ORIGINAL ARTICLE

# Impact Assessment of Iron and Folic Acid Supplementation with and Without Intensive Health Education in Pregnant Women of Rural Area of District Etawah: An Interventional Study

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**ABSTRACT**

**Background**: Low birth weight , post-partum haemorrhage still births and maternal deaths are associated with anaemia in pregnancy. If prevalence of anemia will be reduced then there will be improvement in maternal and child health and its outcome. **Aim & Objectives**: To evaluate the changes in the hematological profile of the study subjects and to determine the impact of intensive health education intervention on anemia status of pregnant women. **Methodology**: A Community based interventional study was conducted among 200 Pregnant women of selected villages in rural area of Etawah district (100 women in each interventional and non-interventional group) using a self-developed, pre designed, pretested, structured and validated questionnaire. statistical package for social sciences (SPSS) software was used to analyse the data. **Result**: After health education intervention there is significant increase in the haematological profile of study participants of interventional group ($p<0.05$) as before intervention values of mean Hb was 10.58±1.79 gm/dl which became 11.72±1.48 gm/dl There were 34 (73.9%) participants in the interventional group that were originally anaemic before the study, but after the intervention, they became non-anaemic. **Conclusion**: Health education sessions helped the pregnant women to improve their knowledge regarding anemia in pregnancy, as well as improve their ability to select iron rich foods, increase compliance with iron supplementation, and raise their haemoglobin levels

**KEYWORDS**

Pregnancy; Pregnant Women; Child Health; Anemia; Iron; Hemoglobins

## INTRODUCTION

Anemia is a vast public health problem all around the world(1). Most common cause of anemia during pregnancy is iron deficiency(2). Increased nutrient demand in pregnancy especially in the developing countries may not

be completely fulfilled by regular diet due to less amount of nutrients presents in it. Other micronutrient deficiencies along with Iron and folic acid are highly prevalent in pregnant women, particularly at pregnancy which can unfavorably impact the health of mothers and children both, before, during and after birth(3). IFA supplementation at the time of pregnancy is an effective way of handling a large portion of this problem.(4) The study participants were requested to take iron folic acid tablets distributed by government of India under Anemia Mukt Bharat Abhiyan.

## MATERIAL & METHODS

A Community based interventional study was done among pregnant women of selected villages in rural area of Etawah district for 10 months (March 2021 to December 2022).

**Sample size**: Sample size was calculated by using the following formula for a clinical trial comparing the equal sample size in both groups and primary outcome is continuous

$n = [\{(Z(1-\alpha/2)+Z(1-\beta)\}2 \times (2\sigma2)]/ (\mu1 -\mu2)2$, where

n = sample size required in each group

$Z(1-\alpha/2)$= standardised normal deviate (two tailed) at $\alpha$=0.05& 95%CL it is 1.96

$Z(1-\beta)$= this depends on power, for 80% this is 0.84

$\mu1 -\mu2$= clinically significant difference

$\sigma2$= Population variance (standard deviation) it is calculated as

$\sigma2$= (N1-1)S12 + (N2-1) S22/ N1+ N2-2

N1& S1= sample size & SD of one group (based on previous study)

N2 & S2= sample size & SD of another group (based on previous study)

Based on previous study(5):

$\sigma2$= (53-1) × (0.4)2 + (54-1) (0.82)2/ 53+ 54-2 =0.42

$n = [\{(Z(1-\alpha/2)+Z(1-\beta)\}2 \times (2 \sigma2)]/ (\mu1 -\mu2)2$

$=[(1.96 +0.84)2 \times (2\times0.42)] / ( 0.26)2$

= 97.4

≈ 98

After round off it is 100 in each group

**Inclusion criteria:** Pregnant women who gave consent to withdraw venous blood sample

Women willing to attend health education session

Women who gave informed written consent

Women or any of their family member having functional smart phone

**Exclusion criteria:** Women who were severely anaemic (Blood Hb level <7 gm/dl)

Women with any known haematological disorder

**Sampling Technique**

**Sampling Method**: Multi stage random sampling technique

**Stage 1**: All the eight community development blocks of Etawah district were line listed with the list of all the villages in each block, then from the list of all the villages two villages were randomly selected using random number table from each block.

**Stage 2**: From the randomly selected two villages in each block, one of them was selected using lottery method as interventional village while the other village served as non-interventional group by default. This method of segregation was adopted for all eight blocks.

**Stage 3**: To get equal representation of study subjects from all the blocks the sample size of 100 study subjects was divided by eight(100/8=13) subjects were selected form each block's randomly selected villages for intervention. Similarly, selection of study subjects was done for non-interventional villages also.

**Methodology**:- The study was done among the pregnant women of selected villages of Etawah district. Two villages from each of the eight community development block were selected randomly from the list of villages before reaching to the selected village, A list of ASHA was collected from district administration CMO office which included the name, contact no, and village of ASHA. ASHA of the respective selected villages was contacted telephonically and introduced about the study. All the pregnant women were gathered by ASHA at pre-decided date and place like anganwadi centers or schools, and told about the study.

**The study had three phases**

**Inception**: baseline data were collected using predesigned, pretested, structured questionnaire, and venous blood was collected in EDTA vials and mixed gently. Collected blood

samples were maintained and transported to central laboratory of the hospital for hematological investigation (complete blood count) which was done by Fully automated CD-Ruby analyzer (Architect of Abbott health care) based on laser flow cytometry. Study subjects were also counselled and ensured to take regular iron and folic acid tablets which are given under Anemia Mukt Bharat program by the health care personnel including ASHA.

**Implementation**: In this phase, 'Intensive health education' sessions were imparted to those study subjects who were selected in the interventional group. Health education sessions were delivered continuously for six months at an interval of one month, there were total six sessions. Physically. Health education interventional session were of 20 to 30 minutes duration comprising lecture, chart demonstration, and discussion used to take place after every health education session so that their query/ doubt about anemia can be solved. Participants also received a weekly youtube link of relevant videos about anemia prevention and control on WhatsApp application to individualize teaching from the researcher via the social media platform.

**Follow up**: - It was the third phase of the study and the study subjects were followed up to the single last health education session.

**Ethical Aspects:** Prior ethical clearance was obtained from the ethical clearance committee of the Uttar Pradesh University of Medical Sciences, Saifai, Uttar Pradesh, India, for the mother study (1895/UPUMS/Dean(M)/Ethical/2020-21). Written informed consent was taken from the pregnant women and assurance was given of confidentiality and privacy of records.

**Data analysis:** The data thus collected was encoded in Microsoft Excel spread sheets and scrutinized for completeness and correctness. The statistical analysis was done by IBM statistics SPSS software (version 25, Chicago, USA). Student dependent t-test and Mc Nemar test were used and statistical interpretation was done at 95% confidence interval $p < 0.05$ was considered statistically significant difference.

## RESULTS

(Table 1) Demonstrates the frequency distribution of socio-demographic characteristics of the study participants in interventional and non-interventional group. Among the 100 pregnant women in each group, the mean age of the participants was 26.57 ± 5.4 years in interventional group and 26.04 ± 5.0 years in non-interventional group. Most participants belonged to age group of 21-30 years (68% in interventional group and 75% in non-interventional group). Most the study respondents were Hindu by religion (96% in interventional group and 90 in non-interventional group), most participants had education status less than equal to high school (75% In interventional group and 87% in non-interventional group). In interventional group 34% participants belonged to Class IV while in non-interventional group 31% participants belonged to Class III of socio-economic status

**Table 1: Sociodemographic characteristics of the study participants N (100) each group**

| Variables | Subgroup | Interventional Group n(%) | Non-interventional Group n(%) |
|---|---|---|---|
| **Age (In years)** | Up to 20 | 11 | 10 |
| | 21-30 | 68 | 75 |
| | >30 | 21 | 15 |
| **Religion** | Hindu | 96 | 90 |
| | Muslim | 4 | 10 |
| **Caste Category** | General | 30 | 26 |
| | OBC | 48 | 48 |
| | SC | 22 | 26 |
| **Family type** | Nuclear family | 40 | 44 |
| | Joint family | 55 | 52 |
| | Three generation family | 5 | 4 |

| Variables | Subgroup | Interventional Group n(%) | Non-interventional Group n(%) |
|---|---|---|---|
| **Education status** | Upto high school | 75 | 87 |
| | More than high school | 25 | 13 |
| **Socio-economic status (Modified BG Prasad Classification)** | Class I | 9 | 3 |
| | Class II | 19 | 24 |
| | Class III | 26 | 31 |
| | Class IV | 34 | 28 |
| | Class V | 12 | 14 |

Table-2 depicts the comparison of the haematological profile of study participants before and after intervention in both groups and shows a significant increase in the haematological profile of study participants in the interventional group after intervention ($p<0.05$) as before intervention values of mean Hb was 10.58±1.79 which became 11.72±1.48, RBC count was, 4.09±0.59 before and became 3.92±0.61after intervention while mean corpuscular volume (MCV) was 85.53±14.28 before and became 89.89±8.20 after intervention. While in non-interventional group, there is significant in increase in values of Hb and RBC count but the increment of Hb is more in interventional group then non interventional group

**Table 2: - Comparison of the mean values of haematological profile of study participants before and after intervention in both group**

| Parameter | Interventional Group (N=100) | | p-value$ | Non-interventional group (N=100) | | p-value $ |
|---|---|---|---|---|---|---|
| | Before Mean ±SD | After Mean ±SD | | Before Mean±SD | After Mean±SD | |
| **Hb (gm/dl)** | 10.58±1.79 | 11.72±1.48 | <0.001* | 10.33±1.62 | 11.01±1.48 | 0.002* |
| **RBC Count (million/cumm)** | 4.09±0.59 | 3.92±0.61 | 0.046* | 3.69±0.55 | 3.98±0.60 | <0.001* |
| **MCV (fL)** | 85.53±14.28 | 89.89±8.20 | 0.008* | 89.67±12.77 | 89.96±9.66 | 0.856 |
| **MCH (pg)** | 26.90±3.53 | 28.87±3.32 | <0.001* | 28.19±4.17 | 27.86±3.81 | 0.559 |
| **MCHC (gm/dl)** | 31.08±3.06 | 32.06±1.95 | 0.007* | 31.26±2.38 | 30.83±2.36 | 0.201 |

*$Students dependent t-test; *Statistically significant at 95% CI*

Table-3 depicts that in interventional group there were 34 (73.9%) participants that were originally anemic before the study, but following the intervention they became non anemic while there were 12 (26.1%) non anemic participants who became anemic following intervention. But the proportion of becoming to non anemic from anemic is more than anemic to non anemic (more positive change than negative change) and it is statistically significant (p=0.002) while in non-interventional group there were 30(58.8%) participants that were originally anemic at baseline of the study, at endline they become non-anemic, but there were 21(41.2%) non anemic participants became anemic at endline.

**Table 3: Proportional change in anemia status among study group during study period**

| Groups | Anaemia status | Anaemia status endline | | Total | Statistical |
|---|---|---|---|---|---|
| | Baseline | Non-anemic n | Anemic n | | Interpretation$ |
| **Interventional** | Non-anemic | 30 | 12 | 42 | p=0.002* |
| | Anemic | 34 | 24 | 58 | |
| | Total | 64 | 36 | 100 | |
| **Non-interventional** | Non-anemic | 20 | 21 | 41 | p=0.253 |
| | Anemic | 30 | 29 | 59 | |
| | Total | 50 | 50 | 100 | |

*$McNemar test; *Statistically significant at 95% CI*

 

## DISCUSSION

### Socio demographic profile

A total of 200 study participants were interviewed (100 intervention group and 100 non-intervention group) to fulfil the objectives of study. In present study, majority of study participants were Hindu ( 96% in interventional group and 90% in non-interventional group) followed by Muslim/other (4% in interventional group and 10 % in non-interventional group), In present study majority of study participants belonged to OBC category (48% in interventional group and 48% in non-interventional group) followed by General category (30% in interventional group and 26% in non-interventional group) and SC (22% in interventional group and 26 % in non-interventional group) study conducted by Bone JN et al (6) in rural west bengal show comparable ratio of hindu muslim population,in their study sc caste was the predominant caste in contrast to our study where obc caste is the predominant caste. In present study majority of study participants belonged joint family (55% in interventional group and 52% in non-interventional group) followed by nuclear family (40% in interventional group and 44 % in non-interventional group) and then three generation family (5% in interventional group and 4% in non-interventional group) and it was supported by various studies(6,7).

### Haematological changes in study participants of interventional and non-interventional groups before and after the intervention

In present study, the mean±SD haemoglobin before and after intervention was found to be 10.58±1.79 gm/dl and 11.72±1.48 gm/dl respectively (which increased by 1.14 gm/dl increased) in interventional group, while in non-interventional group mean±SD haemoglobin was 10.33±1.62 gm/dl at baseline and 11.01±1.4 gm/dl at endline (mean increase of 0.68gm/dl increased). More increase in haemoglobin in interventional group as compared to non-interventional group may be due to the effect of health education intervention. It is supported by a study done by Aditi sen et al (8) in which mean increase in Heamoglobin was significantly higher in interventional group (0.9 g/dL to 1.5 g/dL) than in non-interventional group (0.08 g/dL to 0.3 g/dL) .study conducted by Sunuwar DR et al also show similar findings in their study where changes in hemoglobin level was significantly high in the intervention over control group [0.56±0.40gm/dl vs. 0.16±0.82gm/dl, p = 0.002].similar results were found in study conducted by Ramachandran R et al 9 In the present study, RBC counts was 3.92±0.61 before intervention and after intervention it became 4.09±0.59, in non-interventional group RBC counts was found to be 3.69±0.55 at baseline and at endline it was 3.98±0.60. MCV was recorded 89.89±8.20 and 85.53±14.28 before and after intervention respectively in interventional group, in non-interventional group MCV was found to be 89.96±9.66 at baseline and 89.67±12.77 at endline. In interventional group, before intervention, Mean corpuscular haemoglobin (MCH) and Mean corpuscular haemoglobin concentration (MCHC) were found to be 26.90±3.53 and 31.08±3.06 respectively, and after intervention it became 28.87±3.32 and 32.06±1.95 respectively. In non-interventional group Mean corpuscular haemoglobin (MCH) and Mean corpuscular haemoglobin concentration (MCHC) at baseline were found to be 28.19±4.17 and 31.26±2.38 respectively which became 27.86±3.81 and 30.83±2.36 at endline. The findings of present study were similar to study done by Shankar B et al(9)

### Comparison of anemia status of study participants before and after intervention in both groups revealed that

There were 34 (73.9%) participants in the interventional group that were originally anaemic before the study, but after the intervention, they became non-anaemic while there were 12 (26.1%) non-anaemic participants who became anaemic following intervention. But the proportion of becoming non-anaemic from anaemic is more than anaemic to non-anaemic (more positive change than negative change) and it is statistically significant (p=0.002) while in the non-interventional group, there were 30 (58.8%) participants that were originally

anaemic at baseline of the study, at endline they become non-anaemic, but there were 21 (41.2%) non-anaemic participants became anaemic at endline. The difference in anaemia at baseline and end line of the study is statistically non-significant p>0.05 in the non-interventional study participants. Comparable results found in the study conducted by Ramachandran R et al (9,10) where 21 (35.6%) of pregnant women in the intervention group and 06 (10.3%) in the comparison group had a normal level of hemoglobin after four weeks of intervention.

## Conclusion

The present study highlights that the intensive health education sessions were effective. Health education sessions helped the study subjects to increase their knowledge regarding anemia, and improved their selection iron rich foods, enhanced compliance with iron supplementation, and improved their haemoglobin levels. The Health education with follow-up sessions and reminding the participants by whatsapp was an effective measure. As awareness motivates behavioural changes, awareness should be created through appropriate nutritional counselling during antenatal visits and through media and social media.

## Limitation of the Study

Iron and Folic Acid tablet adherence was decided by the pregnant women's nod of taking medication which might not be the actual adherence in pregnant women. This study was conducted among relatively smaller sample size which limits us to generalize the results. Health education was given but pursuance of that education was not monitored.

## Authors Contribution

All authors have contributed equally.

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Nil

## Conflict of Interest

There are no conflicts of interest.

## Declaration of Generative AI and AI Assisted Technologies in the Writing Process

The authors haven't used any generative AI/ AI assisted technologies in the writing process.

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