Every year, IIPS undertakes many research studies on a number of themes related to population and health at the state and national levels using its own resources. The **'Research Brief Series'** is a new initiative by the Institute to provide an opportunity to the faculty, Ph.D. students and visiting fellows to quickly disseminate the important findings of their research studies before they are published as a research report or in a scientific journal. The authors of the Research Brief look forward to receive feedback from readers that could be helpful in revising the larger study report.

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CAUSES OF ANAEMIA AMONG WOMEN IN WEST BENGAL

Sayeed Unisa, Aparajita Chattopadhyay and Tarun Kumar Roy

Introduction

Anaemia is a broad term applied to the condition in which there is inadequate or defective formation of haemoglobin or defective maturation and formation of red blood cells (Swaminathan, 1985). The most common and the most severe type of anaemia is iron deficiency anaemia, which basically means the body is running low on iron. Iron deficiency affects a significant part of the population in nearly every country in the world (WHO, 2001; Nynke, 1998). The prevalence of iron deficiency varies greatly according to host factors: age, gender, physiological, pathological, environmental and socioeconomic conditions. In persons with severe anaemia deficiency, a condition called high-output heart failure may develop, where the heart has to work hard to provide enough oxygen to the brain and other internal organs. Among women, iron deficiency anaemia during pregnancy increases prenatal risks for mothers and neonates; and also increases the overall infant mortality. If anaemia is left untreated symptoms will get worse and one may become very tired and weak, and may develop angina or suffer with leg pains while walking. The body's ability to fight infection may also be weakened, so one may pick up infections more easily.

Iron deficiency anaemia is a major public health problem in developing countries, including India. Commonly, iron loss occurs through the gastrointestinal tract, skin, genitourinary tract, and during menstruation and pregnancy. Ravages of poverty, illiteracy, poor environmental sanitation, tropical weather and large prevalence of intestinal worm infestations have been the major causes for the prevalence of iron deficiency anaemia (Reddy, 2004). In India, fifty-two percent of women have some degree of anaemia, which is in reality a very large public health concern. Majority of the women are anaemic in ten states of India, and anaemia is particularly evident in the eastern region of the country consisting of Bihar, Orissa and West Bengal. It is a matter of concern that in these areas prevalence of anaemia is clustering, and this perhaps may be an area-specific problem. Clustering of cases in this region suggests that this deficiency is not only related to individual health problems but also to the availability and adequacy of iron rich food in this region. Also, this may be due to the mode of cooking in this region, which may be destroying the iron content in the food. Therefore, there is an urgent need to examine the iron intake, the availability of iron rich food and the mode of cooking in order to understand the nature of anaemia among the population. A community level study in the area where the level of anaemia is higher will be helpful from the policy and programme perspective.

Objectives of the study

- To asses the prevalence of iron deficiency anaemia in the selected villages.

- To examine the pick up rate of anaemia by different methods; syndromic approach, low cost method and gold standard method.

- To examine the relationship between demographic events and anaemia.

- To assess the menstrual blood loss, other forms of blood loss and the level of anaemia among women.

- To understand the lifestyle of women and to examine its association with anaemia, and

- To examine the nutrient contents of the food consumed by the women and the method of cooking of food and its association with anaemia.

Sampling

Anaemia level was examined for all the Primary Sampling Units (PSUs) of West Bengal in National Family Health Survey-II (1998-99). Villages which have more than two-third women suffering from any kind of anaemia were identified as case villages. Villages with one-third or fewer women who were suffering from any degree of anaemia were identified as control villages. As the prevalence of anaemia was found universal in most of the districts of West Bengal as per NFHS-II, only five districts which were in proximity with each other had been purposively selected for logistic convenience. From each selected district, one case village and one control village were selected. The names of the selected districts are Howrah, Hooghly, Bardwan, Nadia, 24 Pargana (North and South). In case of South and North Parganas, PSUs were not many, and hence one case village from North 24 Parganas and one control village from South 24 parganas were selected. From each selected villages 50 households were selected by systematic sampling. From each selected household all the women in the reproductive ages (15-49) were interviewed. A total of 529 households were covered and a total of 559 ever married women in the age-group of 15-49 were interviewed.

Sample Characteristics

The respondents comprised of mainly currently married women (96 percent) living with their husbands and most of them are in the reproductive age group. Nearly 45 percent of the women are illiterate. Most of the head of the households are daily wageworkers (36 percent). Sixty-three percent of the women are Hindus and 37 percent are Muslims. About 60 percent of the women were married before attaining the legal minimum age at marriage of 18 years. The villages are mainly composed of *kachcha* houses. Most of the households have a medium standard of living (53 percent).

Prevalence of Anaemia

Three levels of severity of anaemia have been identified - mild anaemia (10.0 - 10.9 g/dl for pregnant women and 10.0 - 11.9 g/dl for non pregnant women), moderate anaemia (7.0 - 9.9 g/dl), and severe anaemia (less than 7.0 g/dl). Ninety four percent of women have anaemia in the study sample. A total of 49 percent women are moderately anaemic, and 45 percent are mildly anaemic and less than one percent women are severely anaemic. A comparison of two methods of haemoglobin measurement is done to explore the possibility of using a less costly method in the field against gold standard. Cyanmethemoglobin method (CYAN-MATH) - laboratory method by trained pathologist is used as gold standard. It serves as a reference for comparison and standardization of other methods.

Fig 1: Anaemia among respondents (N=444)
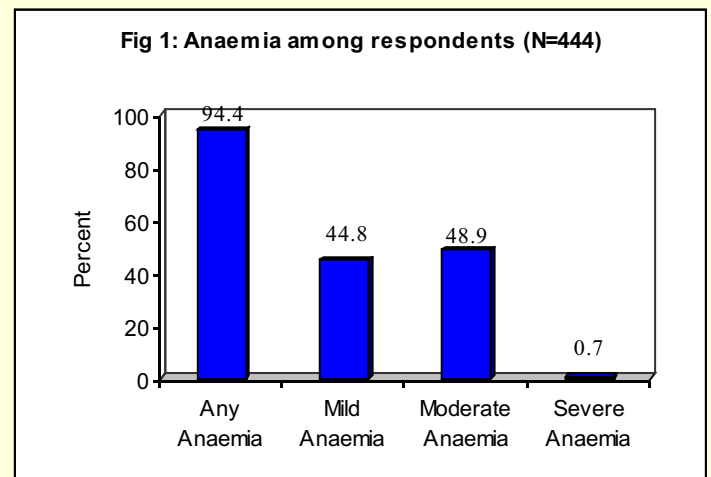
In this procedure, a fixed quantity of blood is diluted with a reagent (Drabkins solution) and haemoglobin concentration is determined after a fixed time interval in an accurate-well calibrated photometer. Another method, which is called the Helliges method, where a few drops of blood is collected after a little pricking on the finger and the blood is tested for anaemia immediately after its collection (screening test - less costly). Correlation between Cyan-math and Helliges haemoglobin readings is found to be 0.889, which is quite high. Other indicator of agreement of these two methods is examined by considering the capability of identification of severe and moderate anemia (high risk level) among women by Helliges method (screening method) of blood testing. Sensitivity and
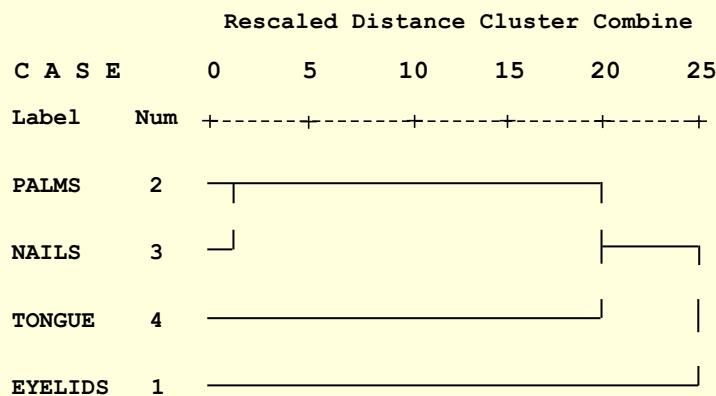
specificity of this method is found as 84.5 and 90.4 percent respectively. Hence, it may be emphasised that Helliges method can be used in resource poor countries for identification of high risk group i.e. severe anaemia among population in field situations.

Anaemia levels by Colour of Conjunctivae, Palms, Nails, and Tongue

Prevalence of anaemia by clinical signs namely pallor of eyelids, palms, nails, and tongue are examined. Cluster analysis is carried out to study the co-existence of clinical signs among women (Figure 2). It is interesting to note that pallor of palms and nails (clinical signs) are linked very closely with shortest distance on a distance line. At the second stage, pallor of palms and tongue are forming cluster followed by eyelids in the third stage. Dendrogram and distance measures show clear clustering of clinical signs.

Figure 2: Hierarchical Cluster Analysis of clinical signs

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Dendrogram using Average Linkage (Between Groups)

                Rescaled Distance Cluster Combine

C A S E     0     5     10    15    20    25
Label   Num +------+------+------+------+------+

PALMS    2       ┌──────────────────────────┐
                 │                          │
NAILS    3     ──┘                      ┌───┴───┐
                                        │       │
TONGUE   4     ─────────────────────────┘       │
                                                │
EYELIDS  1     ──────────────────────────────────┘
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To examine the relationship between clinical signs and anaemia, we have carried out agreement analysis in comparison to gold standard (CYAN-MATH) method. Positive clinical signs are considered here as any pallor of eyelids, palms, nails and tongue, and if tested against severe to moderate anaemia by gold standard. Identification of mild anaemia by clinical sign will be difficult and also it is not a major problem from the point of view of public health programme. Sensitivity and specificity along with contingency coefficients are calculated. Any clinical sign which has high sensitivity and specificity is considered good for identification of severe to moderate anaemia among women. Sensitivity is highest for eyelids but specificity is lowest, whereas for all other signs, sensitivity is found lower than eyelids but specificity is much higher than eyelids. Combined value of sensitivity and specificity is highest for palms followed by tongue.

Anaemia after Iron Supplementation

Assessment of iron deficiency anaemia is possible only by multiple tests. Further iron related tests do not correlate closely with one another and also involved high cost. One established approach to the diagnosis of iron deficiency in population, particularly in large-scale surveys and resource poor countries, involves monitoring the changes in haemoglobin level after oral supplementation. In the present study also, iron supplement method is used to examine iron deficiency in the sample women. A follow-up of 352 women whose haemoglobin level was less than 12g/dl in the baseline survey was carried out after one month of giving them Iron tablets. After iron supplementation for one month, 63 percent of women shown improvement and 2.6 percent are at the same level. Bar diagram of follow-up survey shows significant improvement in level of haemoglobin over baseline survey (Figure 3).

The following conclusions are drawn from the study:

- Level and pattern of anaemia is similar in both the case and control villages.

- Ninety-four percent of women are suffering from different levels of anaemia in the sample. One out of every hundred women is suffering from severe anaemia.

- As our clinical test was statistically significant for sensitivity (84.5%) and specificity (90.4%), we affirm that low cost anaemia detection test may be used at community level to estimate the prevalence of anaemia.

- Pallor of palm is found most significant clinical diagnostic sign followed by tongue and nails. Sensitivity and specificity of these clinical signs for detection of moderate to severe anaemia is good. This has been achieved by the rigorous training of investigators. Hence, at sub-centre level ANM can use these signs to identify severe anaemia cases in the villages.

- In the follow-up survey, haemoglobin level has increased in substantial number of cases (63 percent) after iron supplementation. This indicates that women of the surveyed village are suffering from iron deficiency anaemia.

- Increase in the hours of work (five hours and above), and increase in the nature of household work from mild to hard is positively associated with a rise in the anaemia levels from moderate to severe.

Fig 3: Distribution of women by Haemoglobin level before and after iron supplementation
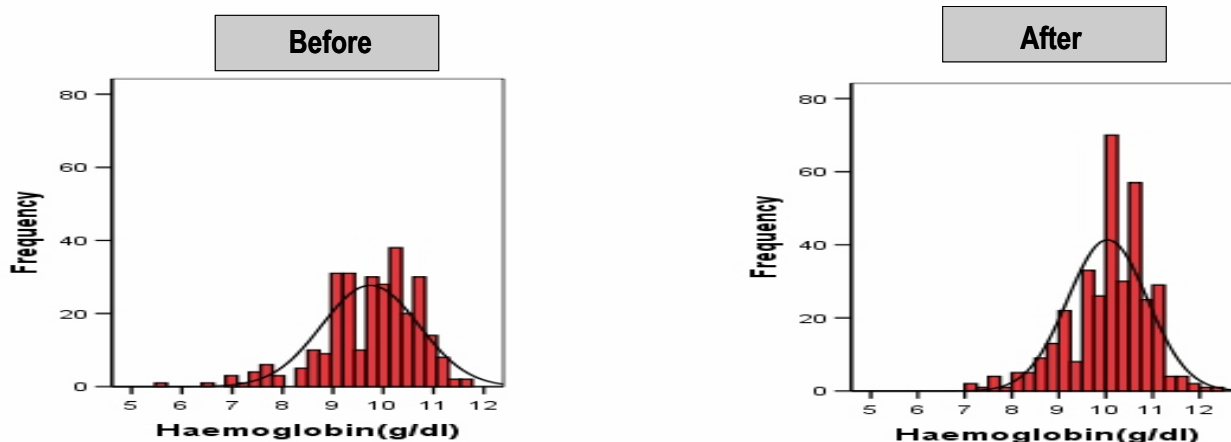
- Heavy blood loss during menstruation, feelings of tiredness with severe back pain and clotting of blood during menstruation are having a positive association with higher levels of anaemia.

- Women who have had three and more births seem to be more anaemic compared to those who have had less than three births. Women whose last delivery was a caesarian section are found to be more anaemic.

- Currently breast-feeding women are found to be more anaemic.

- Higher is the calorie intake, lesser is the propensity to be anaemic.

- Among those who are consuming lemon, *amchur/imly/ amla* daily or at least once a week, a good proportion of them are not severely anaemic compared to those who are irregular in vitamin C consumption.

In resource poor settings clinical signs should be regularly used to screen every women to identify high-risk subjects before the onset of life threatening complications. It is therefore necessary to have basic low-cost pathological testing facility at every Sub center. Iron folic acid supplementary medicine can also be given to those who are suffering from severe anaemia. The basic reason for high prevalence of anaemia in the study area is the poor nutritional status of women, their reproductive health problems and the non-scientific method of cooking. In rural Bengal, grains, vegetables and fruits are available adequately. What is lacking is the awareness among people about anaemia and of proper knowledge to prevent it. Anaemia can be prevented to a great extent if proper knowledge is disseminated to the members of households.

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