is higher than increase in red blood cells during pregnancy, which results in physiological anemia. Iron needs are also increased to 1000 mg per day. Thus normal decrease of iron occurs during any pregnancy and this is why lower Hb value is needed to make diagnosis of anemia and iron tablets are systematically given to every pregnant woman. At least half of all ever-married women aged 15-49 years and adolescent girls are believed to have some degree of IDA. In this way, if the women suffers from anemia by the time of conception, there is risk of increasing severity during pregnancy. Important loss of blood during delivery is also another conditions that increases iron needs along with adolescence, menstruation and breastfeeding. When these conditions are combined, risk of IDA is even higher.

Nutritional requirements considerably increase during pregnancy. A normal healthy woman should gain 12 kg to meet the metabolic requirements of pregnancy. According to several studies, poor Indian women gain an average of 6.5 kg during the whole pregnancy. Insufficient maternal iron store during pregnancy may lead to lack of baby iron store after birth, which is necessary for growth and to increase muscle volume and blood mass in the first year of life. Daily requirements of iron are increased in the second half of pregnancy, more than during menstruation. (See Table 2: Iron needs according to different age group)
ANEMIA AND PREGNANCY

Estimates from the World Health Organization report that from 35% to 75% (56% on average) of pregnant women in developing countries, and 18% of women from industrialized countries are anemic. However, many of these women were already anemic at the time of conception, with an estimated prevalence of anemia of 43% in non pregnant women in developing countries and of 12% in women in wealthier regions.

High fertility rate, young age at first childbirth and low birth spacing contribute to anemia as the body doesn’t get time to restore iron between each pregnancy. In this way, no family planning and lack of education about pregnancy are factors contributing to anemia. Religion also play a role in large family size as family planning methods, such as tubectomy, are prohibited for Muslims. Age at marriage determines the moment a women enters the reproductive period of life. Women who marry before 18 usually give birth to a larger number of children. “In India some demographers have estimated that if marriages were postponed from the age of 16 to 20-21, the number of births would decrease by 20-30 %.”

The national average for age at marriage is 20.5 years (…) The exceptions are the rural areas, where a substantial proportion of marriages continue to take place when the girl is around 16 years of age.”

According to the results of the NFHS-3, other factors contributing to lower fertility rate are education, high economic status, good nutritional status, better health conditions, housing, family planning, etc.

Stresses such as infections have consequences on the pregnancy outcome. Malaria and intestinal parasites exacerbates anemia, which increase the risk of maternal mortality.

TOXEMIA IN PREGNANCY

Anemia can also be caused by an other condition developed during pregnancy. For example, pre-eclampsia is a pregnancy related condition where hypertension is induced at the onset of pregnancy. Thus for every antenatal check-up, evaluation of the blood pressure is recommended to diagnose this disease. Toxemia occurs when the placenta starts to develop usually after 20 weeks of gestation. The cause of toxemia is still unknown. A severe toxemia in pregnancy can conduct to pre-eclampsia, which may lead to eclampsia, and later on, can turn into a serious complication known as the HELLP syndrome, (HELLP is the abbreviated form of the findings; Hemolytic anemia, Elevated Liver enzymes and Low Platelet count). It is usually seen in primipare women or in women who are carrying multiples babies. Teenage mothers and pregnant-women older than 40 years old are also predisposed to toxemia in pregnancy. Signs and symptoms like proteins and blood in the urine, persistent high blood pressure (>140/90), several abdominal pain, swelling of the face, hands and legs, mother’s convulsions, etc. Screening of these symptoms in every ANC visits, particularly for swelling, must be done.

Some prevents measures are known such as:

- Avoid eating junk and fried foods, limit the intake of caffeinated or alcoholic drinks
- Hydrate the body by drinking 7 to 8 glasses of water per day, and reduce the intake of salt
- Elevate your legs with pillows when sleeping
- Do some light physical exercises daily
- Get adequate and proper rest; avoid sources of stress

If untreated, by giving liver and kidney damage, toxemia can lead to the rupture of the placenta, fetal growth impairment, preterm delivery, as well as increasing the maternal mortality.

38 Reference 2- p. 418
39 Reference 2- p.418
40 Reference 2- p.418
BLOOD LOSSES
Blood volume increases of about 45% during normal pregnancy and blood loss is much more harmful for women suffering from anemia or other conditions than for healthy women. Moreover, we notice that some conditions that lead to anemia also contribute to complications of pregnancy and delivery. Hemorrhage in the first third of pregnancy may be caused by spontaneous abortion. In such case, abdominal pain will also be present. Infection, hemorrhage and deficient cervix may occur due to abortion. Bleeding during second and third part of pregnancy may occur if placenta is too close to cervix and this might happen to women having several pregnancies, having pregnancy at an old age or for those who have ever had a caesarian procedure. Another cause of bleeding during late pregnancy is early removal of placenta from the uterus and etiologic factors include high parity, age of pregnancy and other conditions such as hypertension. Severe hemorrhages may also occur and fetus mortality risk is increased. These condition needs close check-ups and delivery in specialized hospital as complication such as hemorrhages are likely to occur and transfusion of blood should be given in that case. Postpartum hemorrhages (PPH) are in an increased frequency in the developing world mainly due to the lack of experienced caregivers who might not be able to manage PPH if it occurred. Lack of available medication is also to consider. In a home delivery, no one is able to manage correctly those serious complications if happened. Institutional deliveries are really to promote.

OUTCOMES OF ANEMIA ON MOTHER AND BABY'S HEALTH
Iron deficiency anemia increases the risk for low birth weight, premature delivery, perinatal and neonatal mortality, postpartum hemorrhages, puerperal sepsis and thrombotic phenomena for the mother, inadequate iron stores for the newborn, lowered physical activity, fatigue and increased risk of maternal morbidity. Institutional delivery is even more important in this condition as complications are likely to occur. A new-born weighting less than 2500g is considered to have a low birth weight (LBW). About 28 per cent of all babies born in India have LBW and they mainly suffer from fetal growth retardation as compared to only 4 per cent in some developed countries (mainly a preterm consequence). Maternal malnutrition, before and during pregnancy, and anemia are known to be significant risk factors in the occurrence of LBW. It is proven that a woman who has been correctly nourished during infancy has better chances to deliver a baby with a normal size even if she has not taken an adequate diet during her pregnancy. There are also reasons to believe that the lower average birth-weight of a new-born baby in developed countries wouldn’t be due to genetic factors but largely due to maternal malnutrition. Others causes of LBW are hard physical labour during pregnancy, illnesses especially infections, short maternal stature, very young age, high parity, smoking and close birth intervals. These factors are all associated and interrelated.

Anemia represented 19% (22% deaths due to IDA) of all causes of maternal mortality in 1998 according to the Family Welfare Survey. Thus it is responsible for almost a quarter of maternal deaths. Many social factors that contribute to anemia are also associated with higher maternal and child mortality rate in India, as for examples, young age at child birth (below the age of 19 years old), or relatively older (over 30 years), high

41 Reference 19- p.18
42 Reference 2- p. 452
43 Reference 2- p.552
44 Reference 2- p. 490
45 Reference 2- p. 458
46 Reference 6
47 Reference 7- p. 35
48 Reference 13- p. 7
49 Reference 2- p. 490
parity, too close pregnancies, malnutrition, illiteracy, lack of maternity services, delivery by untrained dais in which complications such as hemorrhages might not be given proper cares, poor environmental sanitation, social customs, etc. The highest child mortality rate is found for the first baby, and the lowest among the second baby. Infant mortality rate from nutritional deficiencies is 3-4 times higher for child with a high birth order (> than 3rd) as compared to the three first babies. The lack of birth spacing cause anemia and malnutrition in the mother. A new pregnancy too early and whose the youngest baby is displaced from the breast, and prematurely weaned, leads to several effects on that baby. He will have more risk of developing a protein energy malnutrition, diarrhea and dehydration status. All these factors contributes to increase the mortality rate in infants and have impacts not only on the fetus’s health, but on all children of the family. The Khanna Study in India has showed that an infant born after an interval of 1 year from the last baby has the highest mortality rate. The IMR is lower for infants born after an interval of 2-3 years and is the lowest for those delivered after 4 years of space.

**ANTENATAL CARES**

Antenatal check-ups are essential to treat maternal anemia and prevent from complications. Education and promotion of good habits, iron supplementation and institutional delivery is essential and should be given by every health workers. According to NFHS-3 (2005-2006), 77% of women in overall India get at least one antenatal check-up and 50.7% of pregnant women get at least the recommended 3 antenatal check-ups (compared to respectively 73.4% and 50.1% in 2002-2004 by DLHS-3). Ideally, the mother should have an ANC visit once a month during the first 7 months; twice a month during the 8th month and thereafter, once a week. But because a large proportion of women are doing work, periodic visits are difficult to achieve and 3 ANC check-up are recommended in area where service access are limited. The first visit should be on the 20th week of gestation or as soon as women is known to be pregnant, the 2nd visit on the 32nd week and the last one on the 36th week. Hemoglobin blood test should be conducted to diagnose anemia, as well as other illnesses. Treatment and prevention of anemia are made through iron supplementation. According to NFHS-3, 36.4% of pregnant women in India in years 2005-2006 consumed IFA tablets for 90 days.

One of the principal objectives of the antenatal care is to promote, protect and maintain the health of the mother during pregnancy, as well as to detect “High Risk” cases and give them a special attention. In this way, mothers should report themselves immediately if they present one of the following warning signs: swelling of the feet, fits, headache, blurred vision, bleeding or vaginal discharges. ANC are also good opportunities for health workers to sensitize the mother to the need of family planning, to teach the mother elements of nutrition, personal hygiene, environmental sanitation and child care, knowing that education about these topics are essential to prevent anemia.

**POSTNATAL CARES**

Postnatal check-up aim to:

1. Provide care for the rapid restoration of the mother to optimum health. Other than regular postnatal examination, routine hemoglobin examination should be done during postnatal visits and anemia

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50 Reference 2- p. 482, table 16
51 Reference 2- p.490
52 Reference 2- p. 490
53 Reference 2- p. 490
54 Reference 2- p.482, table 17
55 Reference 2- p. 450
56 Reference 2- p. 482, table 17
57 Reference 2- p. 451
58 Reference 2- p. 452
treated for one or more year. In order to help breastfeeding and mother’s health, she should be shown how to eat better, with limited budget. Advices on exercising and psychological support are also part of PNC.

2. Prevent complications of postpartial pediod. Most common include puerperal sepsis, thrombo-phlebitis, secondary hemorrhages and urinary tract infections to which anemia might contribute.

3. Provide family planning services to space births and limit family size.

4. Provide health education to mother and family on hygiene, nutrition of mother and baby, pregnancy spacing and importance of check-up.59

All these elements are key parts of prevention and treatment of anemia.

**INSTITUTIONAL VS HOME DELIVERIES**

In rural areas, most of deliveries are still done by the only person who is readily available and, unfortunately, not trained. To reduce maternal and infant mortality, caretakers need to have some knowledge on safe hygienic conditions and techniques. Otherwise, the Rural Health Scheme of India has undertaken an extensive program to improve the knowledge on obstetrics skills, elementary concepts of maternal and child and sterilization of these traditional birth attendants, which are called local dais. After having successfully completed 30 working days of training, every local dais get a certificate and a delivery kit. India's target is to train one local dai per village who could play a vital role in spreading education on small-family standards60. This aim to improve delivery safety, but home delivery conducted by these dais are not included in safe delivery definition by NFHS-3 and DLHS-3. In India (2005-2006), 48,2 % of delivery were “safe”61, with most of them being institutional deliveries and a few being home deliveries trained by skilled staff. Home deliveries, by untrained people lead to increase blood losses and then, more postpartum hemorrhage have been seen. Lack of hygiene and sterilization (e.g. utilization of dirty tools) increase infections in mother and baby.

**SERVICES ACCESS**

India has a national health policy (not a national health service). Financial resources are inadequate to assure the costs of running health services for every one. Even if the problem is large in urban area, in rural areas where 72 per cent of the population is living62, the problem is enormous. People cannot benefit from the modern curative and preventive health services. A lot of villages depend on indigenous systems of medicine to get help for health problem.

As long as money is a scarce resource for providing health services, it will affect all parts of the health delivery system. In many developed countries, average government expenditure for health is approximately 18% of the Gross Net Product (GNP). Today about 3 per cent of the GNP of India is spent for health and family welfare development63 and to make matters worse, in every country much of this money is given for services that reach only a small part of the population. “To achieve Health for All, WHO has set as a goal the expenditure of 5 per cent of each country’s GNP on health care.”64 Due to lack of money, some organizations have to change their procedures and fees for the patients because they cannot afford all the costs. For example, since October 1st 2011, in Gusbethi’s Deepalaya Hospital, the patients have to pay for many prescribed medicines. Furthermore, non-pregnant women have to pay to get iron and calcium supplementation. It will probably limit the access to the clinic’s services for villagers with poor incomes. Hopefully, the clinic is still providing free calcium and iron

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59 Reference 2- p.454
60 Reference 2- p. 803
61 Reference 2- p.482, table 17
62 Reference 2- p. 800
63 Reference 2- p 801
64 Reference 2- p. 801
supplementation to every pregnant woman who visits the clinic. All these changes are good examples of how
money can limit an healthy status.

ANGANWADI WORKER
Under the Integrated Child Development Services (ICDS) schemes, there must be an Anganwadi worker for
every 1000 people in a village. It constitutes, with the village health guides, the primary link between the
community and health services. The Anganwadi worker is usually a woman chosen by the community who
provides and undergoes training in several aspects of health such as nutrition and child development for 4
months. She works in a little organized house in the courtyard of the village, as a multipurpose agent. She
gives services like general check-ups including maintenance of grow chart, immunization, supplementary
nutrition, vitamin A prophylaxis, iron and folic acid distribution, health education, non-formal pre-school
education and referral services such as family planning. She helps lactating mothers, pregnant and non-
pregnant women, adolescent girls from 11 to 18 years old and young pre-school children below 6 years of age.
She is paid Rs. 1500 per months for a part-time work.

Accredited social health activist (ASHA)
ASHA are also playing an important role as a worker for the "National Rural Health Mission" (NRHM), launched
by the government of India in 2005. For a period of 7 years (2005-2012), this mission aims to provide accessible,
affordable, accountable, effective and reliable primary health cares in villages. Thus, it is bridging the gap in
rural health care through creation of a cadre of ASHA (Accredited Social Health Activist), a resident of the
village, ideally a women between 25-45 years old with a formal education up to the 8th class, having leadership
qualities and a good representation of the disadvantaged populations. At the community level, this program has
some goals such as providing available trained community level worker with a drug kit for general diseases. On
a fix day, once a month, ASHA organizes the Health Day, where immunization, ante/post natal care checkups
and services related to mother and child healthcare are given. She also gives advices on nutrition and facilities
to promote institutional deliveries. In this way ASHA is a health activist in the community where she will create
awareness on health on different topics such as, nutrition, basic sanitation, hygiene practice, etc. She will
counsel women on the importance of safe delivery, breast-feeding, family planning, contraception and
prevention against common diseases. She facilitates access to health care centers for the population, available
at the Anganwadi/sub-center/primary health centers, and provide escort/accompany pregnant women and
children requiring treatment to the nearest pre-identified health center. ASHA will also provide basic primary
medical cares, as well as promoting construction of household toilets. The integration of ASHA with
Anganwadi in the villages is based on the way that Anganwadi worker acts like a guide and a resource person
for ASHA, by helping her in her different roles previously mentioned. With all these functions, both of them are
playing essential roles in prevention of anemia... They can also constitute a way to work on anemia in the
villages, through several organizations (e.g. Deepalaya).

Indian interventions/program for treatment and prevention of anemia
Measures to control iron deficiency anemia amongst population include iron supplementation, food
fortification and other public health measures, such as helminth control, malaria control, improving sanitary

65 Reference 2- p 803
66 Reference 2- p. 511
67 Reference 2- p. 574
68 Reference 2- p. 380
69 Reference 2- p. 380
conditions. Iron supplementation program is one of the major measures to use in order to fight against IDA especially when the amount of absorbable iron in the diet cannot be improve with pregnant women being amongst the targeted groups. Thus diagnosis and treatment of anemia in highly prevalent areas is essential.

The government has implanted interventions to control anemia in India. Iron and folic acid supplement tablets are given daily to pregnant women through antenatal clinics (e.g. Mother and Child Health, MCH), primary health centers and their sub-centers under the Governments Reproductive and Child Health Programme. Dosage of tablets should be adjusted according to the duration of supplementation.

The program called Prophylaxis against nutritional anemia, through the Ministry of Health and Family Welfare used to distribute iron and folic acid (folifar) tablets to pregnant women and young children (1-12 years). Moreover than centers previously given, ICDS (explained below) projects are engaged in the implementation of this program such as Anganwadi Center in the villages.

Iron supplementation improves maternal iron status, especially in late pregnancy (third semester). However, for women entering pregnancy with low iron stores, supplementation often fail to prevent deficiency.

As described by the WHO, benefits of iron supplementation program on pregnant woman are decreased low birth and perinatal mortality and when anemia is severe, decreased maternal mortality and obstetrical complications.

Iron fortification in food might be achieved by fortifying a staple food highly consumed by the population, such as flour, salt or curry powder.

Education on nutrition has some benefits. This might include advices on dietary choices, promotion of breastfeeding along with complementary food (great sources of iron). Messages should include encouraging adequate food intake and weight gain during pregnancy.

Preventing adolescent pregnancy, reducing total number of pregnancy and increasing the time between pregnancy are also aims of education and family planning promotion.

For areas where health services cannot reach all the population such as in rural area, we might involve community accessible organizations, such as village women groups, religious leader, schools, as well as community members. This also contribute to improve their participation in the program and to make them feel concerned about it.

An other social welfare programs is the Integrated Child Development Services (ICDS) which is currently the most important scheme in the field of child welfare, initiated by the government of India in 1975. The ICDS scheme is designed both as preventive and development effort. Services like health check-up, immunization and referral services are provided through public health infrastructure. Here are the objectives of the ICDS scheme:

− to improve the nutritional and health status of children in the age group 0-6 years;
− to lay the foundations for proper psychological, physical and social development of the child;

70 Reference 8- p.7
71 Reference 2- p.452
72 Reference 2- p. 574
73 Reference 1
74 Reference 17- p. 9, table 2
75 Reference 2- p. 510
to reduce mortality and morbidity, malnutrition and school drop-out;
- to achieve an effective coordination of policy and implementation among the various departments working for the promotion of child development; and
- to enhance the capability of the mother and nutritional needs of the child through proper nutrition and health education.

Especially for pregnant women, the services provided by the ICDS scheme are health check-up, immunization against tetanus, supplementary nutrition, nutrition and health education. The supplementary nutrition consist of giving food 300 days a year to children below 6 years old, nursing and expectant mothers from low income group. The aims are to give each child (up to 6 years old) 300 calories and 8-10 grams of protein, to supplement each pregnant woman and nursing woman to get 500 calories and 20-25 grams of proteins as well as some other measures for malnourished children and adolescent girls. The costs are assumed by the State Plan under Minimum Need Program. The health check-up include antenatal cares of expectant mothers, post-natal care of nursing mother and care of newborn infants and cares of children under 6 years old. Mothers are given iron and folic acid tablets along with protein supplements. Moreover, they receive immunization and a minimum of 3 antenatal physical examinations are done. High risk mothers are referred to the hospital following their condition.

A hospital-based maternity centered approach to family planning has been introduced by the government of India in 1969. It is called the All India Hospital Postpartum Programme (AIHPP). It is based on the fact women who have recently delivered are more likely to become pregnant again in a short period of time and they are also more receptive to adopt a contraception method. Knowing that, this program delivers family planning methods to the women through MCH and Family Welfare programme. It also includes prophylaxis against anemia, as well as antenatal, neonatal and postnatal cares and immunization to children. To reach rural areas, the Postpartum Programme has been extended to 1012 hospitals in the country.

In rural areas, the focal point to deserve such services for the ICDS are the Anganwadi Worker (AWW), known as trained local woman. As previously described in this report, AWW are essential to their community. (See section ANGANWADI, previously).

With the ultimate aim to reach every child in India, the ICDS program has already done several impacts on the lives of children. It increased birth weight, reduced incidence of malnutrition, increased immunization coverage and reduced infant and child mortality rate in areas its covered. At this level, the “National Rural Health Mission” (NRHM) is also promoting ANC healthcare by the creation and the training of ASHA.

**GUSBETHI**

According to the Census of India in 2001, the total population of Mewat is 9,93,617 in which 4.65 % lives in urban area and the 95.6% in rural areas. These data also show a sex ratio of 893 males: 1000 females, which is lower than the National average (927:1000). Gusbethi population is estimated to more than 2000 inhabitants, with around 20 people per house. Combined to poor health facilities, this might increase the maternal mortality rate. Muslism is predominant in this district, with a small Hindu population. The literacy rate in this district Ais 44.07 %, due to low female literacy. (24.26 %). At the state level (Haryana), Currently married non-
literate women represent 38.8% of total population compared to 43.4% in rural areas and currently married women with 10 or more years of schooling represent 25.9% total vs 19.9 rural. In this way, age at marriage is younger than the national average: average age at marriage in Haryana is 19.7 years old for total population (19.2 years old in rural areas). The main occupation of its inhabitants is agriculture. In some area there is canal irrigation but it is mostly rain fed and production rate in Mewat district is low compared to other districts. This limits access to food. Animal products is also a source of income, thus people are used to live with cows, chicken and goats in their courtyard.

Health and sanitation
The Mewat District has the lowest health indicators in Haryana, compared to other districts. According to DLHS-3 (2007-2008) there are less than 30% of institutional delivery and contraceptive use (respectively 46.9% and 62% for the state of Haryana). This district also has the poorest immunization rate amongst children from 1 to 2 years old, with less than 25% having full immunization, compared to 59.6% for the whole state of Haryana. Deepalaya’s dispensary based in Gusbethi welcomes as much as 4088 patients per year (2010-2011).

Free governmental health care services are provided to Gusbethi and its surrounding through “Anganwadi”, where people can have access to immunization, ANC and iron tablets, free medicine, health education through awareness by health workers. Standards are about one Anganwadi per 800 population. In Patuka village (population > 3500 people), there are 2 Anganwadi, in Gusbethi (population >2000), there is one Anganwadi.

Moreover, health care services are provided to the population of Gusbethi and other 15 villages of the Mewat District, since 2005 by the Chameli Dewan Memorial Rural Health & Mobile Clinic. Through these health facilities, Deepalaya provide basic cares. Gynae and obstetric for ante and post-natal cares are an important part of these services. Note that in Haryana, 87.3% of mothers have received any ANC (85.2% in rural areas). Other services are delivery, training of dais, immunization, family planning, lab tests along with awareness and health camps on various topics (breastfeeding, ANC, PNC, family planning, child care, anemia, TB, waterborne disease, malnutrition, pneumonia, HIV, communicable diseases, skin diseases, etc.) to about 80 000 people around the Tauru block of Mewat district in Haryana. Promotion of institutional delivery is also a part of these awareness, as Mewati district has less than 30% of home delivery, but 46, 9% of delivery are institutional in whole Haryana (42.2% in rural areas).

The price for delivering in Gusbethi Hospital is 1500 Rs and includes, for example, injections, services and transport to home. Other examples of fees charged by the clinic are 60 Rs for 2 weeks of iron tablets if not pregnant. Note that from October 1st 2011, due to different reasons, the mobile clinic has stopped but awareness are still going on by health workers to promote institutional delivery, the dispensary in Gusbethi, staff available 24 hours a day, etc. in order to keep providing health cares to this population. Gusbethi’s clinic has X-rays equipment, laboratory room, OT room, delivery equipment. The staff is composed of a general physician, a pharmacist, ANMs, health workers, an optometrist, caretakers, accountants, lab technicians, and ophthalmologists come from Nuh every week to operate cataract surgeries. Eye camps take place every week in different villages in which diagnosis of cataract and promotion of the new clinic are held. Since september 2011, free cataract surgeries are operated in the main clinic based in Gusbethi to address the increasing needs for eye cares in this area. This surgery is free for patients who have previously attended eye camp given by the staff and 1500 Rs for other patients.

83 Reference 7, p.3
84 Reference 7, p. 3
85 Ref. DLHS-3 Haryana, p.7
86 Ref. clinic’s statistics : deepalaya’s clinic
87 Reference: HaryanaDHLS-3, p.4
88 Idem
Health cares are also provided to all children of Deepalaya school as well as general check-ups that take place every month in school.

The team is seconded by St Stephens Hospital in New Delhi and patients are referred to Government Hospital and other institutions, such as Tauru Hospital (private) for further investigation and specialized cares. Pregnant women also have a free service of ambulance (government services) that they can use in case of emergency during delivery. Calling to this number, they can reach the ambulance that will bring them up to the closest government hospital.

Anemia, the major disease reported in the clinic during year 2010-2011, represents 46% of all disease reported. Some other diseases are malnutrition (5%) and diarrhea (2%) along with malaria (which is not so prevalent in this area), cold and cough, and others.
PART 2 – OUR RESULTS

Part A- Cases study

All five interviews have been done in the villages after check-ups (ANC and PNC) in the mobile clinic. The place was crowded and we had limited time for each woman and sometimes, we didn’t achieve to ask all our questions. All questions have been asked by the same translator (ANM from Deepalaya clinic). All patients were properly answering our questions but some answers were not so easy to get as they were surrounded and watched by many other villagers, so there wasn’t any privacy. Doctors and all health staff were also present and that might have influenced answers as they would say they have taken their tablets even though they might have not. Interviews were short because of time limitation and we didn’t have any measuring tape so height of the mother is estimated from comparison with our known height and BMI is then, calculated from an estimation. Weight has been taken with the same weighting machine for all patients, same for blood pressure and Hb value (Sahli’s method).

See Annex 2- Survey for the 5 case studies

Case #1 - Sheatar w/o Rambakh from Padheni

Clinic data
22 years old
G2P1A1
Severe anemia

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<th>Weight</th>
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<td>4,8</td>
<td>55</td>
<td>110/70</td>
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</table>

Interview of September 29th 2011
Physical examination

- Number of weeks: 34
- Weight: 55 kg
- Height: 1.65 m
- BP: 110/70
- Hb: 4.8 gm %
- BMI: 20.2 kg/m$^2$

Comments: This woman had more than 3 ANC, as recommended. Within three fourth of the 3rd trimester of gestation reported here, we notice that her weight intake is 3kg. She might not meet the expected weight intake of 6 kg for the last trimester (see Data analysis section for more explications). The increase in Hb value might be a mistake by the health worker while pasting the note in the pad or, hopefully, due to iron supplementation.

General information

This woman is 19 years old and is Hindu. She has completed her 8th grade at school and got married at the age of 18 years old.

Habits and living conditions

She eats meat on some occasions but she considers herself as a vegetarian, thus we understand that she might have a typical diet composed of vegetables, rice and flour products. She has access to water by hand pump and sometimes has electricity at home. She doesn't have access to any toilet/latrines and defecates in the garden. She drinks about 5-6 glasses of water per day and sleeps about 8 hours during the night and 1 hour during the day. Her work consists of carrying grass for the cows (physical work) and she always wear footwear. She visits Tauru's hospital for her annual check-up and in case of any health problem.

Comments: Practicing open air defecation increases her risk of contracting parasites infections by eating contaminated food from the garden. Hey water supply is, on the other hand, probably not a source of contamination as water pump is considered to be a safe source of clean water if area is kept cleaned. Vegetarianism might highly contribute to her anemic status as her diet, though containing some meat products, might not meet the expectations for adequate iron intake.

Gynecological and obstetrical history

She is 19 years and presently in the 32nd week of her second pregnancy. Her last pregnancy ended in abortion after 8 months of gestation (A1) which was probably less than one year ago as she got married at the age of 18 years old.

Her first menses were at age 17 and she reports pain during her periods, but no vaginal discharge or blood loss.

She had more than 3 antenatal check-ups and is taking iron tablets given by Deepalaya's mobile clinic. According to our data, her Hb value has improved from 4.5 gm/dl on August 24th to 4.8 gm/dl today, but she is still suffering from severe anemia.

She gained 2 kg during the last month and as this is her last trimester, we would expect her weight to increase to at least 59 kg until full term, to meet the normal weight intake standards. According to her answers, she didn't change anything in her diet during her pregnancy, but she eats more than usual.

She had never used any family planning method. She plan to deliver in hospital and will visit Gusbethi clinic if she has any problem during her pregnancy.

Comments: Her pelvic pain might be normal “dysmenorrhea” as she doesn't have any other pelvic symptoms. We don't have any information about this previous abortion and antenatal cares that have been provided. We don't know if it happened at home or in hospital and if she had important blood loss that might have
contributed to her low Hb level. Considering that she got married at age 18, and thus enter reproductive life at this age, the birth spacing between her abortion and this current pregnancy is less than a couple of months, if she is 19 years old, which is not favorable to increase her Hb level and is also contributing to severe anemia.

Health status
She has abdominal pain and she thinks that she is infected by worms, but has never seen any worms in her swoons. She knows that she is anemic and she presently has some symptoms such as headache, fatigue and pain in feet. She doesn't have any fear about the outcomes of her pregnancy.

Comments: Her gynecologic-obstetrical history of abortion and severe anemia are risk factors for maternal and newborn mortality and morbidity. Education about family planning and nutrition would be beneficial also for this woman who is entering reproductive life.

Case # 2- Raj Kumari w/o Husaijas from Padheni

Clinic Data
Not available

Information from the interview of September 29th

Physical examination
- Weight : 52 Kg
- Height : 1,63 m
- BP : 110/70
- Hb : 6 gm %
- Now : G1P1L1A0
- Baby's weight: 3,4 kg
- BMI: 19,6 kg/m²

General information
This woman is now 20 years old and she is from Hindu religion. She got married at the age of 19 years old and has completed her 8th grade at school.

Gyneco-obstetrical history
She had her first menses at 17 years old and has always been regular and never had spotting or any blood loss. She has delivered her first baby 21 days ago at home with the Dai from her village (trained) and she is now breastfeeding. She had ANC given by Deepalaya's clinic and she also visited Tauru hospital and some caretakers in other villages during her pregnancy. Thus she had taken iron and calcium tablets, but no other medicine. She had never used any family planning method. Her baby didn't receive any immunization. She changed her diet during her pregnancy; she was eating less than usual only because she had less appetite. Her expected date of delivery was on September 1st and the expected weight of her baby was 3,66 kg according to the clinic's data.

Habits and living conditions
She says she is vegetarian but she eats about 2 pieces of chicken every week. She drinks around 4 or 5 glasses of water per day. She knows how to cook food properly. She gets access to water by water supply and has electricity at home. She doesn't have access to any latrine/toilet so she has to defecate in the garden. She always wears footwear and she is doing housework.
Health status
She doesn't have any symptoms of anemia such as headache, blurred vision, dizziness, weakness and no abdominal pain or worms in her swoons.

Analysis: Breastfeeding while pregnancy increases her iron needs and contribute to anemia (severe). We noticed an important decrease in her Hb value during her pregnancy but we didn't find the cause in the clinic's data. Other than breastfeeding and pregnancy, she doesn't have many factors contributing to her low iron status. Her BMI is not so low but undernutrition might be present. She doesn't have any symptoms of intestinal infections or anemia, even though her Hb is 6 gm % (severe anemia) and she practices open air defecation. From this interview we couldn't find any cause of her severe anemia other than undernutrition, the main cause in overall India.

Case #3- Manisha w/o Arvind from Gogjaka

Clinic Data
Her last control was on the August 18th, where she was at 20 weeks of gestation. She had only her 1st injection of TT+. Her Hb value was 7.29 gm% and her weight 46 Kg.

Information from the interview of September 29th
Physical examination
- Weight : 50 Kg
- Height: 1,46 m
- BP : 110/70
- Hb : 6 gm %
- BMI: 23,5 kg/m²
- G2P1L1
- Baby weight: 8,5 kg, height unknown

General information
She is 21 years old and got married at age 18. She has completed her 8th grade at school.

Habits and living conditions
She is vegetarian and never eats meat but she drink more milk since she is pregnant and since she knows she is anemic. She is doing housework in her home and she sleeps around 8 hours per night. She gets access to water
by water supply and sometimes has electricity at home. There is no access to toilet or latrines thus she has to go in the garden and she doesn't always wear footwear.

Analysis: As previously explained, water supply is not a safe source of water and contamination is likely to happen. She didn’t report any symptoms of intestinal tract infection but she is at high risk of contamination because of open air defecation and walking barefoot in contaminated soil.

Gyneco-obstetrical information
She had her first menses at age 16 and had pain during her periods. She is pregnant for her second time and she is at 26 weeks of gestation. She is breastfeeding her first baby who is now 1 year old. It was an institutional delivery and he got full immunization.

She had taken iron tablets and had antenatal cares for her both pregnancies.

Health status
She didn’t have any worms in her swoons but she reports symptoms of anemia before taking iron tablets. She visits the caretaker of her village and goes to an Anganwadi for her check-ups.

Case #4 - Mamta w/o Arum from Gogjaka

Clinic Data
Not available

Information from the interview of September 29th
Physical examination
- Weight: 50 Kg
- Height: 1.52 m
- BP: 100/70
- Hb: 6 gm %
- BMI: 21.64 kg/m$^2$
- G2P1L1
- One TT+

General information
Mamta is 22 years old and had completed her 8th grade at school. She got married at 16 years old and she is from Hindu religion.

Habits and living conditions
She gets access to water by water supply and she does housework only. She is vegetarian. She sleeps 8 hours per night.

Gyneco-obstetrical history
She had her first menses at age 16 and she has never used any family planning method. She successfully delivered her first child in hospital 10 months ago. She got full immunization and she is presently breastfeeding. She is now pregnant since 20 weeks and she is having vaginal bleeding since 21 days. Before that she had pelvic pain and vaginal discharges. During her hemorrhage, she had symptoms such as dizziness, blurred vision and now she is having abdominal pain, but no fever. She doesn’t have any worms in her swoons. Now that she knows she is anemic, she drinks more milk and eats more vegetables. She is taking iron tablets but no other medication.

She had antenatal cares for her both pregnancies and plan to come to Deepalaya's clinic for her next ANCs.

Analysis: Her symptoms are typical of pelvic inflammatory disease (vaginal discharge, pelvic pain) and anemia increases the risk of such infections. Abortion may be suspected by blood loss during pregnancy and this woman has increased risk of such complication as her Hb value is very low (severe anemia). Abdominal pain is also a typical symptom of abortion. Moreover, she has symptoms of anemia (dizziness, blurred vision). Treatment recommended for that should include restoring iron in blood, at least with iron supplementation, so the importance of taking her tablets should be explained by health workers on each visit. Other factors that contribute to this are vegetarianism and breastfeeding while being pregnant. Education on birth spacing and family planning and nutrition would be beneficial also for this woman.

Case # 5- Seena w/o Depansh from Gogjaka

Clinic data
Her last examination was on the August 25th, at 32 weeks of pregnancy. She was 44 Kg and her Hb value was at 8.5 gm %.

Information from the interview of September 29th
Physical examination
- Weight: 44 kg
- Height: 1.54 m
- BP: 100/70
- Hb: 8.5 gm %
- G8P3L3A5
- Youngest baby's weight: 3.1 kg
- BMI: 18.6 kg/m²

General information
Seena is 25 years old and got married at 22.

Habits and living conditions
She is vegetarian and she sleeps around 10 hours per night. She has water supply and electricity at home. She does housework and always wears footwear.

Gyneco-obstetrical history
She had her first menses at age 17 and her last delivery was 11 days ago and she is now breastfeeding. She had blood losses during her last pregnancy. She delivered in hospital because the fetus was breech and complications happened during delivery. She had vaginal stitches and now she has vaginal pain, but no discharge and no abdominal pain. During that last pregnancy, she took iron and calcium supplementation and had 2 T.T.+ injections, but she is not taking anymore medicine. She didn't visit any other clinic during her pregnancy and didn't take any other medication.
Her 3 years old girl's weight is 8 kg and we couldn't measure weight of her 6 years old son. They all had their full immunization and both deliveries were in hospital.
Health status
She doesn't think she has worms and she is now visiting mobile clinic for postnatal cares.

Comments: Her low BMI might be a consequence of lack of food that contributes, with vegetarianism, to lower her Hb status that was probably low before entering pregnancy. Moreover, having 25 years old and a background of 8 pregnancies, she might suffer from chronic iron deficiency, as her body can never restore iron between each pregnancy. She also had 5 abortions, so she might have lost amounts of blood in her motherhood life. Abortion might also be consequences of chronic iron deficiency, and having this gynecological history, she has increased risks of delivery complications, as we have seen in her last pregnancy. Her blood losses have also decreased her iron store during her last pregnancy. The newborn weight of 3.1 kg on the 11th day is not very high, but we don't know his birth weight. Anemia and breech position with hard labor during delivery are factors that could increase risk of low birth rate for Seena's baby. Proper cares should be given to him as is at higher risk for neonatal mortality, malnutrition and anemia. Visiting the clinic for ANC and PNC, taking her iron tablets and having institutional delivery are good habits that may prevent Seena to suffer from more severe level of anemia, considering her gynecological story. Her iron supplementation should be continued as her Hb value is still low and because breastfeeding also increases her needs in iron. We think she could benefit from a family planning method as she had many complications during her several pregnancies, she suffers from moderate anemia and also because as she is living in Gogjaka, she used to have access to health care from the Mobile Clinic that is not running anymore from October 1st (then she could hardly get ANC in case for subsequent). Pills would be a good option as they could stop her menstruation and then reduce her blood losses to improve her iron status and her health.
Part B- Results of Questionnaire for married women of Patuka, Kiruri and Gusbethi villages

See also Annex 3- Main Questionnaire for married women and results

Table: Statistics from the General Survey on Anemia

<table>
<thead>
<tr>
<th>Description of the survey</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>% of interviews in the clinic</td>
<td>56,7</td>
</tr>
<tr>
<td>% of interviews in the villages</td>
<td>43,3</td>
</tr>
<tr>
<td>% of pregnant women</td>
<td>23,3</td>
</tr>
<tr>
<td>% of women not in age of pregnancy</td>
<td>26,7</td>
</tr>
<tr>
<td>% of women in age of pregnancy</td>
<td>73,3</td>
</tr>
<tr>
<td>% of pregnant women breastfeeding</td>
<td>14,3</td>
</tr>
<tr>
<td>% of breastfeeding women</td>
<td>30,0</td>
</tr>
<tr>
<td>Age</td>
<td></td>
</tr>
<tr>
<td>Average age</td>
<td>32,0</td>
</tr>
<tr>
<td>Youngest woman</td>
<td>19,0</td>
</tr>
<tr>
<td>Oldest woman</td>
<td>60,0</td>
</tr>
<tr>
<td>Religion</td>
<td></td>
</tr>
<tr>
<td>% of Muslims</td>
<td>96,7</td>
</tr>
<tr>
<td>% of Hindus</td>
<td>3,3</td>
</tr>
<tr>
<td>Marriage</td>
<td></td>
</tr>
<tr>
<td>Average age</td>
<td>16,9</td>
</tr>
<tr>
<td>Age of youngest</td>
<td>14,0</td>
</tr>
<tr>
<td>Age of oldest</td>
<td>21,0</td>
</tr>
<tr>
<td>Number of women who got married before 18 years old</td>
<td>19,0</td>
</tr>
<tr>
<td>% of women who got married before 18 years old</td>
<td>63,3</td>
</tr>
<tr>
<td>Education</td>
<td></td>
</tr>
<tr>
<td>Average of last grade completed</td>
<td>0,2</td>
</tr>
<tr>
<td>Number of women know about anemia (khoon ki kami)</td>
<td>13,0</td>
</tr>
<tr>
<td>Number of women that have attended</td>
<td></td>
</tr>
<tr>
<td>Any Deepalaya's health awareness</td>
<td>4,0</td>
</tr>
<tr>
<td>Average number of siblings</td>
<td>6,7</td>
</tr>
<tr>
<td>Pregnancy</td>
<td></td>
</tr>
<tr>
<td>G</td>
<td>5,7</td>
</tr>
<tr>
<td>% of women who ever had any abortion</td>
<td>36,7</td>
</tr>
<tr>
<td>Average age of FIRST pregnancy</td>
<td>19,5</td>
</tr>
<tr>
<td>Average time between each pregnancy (years)</td>
<td>1,5</td>
</tr>
<tr>
<td>% of women who had only home delivery</td>
<td>70,4</td>
</tr>
<tr>
<td>% of women who had any institutional delivery in their life</td>
<td>29,6</td>
</tr>
<tr>
<td>Average age at first menses</td>
<td>13,7</td>
</tr>
<tr>
<td>% of women who have ever used any family planning method</td>
<td>10,0</td>
</tr>
<tr>
<td>% of women who have taken iron tablets</td>
<td>37,0</td>
</tr>
<tr>
<td>Number of women who have received any ANC during last pregnancy</td>
<td>11,0</td>
</tr>
<tr>
<td>Pelvic symptoms</td>
<td></td>
</tr>
<tr>
<td>Number of women who had blood loss during pregnancy</td>
<td>8,0</td>
</tr>
<tr>
<td>Number of women who ever had vaginal discharge</td>
<td>4,0</td>
</tr>
<tr>
<td>Number of women who ever had pelvic pain</td>
<td>3,0</td>
</tr>
</tbody>
</table>

Note: Women not considered in age of pregnancy are women aged 40 years and older.

G correspond to G score (total number of pregnancy)
Note: Symptoms of anemia include weakness, fatigue, headache, pain in legs, dizziness, blurred vision, chest pain, shortness of breath, rapid heartbeat.

**Part C- Mobile clinic data on ANC**

*See also Annex 4- Data from mobile clinic*

<table>
<thead>
<tr>
<th>Statistics</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Average age of women</td>
<td>23,9</td>
</tr>
<tr>
<td>Average number of weeks of iron supplementation</td>
<td>8,5</td>
</tr>
<tr>
<td>% of severe anemia</td>
<td>20,0</td>
</tr>
<tr>
<td>% of moderate anemia</td>
<td>71,1</td>
</tr>
<tr>
<td>% of mild anemia</td>
<td>8,9</td>
</tr>
<tr>
<td>Average G score</td>
<td>3,7</td>
</tr>
</tbody>
</table>

*Table 3- Statistics of data from the mobile clinic*
PART 3 - ANALYSIS

Our general Questionnaire has been prepared for married women who are visiting Deepalaya's clinic or are living in or around Gusbethi.

The aim of this Questionnaire is to identify habits and living conditions that might contribute to the problem of anemia amongst rural Indian population, and to understand the beliefs associated with some common practices, as well as religious and cultural influences. We tried to target the most contributing factors in this area, then to compare with the rest of India. We included many questions related to pregnancy and motherhood but we couldn't exclude non-pregnant women as we could not meet so many women during our internship.

Thus, we have interviewed 30 volunteer married women, without any criteria of age or village. This way we have asked people corresponding to these criteria coming to the clinic for any reason and we went to the villages. The context of interview varies a lot. In some cases, we joined the doctor and made the interview while he was doing the consultation. In most cases, privacy was impossible and many other people were attending the conversation, men included some occasions. Answers might also have been influenced by their mind set, especially in hospital where people were in a hurry to head back to their house. We had to adjust the length of our questionnaire as many women were getting irritated of being asked private questions by foreigners like us without getting anything in return. A translator helped us to first get in touch with them, but as he could not always be available, we had to ask to different people (clinic staff) to translate our questions to the villagers and for a couple times we had to interview without any translator and we had some doubt about the full understanding of each others. Thus, our questions and answers have been translated in many different ways, reducing its validity. In this way, we are missing some answers and information for some patients because they could not understand our questions or because we didn't have time to ask to them.

For some questions, especially age related questions, many women could not answer properly as they didn't know the answer and our translator calculated their age according to the number of children they have.

Finally, the population that we have chosen for our research project is very different from the rest of India and even from Haryana state for many reasons, as explained in the next sections.

General information

We have done our interviews from October 10th to October 29th, in the clinic (for 17 of our 30 women) and in villages. Seven of them were pregnant women but 22 of them were less than 40 years old and could still give birth. The average age of all women is 32 years old and 97 % are Muslims. Hindus account for 80,5 % of the total population in India on the whole (ADB Report, 2009)90. Knowing the differences associated with the religion, we understand that our survey might not be representative of the rest of India, even though most population of this country (72%) is living in rural area90. Nearly 3/4 of the population (of India) still lives in rural areas (2004)91. The women we have interviewed come from Gusbethi, Pathuka and Kiruri villages. These three villages have always been provided health care services by Deepalaya's clinic but the Mobile Clinic was not used to go there.

We have noticed the importance of cultural and religious beliefs through this survey and through our visits to the villages as some women are visiting the religious leader of their village. For example, in Patuka village, people meet the “Molawi” when they have health problem. From him they get threads and prayers that,

89 Reference 18
90 Reference 2- p. 800
91 Reference 5- p.4
according to the belief, would cure them. Religion is also important in the way that health workers promote the fact that the new doctor in Deepalaya’s clinic is from the same religion as most of them (Muslim) to encourage women to deliver in hospital.

**Fertility rate**

Nowadays, families are still very large in this area, with an average number of siblings of 6.7 for women interviewed and average G score of 5.7. This is the Gravida score which include all pregnancies during the reproductive life of the woman, all abortions, living and death babies. However this last data would be higher in reality, because it now doesn’t include pregnancies coming for young women who will have more children. We could not calculate the fertility rate as some data are missing but knowing this, we estimate a high fertility rate as we were expecting. In comparison with country data, we think fertility rate in this area might be close to old statistics of India (“(In India) Total fertility rate has come down from 6 children per woman to slightly more than 3 children in 1999.”). According to MCH data, total fertility rate in India is 2.8 in 2007. This rural area is favorable for high birth rate as many factors contribute to it. First, low educational level as discuss below, knowing that poverty contribute to this problem. Second, young age at marriage, with average of 16.9 years old, causing young age at first pregnancy (with an average of 19.5 years old in our survey), meaning that women are likely to have more children than women who get married at an elder age. “In India some demographers have estimated that if marriages were postponed from the age of 16 to 20-21, the number of births would decrease by 20-30%.” This result shows a large difference from country data, in which mean age at marriage is estimated to 20.5 years and 19.7 years for Haryana. Very high rate of women got married before age of 18 in our survey (63 %), compared to state level (15.9% of total population of Haryana). We understand the importance of this problem when we see such post in the clinic that prohibit marriage before age 18.

Then, no use of family planning method, with only 10% of our interviewed women who have ever used any method, compared to 62.0% of total population of Haryana (61.8% in rural areas), shows that a large difference in beliefs and knowledge existing between Mewati district and the rest of the state. At country level, for years 2000-2007, couple protection rate by any family planning method is 56% according to MCH.

We have noticed that many women felt ashamed to talk about this topic and would not show their interest in using family planning method in front of other women in village meetings. Many women coming to the clinic didn’t know about Saheli and Mala-D pills and were asking many questions about this method. Lack of education about menses and pregnancy risks is also a problem in rural areas such as Gusbethi.

Finally, Muslim religion is also a factor increasing family size and fertility. We learned from clinic staff that some family planning methods, such as tubectomy, are prohibited for Muslims because of a belief that children are gifts from God and pregnancy should not be stopped.

This results in low birth spacing that contributes to anemia, as iron level in blood doesn't increase enough to reach normal level of Hb between each pregnancy. Average time between each pregnancy has been calculated by comparing the number of pregnancy (G score including abortions) to the number of years of fertility (from

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92 Reference 8 - p.1  
93 Reference 2 - p. 478, table 11  
94 Reference 2 - p. 418  
95 Reference 2 - p.418  
96 Reference 7 - p.3  
97 Reference 7 - p.3  
98 Reference 2 - p.478, table 11  
99 Reference 7 - p.4
the age on first pregnancy to the age on last pregnancy). We observe that in average, women are getting pregnant every 1,5 year which is far from the recommendation of one baby every 3 years minimum. Breastfeeding also increases iron needs in the body and pregnant women who are also breastfeeding (14% of women in our survey) are at increased risk of anemia.

Complications of delivery are consequences and causes of anemia as explained previously. In our survey, 36,7 % of women ever had abortion. They are more likely to happen in home deliveries, which are still more common than institutional delivery in Gusbethi surroundings (70 % of all interviewed women never had institutional delivery). Thus, important blood loss during pregnancy without adequate health cares contribute to persisting lack of iron until next pregnancy and increases severity of anemia. Mewati district has less than 30 % of home delivery, but 46, 9 % of delivery are institutional in whole Haryana (42.2% in rural areas). We have noticed much resistance from villagers to deliver in hospital as practices by health workers are very different from traditional home deliveries operated by dai. Again, low educational level contribute to poor knowledge about risks of complications during delivery. Thus, important blood loss without adequate care given by skilled staff is another factor that might cause anemia or increase its severity for which treatment, when given, is not as efficient as prevention. Also, we understand that many women prefer to deliver at home because they feel more comfortable being surrounded only by the people they know and they don’t have to reach the hospital and stay there for hours. The cost for delivering in Deepalaya’s clinic is Rs.1500 and some people might not afford that amount. Furthermore, this amount include iron supplementation for 15 days after the delivery (cost usually Rs.60). The body needs to increase its reserves in iron after a delivery and usually, women who delivered at home do not pay for a supplementation in iron after delivery. By using the hospital delivery, at least women have iron and calcium supplements in their possession and they have been advice that they should use it.

From our survey we see that some women report symptoms of PII or Pelvic Inflammatory Diseases (pelvic pain, vaginal discharge). Anemia, inadequate hygiene habits and unsafe procedures during delivery (especially home delivery) may be favorable to this problem. Moreover, complications of PII might affect mother’s fertility and pregnancy and worsen the issue of pregnancy in case of preexisting illnesses.

Habits
Food

Due to an important Muslim population, vegetarianism is not so prevalent in Gusbethi area as we have found that only 10 % of women interviewed never eat meat. In the rest of India, vegetarianism varies from state to state, and its prevalence reaches 88% in Haryana. However, we think limited access to sufficient quantity of food is a factor contributing to undernutrition in our survey because many women answered that any modification in their diet would depend upon the money they have. Agriculture is their main source of food. Productivity at this time of the year is quite low as farmers are seeding the soil and winter is coming, according to people’s saying in the clinic.

The average BMI is 19,2 kg/m$^2$ and 52 % are underweighted (BMI less than 18,5 kg/m$^2$) compared to 36 % for overall India which shows the importance of undernutrition in this area. However, our measures are estimated from our own height and we could only calculate the BMI of 23 of our patients so this percentage is not very valid for comparison. But according to the rest of our observation we think undernutrition is very prevalent in this area.

100 Reference 2- p. 478, table 11
101 Reference 8- p.11
102 Reference 11- p. 49
Age at first menses might also be affected by nutritional status and late menarche is likely to happen in case of malnutrition, but there are many other causes. This is why we included this question in our survey but the average age at first menses is quite normal (13.7 years) and is actually very imprecised as many women don’t know anything related to their age.

We have also noticed that some of them know about the sources of nutrients in the food as they have increased their intake of some food, for example milk, green leafy vegetables (women no. 18 and 20) during pregnancy. These 2 women have also taken iron tablets so we think they have been informed about this by their doctor. We were also pleased to know that many of them have increased the quantity of food they eat during pregnancy. This shows us that the belief of eating less conduct to better delivery as the baby doesn’t get too big is not so known amongst the women we have interviewed.

Footwear

As explained previously, hookworms can reach the intestine from foot skin and thus walking barefoot on contaminated soil increases the risk for infections. From our survey, only 69% of women are wearing footwear at all time and as most of them are doing work in the field, where most people are going for defecation, transmission is likely to occur. Moreover, many women have reported signs of intestinal infection and hookworms have been reported by some of them. As for food, some women explained that lack of money is a limiting factor for buying adequate footwear.

Use of health care services

The private sector accounts for more than 80% of total healthcare spending in India. We have noticed during our internship that access to health care services is often limited by monetary problem. Many families cannot afford further treatments or investigations in specialized hospitals due to high costs. Deepalaya’s clinic is free of access for many services and fees are affordable by most people. For example, Iron tablets are given for free to all pregnant women, as mentioned previously, but 2 weeks of iron supplementation is 60 Rs for non-pregnant women.

Recommendation for ANC is at least 3 visits during pregnancy in which Hb blood test are done and iron supplementation are given systematically to every pregnant (anemic or not) women. So access to treatment of anemia by iron tablets or syrup doesn't depend of prices. But low rate of ANC in our survey (37 %) is obviously due to limited access to health care services, poverty and low educational level. Now that mobile clinic has stopped its weekly visits to the villages, many patients are limited by distance and road condition to reach Deepalaya’s clinic in Gusbethi. Low educational level is also an important factor contributing to poor use of health services by the population and promotion of the clinic by health workers in the villages aims to improve this situation.

Amongst the 24 women who have ever visited any type of health services for health problems (including Deepalaya’s dispensary and mobile clinic, Tauru hospital, religious leader and Anganwadi in the villages), 67 % of them are totally depending on Deepalaya’s services. Knowing the prevalence of anemia and other health problems in this area, and knowing that Deepalaya can reach the population in the villages with the mobile clinic and the dispensary, we understand the importance of this NGO’s amongst the population of Gusbethi and surroundings.

Low rate of iron tablets supplementation (37% of women that have taken iron tablets during their last pregnancy). We think this is a national problem as according to NFHS-3, 22.3 % of pregnant women in India in

Reference 5- p.3
years 2005-2006 consumed IFA tablets for 90 days\textsuperscript{104}. This rate is also low at state level: In Haryana 29.0\% of mothers and 28.1\% in rural areas have consumed 100 IFA\textsuperscript{105} despite the iron supplementation program instaured by the Government of India. In Patuka, Kiruri and Gusbethi, many women have given this explanation to us. Many didn’t take their tablets/syrup properly because they didn’t believe in its benefits and didn’t know much about the importance of iron supplementation, maybe due to lack of information given by the doctor/health worker. We also believe this results from a low rate of ANC in this area. Out of 29 mothers, 27 of them answered to our question: “Have you ever had any antenatal care during your last pregnancy?”. Less than 50\% had any ANC during their last pregnancy which is a consequence of factors listed below (including road conditions). These results are quite different from the country data and we think it is mainly due low educational level associated of this small population and poor urban installations that facilitate transport in urban areas. According to NFHS-3 (2005-2006), 77\% of women in overall India get at least one antenatal check-up and 50,7\% of pregnant women get at least the recommended 3 antenatal check-ups (compared to respectively 73,4\% and 50,1\% in 2002-2004 by DLHS-3)\textsuperscript{106}. In Haryana, 87,3\% of mothers have received any ANC (85,2\% in rural areas). 51,9\% of mothers have received 3 or more ANC (47,2\% in rural areas)\textsuperscript{107}. Immunization status amongst children of women from our survey is quite low (29\%) compared to country data (56\% of infants are fully immunized (measles, DTP, Polio, BCG) in 2007 in India\textsuperscript{108}). In a way it indicates the prevalence of PNC amongst women, as immunization if usually provided by Deepalaya clinic and Anganwadi while doing PNC. Immunization against infectious diseases that cause diarrhea would be beneficial knowing that hygiene and sanitation is very low in this area.

**Electricity and home conditions**

In our survey, 26 women out of 28 have electricity at home (92\%) which is very close to state data (92,4\% have electricity at home vs 90,5\% in rural areas\textsuperscript{109}). Technology is almost nonexistent in villagers houses and basically, having electricity at home means having light for few hours in the day. This is a good example of their minimal living conditions at home. While visiting the villages, we have noticed that most houses are Kaccha type, with people sleeping whether outside, whether in an open air room on hand made beds or directly on the sandy ground, without any protection from mosquitoes. With open air defecation, outside tap for showers and agriculture as their main activity, they are almost living outside and this, combined with inadequate sanitation disposals, increases their risk of contracting diseases such as hookworms and malaria. “If proper sanitation services are provided to the households, the risk of diseases can drop by 40\% ( e.g. malnutrition, anaemia or retarded growth by 60\%)\textsuperscript{110}.”

Also, at this time of the year, sunlight is coming from around 6 a.m. which correspond to the time most of them wake up in the morning, with an average of 7 hours of sleep per day. Thus we understand that people life and health depend much on environment and weather. Practicing agriculture, their access to food depend on the climate and soil and that explains the high proportion of women that have to contribute to field work (70\% in our survey).

Limited access to any technology in home in this area is due, according to our observations, to poverty and traditional beliefs.

\textsuperscript{104} Reference 2- p. 482, table 17
\textsuperscript{105} Reference 7- p.4
\textsuperscript{106} Reference 2- p.482, table 17
\textsuperscript{107} Reference 7- p.4
\textsuperscript{108} Reference 2- p. 478, table 11
\textsuperscript{109} Reference 7- p.3
\textsuperscript{110} Reference 18
Water access

“As of 2003, it was estimated that only 30% of India’s wastewater was being treated. Much of the rest—amounting to millions of liters each day—finds its way into local rivers and streams. Knowing that access to latrine is insufficient in rural areas like Gusbethi and that infectious diseases (diarrhea, parasites) are spread through oral-fecal transmission, water in this area is an important cause of intestinal infections and might contribute to the problem of anemia. In this way, we have noticed a high prevalence of reported symptoms of intestinal infections (60%) in our survey.

In Haryana, 96% of total population has access to improved source of water (94.7% of rural areas). Situation in Gusbethi and surroundings is quite similar as most interviewed women have access to quite “safe” sources water (57% are using tube well and 27% are using hand pump). However, as it is a problem in overall India, sanitation is lacking in the villages that we have visited (Patuka and Kiruri). In India the coverage of sanitation in developed states is also not satisfactory. Taking example of Haryana, a state that ranks very high in terms of per capita income among the major states, almost half of the household are without latrine and bathroom facility. Further ¼ households are without connectivity to waste water drainage. The state is marked with a great amount of variation in coverage of sanitation across the districts. Thus contamination is likely to happen. According to the country’s Tenth Five-Year Plan, three-fourths of India’s surface water resources are polluted, and 80% of the pollution is due to sewage alone.”

111 Reference 9- p.13
112 Reference 7- p.3
113 Reference 18
114 Reference 9- p.13
According to our observations, in all cases, the tube well reservoir was not covered and appearance of the water was doubtful with lot of particles and brownish color. People could possibly shower and kids play in these tank as most villagers have low educational level and might not be aware of the importance of having hygienic disposal of the water. The bins they are using to carry water to their home might also be another source of contamination. Moreover, many animals are living in the courtyard, very close to the reservoir in some cases, and could drink water from it or defecate into it. In other cases, the reservoir was very close to the field, where people are used to defecate and to the outdoors shower where they bath, so the area surrounding it wasn't exempt of any sources of contamination as recommended. Pollution of soil by houses wastes also contributes to sewage. For 17 % of all women interviewed, water was provided for free by the government. These water tank are not considered to be a safe source of water as the container where water is stored used by all the community is a great source of bacterial proliferation.

**Access to latrines and sanitation**
The proportion of women interviewed having access to any excreta disposal is of 30 %. Open air defecation represents 70 % of excreta disposal according to our results, about the same as overall India rural population
Knowing that most people in the villages work in the field, that they take their food from there, that an important part doesn't wear footwear and that sanitation is inadequate in this rural area, there is high risk of contamination and transmission of hookworms. In this way we have also noticed that 60 % of interviewed women told us that they have or had any symptoms of intestinal/parasitical infection including fever, abdominal pain, diarrhea or worms in their swoons.

**Education**

Almost every women from villages had never gone to school and are illiterate, unable to read and write. Thus, the average of last grade completed is grade 0.2 for those women. At the state level, currently married non-literate women represents 38.8 % of total population (vs 43.4% in rural areas). Currently married women with 10 or more years of schooling represent 25.9 % total in Haryana vs 19.9 rural. A part of this difference between state level and our results is again due to validity of our survey.

As explained previously, low educational level is associated with high fertility rate in the country, and contribute to poor knowledge on health. This results in hygiene and food habits that contribute to increase risks of infection, malnutrition and high fertility rate.

We’ve also been told by clinic staff that most of the time, in the villages surrounding Gusbethi, people who are illiterate or who are having a low educational level have to ask permission to their parents to use any family planning methods. Considering that, a lot of elder persons are also illiterate and had never use any contraception methods, the number of children in those families is not going to decrease as long as young women and men are illiterate... To increase the time between births and then, help the body to store enough iron for the next pregnancy, a good knowledge about the main contributing factors of anemia is essential.

The language is a real barrier because they speak Mewati language only and don't understand Hindi which limit communication with the clinic staff and outsiders.

**Knowledge about anemia**

None of the women interviewed had ever attended any awareness about anemia from Deepalaya’s mobile clinic, but some of them heard about “Khoon ki kami” meaning “lack of blood” in Hindi, by family members, friends or by their doctor after doing Hb blood test during ANC, meaning that they are affected by this illness when they know what it is. Therefore, education on this topic is essential in this area, knowing that the prevalence of anemia is very high amongst pregnant women as shown by our data analysis of the mobile clinic and in overall India. Moreover, with 2/3 of women having any symptoms of anemia and 47% having physical signs, as listed in our Questionnaire, awareness on this illness to help them prevent, recognize and know the importance of treating anemia.

**Retrospective analysis of Mobile Clinic data**

As an other part of our research, we investigated the most recent data of the Mobile Clinic when it was still going in the villages to find information on pregnant women. Thus we randomly chose 45 women coming from the twelve villages available in the clinic data. We found in these prescription pads their age, their obstetrical score, their weight, their blood pressure, their Hb value (Hemoglobin level), their symptoms and the medication

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115 Reference 13- p. 9, table 3
116 Reference 7-p.3
117 Reference 7 p.3
that has been prescribed to them. Following each visit in Deepalaya’s Mobile Clinic, it has been possible to see
the evolution of their condition during their pregnancy, some for more than six visits as some for less.

We used the randomized trial method to find our patients so that, it has not been possible to see their
evolution during the whole pregnancy. Most of the time, it has not been possible to follow them for a complete
trimester. Thus, a lot of error could have interact with our results.

Firstly, people doesn't really know their age. By doing our questionnaire, we noticed that sometimes people are
calculating their age according to the number of pregnancies they had. So unfortunately our results can be
falsely under or over the reality. Eventhough, the same lack of precision must be also found in the data of the
Mobile Clinic. We have noticed that they calculate their age by knowing that a woman probably had about one
child by year and a half since her marriage. According to our data, the average of age of the women we took
information is 23,87 years old. The mean of their G score, which is the Gravida score representing the total of
pregnancies the woman got in her life, including living children, abortions and deaths babies, is 3,73
pregnancies/woman. In other words, by example, a woman of 24 years old already had about 4 pregnancies in
her life if she is living in the surroundings of Gusbethi. This is one of the main contributing factor of anemia
because a high number of pregnancies in a short period of time (with low of birth spacing) results in lack of
iron. The body does not have the time to increase its iron store between two pregnancies.

About anemia amongst these women we have seen that all pregnant women are anemic, from mild to severe.
As previously explained in thereview, a Hb value lower 7,0 g/dL is considered as a severe anemic status, a Hb
value between 7,0 and 9,9 g/dl represents moderate anemia and a Hb value between 10,0 and 10,9 g/dl is
mild. Hb value > 11,0 g/dl is in the normal range. According to these data, 20,0% of our patients have severe
anemia and 71,1% are moderately anemic. Only 8,9% have mild anemia. At country level, we know that In
2005, 45 % of pregnant women were anemic\textsuperscript{118}. The highest level of moderate and severe anemia are found
amongst pregnant women\textsuperscript{119}. NFHS-3 results show that 55% of ever-married women 15-49 years old are anemic
(39 % mild, 15 % moderate and 1 % severe). Note that the three different levels for pregnant women are : mild
(10,0-10,9 g/dl), moderate (7,0-9,9g/dl) and severe (<7,0g/dl)\textsuperscript{120}. Many factors listed in this report contribute to
higher rate of anemia and more severe level of anemia amongst women in this rural area we have studied.

From what we have seen, Deepalaya’s clinic provides free iron and calcium supplementation to all of them.
Even if a medicine has been prescribed and given to someone, it doesn't mean that this medicine has been
taken properly. Thus, even if iron tablets or syrup and calcium supplementation have been given to every
woman from whom we took the data, it does not mean that they always took it properly. At the beginning, our
goal was to take these data and to analyze them to see the evolution of the Hb value during the pregnancy,
following each visit of the mother. Unfortunately, we have seen that the Hb value was not increasing and had
no significant variation over the months. We were expecting to see the Hb value increasing considering that the
patient was taking properly her supplementation but we have been told afterward that the Hb value was only
taken at the first antenatal check-up. Thus it was impossible to follow the evolution of the Hb because this value
was just pasted on the prescription pad on every visit. If any variation is present, as few as -0,2gm%, we must
attribute it to a mistake during the transcription.

For 3 patients (Number 11, 25 and 34 in our data), an increased in Hb value has been found for the last blood
test. For the 1\textsuperscript{st} one (number 11) an increase of 0,8 gm% over 8 weeks of supplementation has been found, 0,5
gm% over 5 weeks for the 2\textsuperscript{nd} one (no. 25) and 0,4 gm% over 5 weeks for the 3\textsuperscript{rd} one (no 34). It seems that the
measurement of their Hb value has been done a second time for these patients, maybe because the first

\textsuperscript{118} Reference 6 p.1
\textsuperscript{119} Reference 8- p. 9
\textsuperscript{120} Reference 11
measure was lost, or maybe because the health worker has done a mistake while copying. Considering the number of weeks of supplementation for these women, if the iron tablets have been correctly taken, it is possible to find such increase in Hb. Hopefully, these data reflect the reality.

Actually, an Hb test costs 20/- Rs to the patient and only one test at the beginning of the pregnancy is not of any use if we want to know if Hb is increasing or not. We must recommend to any pregnant woman to do at least 2 times this test, in order to see the evolution of their Hb during the pregnancy and to be able to adjust the given doses of iron supplementation. Also, when the doctor prescribe iron and calcium supplementation to the patient, he/she should always be aware of the favorite choice of the patient. Some woman prefer tablets and some others prefer tonic to improve compliance.

The color-matching technique called Sahli’s method is the most commonly used in India to estimate the red cells mass in the blood by measuring the hemoglobin-Hb value. Basically, it is a squared tube with marks of Hb% on one side and the corresponding percentage on the other side (100% = 14,5 gm%). There is a comparator with a flat surface and with a standard brown color. There is a dropper for HCL and for distilled water, and the Hb-pipetter is graduated every 0.02mL. Blood is added to HCl which converts Hb into acid hematin of a brown color. This color is then compared with the brown color of the comparator in a natural light. At this time, if our solution is darker than the comparator, we have to dilute it with distilled water until it matches. After this, it is possible to know the Hb value by looking the upper meniscus on the gm% scale.

With this test we should wait for 10 minutes before reading the result to let the red blood cells interact with the acid solution. But this delay might not have been always respected because of the crowd during visits of the Mobile Clinic. Also if the blood is not mixed correctly with the HCl, we can get false low Hb value as well as if
there would be a calibration error in the tube or in the pipetter. Acid doesn’t convert all the hemoglobin into
acid hematin so the Hb value obtained can be slightly lower that the real Hb of the patient. A visual error in
matching color can also happen. Rinsing properly the pipette and the tube at least twice are important steps to
improve the validity of the test but they’re not always correctly done. Considering all this and according to what
we have seen, this method is quite imprecise. Otherwise, it was always the same health worker who did the
test so that there shouldn’t be mistakes from differences in techniques. If an error is done by an health worker,
we suppose this error would always be the same for every measurement done by this same person.

With this technique a normal range of Hb value for a woman is between 11.0 and 16.0 gm%. As previously said
in this section, 20 per cent of our data had severe anemia (Hb<7gm%) and the average of the Hb values for all
women is 7.9 gm%, which corresponds to moderate anemia, as for 71.1 per cent of our results.

On the other hand, with these data it has been possible to check the evolution of their weight because the
weight was systematically taken on every visit. A normal weight intake should be 1 Kg during the 1st
trimester, 5 Kg during the 2nd and of 6 Kg during the last trimester. According to what we found, most of them seem to have
taken less weight than expected. Unfortunately, because we sometimes have only 2 or 3 weeks of consultations
for some patients and for few others we have 16 weeks of information on pregnancy, we cannot compare
weight intake or calculate any statistic from that. Moreover, because some of them are in their second trimester
and some others are in their 3rd trimester and that we don’t have their weight intake during all the trimester,
calculation of an average is not of any use. In brief, we think that the undernutrition is the most important
cause of anemia but all infections and other conditions explained below are also important.

In the prescription pads, the height of each woman was not available so it was impossible to follow the
evolution of their BMI as well.

We have also explored the reasons of consultation of these women. Most of the time it was for an ANC
checkup, but some symptoms due to a severe anemic status or to parasites infections have also been frequently
found such as headache, diarrhea and fatigue. Patient no 38 is a good example of anemia induced by an with
decreasing in Hb, if the Hb value written in these data is not due to a transcription mistake. In fact, this patient
went from 8.0 gm% to 6.5 gm% within 5 weeks of consultations (2 visits). We saw that the second time she
consulted, she has been treated for an infection. We previously saw in the review that infections contribute to
decrease the body’s iron store. Here is a perfect example. Others symptoms that have been frequently seen are
bodyache, cramps in legs, lower abdominal pain, etc. Most of them can be due to anemia. Vaginitis and fungal
infections are more likely to happen because anemia decreases the immunity.

Because the Mobile Clinic has stopped its functions it is sometime impossible to see the complete evolution
until the third trimester of pregnancy when iron and calcium supplementation are the most important
regarding increased needs in women. Fortunately, the hospital is still giving these medicine for free to pregnant
women who come to the clinic.
PART 4 - RECOMMENDATIONS FOR DEEPALAYA

One of our main aims at the beginning of this internship was to be able to give Deepalaya’s organization some recommendations from our observations. From our visits in the villages and all the time we have spent in the clinic, we are now able to give some brief advices on what would be important to do in the area deserved by Deepalaya to improve community health.

OUR INTERVENTIONS

Education is the basis of many factors contributing to anemia. While completing the report, we have noticed that it would be essential to improve education on health topics in villages. Thus we have chosen to do awareness on anemia in the villages to discuss about the causes, symptoms, consequences, prevention and treatment of anemia. Our aim was to increase their knowledge about this issue and make them aware of good habits, so that they can hopefully improve their health. Anemia also results from many socioeconomic factors that depend on the Government of India, but enhancing self reliance amongst villagers is one of the most efficient way to solve the problem. For this purpose, we already have made 2 posters onto which pictures can easily be understood by illiterate people. In this way we went to “Kiruri” village, where we had a meeting with villagers in an old Anganwadi and we have made a presentation on these topics and then, we discussed with them and answered their questions. About 25 to 30 women attended our presentation and many of them brought their children with them. Men were not allowed to come to this meeting so that women could feel free to ask any questions and to talk about women topics such as family planning methods and pelvic infections. In the second village, “Bootlaka”, around 15 to 20 women and children attended the awareness. Presentation lasted for around 25 to 30 minutes and during this whole time, they were paying much attention to us and told us that they had learned much about anemia, as only one of them knew this illness when we first asked this question before our presentation. We hope that they will share what they have learned between each others in the villages.

As most of women from our survey didn't know about anemia or "khoon ki kami", we first introduced the topic by explaining that it is due to lack of iron in the blood, then we have listed the main symptoms (headache, pain in legs, fatigue, weakness, dizziness, pallor of nails, conjunctive and gums, etc.) so that they could know when to visit the doctor. We also discussed about the consequences on health to make them aware of the importance of this illness. Then we explained the main causes and taught them how in their daily life they could get good habits that would help prevent this illness, including rich sources of iron in food, family planning methods, hygiene (footwear, boiling water and washing hands) and encouraged them to go to clinic for at least 3 ANC check-ups, to get free iron tablets and to deliver. Knowing the prevalence and outcomes of this illness, we believe that awareness should be done periodically in different villages by health workers in order to reach as much people as possible.

RECOMMANDATIONS FOR IMPROVEMENT OF HEALTH AMONGST ANEMIC MARRIED WOMAN IN GUSBETHI

Iron supplementation is an important part of control of iron deficiency anemia. Priority should be given on targeted groups that are more likely to suffer from deficiency and that would benefit the most from iron supplementation. Because iron needs are highest during childhood, pregnancy and postpartum time, daily iron supplementation should be provided to these groups.

Therefore, systematic prescription of free iron tablets to every pregnant woman should be continued through ANC given in the clinic. At least two Hb tests should be done during the prenatal cares, one at the beginning and one at the end of pregnancy, to show the evolution of blood hemoglobin and adjust the iron supplementation if
needed. Iron tablets should be taken after pregnancy if anemia is still present in post-partum, as lot of blood is lost during delivery. Hb should also be measured in PNC and iron supplementation continued if needed.

This program wouldn't be successful if not combined to other measures to control iron deficiency in the population. The importance of antenatal and postnatal cares should be promoted. Health workers should be trained to educate patients about the aim and the appropriate way to take these tablets. Awareness in the villages through mobile clinic should be continued by health workers. During these meetings, information on nutrition should be given, explaining good ways to cook food to keep as much nutrients as possible, choosing food containing great amounts of iron and reducing food that contain products that might inhibit iron absorption such as tea especially during pregnancy. Information on prevention of different infectious diseases (parasites, hookworms and malaria) should be given as well in the way that villagers would be able to change some habits, such as wearing footwear all the time. In this way, personal hygiene and hygiene of food should also be promoted. An effective way to drink water should be promoted. Here are some advices that could be given:

- Boiling water for 10-20 minutes is an efficient way to kill pathogens
- Clean sanitary buckets should be used to carry water from the well.
- Avoiding pollution with excreta, solid or liquid waste and living animals within a 15 m area surrounding the tube well. The top of the Tube-Well should always be covered.

Teaching villagers about the symptoms and the consequences of anemia is also important to encourage them to visit the clinic.

Education about pregnancy is also a key part of controlling maternal anemia. Discussion about institutional delivery and family planning methods to improve birth spacing would be important in this population. Moreover, promoting ANC in the clinic is essential to iron supplementation program. A screening of the symptoms of anemia and its complications must be done at each time. Population should also be involved in this program and creating village women groups as well as training Dai are good ways to transfer health workers' knowledge to the villagers. A partnership with Anganwadi/ASHA of the village, when possible, would be favorable. Deepalaya should also encourage the intake of iron supplementation in young women, even before pregnancy to avoid anemia during pregnancy.

Another recommendation would be to promote the maintenance of the records by Deepalaya's hospital. For all women, pregnant or not, a Personal Health Register should be done and kept in the hospital with the files. For pregnant woman, an Antenatal Card would be prepared at the first examination, including a registration number corresponding to her file in the clinic, her identifying data, previous health history, medication given, information about any follow up, etc. A Postnatal card could also be done. This registration system could also be established for all patients, male or female, coming to the clinic. In this way, follow up of the patients would be better as the patient cannot lose his file and a long-term relation between the patient and the clinic services can be created.

Home visits during pregnancy are also to be promoted if possible because the mother is usually relaxed, more confident and receptive to the prenatal advices at home. This is also an opportunity for the health worker to watch the living conditions of the mother and to give counseling about the conditions observed. For example, the female health worker can instruct the woman how to properly cook her food or boil her water before drinking. While having the confidence of the woman, she could also talk about family planning methods and hygiene habits.

**RECOMMENDATIONS FOR IMPROVEMENT OF THE EFFICIENCY, THE SECURITY**
AND THE ACCESSIBILITY OF THE CLINIC IN GUSBETHI

MANAGEMENT OF MEDICAL WASTES

According to the ONU, the medical wastes are considered as the most dangerous wastes after the radioactive wastes. About 15 to 25% of them are contaminated and represent high risks for health. All around the world, use of medical stuffs is increasing but there is no more way to eliminate them. Nevertheless, we have been noticed that in Gusbethi clinic, used needles are thrown in the same waste bin as others medicals and non-medicals wastes. The risk of infection is thus increased, because anybody can hurt himself with these needles especially the sweeper while cleaning the clinic and even some patients. Our recommendation would be to use special containers (e.g. BioHazard boxes) that cannot be opened by anyone for used needles and these wastes should then be destroyed in the right way.

In the clinic, we have seen a machine that can grind and cut the needles after use, but it is not used by staff people because it is not always working. This is also a good option but needles box is more affordable and more secure to people in the clinic.

HUMAN RESOURCES AND ACCESSIBILITY OF THE CLINIC

For sure a recommendation to improve the efficiency of the clinic would be to get more staff but we know that because the clinic is located in a small village it is usually difficult to achieve.

We think that improving the access to the clinic would be very beneficial. With these roads conditions, the lack of electricity and the difficulties to villagers to get transportation up to the clinic, this is sometimes difficult to reach it. Transport service provided by Deepalaya from and to the clinic is an excellent way to overcome this problem and should be continued.

In the clinic we have also noticed that all X-Rays equipments are available and we think that partnership could be made with another Hospital, e.g. Tauru Hospital, to operate X-Rays in Gusbethi without hiring a radiologist. With the help of a technician who would come periodically to the clinic, X-Rays could be operated and then sent to Tauru Hospital to be read by the doctor.

Conclusion

From what we've learned of this research project, we can now say that in the area deserved by Deepalaya's health services in Gusbethi, a lot of factors contribute to the high rate of anemia in the area, as seen in overall India. Malnutrition, lack of iron in diet intake, blood losses and infections such as malaria, hookworms and parasites are responsible for a big part of the problem. The water access, lack of hygiene, family planning, education, non-utilization of footwear and open air defecation contribute to anemia. By preventive measures, outcomes on pregnancy such as low birth weight of the baby, maternal mortality, abortions and new-born mortality, postpartum hemorrhage and sepsis can be reduced. Otherwise, Deepalaya’s organization could improve the situation in Mewat’s district by improving the knowledge of the population about anemia; what is it? How to prevent it and to reduce it? Creating more awareness on anemia in the villages and give advices to the people about nutrition, hygiene, treatment of the water and family planning methods must constitute a good way to achieve this goal. Promotion of iron and calcium supplementation, regular antenatal care visits and hospital deliveries is also essential. With time and knowledge, everything is possible.
Special Thanks

We would sincerely like to thank all the Deepalaya’s staff for their help during all our internship, especially the health workers, the doctors and ANM staff who have been devoted for us. Every people's help, sincerity and smile contributed to make this report even more better. We know that as foreigners, people in the villages don't trust us so easily and the help of clinic members was very useful to get in touch with them and to translate for us. We would like to thank Deepalaya's organization to give the chance to interns like us, to live such a great experience while learning so much. Specials thanks must also be given to villagers who greatly accepted to answer with honesty to our questions and have welcomed us arms wide open in their houses. All the pictures showed in this report have been taken with permissions and have been generously given to us. Without all these people, nothing would have been possible.
Annex 1- Statistics of India: Table of content

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General information
The private sector accounts for more than 80% of total healthcare spending in India\textsuperscript{121}.

Hindus account for about 90 percent of the population in the state\textsuperscript{122}.

This is because more than 70 percent of population in Haryana still lives in the villages\textsuperscript{123}.

Hindus account for 80.5 % of the total population in India on the whole (ADB Report, 2009)\textsuperscript{124}.

Haryana has a skewed sex ratio of 861, and a literacy rate of 67.91 percent\textsuperscript{125}.

Nearly three quarters of the population (of India) still lives in rural areas, and as of 2004, an estimated 27.5% of
Indians were living below the national poverty line\textsuperscript{126}. 72 % of the population of India is living in rural areas\textsuperscript{127}.

Education

Currently married non-literate women represent 38.8 % of total population of Haryana compared to 43.4 % in rural areas and currently married women with 10 or more years of schooling represent 25.9 % total vs 19.9

\textsuperscript{121} Reference 5- p.3
\textsuperscript{122} Reference 18
\textsuperscript{123} Reference 18
\textsuperscript{124} Reference 18
\textsuperscript{125} Reference 18
\textsuperscript{126} Reference 18
\textsuperscript{127} Reference 2- p. 800
Age at marriage

“In India some demographers have estimated that if marriages were postponed from the age of 16 to 20-21, the number of births would decrease by 20-30%.”\(^{129}\)

“The national average for age at marriage is 20.5 years (...) The exceptions are the rural areas, where a substantial proportion of marriages continue to take place when the girl is around 16 years of age.”\(^{130}\)

Average age at marriage in Haryana is 19.7 years old for total population vs 19.2 years old in rural areas\(^{131}\).

In Haryana, proportion of girls who get married before 18 years old represents 15.9 % (18.5 % in rural areas)\(^{132}\).

Fertility rate

“(In India) Total fertility rate has come down from 6 children per woman to slightly more than 3 children in 1999.”\(^{133}\)

According to MCH data, total fertility rate in India is 2.8 in 2007\(^{134}\).

According to the results of the NFHS-3, other factors contributing to low fertility rate are education, high economic status, good nutritional status, better health conditions, housing, family planning, etc.\(^{135}\)

Family planning

Family planning method in Haryana: 62.0 % of total population are using any kind of method and 61.8 % in rural areas. 2.8 % are using pills (2.6% in rural areas)\(^{136}\).

At country level, for years 2000-2007, couple protection rate by any family planning method is 56% according to MCH\(^{137}\).

ANC

In Haryana, 87.3 % of mothers have received any ANC (85.2% in rural areas). 51.9% of mothers have received 3 or more ANC (47.2 % in rural areas)\(^{138}\).

Studies show that antenatal care coverage for years 2000-2007 in India are 74 % (at least once) and 37 % (at

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128 Reference 7 p.3
129 Reference 2- p. 418
130 Reference 2- p.418
131 Reference 7- p. 3
132 Reference 7- p.3
133 Reference 8 - p.1
134 Reference 2- p. 478, table 11
135 Reference 2- p.418
136 Reference 7 - p.4
137 Reference 2- p.478, table 11
138 Reference 7- p.4
least four times\textsuperscript{139}.

Data from the Rapid Household Survey (RHS) 1998-99 indicate that at the national level 67.2 per cent pregnant women received at least one check up but only 10.6 per cent had three ante natal check ups\textsuperscript{140}.

According to NFHS-3 (2005-2006), 77\% of women in overall India get at least one antenatal check-up and 50.7 \% of pregnant women get at least the recommended 3 antenatal check-ups (compared to respectively 73.4 \% and 50.1 \% in 2002-2004 by DLHS-3)\textsuperscript{141}.

**Iron supplementation**

In Haryana 29.0 \% of mothers and 28.1 \% in rural areas have consumed 100 IFA\textsuperscript{142}

According to NFHS-3, 22.3 \% of pregnant women in India in years 2005-2006 consumed IFA tablets for 90 days\textsuperscript{143}.

**Mortality indicators**

Maternal mortality (per 1000) in India in 2003 is 301, neonatal mortality is 37 in 2006\textsuperscript{144}.

Nearly 50 per cent of total deaths in the developing countries occur among children under 5 years of age as compared to less than 5 per cent in developed countries\textsuperscript{145}.

**Delivery**

Mewati district has less than 30 \% of home delivery, but 46, 9 \% of delivery are institutional in whole Haryana (42.2\% in rural areas).

Home deliveries represent 52.6 \% of total Haryana (57.4\% in rural areas) and 6.5 \% are conducted by skilled health personnel (5.8 \% in rural areas)\textsuperscript{146}

Delivery conducted by skilled personnel in India for year 2000-2007 represent 47 \% of all deliveries\textsuperscript{147}.

Institutional deliveries represent 39 \% of all deliveries in India in 2000-2007\textsuperscript{148}.

NFHS-3 in 2005-2006 for overall India\textsuperscript{149}.

\textsuperscript{139} Reference 2- p. 480, table 13
\textsuperscript{140} Reference 8- p.35
\textsuperscript{141} Reference 2- p.482, table 17
\textsuperscript{142} Reference 7- p.4
\textsuperscript{143} Reference 2- p.482, table 17
\textsuperscript{144} Reference 2- p. 478, table 11
\textsuperscript{145} Reference 2- p. 566
\textsuperscript{146} Reference 2- p. 478, table 11
\textsuperscript{147} Reference 2- p. 480, table 13
\textsuperscript{148} Reference 2- p. 478 table 11
\textsuperscript{149} Reference 2- p.482, table 17
Anemia

Anemia represented 19% (22% deaths due to IDA\textsuperscript{150}) of the causes of maternal mortality in 1998 according to the Family Welfare Survey\textsuperscript{151}.

Actually, almost 60-80%\textsuperscript{152} of pregnant women are anemic.

NFHS-3 results show that 55% of ever-married women 15-49 years old are anemic (39% mild, 15% moderate and 1% severe). Note that the three different levels for pregnant women are: mild (10.0-10.9 g/dl), moderate (7.0-9.9 g/dl) and severe (<7.0 g/dl).

In 2005, 45% of pregnant women were anemic\textsuperscript{153}. The highest level of moderate and severe anemia are found amongst pregnant women\textsuperscript{154}.

At least half of all ever-married women aged 15-49 years and adolescent girls are believed to have some degree of IDA. One recent study showed that the prevalence of iron deficiency anemia among both pregnant and lactating women is over 75% and that more than half of pregnant women and a third of lactating women are moderately or severely anemic\textsuperscript{155}.

According to the world bank data, 87% of pregnant women in India suffer from iron deficiency\textsuperscript{156}. About 50% of non-pregnant women and young children are estimated to suffer from anemia. It also increase the mortality of women because 19% of maternal deaths are due to anemia\textsuperscript{157}.

For instance, "surveys in different parts of India indicate about 50-60% of women belonging to low socio-economic groups are anemic in the last trimester of pregnancy."\textsuperscript{158}

Estimates from the World Health Organization report that from 35% to 75% (56% on average) of pregnant women in developing countries, and 18% of women from industrialized countries are anemic (1). However,

\textsuperscript{150} Reference 6
\textsuperscript{151} Reference 8- p. 35
\textsuperscript{152} Reference 2- p.800
\textsuperscript{153} Reference 6 p.1
\textsuperscript{154} Reference 8- p. 9
\textsuperscript{155} Reference 13- p. 20
\textsuperscript{156} Source: http://siteresources.worldbank.org/SOUTHASIAEXT/Resources/223546-1147272668285/undernourished_chapter_1.pdf (rapport world bank, p.5 table 1)
\textsuperscript{157} Reference 2- p.800
\textsuperscript{158} Reference 2- p. 452 (3)
many of these women were already anemic at the time of conception, with an estimated prevalence of anemia of 43% in nonpregnant women in developing countries and of 12% in women in wealthier regions.

**Immunization**

56% of infants are fully immunized (measles, DTP, Polio, BCG) in 2007 in India\(^\text{159}\).

The prevalence of low birth weight amongst newborns is 28 % in 2000-2007 in India\(^\text{160}\).

The prevalence of T.T. Injection amongst pregnant women in overall India in years 2000-2007 is 80 %\(^\text{161}\).

**Nutrition in India**

Vegetarianism varies from state to state, and its prevalence reaches 88% in Haryana\(^\text{162}\).

Unfortunately, these sources of iron that originate from animals are not frequently eaten by Indians because many of them are vegetarian. NHFS-3 shows that about the third of men and women never eat meat, chicken or fish as only 7 % of men and women eat these food products daily\(^\text{163}\). Vegetarianism varies from state to state, and its prevalence reaches 88% in Haryana, while it is less than 10 % in some other states\(^\text{164}\). Anemia has a lower level in women who eat fruits frequently\(^\text{165}\).

**Dietary intake**

36 % of women and 34 % of men are undernourished in overall India (BMI less than 18,5 kg/m\(^2\))\(^\text{166}\) 25.9 % of population are undernourished in Haryana.

47 % of the population of India is underweight in 2000\(^\text{167}\).

Chronic energy deficiency is usually indicated by a BMI of less than 18.5. More than one-third (36 percent) of women have a BMI below 18.5, indicating a high prevalence of nutritional deficiency. Nutritional problems are particularly serious for rural women, illiterate women, women from 'other' religions, scheduled-caste and scheduled-tribe women, working women who are not selfemployed and women who live in households with a low standard of living.\(^\text{168}\)

According to a recent FAO reports, about 15 per cent of the world's population has malnutrition, excluding

\(^{159}\) Reference 2- p. 478, table 11
\(^{160}\) Reference 2- p. 478, table 11
\(^{161}\) Reference 2- p 478, table 11
\(^{162}\) Reference 8- p.11
\(^{163}\) Reference 11- p. 59
\(^{164}\) Reference 11- p. 60
\(^{165}\) Reference 11- p. 11
\(^{166}\) Reference 11- p. 49
\(^{167}\) Reference 13- p. 9, table 3
\(^{168}\) Reference 8- p. 244-245
South of Asia composes about the third of this population. Undernutrition, a kind of malnutrition, is the condition which results from an insufficient food intake over an extended period of time. Its main victims are children under the age of 15, and those under 5 years old are hit the hardest (nearly 50 per cent of total deaths in the developing countries occur among children under 5 year of age as compared to less than 5 per cent in developed countries)\textsuperscript{170}.

**Sanitation in India**

If proper sanitation services are provided to the households, the risk of diseases can drop by 40\% (e.g. malnutrition, anaemia pr retarded growth by 60%)\textsuperscript{171}.

In India the coverage of sanitation in developed states is also not satisfactory. Taking example of Haryana, a state that ranks very high in terms of per capita income among the major states, almost half of the household are without latrine and bathroom facility. Further $\frac{1}{4}$ households are without connectivity to waste water drainage. The state is marked with a great amount of variation in coverage of sanitation across the districts\textsuperscript{172}.

**Electricity**

In Haryana, 92.4\% of population have electricity at home (90.5 in rural areas)\textsuperscript{172}

**Water access**

In Haryana, 96\% of total population has access to improved source of water (94.7 \% of rural areas)\textsuperscript{174}

As of 2003, it was estimated that only 30\% of India’s wastewater was being treated.\textsuperscript{9}\textsuperscript{175}

According to the country's Tenth Five-Year Plan, three-fourths of India’s surface water resources are polluted, and 80\% of the pollution is due to sewage alone.\textsuperscript{176}

As of 2003, it was estimated that only 30\% of India’s wastewater was being treated.\textsuperscript{9} Much of the rest—amounting to millions of liters each day—find its way into local rivers and streams\textsuperscript{177}.

**Latrines/toilet access**

Around 55\% of Indians (close to 600 million people) still do not have access to any kind of toilet(year). People
living in rural areas are affected the most as 74 % of rural population still defecate in the open\textsuperscript{178}

People from more than half of the households in the state still use open space for defecation\textsuperscript{179}.

"78 % of the people in rural areas use open fields for defecation. This practice has been used since a long time and is considered harmless. Latrines are considered by villagers as an alternative for urban areas where no field is available for defecation\textsuperscript{180}.

Nearly 77 percent of the households in the state are connected with drainage outlet for the disposal of waste water\textsuperscript{181}.

\textbf{Malaria}

Malaria is still an important health problem in India, as 27 % population lives in areas of high transmission and 58% in low transmission areas\textsuperscript{182}.

\textbf{Hook worms infections}

An estimated 55% of all Indians, or close to 600 million people, still do not have access to anykind of toilet. Among those who make up this shocking total, Indians who live in urban slums and rural environments are affected the most.

In rural areas, the scale of the problem is particularly daunting, as 74% of the rural population still defecates in the open.\textsuperscript{183}

A single gram of human excreta contains numerous viruses, bacteria, parasite-cysts and eggs of worms (WHO/UNICEF, 2006)\textsuperscript{184}.

\begin{itemize}
\item \textsuperscript{178} Reference 13- p. 9, table 3
\item \textsuperscript{179} Reference 18
\item \textsuperscript{180} Reference 2- p.598
\item \textsuperscript{181} Reference 18
\item \textsuperscript{182} Reference 2- p. 222
\item \textsuperscript{183} Reference 9- p.12
\item \textsuperscript{184} Reference 18
\end{itemize}
Annex 2- Questionnaire for the case studies

Case studies in Patheni and Gogjaka villages deserved by the mobile clinic  September 29th 2011

Identification :
Name :
Village :
Age :
GPAL :
N. of weeks :
Marital status :
Hb :

Food
Are you vegetarian?
How much water do you drink in a day?
How do you cook your food?
How do you have access to water?

Housing :
Do you have access to toilet/latrines?
Do you have electricity at home?

Infections
Do you/did you have during your pregnancy, symptoms of malaria/parasite infection such as fever, diarrhea, abdominal pain, worms in your swoon?
Have you ever had any pelvic pain or vaginal discharge?

Habits :
Do you do physical work?
How many hours do you sleep everyday?
Do you always wear footwear?

What is your educational level?
At what age did you get married?

Gynecologic history :
Have you ever had any pelvic pain or vaginal discharge?
At what age did you have your first menses? Have your menstruations always been regular? Did you have spotting? Did you have any blood loss during your pregnancy?

How many children do you have? Did they get full vaccination?
Have you ever use any family planning method?
Are you presently breastfeeding?
When was your last pregnancy? Did you deliver at home or in an hospital?
Are you pregnant? How many weeks?
Did you receive any antenatal care?
Did you take iron tablets?
Did you get health cares/medicine out of the deepalaya's clinics? Have you seen a religious leader/dai?
Do you plan to deliver at home or in an hospital?
Do you plan to visit any health facilities when the mobile clinic is done? (1st of October)

Have you changed anything in your diet during your pregnancy? Explain.

Did you have symptoms of anemia, such as headache, fatigue during your pregnancy?

Physical examination:
- weight
- Blood pressure
- Height
- weight of children
Annex 3- Main Questionnaire on anemia for married women from Patuka, Kiruri and Gusbethi
Informations

Date of the interview
Context of the interview (C=Clinic, H=Home)

Village
Kaunse gaon se aayi ho

Name w/o Name
Apka nam kya hai?

Age
Kaap kitne saal ke ho

Religion (m=muslim, h=hindou, o=other)

Age at marriage
Jab apki shadi hui thi tab apki umar kitne thi

GPAL
Aapke kitne bacche hain, kya coi abortion to nahi hua

Did your children get full vaccination? From where?
Kya apne baccho ko sare thike lag wai hain, apne baccho ko thike kahan lag wai (agan wadi-small clinic)

Are you pregnant, if so, number of weeks
Kya aap abhi pet se ho, agar ho to kaunsma mahima chal raha hai

Educational level (last grade completed)
Kahan tak parde ho/ kahan tak padhati ki hai

Number of siblings (living and dead)
Aapke kitne bhai-behan hai

Information on previous visits, if any

Have you ever use any family planning method?
Kya aap oss badhane ki dawa le rahe ho (mala-D, saheli)

How many children do you want?

Are you presently breastfeeding?
Kya aap abhi apne baccho ke apna dud pilate ho

When was your first pregnancy?
Jab aapki shadi hui thi tab apki umar kitne thi

When was your last pregnancy? (spacing births)
Ape sabse chote bacche ki umar kitne hai

Did you deliver at home(h) or in an hospital(i)?
Kya apki japa (delivery) gar par hui thi ya phir hospital mein

Do you plan to deliver at home or in an hospital?

Did you receive any antenatal care for your current pregnancy?
Kya apko coi ANC di gai hai ya nahi

Did you take iron/calcium tablets? / Would you prefer iron tonic?
Kya aap Calcium / Iron tablets aur iron syrop le nahi ho (le the ho) ya nahi.

Have you visited any religious leader/doctors outside of Deepalaya's And governmental health facilities? If so, have you taken any medicine?
Kya apne Deepalaya ki alawa kahi aur apna check-up karwaya hai (haan : to kaunsma hospital mein)

How many times have you/will you visit this clinic during your pregnancy?
Jab aap pregnant ho the ho to tum clinic mein kitne bar check-up karane aate ho

Did you have any blood loss during your pregnancy?

Pregnancy ke doran apka khun to nahi gaya

GYN: Have you ever had any pelvic pain or vaginal discharge? (infection/vaginite)

At what age did you have your first menses?
Jab apko pehle bar mahina hue the to apke umar kitne thi

Have your menstruations always been regular?

Did you have spotting?

Are you vegetarian? (yes=ve; no=eat meat)
Kya aap meat khate ho ya nahi

Have you changed anything in your diet during your pregnancy? Explain.
Kya aap jab pet se the to apne apni diet mein kuch extra (zyada) lia tha, example dud, hare sabzi, dahi...

How do you get access to water?
Aap pari kahan se let the ho, (water pump, bring from other villages, public pump...)

How much water do you drink in a day?
Aap ek din mein kitna parre haranch liter/glass aur zyada

Do you drink tea everyday?
Kya aap chai roj pite ho

Do you have access to toilet/latrines? (o=open air defecation; l=latrines/Toilets)
Kya aap ke ghar mein latrine hai ya phir bahar jahre ho

Do you have electricity at home?
Kya aap ke ghar mein bijili aati hai

Do you/did you have during your pregnancy, symptoms of malaria/parasite infection

Such as fever, diarthea, abdominal pain, worms in your swoon?

Do you have physical work?
Aap ek din mein kitne ghar te sote ho

Do you always wear footwear? (yes=f; no=n)
Kya aap hamesha chapal pehen kar rakte ho

Do you have or have you ever had during your pregnancy, symptoms Like headaches, fatigue, weakness, diziness, numbness/coldness in hands and feet, chestpain, rapid/irregular Heartbeat, shortness of breath, etc...??
Kya apko sif ghar ka kam karte ho ya phir khet (field) kabhi kam karte ho

Do you do so much work per day?
Aap ek din mein kitne ghar te sote ho

Do you always wear footwear? (yes=f; no=n)
Kya aap hamesha chapal pehen kar rakte ho

You have or have you ever had during your pregnancy, symptoms Like headaches, fatigue, weakness, diziness, numbness/coldness in hands and feet, chestpain, rapid/irregular Heartbeat, shortness of breath, etc...??

Do you know what is anemia or lack of blood?
Kya apko anemia/klooon ki kami ke baj mein pata hai

If anemia is known, where have you learned it?
Kya apne Deepalaya ke swadhiya (swasthain) kendra mein gaye ho

Do you know what cause anemia? How to prevent?
Ab hamapka bajen aur height lenge to aap yahan as jaiye

Check for signs of anemia (pale nails, gums, bulb conjunctive)

Weight (kg)

Height (m)

BMI for pregnant women
<table>
<thead>
<tr>
<th>Context of interview</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of interviews in the clinic</td>
<td>17.0c</td>
</tr>
<tr>
<td>Number of interviews in the village</td>
<td>13.0h</td>
</tr>
<tr>
<td>% of interviews in the clinic</td>
<td>56.7</td>
</tr>
<tr>
<td>% of interviews in the villages</td>
<td>43.3</td>
</tr>
<tr>
<td>Pregnant women</td>
<td></td>
</tr>
<tr>
<td>Number of pregnant women</td>
<td>7.0y</td>
</tr>
<tr>
<td>Number of non pregnant women</td>
<td>15.0h</td>
</tr>
<tr>
<td>Number of women not in age of pregnancy</td>
<td>8.0NA</td>
</tr>
<tr>
<td>% of pregnant women</td>
<td>23.3</td>
</tr>
<tr>
<td>% of women not in age of pregnancy</td>
<td>26.7</td>
</tr>
<tr>
<td>% of women in age of pregnancy</td>
<td>73.3</td>
</tr>
<tr>
<td>Breastfeeding</td>
<td></td>
</tr>
<tr>
<td>Number of pregnant women presently breastfeeding</td>
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</tr>
<tr>
<td>% of pregnant women breastfeeding</td>
<td>14.3</td>
</tr>
<tr>
<td>Number of breastfeeding mother</td>
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</tr>
<tr>
<td>% of breastfeeding women</td>
<td>30.0</td>
</tr>
<tr>
<td>Age</td>
<td></td>
</tr>
<tr>
<td>Average age</td>
<td>32.0</td>
</tr>
<tr>
<td>Youngest woman</td>
<td>19.0</td>
</tr>
<tr>
<td>Oldest woman</td>
<td>60.0</td>
</tr>
<tr>
<td>Religion</td>
<td></td>
</tr>
<tr>
<td>Number of muslism women</td>
<td>29.0m</td>
</tr>
<tr>
<td>Number of hindu women</td>
<td>1.0h</td>
</tr>
<tr>
<td>Number of women from other religions</td>
<td>0.0o</td>
</tr>
<tr>
<td>% of Muslims</td>
<td>96.7</td>
</tr>
<tr>
<td>% of Hindus</td>
<td>3.3</td>
</tr>
<tr>
<td>% of other religion including</td>
<td></td>
</tr>
<tr>
<td>Christianism, sikkhism, jainism</td>
<td>0.0</td>
</tr>
<tr>
<td>Age at marriage</td>
<td></td>
</tr>
<tr>
<td>Average age</td>
<td>16.9</td>
</tr>
<tr>
<td>Age of youngest</td>
<td>14.0</td>
</tr>
<tr>
<td>Age of oldest</td>
<td>21.0</td>
</tr>
<tr>
<td>Number of women who got married before 18 years old</td>
<td>19.0y</td>
</tr>
<tr>
<td>% of women who got married before 18 years old</td>
<td>63.3</td>
</tr>
<tr>
<td>Educational level</td>
<td></td>
</tr>
<tr>
<td>Average of last grade completed</td>
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</tr>
<tr>
<td>Number of women know about anemia (hoon ki kami)</td>
<td>13.0y</td>
</tr>
<tr>
<td>Number of women that have attended</td>
<td></td>
</tr>
<tr>
<td>Any Deepalaya’s health awareness</td>
<td>4.0y</td>
</tr>
<tr>
<td>Family</td>
<td></td>
</tr>
<tr>
<td>Average number of siblings</td>
<td>6.7</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>------------------------------------</td>
<td>-------</td>
</tr>
<tr>
<td><strong>Pregnancy</strong></td>
<td></td>
</tr>
<tr>
<td>G</td>
<td>5.7</td>
</tr>
<tr>
<td>P</td>
<td>4.7</td>
</tr>
<tr>
<td>A</td>
<td>0.6</td>
</tr>
<tr>
<td>% of women who ever had any abortion</td>
<td>36.7</td>
</tr>
<tr>
<td>L</td>
<td>4.6</td>
</tr>
<tr>
<td>D</td>
<td>0.3</td>
</tr>
<tr>
<td>Average age of FIRST pregnancy</td>
<td>19.5</td>
</tr>
<tr>
<td>Average age of LAST pregnancy</td>
<td>28.0</td>
</tr>
<tr>
<td>Average time between each pregnancy (years)</td>
<td>1.5</td>
</tr>
<tr>
<td>Number of home delivery for last pregnancy</td>
<td>19.0h</td>
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<tr>
<td>Number of institutional delivery for last pregnancy</td>
<td>8.0i</td>
</tr>
<tr>
<td>% of women who had only home delivery</td>
<td>70.4</td>
</tr>
<tr>
<td>% of women who had any institutional delivery in their life</td>
<td>29.6</td>
</tr>
<tr>
<td>Average age at first menses</td>
<td>13.7</td>
</tr>
<tr>
<td>Number of women who have ever used any family planning method</td>
<td>3.0y</td>
</tr>
<tr>
<td>% of women who have ever used any family planning method</td>
<td>10.0</td>
</tr>
<tr>
<td>Number of women who have ever taken iron tablets</td>
<td>10.0y</td>
</tr>
<tr>
<td>Number of women who have never taken any iron tablets</td>
<td>17.0n</td>
</tr>
<tr>
<td>% of women who have taken iron tablets</td>
<td>37.0</td>
</tr>
<tr>
<td>Number of women who have received any ANC during last pregnancy</td>
<td>11.0y</td>
</tr>
<tr>
<td>% of women who had any ANC during last pregnancy</td>
<td>36.7</td>
</tr>
<tr>
<td>Number of women who had blood loss during pregnancy</td>
<td>8.0y</td>
</tr>
<tr>
<td>Number of women who ever had vaginal discharge</td>
<td>4.0v</td>
</tr>
<tr>
<td>Number of women who ever had pelvic pain</td>
<td>3.0p</td>
</tr>
<tr>
<td><strong>Habits and sanitation</strong></td>
<td></td>
</tr>
<tr>
<td>Number of vegetarian women</td>
<td>3.0v</td>
</tr>
<tr>
<td>Number of women eating meat</td>
<td>27.0m</td>
</tr>
<tr>
<td>% of vegetarian women</td>
<td>10.0</td>
</tr>
<tr>
<td>Number of women using tube well for water supply</td>
<td>17.0t</td>
</tr>
<tr>
<td>Number of women using water supply</td>
<td>5.0s</td>
</tr>
<tr>
<td>Number of women using hand pump</td>
<td>6.0h</td>
</tr>
<tr>
<td>% of tube well</td>
<td>56.7</td>
</tr>
<tr>
<td>% of women using water supply</td>
<td>16.7</td>
</tr>
<tr>
<td>% of hand pump</td>
<td>26.7</td>
</tr>
<tr>
<td><strong>Hygiene</strong></td>
<td></td>
</tr>
<tr>
<td>Number of women practicing open air defecation</td>
<td>21.0o</td>
</tr>
<tr>
<td>Number of women having access to latrines/toilets</td>
<td>9.0l</td>
</tr>
<tr>
<td>% of open air defecation</td>
<td>70.0</td>
</tr>
<tr>
<td>Number of women wearing footwear at all time</td>
<td>20.0y</td>
</tr>
<tr>
<td>Number of people not wearing footwear at all time</td>
<td>9.0n</td>
</tr>
<tr>
<td>% of women wearing footwear all the time</td>
<td>69.0</td>
</tr>
</tbody>
</table>
### Health

<table>
<thead>
<tr>
<th>Category</th>
<th>Value</th>
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</thead>
<tbody>
<tr>
<td>Number of living children having full immunization</td>
<td>40.0</td>
</tr>
<tr>
<td>% of children having full immunization</td>
<td>29.0</td>
</tr>
<tr>
<td>Number of women having any signs of intestinal/parasital infection</td>
<td>15.0y</td>
</tr>
<tr>
<td>(% fever, abdominal pain, diarrhea, worms in her swoons)</td>
<td></td>
</tr>
<tr>
<td>% of women having any of these symptoms/signs</td>
<td>60.0</td>
</tr>
<tr>
<td>Number of women having any symptoms of anemia</td>
<td>20.0y</td>
</tr>
<tr>
<td>% of women that have or had any symptoms of anemia</td>
<td>66.7</td>
</tr>
<tr>
<td>Number of women who have never visited anything</td>
<td>6.0n</td>
</tr>
<tr>
<td>Number of women who have only visited Deepalaya services</td>
<td>16.0y</td>
</tr>
<tr>
<td>% of women who depend upon Deepalaya to get health care services</td>
<td>66.7</td>
</tr>
<tr>
<td>Number of women who had ANC during their last pregnancy</td>
<td>11.0y</td>
</tr>
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</table>

### Home

<table>
<thead>
<tr>
<th>Category</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of women having electricity at home</td>
<td>26.0y</td>
</tr>
<tr>
<td>Number of women doing physical work</td>
<td>21.0y</td>
</tr>
<tr>
<td>% of women doing physical work</td>
<td>70.0</td>
</tr>
<tr>
<td>Average number of hours of sleep per day</td>
<td>7.2</td>
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</tbody>
</table>

### Physical examination

<table>
<thead>
<tr>
<th>Category</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of women having any sign of anemia</td>
<td>14.0y</td>
</tr>
<tr>
<td>% of women having any signs of anemia</td>
<td>46.6666666667</td>
</tr>
<tr>
<td>Average BMI</td>
<td>19.2</td>
</tr>
<tr>
<td>Number of BMI under 18.5</td>
<td>12.0y</td>
</tr>
<tr>
<td>% of underweighted women (BMI under 18.5%)</td>
<td>52.2</td>
</tr>
</tbody>
</table>

---

**Annex 4- Data from the mobile clinic**
<table>
<thead>
<tr>
<th>Patient no</th>
<th>delta Hb</th>
<th>Number of weeks of iron supplementation</th>
<th>Average Hb For this period</th>
<th>Type of Anemia</th>
<th>G score</th>
<th>Age</th>
<th>Delta weight (kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0</td>
<td>8</td>
<td>7.9 m</td>
<td>2</td>
<td>20</td>
<td>2</td>
<td></td>
</tr>
<tr>
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Note: Types of anemia correspond to s=severe, m=moderate, l=mild
[http://dasra.org/IPF/sites/default/files/NourisingOurFuture-ExecutiveSummary.pdf] -
13. Chapter 1- What are the dimensions of the undernutrition problem in India?
15. WORLD BANK DATA. India: Undernourished Children : A call for Reform and Action

