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# *Anemia in Pregnancy: Impact of Iron Supplementation, Deworming, and IEC*

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## *I. Background:*

The prevalence of anemia among pregnant women in various developing countries ranges from 35% to 75% (WHO 1992). Among the countries studied, the prevalence of anemia was highest in India. The Rural Unit for Health and Social Affairs (RUHSA) Department of Christian Medical College and Hospital in Vellore, Tamil Nadu has been providing maternal and child care as part of its comprehensive health and development program since 1977. In working to increase the awareness of women on health related issues, RUHSA realized the need to address anemia within the population of pregnant women and adolescent girls in its catchment area.

In an effort to assess anemia prevalence and implement a pilot project to reduce iron depletion and prevent anemia, an intervention was developed to measure the effectiveness of iron supplementation, deworming, and IEC. The intervention was assessed using a two-group pre/post-test experimental study design. The study area women received a supply of daily iron supplements (ferrous sulfate tablets containing 60 mg elemental iron) beginning in the fourth month of pregnancy. They were dewormed after completing 12 weeks gestation and received education and counseling from trained Family Care Volunteers. Control area women received only the routine, government health service inputs. A baseline survey of anemia prevalence among adolescent girls was also conducted.

## *II. Project Goals and Objectives:*

To reduce the prevalence of iron deficiency anemia (Hb<11 g/dL) among pregnant women by 15% over 2 years by:

- Ensuring that at least 80% of all pregnant women consume at least 80 iron supplements during pregnancy;
- Promoting early consumption of iron tablets among pregnant women by ensuring at least 75% enrollment into antenatal care in the first trimester and 90% in the second trimester;
- Promoting awareness of anemia and its prevention using information, education, and communication (IEC) strategies; and
- Providing routine deworming during second and third trimesters to reduce the prevalence of hookworm (100mg Mebendazole twice daily for 3 days).

## *III. Project Strategy and Intervention:*

### *A. Study population*

Two geographical areas were selected for the experimental and control groups. These areas were located in Vellore District, in the Tamil Nadu State of South India. K.V Kuppam Block (*pop.* 110,000) was selected as the experimental area and Gudiyatham Block (*pop.* 130,000) as the control area. Both Blocks are similar in terms of socio-economic and geographical characteristics. In K.V. Kuppam Block, RUHSA and the Government primary health care program's Tamil Nadu Integrated Nutrition Program (TINP) supply iron and folic acid tablets to pregnant women. In Gudiyatham Block, non-governmental organizations that emphasize health, such as RUHSA, do not exist. Only the Government primary health care program and TINP implement health and nutrition initiatives. Iron and folic acid are supplied to pregnant women by these two programs.

Twenty panchayats (government administrative units within blocks) were randomly selected from both Gudiyatham Block and K.V. Kuppam Block. All pregnant women from the selected panchayats of both blocks were included in the survey. Alternate panchayats were randomly selected for surveying pregnant women and adolescent girls. The girls' age ranged from 13 –19 with a mean age of 15.6 years.

### *B. Data Collection*

For the baseline survey the team consisted of 6 field workers, a lab technician, a supervisor, and an assistant project officer. Their role was to identify all pregnant women in their respective panchayats and ensure full coverage by conducting household surveys. Administration of the survey instrument was divided into two visits. At the first visit, the survey schedule was administered, followed by clinical screening for anemia. Measurements were collected for height, weight, and mid-upper arm circumference. Survey schedules provided the bulk of the quantitative information on socioeconomic variables, obstetric risk factors, and knowledge, attitude, and practice regarding maternal anemia (Abel et al., *Anemia in Pregnancy*, 1999). The initial interview and measurements lasted an average of 20 minutes. During the second visit, conducted the following day, a venous blood sample was drawn from the surveyed pregnant women for hemoglobin (Hb) and serum ferritin (SF) levels. In K.V. Kuppam Block, 522 samples were surveyed and hemoglobin levels were estimated for 464 subjects. A total of 260 samples were selected for SF estimation. In Gudiyatham Block 510 subjects were surveyed and blood was collected from 431 women for Hb and SF levels. In the control area, 211 samples were selected for SF estimation. Anemia was defined as Hb<11g/dL during pregnancy and SF< 12μg/L.

In the post-intervention data collection phase, the process was similar to the above. However, blood samples were collected on the same day of the interview and anthropometric measurements were not performed. There were 409 pregnant women interviewed in the study areas and 464 in the control areas. Blood samples were obtained from 403 (study group) and 425 (control group) women for hemoglobin levels. A total of 216 (study group) and 223 (control group) women gave samples for serum feritin levels

Stool samples were collected from pregnant women (111 study area, 42 control area) and tested for the presence of hookworm ova during the post-intervention study. The deworming intervention was conducted among post-first trimester pregnant women for 15 months, after the project staff's concerns about possible teratogenic effects of anthelminthic agents were addressed.

The adolescents' baseline survey in both blocks was conducted in a similar manner, and the same field workers were used.

*C. Data Analysis*

The survey schedules were reviewed and edited daily by a supervisor to check uniformity among data collectors and to ensure completion and accuracy of the data. The data were coded using the Foxplus computer package. Data were analyzed using SPSS 5.0.

*D. Intervention Method*

Results from the baseline survey and formative research (conducted in 1996 to determine knowledge and behavior related to maternal anemia) formed the basis for program design in the study area.

1. Early Antenatal Registration and IFA Distribution

The intervention trained and supported Family Care Volunteers (FCVs) to identify and register pregnant women by the third month of pregnancy. Previously, the government registered pregnant women for antenatal care in the fifth month of pregnancy.

Iron tablets were distributed by a mobile clinic every week that services 18 Peripheral Service Units (PSUs) within the K.V. Kuppam study area. Each PSU has an average population of 5000 in which the FCV is responsible for an average of 200 households. All pregnant women were identified by the FCV and their status was reported weekly to the respective Health Aide (HA) who maintains the registers for every PSU. Sachets of 30 iron tablets were available free of charge in all the mobile clinics and distributed from the fourth month of pregnancy. Pregnant women were also encouraged to obtain iron tablets distributed by the Government Village Health Nurse (VHN), the health sub-centers, and the primary health care facilities in order to expand women's options for obtaining iron supplements.

2. IEC – Community Based Education Intervention for Behavior Change

Messages on anemia were developed through a participatory process involving all levels of workers and volunteers. Seven simple community-appropriate messages were developed that were easy for health workers to remember and disseminate. Information on anemia was printed on posters and distributed as a part of a mass media campaign. The following materials were used:

- Pictorial Flash Cards
- Educational Booklets
- Audio Cassettes (contained 8 songs about anemia accompanied by a commentary)

Various approaches were used to teach pregnant women and adolescent girls about anemia. For pregnant women, FCVs conducted personal education sessions (one-to-one education), group teaching in the community, and group teaching at the clinic. Health educators, nurses, and other staff conducted workshops in the community and schools for adolescent girls.

The general population received group education through videos displayed by the FCVs in homes and other locales throughout the community. Mass campaigns have been one of RUHSA's successful strategies for behavior modification in the various health issues they address. Their expertise in this area was also used for anemia control. Loud speakers were attached to a RUSHA vehicle and songs on anemia were played throughout the community. Heath educators, nurses, and students were used in broadcasting messages in the villages. Pamphlets on anemia were also disseminated among the general community.

3. Deworming

Pregnant women were issued mebendazole tablets in the mobile clinic routinely either in the second or third trimester. Each woman received six 100mg tablets with instructions to take one tablet twice daily for three days.

4. Monitoring

The FCV made field visits to each pregnant woman to confirm consumption of the IFA by counting the leftover tablets. During the later stages of the project, a monitoring card was issued to each pregnant woman in the clinic. The women were to maintain a record of their compliance by making tick marks on the card each time they consumed a tablet, returning the card to the nurse in the clinic every month. Supervisors also conducted field visits to monitor the educational sessions given to the women by the FCVs.

## *IV. Results:*

The baseline survey revealed a 70.3% prevalence of anemia (Hb<11g/dL) at a gestational age of 24 weeks and above, and a decrease to 50.4% after the intervention ($P<0.001$) in the intervention community. By contrast, the prevalence of anemia increased from 68.2% to 75.5% in the control area ($P<0.05$). A significant difference of 19.9% ($P<0.001$) was observed in the post intervention assessment between the study and control area. When using serum ferritin levels as an indicator, the outcome was non-significant. The mean serum ferritin level increased from 23.31 to 25.69 µg/L in the intervention area and decreased from 24.45 to 22.09 µg/L in the control area.

Prior to the intervention, 39.2% of pregnant women in the study area were diagnosed with iron depletion (defined as SF<12 µg/L), which was reduced to 27.3% after the intervention. Using the cut-off of SF<15 µg/L, there was a significant decrease from 47.7% to 35.2% ($P<0.01$) in the study area. In the control area iron depletion increased from 32.7% to 35.4%. Iron deficiency anemia decreased significantly from 33.1% to 20.8% ($P<0.01$) in the study area when categorized by combining cut-offs of hemoglobin and serum ferritin levels (Hb<11g/dL and SF<12 µg/L). The percentage of women classified with no iron deficiency (Hb>11 g/dL and SF>12 µg/L) increased significantly in the study area from 24.0% to 46.3% ($P<0.001$).

Analysis of the impact of the various information materials demonstrated that pregnant women's knowledge of anemia occurred primarily through their exposure to flash cards on anemia (52.8%). Only 4.4% had seen the video, 3.2% heard the songs from the audio-cassettes, and 5.4% had read the messages in the pamphlets. Of the different communications strategies used for IEC, 39.1% learned about anemia through a one-to-one approach by the FCV using flash cards, 27.4% received their knowledge through group education in the clinic using flash cards and 4.2% learned about anemia through group education in the community.

The presence of hookworm ova in the stool of pregnant women was not assessed before the intervention. However, an assessment was made after the intervention in both study and control areas. A total of 111 samples from K.V. Kuppam Block and 42 from Gudiyatham Block were collected. Only 14.0% of pregnant women had hook worm ova in the intervention area in contrast to 43.8% in the control area. The difference in hookworm ova prevalence among pregnant women in the study and control areas was statistically significant ($p<0.001$).

Knowledge of the signs of anemia, iron supplement consumption, and hookworm infestation were significantly ($P<0.001$) higher in the study area than in the control area after the intervention.

## *V. Key Findings:*

The study demonstrated a significant reduction in the prevalence of anemia and a corresponding increase in the mean hemoglobin concentration among pregnant women in a rural community setting. The intended outcome of this project was a decrease in the prevalence of anemia by 15%. The actual reduction was 18.9%. The study also demonstrated significant improvement in knowledge of the causes, consequences, and prevention of anemia and iron deficiency through multiple teaching methods and an intensive communications approach.

However, anemia prevalence continues to be a serious public health problem in South India and the need to expand successful efforts in community-based prevention and control among pregnant women is paramount.

### *VI. Lessons Learned:*

- A team of multidisciplinary professionals ensures an effective output (doctors, nurses, researchers, statisticians, health educators, laboratory technicians, volunteers, etc.)
  IEC is effective for behavioral changes if the health services needed to achieve the desired behavior are available, affordable, and accessible.
  It is necessary to educate women about the purpose of giving any medication such as mebendazole or IFA. Repeated information encourages women to relate the medicine with the purpose.
  There is a need to include the role of anthelminthics during pregnancy to reduce anemia in the curricula of medical and nursing training.

### *VII. Publications:*

Abel R., Rajaratnam J., Gnanasekaran V.J., Jayaraman P., *Prevalence of Anemia and Iron Deficiency in Three Trimesters of Pregnancy*. Accepted for publication in Tropical Doctor.

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*IFA distribution through mobile clinic*

*One-to-one education: FCV with pregnant women*

*IEC materials (flashcards, pamphlets, audio and visual tapes)*

*Teaching a group of nurses in a mobile clinic*

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