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Improving Adherence to Oral Iron Supplementation during pregnancy

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RESEARCH

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Abstract

Background
Iron deficiency is the most prevalent nutritional deficiency on the globe. In India, pregnant women are amongst the most vulnerable population for iron deficiency anaemia. Even though iron supplements are prescribed, the compliance to therapy is inconsistent. Since India has a predominant rural population, shortage of medical manpower and lack of healthcare facilities may contribute to poor compliance with therapy.

Method
A controlled trial study was conducted with 140 pregnant women, from a rural area of J N Medical College, Belgaum, India. Direct observers were assigned as volunteers, who monitored consumption of oral iron supplementation tablets by pregnant women. The direct observer was a consenting adult from the same village. Detailed history and baseline investigations were done before the initiation of study and periodical assessment of haemoglobin levels were used to monitor progress.

Results
The mean adherence rate and haemoglobin levels in the direct observers' group were higher compared to the control group, across all visits. The mean haemoglobin value of participants in study group during 1st visit was 7.97 gm%, whereas in control group, it was 7.98 gm%; in the 2nd visit, mean haemoglobin level in the study group was 8.47 gm% and 8.18 gm% in the control group; in the 3rd visit, mean haemoglobin was 8.99 gm% in the study group and 8.42 gm% in control group. There was no statistical difference in the mean haemoglobin values between two groups in the first two visits. Although the mean haemoglobin values were similar on baseline investigations (1st visit), there was a difference of 0.30 gm% in 2nd visit and 0.57 gm% difference in the 4th Visit. The difference in haemoglobin values at 4th visit was statistically significant.

Conclusion
The deployment of a direct observer, to monitor the administration of oral iron supplementation is feasible and helps to improve compliance with oral iron tablets.

Key Words
Compliance, Monitoring, Supervision, Direct Observer

Background

Iron deficiency is the most prevalent nutritional deficiency on the globe.[1] Pregnant women are most susceptible to develop iron deficiency anaemia. Despite large-scale health interventions, the incidence of iron deficiency anaemia continues to raise in developing countries.[2] Current estimates from the World Health Organization (WHO) (1993-2005) put prevalence of anaemia at 41.8 % among pregnant women, with the highest prevalence rate (61.3%) found among pregnant women in Africa and 52.5 % among South East Asia.[3]

The overall prevalence of anaemia among pregnant women in India is estimated to be about 54.6% in urban areas, and 59% in rural areas. There is evidence to suggest that up to 90% of maternal anaemia may be contributable to inadequate consumption of dietary iron. Furthermore, increased blood loss due to hookworm or schistosomiasis; bleeding haemorrhoids, vitamin deficiencies, HIV and genetic disorders such as sickle cell anaemia and thalassemia add to prevalence of anaemia in pregnant women.[6]

The Standards for Maternal and Neonatal Care developed by the World Health Organization has been working alongside National Nutrition Anaemia Prophylaxis Program in India, for effective deployment of available resources in expediting oral iron and folic acid supplementation for pregnant women in order to improve adherence to prescribed supplements. [6, 7]

Efforts are being made to generate interest and commitment on the part of health care providers to deliver iron/folate tablets, and to improve training of providers in promoting the use of iron supplements, through counselling. However, such degree of commitment on the part of health care system still needs refinement at the grass root level. The concept of how best to assist the women to adhere to a daily regimen of supplement consumption is not fully understood. Looking into other types of daily protocols (e.g., tuberculosis control) may hold some clues to this complex behavioural issue.[9]

National programs of iron/folate supplementation for pregnant women have focused on providing supplement medications and amplifying provider performance. However, inadequate awareness about iron deficiency in anaemia, combined with medical delivery system which is not sufficient to cater the health needs of the entire population, has actively contributed to decreased compliance for iron therapy among pregnant women in developing countries.[6] Compliance to therapy is one of the important factors that affect the outcome of therapy. Compliance can be defined as the extent to which a patient's behaviour coincides with medical advice. In case of tuberculosis, non-compliance may also result in acquired drug resistance requiring more prolong and expensive therapy that is less likely to be successful than the treatment of drug susceptible tuberculosis. Therefore, the Directly Observed Treatment Short Course was designed to reduce the rate of treatment failure, relapse, and drug resistance.[10]

To increase the compliance for iron tablets, there is an impending need to develop specific tools and approaches to address the difficulties of a daily regimen. Some studies indicated that forgetfulness was a significant barrier for consumption of iron tablets. Researchers have suggested that direct supervision helped pregnant women adhere to the iron tablets consumption.[6] Considering all the interventions done to improve adherence, this study aims to monitor compliance with the consumption of iron tablets. Though there are many alternative ways of supplementing iron and folic acid, all of them may not be cost-effective. With the available resources, a better way of delivery system is warranted to improve compliance. One of the main components in iron supplement delivery system would be monitoring and evaluation. Therefore, appointing a direct observer from the community itself may be cost-effective. The primary objective of this study was to document the effect on adherence of directly observing patients taking iron therapy and to monitor the haemoglobin status of pregnant women.

Iron compliance is one of the major factors contributing to the effectiveness of iron supplementation programme. Some studies on iron compliance have opinionated that better delivery system of iron tablets is the need of the hour.[6] Seldom there have been studies which have focused on iron supplementation interventions with the help of a direct observer for the traditional method of delivering iron supplements. These studies have been discussed in this section to provide a broad-based conceptual understanding of the needs for and the advantages of directly observed iron therapy. The reviews are related generally to the overall population and specifically to the pregnant women.

Factors contributing for low/non-adherence to iron supplements

In the course of advocating a direct observation for validating the consumption of nutritional supplements like iron, we also have to consider a significant number of factors that may invariably affect the adherence to these supplements. A study conducted among low-income group of women in USA during 2005, on pill count adherence to prenatal multivitamin/ mineral supplement use, the researchers reported that ethnicity, nulligravidity, smoking, educational and marital status, affected compliance with prescribed medication. The study was monitored using a pill bottle fitted with Medical Event Monitoring System. The results indicated that side effects were distributed equally in different ethnic groups, but the adherence showed no association with side effects. Since the study involved no intervention with direct observers, an extension of the method is to observe and record if the adherence to iron supplements can be strengthened by direct observation. [11]

A qualitative study on women's perceptions of iron deficiency and anaemia prevention and control in eight developing countries describes the major reasons for women not continuing iron tablets consumption are poor access to supplies (i.e., low utilization of antenatal care services or inadequate supplies at facilities), the form of the tablet (i.e., unappealing taste, smell, or colour), side effects (e.g., gastrointestinal problems), fear (e.g., high birth weight, difficult delivery, harm to the foetus), recovery (i.e., discontinuation of supplements as a result of improvement in symptoms) and behaviour (i.e., forgetting or not wanting to take the tablets). In the nation-wide surveys of Latin American countries, it is observed that women are reluctant to accept iron tablets from sources outside the government health system, fearing poor quality control and lack of medical supervision. In South India, where the private sector is well developed at the community level, the opposite is true. Potential consumers of supplements are suspicious of the quality of government-supplied pharmaceuticals. In such instances, tablets procured and distributed through NGOs, purchased from private clinics, or in the marketplace are regarded safer.[12]

In developing countries like India, there are various causes that contribute to decreased adherence to iron supplementation including, misunderstanding of instructions, side effects, cultural beliefs, and inconvenient dosing regimens. In addition one may cite access to motivated and trained health professionals. [13]

Dealing with non-compliance issues

Typically, non-compliance (or non-adherence) with medical advice is assumed to reflect patient's lack of knowledge, inability to retain medical instructions, or other behavioural factors. Recent research suggests that compliance (or not) with medical advice is the result of rational decision-making by the patient about the costs and benefits of prescribed actions, depending upon individual socio-cultural circumstances. It is suggested that "more open, cooperative doctor-patient relationships" are the key to improved compliance. Finding ways to improve the patient-provider relationship through "negotiation and accommodation" must be found.[21]

A study done in Bangladesh during 2002, to study the effect of adverse events on compliance, showed that gastrointestinal side-effects were not significantly associated with compliance. Compliance was monitored with a counting device, electronically pinned to the pill bottle, which recorded the date and time, whenever the bottle was opened. [22]

Empirical evidence for directly observed therapy

Even though there are not many studies that have explored the direct observation to monitor iron supplementation, there is ample evidence to suggest the validity of such methods in ensuring better drug compliance and adherence. A study done in Philippines in 2008 to evaluate the effectiveness of a redesigned iron supplementation delivery system for pregnant women showed that pregnant women in the experimental area were four times more likely to take iron tablets (OR = 3.79) and sixteen times more likely to being monitored for iron intake (OR = 16.86) compared to the control. In this study 1180 pregnant women were given iron/folic acid tablets daily through the redesigned ISDS in the experimental areas and the existing ISDS in the control areas.[23]

The impact of a weekly iron-folic acid supplement delivered with social marketing to Cambodian women in 2005 revealed that supplementation was increasingly effective among women of higher socioeconomic status (SES). Among higher SES schoolgirls, 58% took the supplements, compared with 49% for lower SES. Social marketing program promoting weekly iron-folic acid supplementation improved haemoglobin levels in women of reproductive age in Cambodia.[24] A study conducted in Toronto, to investigate the effects of iron content on the tolerability of prenatal multivitamins in pregnancy. There was no statistically significant difference detected in proportions of women who actually started taking either [35mg or 60mg] multivitamin. Kaplan-Meier survival curves demonstrated no significant differences in rates of adherence or reported adverse events. The range of pill intake for both the groups was zero to 100%, and the mean pill intake for both groups was approximately 50%.[25]

The concept of seeking help of community women as "Volunteers" was pioneered in India during 1998, at the St John's Medical College, Bangalore. The authors identified Community Health Volunteers (CHVs) with special predetermined criteria (e.g. willingness and enthusiasm even being a mother and having family approval). Village leaders, government functionaries, Traditional Birth Attendants were given priority and selected in many villages as they already enjoyed an excellent relationship with women in the community and were trusted caregivers during pregnancy.[26] Under a MotherCare-supported project in Haryana, India, the Survival for Women and Children Foundation (SWACH) adapted the DOTS strategy for anti-tuberculosis treatment, to deliver iron supplements. The project implemented personally observed treatment [POT], as a mechanism to combat the difficulties of a daily iron regimen. Adolescent girls on their way to and from school stopped by the homes of pregnant women who had been diagnosed with moderate anaemia. They supervised the consumption of twice-daily iron supplements and provided information about iron and anaemia. With this treatment strategy, they were able to achieve nearly 100% compliance.[6, 12] Iron supplementation reports across the globe have been suggesting that communication efforts must be expanded to increase understanding of the importance of taking supplements and to address any fears or misconceptions relating to supplementation. Overall, measures are recommended to increase the capacity of individuals and communities to define, analyze and act to address their own health needs.[27]

Method

The study was approved by the Institutional Medical Ethics Committee.

Participants

The study was conducted between January 2008 and December 2008, with 113 pregnant women (58 participants in the study group and 55 criteria-matched individuals in the control group) in the second trimester, from two sub centres of neighbouring villages, associated with Handignur Primary Health Centre (PHC), a rural field practice area of department of Community Medicine, J.N. Medical College, Belgaum, India. Participants visiting each sub-centre were randomly assigned to either of the groups. They were inducted into the study, after obtaining an informed consent. Pregnant women with history of severe side effects to iron therapy were not included. Additionally, those women currently undergoing iron supplementation were instructed not to participate in the study.

Matching criteria

The participants in both groups were matched for age, sex, literacy level, caste, socioeconomic status, time and place of ANC registration, gravida and parity status of pregnant women, toilet facility at home, deworming status, footwear use, haemoglobin status at registration, initial peripheral smear status. At the first visit, majority of the participants were provisionally diagnosed as being anaemic (97.1%).

Additionally, most of them were categorized to be having a moderate anaemia (88.6%). There was no significant difference in the distribution of anaemia in Study and control group.

Materials and methods

Materials included 1) Health *Pro forma* 2) Sahli's Haemoglobinometer and peripheral smear 3) Direct Observer's Calendars, and 4) IFA blister tablets.
Haemoglobin estimation was done for both the groups at the beginning of the study and depending on their haemoglobin status, strength and frequency of iron tablets were adjusted. The haemoglobin estimation [Sahli's method] and peripheral smear preparation was carried out by the lab technician from the PHC and the researcher validated every 5th measurement. Haemoglobin less than 11 gm % were given therapeutic dose [2 tablets/ day] and haemoglobin more than 11gm% were given prophylactic dose [1 tablet/day].[8,28] They were advised to take the tablets for 100 days across three intervals starting from 16th week of gestation.[8] The tablet used was the IFA supplied by Government of Karnataka to PHCs (Annexure V). An Antihelminthic drug [400 mg Albendazole – Single dose] was given under supervision at the beginning of the study to both the groups if they were not dewormed within the past 6 months. Peripheral smear was taken from both the groups at the beginning of the study to identify the type of anaemia.

Adherence rate[11] = $\frac{\text{No. of pills given – No. of pills remaining in the bottle}}{\text{Expected number of pills to be taken}}$ X 100

Detailed questionnaire was used to collect the data and clinical examination was done in the presence of a female attender. In total four visits were undertaken to each pregnant woman in 100 days. At the end of the study, Haemoglobin estimation was sampled again. The details of each visit are given below.

VISIT 1: Informed consent, history collection, Haemoglobin estimation and peripheral smear examination, distribution of IFA blister tablets for 30 to 35 days, appointing a volunteered direct observer for the Study group and distributing Direct Observer's Calendar of 30 to 35 days in the Study group.
VISIT 2: Calculation of adherence, disqualification of pregnant women from the study who developed severe side effects, prescription IFA blister tablets for the next 30 to 35 days, distributing Direct Observer's Calendar of 30 to 40 days for study group, and Haemoglobin estimation/ peripheral smear examination.
VISIT 3: Calculation of adherence, prescription IFA blister tablets for the duration of 30 to 35 days and distribution of Direct Observer's Calendar [30 to 35 days] for Study Group.
VISIT 4: Calculation of adherence rate, Haemoglobin estimation and peripheral smear examination.

Study Group

Study group was supervised by a direct observer per pregnant woman and on some occasions, two pregnant women were supervised by a single direct observer. The direct observer was an adult from the same village who consented to participate. Ideally, the observer was a literate individual who also happened to be a relative or neighbour of the pregnant woman. Each pregnant woman was administered iron tablets for 100 days across three intervals and advised to consume daily under direct observation. The observer was given a 'Direct Observer's Calendar' in which a single tick mark or double tick mark was required to enter the data for that day. If the patient consumed a single dose of iron tablet/day, a single tick mark was written for that particular day and a double tick mark if iron tablets were consumed twice daily. If she missed any dose prescribed for that particular day, a cross mark was made for that specific dose. Following the completion of the stipulated time, the data was collected at the end of each interval for every pregnant woman. Since the direct observer used only the orthographic signs [tick marks/cross mark] The diary was suitable for people who were not literate.

Control group

After identifying each pregnant woman in her second trimester, iron tablets were prescribed for 100 days, to be consumed across 3 intervals. The pregnant woman was counselled to take the iron tablets regularly and consistently.

Periodic visits were undertaken according to the prescription intervals for both the groups. During these visits Iron tablet strip/blisters were cross checked for any remaining doses. The adherence to the iron tablets for that particular interval was calculated using the formula.

Socio-economic status

Information regarding per capita income (in Rupees / month) was collected and socio-economic status was classified using Modified B G Prasad's classification for the study period (2008-09) and it was calculated by Multiplication factor (2008-09) with 1961 Prasad's classification values.[29] Average consumer price index for year 2008 - 09 was 439.33 [30]

Results

There were 140 pregnant female participants (n=140). The level of significance was set at a conventional 'p' value of 0.05. Since the dependent measure of adherence represents a categorical data with two levels and the levels of haemoglobin, a continuous measure, A Chi-Square test and a Students unpaired t test was conducted respectively, using SPSS Software Version 17. Many other parameters [demographic profile, antenatal history, general physical examination, systemic examination, etc] were included in

the data collection. These potentially confounding variables were not statistically significant.

There was no statistically significant difference between Study and control group in the distribution of participants according to caste, age and literacy. All the participants were Hindus. There were no Christians nor Muslims in our study as the PHC had <1 % of Muslim population and no Christians. Most of the participants were belonged to the general Hindu (57.1%) category and remaining were Scheduled Caste (20.7%) and Scheduled Tribes (22.1%). A large number of participants were in the age group 16-20 years (52.9%) followed by 21-25 years group (42.9%). Most of the participants were not literates (35.7%).

In the current study, the participants were equally distributed in Study and control group, with regard to their Socio-economic status. A higher number of participants were in Class IV (45%) and Class III (32.1%) level. There was a statistically significant difference in the distribution of participants among Study and control groups in relation to the family type. Joint families were observed to be similarly distributed. However, nuclear families were identified in higher number in the Study group (34.7%) compared to the control group (13.2%); whereas three generation families were observed more in the control group (23.5%) compared to the Study group (5.6%).

Iron rich foods such as meats (72.1%), dried fruits (63.2%), green leafy vegetables (92.6%), eggs (52.1%) were consumed by the participants; whereas ragi (22.1%), jaggery (40%), whole grain cereals (23.5%) were consumed in lesser quantity across both groups. Enhancers of iron absorption like meat (80.7%), poultry (57.1%), fish (27.9%), fruits and vegetables rich in Vitamin C (90%) were also consumed. Inhibitors of iron absorption like spinach (52.9%), tea (47.1%), coffee (15%), legumes (44.3%), fibre (35%), calcium (77.9%), and zinc (83.6%) were consumed by participants similarly in both the groups.

In this study, all participants were identified to have a moderate deficiency of daily calorie consumption. Most of them (47.9%) were having a deficiency of 25-34.99%. The protein deficiency was observed in a higher number among all the participants (92.1%); majority (47.1%) were observed to have <15% deficiency in protein intake. The parameters of protein and calorie deficiency were observed to be similarly distributed among the study and control groups.
All the participants got registered in their first trimester and most of the registrations were completed in Primary Health Centre (37.9%) followed by Sub centres (33.6%) in both the groups. None of the control group got registered in Anganwadi centres; where as more of control group registered in the private hospital (26.5%) compared to the Study group (9.7%). The results of this study show that the mean haemoglobin values of participants in study group during 1st visit was 7.97 gm%, whereas in control group, it was 7.98 gm%; In the 2nd visit, mean haemoglobin level in the study group was 8.47 gm% and a 8.18 gm% in the control group; In the 3rd visit, mean haemoglobin was 8.99 gm% in the study group and 8.42 gm% in control group. There was no statistical difference in the mean haemoglobin values between two groups in the first two visits. Although the mean haemoglobin values were similar on baseline investigations (1st visit), there was a difference of 0.30 gm% in 2nd visit and 0.57 gm% difference in the 4th Visit. This moderate increase was observed in Study. The difference in haemoglobin values at 4th visit was statistically significant.

In this study, there was no statistically significant difference in the distribution of participants according to anemic status, across both groups during 1st, 2nd and 4th visits. Prevalence of anaemia in Study group was at 1st visit (95.8%), at 2nd visit 95.2% and at 4th Visit 82.8%; whereas in control group at 1st Visit(98.5%), at 2nd visit 94.8% and at 4th visit 92.6%.

In this study, a statistically significant difference was observed in the distribution of adherence rates among study and control groups. The mean adherence rate in study group during 2nd visit was 78.48 %. However, in the control group it was 49.22%. Likewise, during 3rd visit mean adherence rate was 79.13% in study and 52.75% in controls. In 4th Visit, the adherence rate was 76.44% in study group and 53.87% in control group.

The following reasons were reported by the participants for missing the doses: Forgetfulness was the main reason among the control group (29.3%). Vomiting was one of the main reasons for failing to adhere to the therapy in the Study group (25.4%). In the 3rd visit it was noticed that forgetfulness (51.8%) was the main reason among control group, whereas nausea (49.2%) and heart burn (41%) were more observed in the Study group. In the 4th visit diarrhoea (24.1%) and heartburn (72.4%) were observed to be the predominant reasons in the study group, whereas forgetfulness (36.4%) was the most common reason in the control group.

Discussion

We assessed a method of improving compliance with therapy. We present some evidence that a direct observer may have been a significant factor in improving the adherence to the supplement regimen. There has been empirical evidence to support this claim with similar studies. Even though not all of the studies included direct observers, some form of supervision of treatment was a notable factor in adherence to therapy.

Reserachers at Panyali, Himachal Pradesh, observed that a total of 87.3% of the recruited participants completely adhered to the three months iron therapy. Compliance was defined as total number of patients who completed the therapy, to the total number of patients enrolled and the resulting parameter multiplied by the factor of 100.[18] In the study done in Vietnam, a total of 73% of literate women reported high compliance when compared with women who were not literates who showed a 50% of compliance.[35] The literacy level in both the groups was controlled, as there

were approximately similar number of literate women in both groups. In a study conducted in Toronto, the range of pill intake for both groups was zero to 100%, and the mean pill intake for both groups was approximately 50%. Among those who started taking assigned prenatal supplements 73% were adherent in 35mg iron group and 76% were adherent in 60 mg iron group. Among them >80% adherence was seen in 37% in 35mg group and 38% in 60 mg iron group. >50% adherence was seen in 56% in 35mg iron group and 60% in 60mg iron group. Participants were controlled for strength of iron supplementation at 100 mg. [25]

In a study conducted in Philippines, the percentage of women consuming iron and folic acid tablets in control group was 57.4% and in experimental group 79.2% after intervention.[23] However, the follow up of the participants was conducted for 180 days in that study, compared to 100 days in this study [considering actual follow up cases only]. The results of the study conducted in New Delhi, showed that the completion rate of participants who availed oral iron group, was 67.5% and parenteral iron group was 94.3% indicating relatively better acceptance for parenteral iron supplementation, a form of direct observance.[20] The results of the study conducted in Bangladesh suggested that for the supplements provided during week 1 to 4, daily supplements compliance rate was 61.1% and for weekly supplements, it was 92.7%. During week 5 to 11, median compliance in daily group was 65% and in weekly group was 93%.[22] The daily group compliance can be compared to our study since all our participants were given daily iron tablets.

Limitations:

This study was a controlled trial. Randomization was undertaken only to assign the sub centres for groups. It was not deemed possible to randomize at the level of the participants or villages due to possible contamination across the groups.

- The Hawthorne effect may have contributed to the better compliance of both the groups when compared to State and National average.[4,5]
- The main reason for the dropout was relocation of the study participants however it was not possible to trace drop outs to the study.
- Measurement of serum ferritin or serum transferring levels could have given better diagnosis of iron status in the pregnant women. This could not be done because of logistic and feasibility issues.
- Instead of monitoring the blister packets, pill counters could have been used. But, this was beyond the funds available for the study.

Conclusion

There was a high prevalence of anaemia among pregnant women in this study (97.1%). Moderate anaemia was common across the study sample. Deploying a direct observer improves the adherence to iron tablets. The mean haemoglobin was statistically significant in the study group at the last visit. This study was in a rural setting in which participants were administered tablets prescribed by local Government health staff. Therefore replicating the study in other rural areas of the country may be feasible. The results suggest the method may be cost effective

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PEER REVIEW

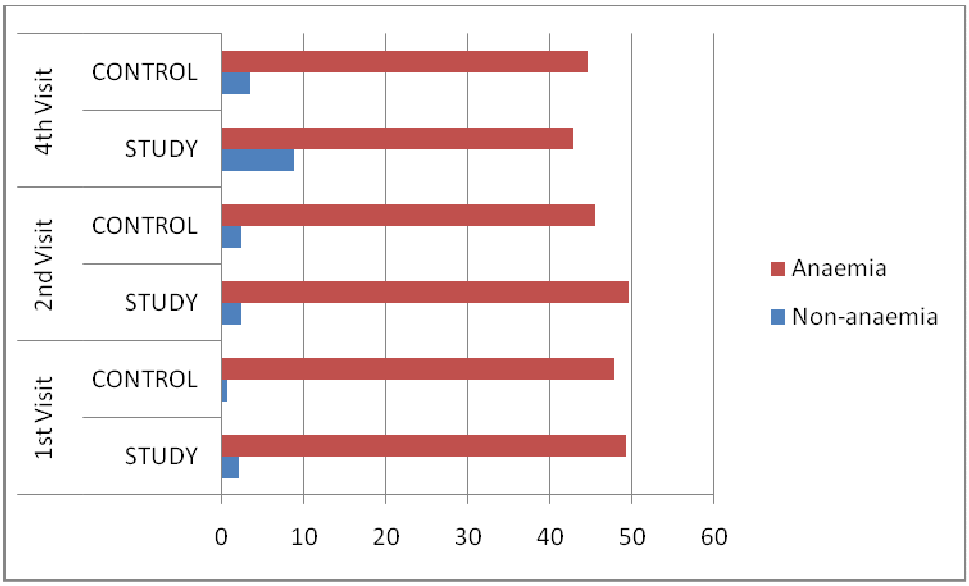
Not commissioned. Externally peer reviewed.

CONFLICTS OF INTEREST

The authors declare that they have no competing interests

Figures and Tables

Graph 1: Anaemic participants during 1st, 2nd and 4th Visits



Graph 2: Mean haemoglobin at 1st, 2nd and 4th visits

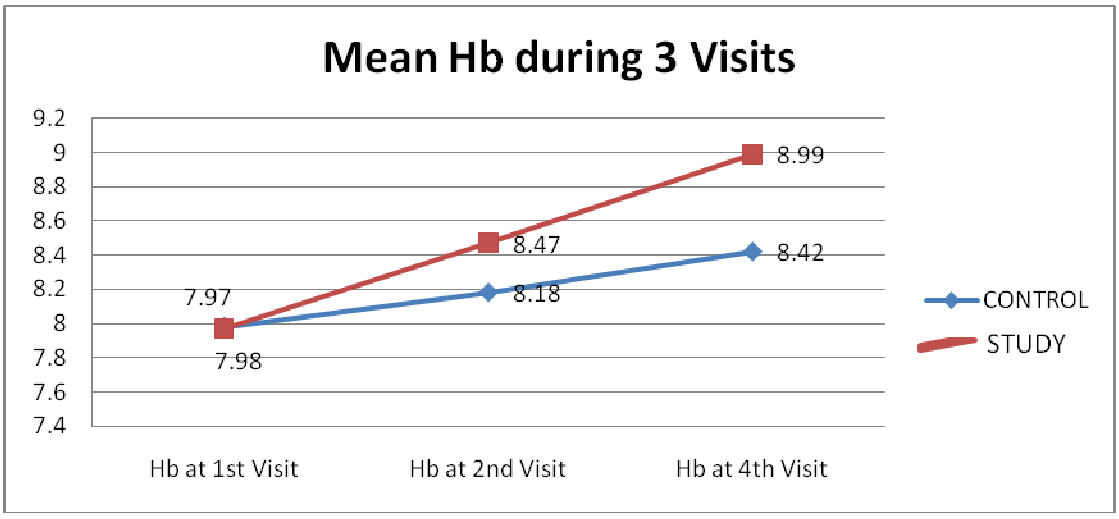


Table 1: Anaemic participants during 1st, 2nd and 4th Visits

		1st Visit		2nd Visit		4th Visit	
		STUDY [n=72]	CONTROL [n=68]	STUDY [n=63]	CONTROL [n=58]	STUDY [n=58]	CONTROL [n=55]
NON ANAEMIA	**No.**	3	1	3	3	10	5
	%	4.2	1.5	4.8	5.2	17.2	7.4
	% of Total	2.1	0.7	2.5	2.5	8.9	3.6
ANAEMIA	**No.**	69	67	60	55	48	50
	%	95.8	98.5	95.2	94.8	82.8	92.6
	% of Total	49.3	47.9	49.6	45.5	42.9	44.6
		$\chi 2_{yc}$= 0.0.202, DF = 1 P = 0.653		**χ^2_{yc} = 0.099, DF = 1, P = 0.917**		**χ^2 = 2.473, DF = 1, P = 0.116**	

Table 2: Distribution of mean haemoglobin at 1st, 2nd and 4th visits in Study and Control groups

	Sub Centre	N	Mean	Std. Deviation	Test
Hb - 1	Study	72	7.97	1.06	t = -0.085, DF = 138
	Control	68	7.98	0.93	**P = 0.932**
Hb - 2	Study	63	8.47	1.07	t = 1.527, DF = 119
	Control	58	8.18	0.99	**P = 0.130**
Hb - 4	Study	58	8.99	1.11	t = 2.804, DF = 111
	Control	55	8.42	1.04	**P = 0.006**

Table 3: Distribution of Adherence rate among Study and Control group during 2nd, 3rd & 4th Visits

	Groups	N	Mean	Std. Deviation	t test
Adherence at 2nd Visit	Study	63	78.48	10.32	**t = 12.053**
	Control	58	49.22	15.98	**DF = 119 P = 0.000**
Adherence at 3rd Visit	Study	61	79.13	11.77	**t = 10.789**
	Control	56	52.75	14.63	**DF = 115 P = 0.000**
Adherence at 4th Visit	Study	58	76.44	9.72	**t = 9.599**
	Control	55	53.87	14.87	**DF = 111 P = 0.000**

Graph 4: Adherence rate during 3 visits