



# Strategies to address anaemia among pregnant and lactating women in India: a formative research study

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## Abstract

**Objective:** Over half of pregnant women in India are affected by anaemia, which can lead to premature birth, low birth weight and maternal and child mortality. Using formative research, we aimed to understand social and cultural factors around iron and folic acid (IFA) supplement provision and adherence to identify potential strategies for improving adherence and behaviours to prevent and treat anaemia among pregnant and lactating Indian women.

**Design:** In-depth interviews and focus group discussions with women and key informant interviews with health officials and workers.

**Setting:** Four districts in two Indian states: Allahabad and Bara Banki districts in Uttar Pradesh and Chikballapura and Mandya districts in Karnataka.

**Participants:** Pregnant and lactating women (*n* 65) and district officials and community health workers (*n* 14).

**Results:** Most women were aware of anaemia but did not understand its seriousness and consequences. All women received IFA supplements (predominantly for free), but many were not adherent because of side effects; lack of information from healthcare providers on the causes of anaemia, its seriousness and solutions and low social support. To address anaemia, women were most confident in their ability to prepare and eat healthier foods but lacked control over resources such as appropriate food availability.

**Conclusions:** Based on the findings, we recommend multicomponent interventions to train healthcare providers, address systemic barriers and involve family members to support IFA supplement adherence and dietary changes. Future research will determine which strategies are most effective to reduce the burden of anaemia in India among pregnant and lactating women.

**Keywords**  
Anaemia  
India  
Malnutrition  
Communication  
Behaviour change

Over half of women in India are affected by anaemia – including 50 % of pregnant women and 58 % of lactating women – and its prevalence continues to increase<sup>(1)</sup>, caused predominantly by iron deficiency<sup>(2)</sup>. The high prevalence of iron-deficient anaemia in India is attributed to the low bioavailability of iron in traditional Indian diets<sup>(3,4)</sup>. Another factor contributing to high rates of anaemia is that women need more iron than normal during the first trimester of pregnancy and while nursing<sup>(5)</sup>.

Anaemia may cause fatigue, shortness of breath, dizziness, headaches and heart arrhythmia. During pregnancy, its consequences are pronounced, leading to premature

births, low birth weight and maternal, perinatal and infant mortality<sup>(6)</sup>. In South Asia, 80 % of maternal deaths attributable to anaemia take place in India<sup>(7)</sup>. Consequently, finding solutions to anaemia is a national imperative.

The government of India has adopted the use of iron and folic acid (IFA) supplements during pregnancy as one of its primary prevention and treatment tools, mandating that all pregnant women receive 100 d of IFA supplements during pregnancy<sup>(8)</sup>. However, even though evidence shows that IFA supplementation reduces anaemia<sup>(9)</sup>, adherence among Indian women is poor<sup>(1)</sup>. Based on qualitative research conducted in India and other developing countries,

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poor adherence can be attributed to supplement side effects; low literacy; unclear instructions that may result in improper dosage<sup>(10)</sup>; constipation, gastritis and vomiting among pregnant and lactating women; forgetfulness and misunderstanding the need to continue taking supplements throughout pregnancy<sup>(11–13)</sup>. Other low-adherence factors include lack of awareness of anaemia symptoms and not understanding the consequences or the benefits of prevention, low agency within one's household, beliefs about pill consumption during pregnancy, poor utilisation of time-appropriate antenatal services and insufficient counselling by healthcare providers<sup>(14,15)</sup>.

Only limited comprehensive research has addressed the challenge of poor adherence to IFA supplement regimens, and little research has examined the efficacy of interventions to reduce anaemia and ways to improve IFA supplement adherence during pregnancy and breast-feeding in India. Consequently, research is needed to (i) better understand beliefs, attitudes, barriers and practices related to IFA provision and adherence to identify potential strategies for improving adherence and (ii) to identify other behaviours and strategies with the potential to address the anaemia burden. To help design or improve behaviour change and communication interventions for this target audience, the current study aimed to better understand the social and cultural factors that affect prevention and treatment of anaemia amongst pregnant and lactating women in India.

## Methods

### Sample

To have both northern and southern regions of India represented, we conducted our study in the states of Uttar Pradesh (UP) in the north and Karnataka (KA) in the south. In the UP, anaemia amongst pregnant women aged 15–49 years is 51.0%, close to the national average of 50.4%; whereas anaemia amongst pregnant women in KA in the same age group is 45.5%<sup>(1)</sup>. We then selected two districts within each state located near one another (because of cost and convenience considerations), whereby one district in the pair had a higher anaemia prevalence (i.e. 55.5% in Allahabad, UP; 53.9% in Chikballapura, KA) and rate of adherence to IFA tablets for 100 d or more amongst pregnant women (i.e. 24.6% in Allahabad, UP; 47.1% in Chikballapura, KA), and the other district had a comparably lower anaemia prevalence (i.e. 38.2% in Bara Banki, UP; 46.2% in Mandya, KA) and rate of adherence to IFA tablets for 100 d or more among pregnant women (i.e. 9.9% in Bara Banki, UP; 18.9% in Mandya, KA)<sup>(16–19)</sup>.

We also recruited a convenience sample of pregnant and lactating women for in-depth interviews (IDIs) and focus group discussions (FGDs). We identified potentially eligible participants with assistance from district-level

program officers and frontline health workers. At the time of IDIs and FGDs, we collected sociodemographic information and rescreened all women to confirm they were 18 years of age or older, living in the district where they were interviewed, currently pregnant or breast-feeding, identified as having been diagnosed with anaemia by a healthcare worker and reported receiving IFA supplements as part of anaemia treatment. Our final sample comprised 65 women, including 31 from UP (16 women from Allahabad, 15 from Bara Banki) and 34 women from KA (16 from Chikballapura, 18 from Mandya) with whom we conducted IDIs and FGDs. For the key informant (KI) interviews, we recruited a variety of district-level health officials ( $n$  9) and frontline health coordinators and workers ( $n$  5) from each of the four districts.

### Procedures

The IDIs allowed us to explore individuals' perspectives in the context of their own experiences, whereas the FGDs enabled us to explore topics broadly and to capitalise on the interaction between participants for generating ideas. Prior to collecting data, interviewers participated in a 2-d training on the research objectives, procedures, interview instruments and interviewing techniques. No incentives were provided to participants other than a light snack in the FGDs. The data were collected between November 2017 and February 2018.

### In-depth interviews

We conducted a total of 28 IDIs with pregnant and lactating women, including 16 IDIs in UP and 12 IDIs in KA. We developed a semistructured discussion guide with flexibility to pursue emergent issues, such as participants' experiences with anaemia during pregnancy and lactation and their food selection and preparation practices. Sample questions asked during the IDIs and other data collection activities are shown in Table 1.

We also included a card sorting activity with the IDIs to assess perceptions of the difficulty of a set of specific behaviours related to anaemia prevention and treatment. Participants were shown a set of 4–7 cards, with each card featuring a behaviour that could be used or leveraged to improve nutrition, increase adherence with supplements or provide greater family or social support. After reviewing each card in a category, participants were asked to sort them based on how hard or easy it would be to perform each behaviour. The use of cards as a projective technique in interviews helps to overcome self-censoring of responses and facilitates conversations on issues that might not easily be broached through direct questioning<sup>(20,21)</sup>. This approach also has been shown to be robust enough to work with low-literacy audiences<sup>(22)</sup>.

### Focus group discussions

We conducted a total of eight FGDs with pregnant and lactating women, including four FGDs each in UP and

**Table 1** Sample of questions from in-depth interviews, focus group discussions and key informant interview guides

<b>Individual factors</b>	
Are there extra things that you are doing to stay healthy during [your pregnancy/while you breastfeed]? Any special foods or drink you are consuming? Have you seen any medical or health specialist?	If you had one wish for your new child, what would it be?
How did you learn you had anaemia?	
<b>Interpersonal factors</b>	
After being told you were anaemic, what were you told you would need to do about it?	Did you receive support from others in addressing your anaemia? What did your husband or partner do?
Were iron supplements (tablets) offered to you as a part of your treatment for anaemia?	What is the standard treatment for anaemia followed in the district/state?*
When/how frequently do the pregnant women get tested for anaemia? Is testing conducted postpartum?*	
<b>Organisational factors</b>	
Can you tell me about the anaemia prevention and control programmes that are taking place in your district/state? What factors do you think are contributing to the impact being generated? Can you highlight the barriers/challenges faced during implementation of these programmes?*	What type of communication efforts have been done or are currently being done to address anaemia in your district? Are there any communication campaigns? Educational materials distributed? Tell me about any communication aspects for the programme you are administering. What communication channels are you using? What are the key messages you are sharing?*

\*Question asked during key informant interviews.

KA. Moderators first engaged participants in an activity to explore anaemia prevention and treatment behaviours and their challenges. Using a poster to facilitate this activity, we asked participants to brainstorm a name and other characteristics for a fictional persona of a woman with anaemia. We then asked participants to comment on what the woman *should* do to take care of her health and address her anaemia and what they thought the woman *would* do. During the activity, moderators used large post-it type notes on a poster to record and share group comments and elicit additional feedback from other participants on the information shared. Then participants completed the same behavioural exploration card sorting activity as done in the IDIs, with participants working together as a group to classify each card's behaviour as easy or difficult.

#### Key informant interviews

We conducted a total of fourteen KI interviews: seven each from UP and KA. We asked KIs a series of questions about the anaemia situation in their district; their experience with

anaemia prevention and control programmes, including the sustainability of programmes, the role of health systems and a multisectoral approach to addressing anaemia and the significance of effective communication for anaemia prevention.

#### Analysis

Audio recordings from IDIs and FGDs conducted in Hindi in UP and in Kannada in KA were transcribed and translated into English. We stored both the study's qualitative and quantitative data in Excel tables. To analyse the qualitative data, in Excel, we created a matrix of questions (columns) by participant/group (rows) and recorded the participant's responses in the corresponding cell<sup>(23)</sup>. This facilitated review and comparison of responses to individual questions and allowed for sorting by type of participant. We used the statistical software package IBM SPSS Statistics (IBM, Version 25.0) to conduct the statistical analysis.

In reviewing responses to individual questions, we used a constant comparative method<sup>(24)</sup> to look for emerging concepts or themes in the responses and to refine those concepts as we encountered outliers or differing views. This approach allowed us flexibility to generate ideas or theories about the data, while constantly testing them on new cases. We also noted substantive quotes as examples of common ideas shared in the responses. We synthesised key findings across the three data sources (IDIs, FGDs and KIs) to develop recommendations to prevent and treat anaemia. We used descriptive statistics to summarise participant characteristics.

#### Results

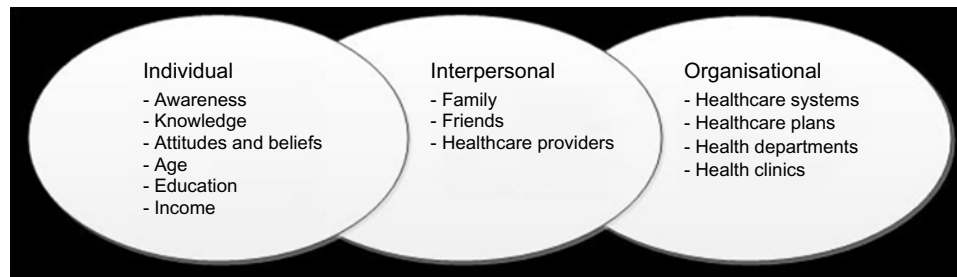
Consistent with our recruitment strategy, a little more than half of IDI and FGD participants were pregnant (57%), and nearly half of participants were breast-feeding (46%), with all participants having received some form of treatment for anaemia. Among the IDI participants, most (67%) had received some formal education. Most women reported that a healthcare provider had shared with them that they had low iron or anaemia (97%), had received IFA supplements (91%) and were receiving care from public-sector health facilities (83%), as shown in Table 2.

To present our formative findings, we use social ecological models of health to organise the prevailing and actionable themes. These models recognise that individuals' behaviour and health are influenced by their interpersonal relationships and their surrounding environment and systems<sup>(25–27)</sup>. They describe multiple levels of influence on which to intervene to change behaviour, such as individual, interpersonal and organisational factors<sup>(25)</sup>. Key influencers on health exist within each of these levels of influence. We present our results according to the key levels of influence and the corresponding key influencers for pregnant and lactating women diagnosed with anaemia,

**Table 2** Characteristics of participants as reported in in-depth interviews and focus group discussions

Characteristic	Uttar Pradesh		Karnataka		Overall	
	Mean or <i>n</i>	Range or %	Mean or <i>n</i>	Range or %	Mean or <i>n</i>	Range or %
	<i>n</i> 31		<i>n</i> 34		<i>n</i> 65	
Age (years)	25	19–36	24	19–37	25	19–37
Level of schooling*						
No schooling	3	30	0	0	3	13.6
Primary	3	30	2	16.7	5	22.7
Secondary	1	10	2	16.7	3	13.6
Higher Secondary	1	10	7	58.3	8	36.4
College	2	20	1	8.3	3	13.6
Currently pregnant	20	64.5	17	50	37	56.9
Number of months pregnant	6.7	1–9	6.6	4–9	6.7	1–9
Currently breast-feeding	14	46.7	16	48.5	30	47.6
Anaemia status shared by the healthcare provider	29	93.5	34	100	63	96.9
Received iron supplements	27	93.1	32	94.1	59	93.7
Sought help from health clinic for diagnosis or treatment of anaemia						
Public-sector facility	24	80.0	30	93.8	54	87.1
Private-sector facility	6	20.0	2	6.3	8	12.9

\*Information provided only by women who participated in in-depth interviews (*n* 28).

**Fig. 1** Socioecological model adapted for our study.

as shown in Fig. 1. We also separately present key insights from the card sorting activity that explored prevention behaviours, as shown in Table 3.

### Individual level

At the individual level, we report women's awareness, knowledge and attitudes about anaemia and their common experiences around their diagnosis and treatment. Most interview participants were aware of anaemia before their most recent diagnosis. Almost half of the IDI participants reported having experienced anaemia during previous pregnancies. Similarly, many participants knew that anaemia could potentially affect them during pregnancy, having heard about it from other women, elders in the community or relatives.

*'Women talk about it very often... women do not take good care of themselves. Few women can eat well, so it is very common.'* – Pregnant woman, UP

A few participants recounted seeing anaemia's more visible effects on other women, such as yellow or pale skin.

*'Yes, I knew someone [a neighbour] who had anaemia. The child is not born yet. Her skin is pale, so they are assuming that she has blood deficiency. Maybe she will have to be operated on [caesarean section].'* – Lactating woman, UP

The participants' common description for anaemia was loss or reduction of blood in the body during pregnancy, which they also associated with potential complications such as the need for a blood transfusion or a caesarean section. Many said anaemia resulted from not eating well, citing a lack of vegetables and fruits in one's diet. Conversely, milk and heat-prone foods were thought to cause anaemia.

*'Eating heat[-prone] food reduces the blood. Working in [the] garment [industry] and peddling machines produces heat [in the body]. Eating brinjal (green chili) creates heat, which reduces blood.'* – Pregnant woman, KA

Participants said the most important thing an anaemic pregnant or lactating woman could do was to 'eat well.' Foods thought to provide iron include green vegetables, beet

**Table 3** Quotations from participants during the behaviour exploration card-sorting activity that exemplify barriers and potential communication and behaviour change interventions to address anaemia

Topics	Quotations
1. Changing diet	
a. Buying a new food. Nearly all participants stated that this is a difficult behaviour. The most commonly reported challenge is that most women do not leave the house and other household members, usually the husband, purchase food. Some noted that buying a new food might be cost-prohibitive.	<i>'I get other people to buy food for me. Most of the time my husband gets it, but if he is not here then I ask someone else to get it.'</i> – Lactating woman, UP
b. Preparing a new food. In general, participants said this was the easiest diet behaviour to adopt. Cooking is not perceived as being difficult.	<i>'Cooking is easier than buying [food].'</i> – FGD participant, KA
2. Eating meals	
a. Preparing a separate meal. Overall, participants reported that this would be the <u>hardest</u> behaviour, although more stated that it would be <u>easy</u> than <u>hard</u> . The most common reason cited for it being hard was the time associated with making a second meal.	<i>'We can't cook separately for ourselves. We need to prepare for everyone.'</i> – Lactating woman, KA
b. Having all the family eat together. Most participants said this is an easy behaviour because they already eat together as a family. A few reported it would be difficult because of cultural and logistical reasons. For instance, one participant noted that the family eats at different times because of conflicting work schedules. Another participant stated that women in the household eat separately from men. One participant said she always eats last after her other family members.	<i>'It is difficult to get all family members to eat together.'</i> – FGD participant, UP
3. Receiving healthcare	
a. Traveling to visit your healthcare provider. Participants stated that this is the most difficult behaviour. Nearly all participants said this was because their healthcare centre is far away and/or transportation is difficult. Participants recalled difficulty in travelling on bikes and buses while pregnant and noted it would be easier if they owned their own vehicles.	<i>'It is hard as it involves lot of climbing up and down on the bus. For everyone, it is difficult to travel by bus. Even on a bike, it is difficult. We get back pain.'</i> – FGD participant, KA
b. Going to your healthcare provider with your husband or partner. Most participants said it would be <u>easy</u> as their husband already attends or would be willing to attend their healthcare visits.	<i>'It is easy and very important. It depends; if my husband is free, he will certainly come. It is important because he will get to know about us and the child's growth. Our doctor advises my husband on how to take care of us.'</i> – FGD participant, KA
4. Taking supplements	
a. Taking a supplement (tablet or pill) with a meal. Participants were evenly divided on whether this is an <u>easy</u> or <u>hard</u> behaviour. Participants who find it easy tended to already have adopted the behaviour. Participants finding it hard reported side effects such as stomach pain and vomiting. A couple of participants said that they do not take supplements because they are lactating.	<i>'I take tablets with a meal daily.'</i> – Lactating woman, KA
b. Visiting a healthcare clinic to get supplements. Most participants said that this would be an <u>easy</u> behaviour, citing that they already go for checkups. A few participants said this would be hard because the healthcare clinic is far away, and it is difficult to travel there, especially as they do not travel alone.	<i>'We already come to the hospital once a week and it is easy to get the tablets at the hospital.'</i> – FGD participant, KA
5. Communicating about anaemia	
a. Sending a text or e-mail message to your healthcare provider. Most participants stated that this would be <u>hard</u> for them because they do not know how to do it. Some participants said they would be willing to learn. The few participants who said it would be <u>easy</u> said they already call their provider on their mobile phone.	<i>'I don't know how to message, but I can talk over the phone. I am not educated.'</i> – Pregnant woman, UP
b. Learning about food nutrition. Most participants were comfortable and open to learning. Some had already talked to their healthcare provider about food-based strategies to treat their anaemia. A few participants stated that they found learning to be difficult.	<i>'If we learn, we will stay healthy, right? My ASHA suggested that I eat different types of foods.'</i> – FGD participant, KA

UP, Uttar Pradesh; FGD, focus group discussion; KA, Karnataka.

root, pomegranate, spinach, carrot, jaggery and sprouted pulses. However, the cost of foods was a challenge to healthy eating. Other barriers to changing one's diet and eating meals are shown in Table 3.

Among the IDI participants, most reported being informed – usually by a doctor in a hospital setting – of their anaemia during their prenatal checkup, based on Hb testing. Most were diagnosed around the fifth month



of pregnancy, although timing of diagnosis ranged from the second to the ninth month. Most participants also reported not experiencing symptoms prior to their diagnosis, although a few experienced shortness of breath, fatigue, tiredness, fainting, dizziness, headache and body pain, which prompted them to seek a diagnosis.

When asked what they were feeling when they learned of their anaemia, participants' responses were mixed. About half said it made them worried or anxious, with concerns focused on the well-being of their unborn baby and having a difficult delivery.

*'I was worried. Anyone could take the pain [of a difficult delivery], but nothing should happen to the baby. I cannot say exactly, but if the mother has low blood, how can the blood be there in the child? So, delivery will always be a problem. Like a person eats and lives, the child will eat through blood and survive.'* – Pregnant woman, UP

The roughly half of participants not concerned about their anaemia said that they knew it was possible during pregnancy or had experienced a prior diagnosis of anaemia during pregnancy.

All IDI participants reported being offered IFA supplements after receiving a diagnosis of anaemia, with most also receiving instructions on how to take the supplements. However, instructions varied in the number of times a day to take them and how to take them.

All participants said that they started taking the supplements. Several shared that they did not like taking the supplements because of the bad taste or associated side effects of nausea, vomiting, dizziness and headaches, which led some participants to stop taking them. Out of sixteen IDI participants who commented on their use of IFA supplements, eight reported completing an uninterrupted course, whereas five reported skipping doses or quitting. Another three participants reported quitting after their delivery, thus not taking them during lactation. Participants who were lactating who quit taking supplements reported being less motivated to continue use after delivery, financial constraints and having to travel too far to get them. In the FGDs, when asked about potential challenges to treating anaemia, participants suggested that women sometimes forget to take their supplements because of household chores, such as caring for other children.

A few participants reported their healthcare provider prescribed an iron tonic, after they had complained about the taste or the side effects of the supplements, although they provided little information on the source or makeup of the tonic. Other participants were prescribed iron injections or iron powder. In KA, blood transfusions appeared to be more commonly recommended, although the cost of this treatment was identified as a barrier to completing the recommended full course of transfusions.

KIs, such as district level officials and community health workers, reported women's lack of awareness about anaemia as the major reason for the extent of the problem. They said pregnant women in their districts were not aware of the seriousness and consequences of anaemia. One KI reported that women only get sensitised about anaemia when they start having complications, which is when they visit an auxiliary nurse midwife (ANM); an accredited social health activist (ASHA), or community health worker; or a doctor. One KI added that ASHAs are not fully knowledgeable about anaemia and contribute to the problem by providing inadequate and incomplete information to women in their village.

### **Interpersonal level**

Family, community members and healthcare workers are important influencers on women's experience with anaemia because these interpersonal relationships shape anaemia treatment practices. Other related barriers to receiving healthcare and taking supplements are shown in Table 3.

To understand women's domestic life during pregnancy, we asked participants about their daily tasks and routines and the support they receive from others during pregnancy. Nearly all participants reported receiving support from family members that made their pregnancies or care for their new child easier. Husbands were most often described as providing help with outside work like making purchases at the market and taking the woman to the hospital.

*'My husband helped with all the household chores, fetching water at home, cleaning dishes, washing clothes, with everything [during pregnancy]!'* – Lactating woman, KA

Although many participants reported their husbands were supportive during pregnancy, other women in the household more often provided support for prenatal care and anaemia treatment. Elder female family members, such as mothers and mothers-in-law, were described as trusted resources for information on pregnancy and breastfeeding. A few participants, primarily from KA, mentioned family members advising them not to take IFA supplements, typically out of concern that the supplements would cause the foetus to grow too large and complicate delivery.

*'Until the fifth month of pregnancy, I took the [IFA] tablets. Then my mother told me not to take them anymore. For 15 d, I have not taken the tablets. My mother told me the baby will grow too big and that taking too many tablets is not good for pregnant women.'* – Pregnant woman, KA

Although family was viewed as playing an important role in the physical and mental health of women during pregnancy, healthcare providers (particularly doctors)



were often seen as the authorities on care and treatment during pregnancy and anaemia. Nonetheless, often the information participants reported receiving was limited. Participants were simply told they had 'less blood' and that they needed to eat well and take all their IFA supplements. Little information was shared about the causes and prevention of anaemia.

*'The doctor advised me to eat well as there is less blood in me. Due to having less blood, there is going to be a problem with the delivery. He [the doctor] told me my blood has to be more than 11.'* – Pregnant woman, KA

When asked about the advice they received about the diet for addressing anaemia, participants' most common response was that healthcare providers said to eat more fruits and vegetables *'to increase the blood [haemoglobin level] and keep the baby healthy.'*

*'The ASHA...told me my blood [haemoglobin level] is 10. The doctor told me to eat green leafy vegetables.'* – Pregnant woman, UP

KIs also reported that women do not pay attention to what they are eating, especially to the nutritional content of their diets, eventually leading to anaemia. One KI stated that vegetarianism contributes to anaemia, as vegetarian foods are poor sources of iron and protein. Overall, KIs rarely mentioned household dynamics that might impact healthy eating or the availability of nutritional resources.

District-level KIs from UP and KA described tracking pregnant women at the district level and providing IFA supplements (depending on their Hb level) as the standard of care. Women are screened for pregnancy confirmation when they visit the ANM, and if affirmative their Hb levels are checked. Once women are registered in the tracking system, they are monitored by ASHAs who visit them regularly, providing them with supplements during pregnancy and postpartum and counselling them about locally available, iron-rich foods to eat.

### **Organisational level**

In general, participants reported getting IFA supplements free of cost from the hospital. Some of the KA participants – primarily women receiving their prenatal care from private hospitals – reported buying IFA supplements from a store. Most of the UP participants mentioned that ASHA workers visited their homes to provide the IFA supplements, whereas only some KA participants mentioned this. The KIs in UP reported receiving support from India's National Iron Plus Initiative (NIPI), an umbrella programme for anaemia reduction that provides children, adolescents, pregnant and lactating women and women of reproductive age with iron supplementation prophylactically. In contrast, the KIs in KA did not specifically identify a programme to address anaemia but mentioned ongoing programmes – such as Pradhan Mantri Surakshit Matritva Abhiyan (PMSMA) <sup>(28)</sup>

and Matru Poorna Yojana<sup>(29)</sup> – that are focused on the well-being of pregnant and lactating women, including anaemia.

KIs identified challenges for programme implementation related to both supply and demand. KIs in both KA and UP reported that beneficiaries' lack of interest, low awareness and knowledge of anaemia, illiteracy, poor uptake of IFA supplements and little family support were major programmatic challenges. Although KIs also reported that there are sufficient supplies of IFA supplements and access to services is improving at district health facilities, they also reported potential insufficient staffing at primary health centres. Other barriers reported by participants related to communicating about anaemia with healthcare providers are shown in Table 3.

### **Discussion**

The current study used formative research methods to improve understanding of the social and cultural factors – such as beliefs, attitudes, barriers and practices – that affect prevention and treatment of anaemia amongst pregnant and lactating women in India. We aimed to gather information to inform the design of behaviour change and communication interventions to address anaemia through increased IFA supplement adherence. Formative research is helpful for designing behavioural interventions because it describes relevant contextual information and current behaviours and beliefs that can influence intervention success<sup>(25)</sup>. This research was driven by the high prevalence and substantial burden of anaemia among pregnant and lactating women in India, coupled with the paucity of research with this population on behavioural interventions to combat anaemia and strategies to increase IFA supplement adherence. Our findings contribute to recommendations for future interventions and research.

### **Pregnant and lactating women**

Although the women in our study and in other qualitative research studies conducted in India generally seem to be aware that anaemia is a common issue during pregnancy<sup>(12,30)</sup>, our study revealed that pregnant and lactating women are not being provided with the information necessary to make informed decisions or to motivate them to make behavioural changes to address anaemia. Healthcare providers commonly advise women to 'eat well and take your IFA tablets' but do not explain the seriousness of anaemia, what they can expect from changing their diet and taking IFA supplements and the benefits of making these changes on their health and quality of life. Also, there is limited focus on anaemia during the breast-feeding period. Because anaemia is often diagnosed during pregnancy, it seems to be handled as a pregnancy-related issue. Consequently, women often stop taking IFA supplements after giving birth.



Our study also explored several behaviours that women could adopt or leverage to prevent and treat anaemia, such as IFA supplement adherence and dietary change. Amongst these behaviours, women seemed most confident in their ability to prepare and eat healthier foods, yet many of the resources related to food were not under their control, such as shopping for foods. Also, interventions aimed at improving women's diets will need to address making iron-rich foods available within the household.

Target audiences' values are important for motivating behavioural change. Women in our study consistently reported their desire for their children to be educated so they can have a better future. This insight could be incorporated as a motivating message in behaviour change interventions, providing a reason for women to stay healthy by eating iron-rich foods and taking IFA supplements, which may lead to healthy brain development and longer-term educational success for their child<sup>(31,32)</sup>. The content and delivery of such messages could be tested and refined through audience research.

### **Family**

Our study showed that, in general, husbands support their wives by encouraging them to eat well and engage in other behaviours to support a healthy pregnancy and by helping with household tasks. Yet, husbands did not seem to be engaged in their spouses' anaemia treatment or health decisions. Further, IFA supplement adherence may be undermined by household members, specifically elder family members, who convey discouraging sentiments about IFA supplementation and share erroneous information. Consequently, interventions may need to address inter-generational issues and counter myths and misconceptions about anaemia treatment, such as that IFA supplements increase baby size and complicate delivery<sup>(33)</sup>.

Based on the results of the current study and prior research in India<sup>(8,34)</sup>, future research is needed on strategies for incorporating husbands, mothers-in-law and sisters-in-law as advocates for anaemia prevention and treatment adherence, such as during healthcare visits to the ASHA or doctor. One consideration is to give husbands specific roles or activities for supporting their wives. Research has shown the benefit of enlisting social support from spouses to assist partners in making dietary changes to lower their cholesterol<sup>(35,36)</sup> and lose weight<sup>(37,38)</sup>. In these studies, spousal involvement was typically defined as attending meetings or medical appointments and/or supporting a spouse who was a patient with a disease or risk factor that called for dietary change<sup>(39)</sup>, similar to anaemia. It might be advantageous to incorporate anaemia into a general discussion of family roles related to maternal health, coupled with messages that resonate with family goals and motivators, such as a healthy mom/wife/daughter-in-law/sister means a healthy family and healthy future.

### **Healthcare providers**

Our findings suggest that healthcare provider training – for example, for doctors and ASHAS – is needed to improve communication with women about anaemia. This is consistent with a review of barriers and enablers for improved coverage and utilisation of IFA supplements by pregnant women in Africa and Asia, which concluded that investment and effort in training for healthcare providers were urgently needed to improve women's adherence to IFA supplements and impact behaviour change<sup>(40)</sup> and with the findings from a qualitative research study conducted in India and other developing nations<sup>(12)</sup>. Providers need to inform women of: (i) their Hb level during pregnancy and breast-feeding, (ii) the consequences of anaemia for themselves and their child during pregnancy and as the child develops after birth and (iii) the effects of IFA supplements, including their side effects and how they relate to other bodily experiences during pregnancy; for example, constipation is a side effect, but also may be caused by pregnancy, and mitigation strategies for side effects.

For most women, dietary change during pregnancy will not be adequate to treat their anaemia<sup>(41–43)</sup>. Studies show that women and healthcare providers believe that eating an iron-rich nutritious diet is the best way to prevent and treat anaemia<sup>(44,45)</sup>. In our study, some providers falsely equated women's improved diets during pregnancy with the benefits of IFA supplementation in their explanations of treatment, which reflects another critical topic for provider education.

### **Health system**

A minority of women chose to obtain IFA supplements outside of the Indian government distribution system and appeared to do so out of choice rather than necessity. In general, women reported few challenges in getting IFA supplements during pregnancy. However, in their current form, IFA supplements produce side effects that hinder adherence. Consistent with other research<sup>(10,11,46)</sup>, our study underscored the challenges of promoting a treatment that can have multiple side effects for women who are already going through a period of intense biological changes during pregnancy.

Strategies to address the challenges of IFA supplement adherence remain elusive, other than recognising and legitimising the discomfort of its side effects and the challenges associated with adherence to any regular medication or supplement. However, promising interventions are emerging in other low- and middle-income countries to improve adherence. For instance, involving family members, especially husbands and mothers-in-law, to support IFA supplementation has been shown to significantly improve women's adherence<sup>(47,48)</sup>. Additionally, improving women's understanding of the impact of anaemia on birth outcomes and the benefits of IFA supplementation shows some improvement in adherence<sup>(48,49)</sup>.





A campaign being conducted in Bihar, India, uses visual reinforcement – blood-drop-shaped stickers to be pasted into a booklet with an outline of a baby – to show that each IFA tablet helps to create a complete, healthy baby<sup>(50)</sup>. Another formative research study conducted in Odisha, India, is examining barriers and facilitators to IFA use and adherence using the theory of normative social behaviour to contribute to the development of a large-scale intervention at the individual, interpersonal and community levels to improve uptake of IFA supplements and reduce anaemia among women of reproductive age<sup>(14)</sup>. These strategies are promising, although they need to be tested to determine efficacy.

Anaemia has a complex aetiology, including a multitude of social and institutional factors associated with anaemia amongst pregnant and lactating women in India. This current study focused mainly on IFA adherence, one aspect of a multifaceted solution to address India's high anaemia prevalence supported by the government of India and explored how it could be addressed with behaviour change and communication interventions. Other approaches include food-based strategies, such as dietary diversification and iron fortification of foods, and improvements to health services<sup>(51)</sup>. Additionally, control of malaria and other parasitic infections, especially in endemic areas, is recommended as part of anaemia prevention<sup>(52)</sup>. Other key challenges include poverty, lack of access to diversified diets, inadequate healthcare services and sanitation and inadequate health promotion<sup>(53)</sup>. One study found that improvements in women's education, household socioeconomic status and sanitation, along with a higher body mass index, greater intake of meat and fish and having fewer young children were key factors for improving anaemia in India<sup>(42)</sup>. Given that reductions in anaemia have been associated with delayed age at pregnancy, reduced open defecation and increased levels of iron, folic acid and phytate, multifaceted interventions should address family planning, sanitation and other nutrient deficiencies in addition to IFA supplementation<sup>(43)</sup>.

### Limitations

One limitation of our study is its reliance on self-reported data, which inherently has the potential to be influenced by social desirability bias. Also, because we used a nonprobability-based sample of participants from two states in India rather than a probability-based sample drawn from the entire country, the study results are not generalisable to the larger population of pregnancy and lactating women in India. These limitations are present in qualitative research studies and do not lessen the contributions of this formative data to inform future research and interventions.

### Conclusion

The findings from this formative research can be used to develop intervention strategies that the government of India and others can use that match the needs of pregnant

and lactating women in India, their families, and their healthcare providers and systems to address the anaemia burden. We recommend healthcare provider training, incorporating husbands and other family members as advocates for encouraging IFA supplement adherence, and strengthening health systems to increase responsiveness as key strategies. Additionally, future anaemia prevention and treatment interventions targeted at pregnant and lactating women in India need to address cultural beliefs related to IFA supplement side effects and facilitators and barriers such as women's lack of control over food purchases and women's inherent motivation to secure the best future for their children, while also involving key influencers such as husbands, other family members and healthcare providers. The complex nature of anaemia underscores the need for multicomponent interventions.

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