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Chiwoneso B. Tinago

West Chester University of Pennsylvania, ctinago@wcupa.edu

Lucy Annang Ingram

University of South Carolina

Christine E. Blake

University of South Carolina

Edward A. Frongillo

University of South Carolina

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Original Article

Individual and structural environmental influences on utilization of iron and folic acid supplementation among pregnant women in Harare, Zimbabwe

Chiwoneso B. Tinago^{*}, Lucy Annang Ingram[†], Christine E. Blake[†] and Edward A. Frongillo[†]

^{*}Department of Health, College of Health Sciences, West Chester University, West Chester, Pennsylvania, USA, and [†]Department of Health Promotion, Education, and Behavior, Arnold School of Public Health, University of South Carolina, Columbia, South Carolina, USA

Abstract

Micronutrient deficiencies are prevalent among Zimbabweans with serious health and social implications. Due to a lack of a national micronutrient food fortification policy, the Zimbabwe Ministry of Health and Child Care established a policy for the prevention of maternal micronutrient deficiencies, which centres on pregnant women receiving daily iron and folic acid (IFA) at their first antenatal care visit and throughout pregnancy. Despite these efforts, utilization of IFA supplementation in pregnancy in Zimbabwe is low. This study aimed to understand the experiences and knowledge of IFA supplementation among pregnant women and healthcare workers in Harare, Zimbabwe, and the influence of health-service and social environments on utilization. Semi-structured in-depth interviews were conducted in Shona and English, with pregnant women ($n = 24$) and healthcare workers ($n = 14$) providing direct antenatal care services to pregnant women in two high-density community clinics. Data were analysed thematically using NVivo 10. Influences on utilization were at the individual and structural environmental levels. Reasons for low utilization of IFA supplementation included forgetting to take IFA, side effects, misconceptions about IFA, limited access to nutrition information, delayed entry or non-uptake of antenatal care and social norms of pregnant women for IFA supplementation. Utilization was enhanced by knowledge of risks and benefits of supplementation, fear of negative health complications with non-utilization, family support and healthcare worker recommendation for supplementation. Study findings can inform approaches to strengthen micronutrient supplementation utilization to improve the micronutrient status of pregnant women to decrease maternal mortality and improve overall maternal and child health in Zimbabwe. © 2016 John Wiley & Sons Ltd

Keywords: iron and folic acid supplementation in pregnancy, micronutrient deficiencies, qualitative research, nutrition in pregnancy, antenatal care, Zimbabwe.

Correspondence: Chiwoneso Tinago, Department of Health, West Chester University, 308 Sturzebecker Health Sciences Center, 855 S. New Street, West Chester, PA 19383, USA. E-mail: ctinago@wcupa.edu

Introduction

Globally, the prevalence of anaemia in pregnant women is 38% (32.4 million) with half due to iron deficiency (WHO 2014). Maternal anaemia, defined as low concentrations of haemoglobin, is associated with maternal and child morbidity and mortality with increased risk of post-partum haemorrhage, miscarriages, stillbirths, prematurity and low birthweight (Levy *et al.* 2005; WHO 2011; WHO 2014). Micronutrient deficiencies are prevalent in Zimbabwe with serious health and social implications, particularly among pregnant

women who have an increased nutritional need (Montgomery 2003). Iron deficiency, the most common cause of anaemia globally, is the most prevalent micronutrient deficiency among pregnant women, with 32.4% of pregnant women having anaemia, which contributes to the country's high maternal mortality ratio of 581 deaths per 100 000 live births (WHO 2011; ZIMSTAT 2015).

Micronutrient deficiencies persist in developing countries like Zimbabwe because of food insecurity and lack of national policy concerning fortification of foods with micronutrients (Gadaga *et al.* 2009;

Darnton-Hill 2012). Given this, the Ministry of Health and Child Care of Zimbabwe established a national policy at independence in 1980 for preventing maternal micronutrient deficiencies that centres on pregnant women receiving daily iron and folic acid (IFA) supplements at their first antenatal care (ANC) visit (at 8–16 weeks pregnant) and throughout pregnancy (WHO 2012; ZDHS 2012; MOHCC 2015).

The recommended IFA composition includes 30–60 mg of elemental iron and 400 µg (0.4 mg) of folic acid (WHO 2012). Folic acid reduces risks of adverse pregnancy outcomes such as fetal malformations, impaired fetal growth, pre-term delivery and maternal anaemia and is included with iron to meet increased requirements during pregnancy (Tamura & Picciano 2006; Fekete *et al.* 2010; Peña-Rosas *et al.* 2012; WHO 2012). Iron supplementation improves iron status during pregnancy and prevents risks associated with iron deficiency and maternal anaemia (Allen 2000; Peña-Rosas *et al.* 2012; Nisar & Dibley 2014). Benefits of iron supplementation extend to infants with an increase in birth length and higher ferritin levels at 3–6 months (Peña-Rosas *et al.* 2012). IFA supplementation is more effective when taken in the periconceptional period and throughout pregnancy with reductions in maternal anaemia, stunting in children under 2 years old, low birthweight, and neonatal and under 5 mortality (Fekete *et al.* 2010; Imdad & Bhutta 2012; Bhutta *et al.* 2013; Nisar *et al.* 2015; Nisar *et al.* 2016). Countries with successful policies for IFA supplementation in pregnancy integrate IFA supplementation with ANC and community outreach (Mora 2007; Sanghvi *et al.* 2010).

The 2010–2011 Zimbabwe Demographic and Health Survey (ZDHS) highlights that utilization of IFA supplementation among pregnant women is low, with 49.8% of women not taking iron supplements during their last pregnancy and 36.5% taking it for less than 60 days. Factors that contribute to consumption such as requests by patients, distribution by healthcare workers, and availability of supply were not assessed in the 2010–2011 ZDHS. In addition, the 2010–2011 ZDHS did not provide qualitative data to explain low IFA utilization rates, and there are no documented studies explaining low utilization of IFA supplementation in Zimbabwe. This research aimed to understand individual experiences with and knowledge about IFA supplementation of pregnant women and healthcare workers in Harare, Zimbabwe, the health-service and social environment in which IFA supplementation occurs, and how these influence utilization of IFA supplementation.

Methods

Setting

Zimbabwe is in south-east Africa and has a population of 12 973 808 with 6 234 931 men and 6 738 877 women (ZIMSTAT 2013). English and Shona are the official and predominant languages, respectively. The study was conducted in two municipality-owed clinics in two low-income high-density communities in the capital city Harare. Mbare has a population of 86 019 and is in southern

Key messages

- Reasons for low utilization of iron and folic acid (IFA) supplementation were forgetting to take IFA, side effects, misconceptions about IFA supplementation, limited access to nutrition information, delayed entry or non-uptake of antenatal care services, and social norms of pregnant women for IFA supplementation.
- Utilization of IFA supplementation was enhanced by knowledge of risks and benefits of supplementation, fear of negative health complications with non-utilization, family support, and healthcare provider recommendation.
- Future approaches to improve maternal IFA supplementation utilization in Zimbabwe should address individual and structural environmental factors that begin before pregnancy and continue throughout pregnancy. These include reaching pregnant women who are currently not seeking antenatal care services and continuing to ensure supplies of the full regimen of IFA are available, not just for women using antenatal care, but for all pregnant women in clinic catchment areas.

Harare, while Mabvuku has a population of 47 154 and is in eastern Harare (City of Harare 2014). The study clinics were selected because they served similar low-income high-density communities to garner diverse perspectives on IFA utilization when compared with including one study clinic and because they had the highest number of deliveries of any municipality-owed clinics in the city (City of Harare 2014).

Study design

We used a qualitative research design with semi-structured in-depth interviews. The study sample included a purposive sample of: (1) 24 pregnant women aged 18 years and older who had attended at least one ANC visit during their current pregnancy and resided in either of the two study communities, and (2) 14 healthcare workers employed by either of the two study clinics and who provided direct counselling and healthcare services to pregnant women seeking ANC services. Sample size was determined based on similar qualitative assessments conducted among similar populations (Galloway *et al.* 2002). Healthcare workers were included because of their integral role in counselling and dispensing micronutrients to pregnant women and their insight on structural influences such as the availability and accessibility of these micronutrients at the health-facility level. The study did not track utilization of IFA supplements among pregnant women.

Instrumentation

A semi-structured interview guide, socio-demographic survey, and consent form were developed in English by the research team and translated to Shona by a professional translator. The interview guide used with pregnant participants had 15 open-ended questions and additional probes, while the guide for interviews with healthcare workers had 12 open-ended questions and additional probes. An example of an interview question for pregnant women was “What do you think are the benefits of taking IFA tablets?”, while healthcare workers were asked “What do you think are the benefits of IFA supplementation to pregnant women?” The socio-demographic survey was completed immediately prior to each interview, and questions included

age, gender, race, marital status, maternal history and profession. The consent form highlighted the study’s purpose and emphasized voluntary participation.

Data collection

Data were collected by the first author and a trained research assistant using a semi-structured interview guide and socio-demographic survey delivered in either English or Shona. Interviews lasted 30–45 min. Prior to data collection, interview questions were pretested with three pregnant women and two healthcare workers residing outside the study sites, and interview questions were refined for comprehension (Willis 2005). Detailed field notes were taken during and immediately following the interviews. Study participants were recruited from study maternity clinic waiting rooms using reactive (e.g. fliers) and proactive (e.g. snowball and in-person) recruitment strategies. Participants provided signed consent and completed a brief interviewer-administered socio-demographic survey immediately prior to each interview. Interviews were conducted between June and July 2014. All study participants received a US\$5 incentive for participating.

Ethical considerations

Approval was sought and received from the University of South Carolina Institutional Review Board, City of Harare Ethics Committee, and the Medical Research Council of Zimbabwe (MRCZ). Participants were assigned an ID number and no names linking participants to data were recorded. Study results were presented to community members, study clinics, the City of Harare and the MRCZ through presentations and written reports.

Data analysis

Interviews were audio recorded, transcribed verbatim and translated by the principal investigator and a professional translator. The transcribed interviews and field notes were analysed thematically using NVivo 10 (QSR International, Melbourne, Australia) (Saldaña 2013). Emergent coding of interview transcripts was conducted to develop a preliminary code book (Saldaña 2013). The code book was reviewed by two research team members,

and further emergent coding was conducted until a final code book was developed after saturation was reached. Univariate analyses were conducted for socio-demographic data using SAS 9.3 (SAS Institute, Cary, North Carolina, USA).

We used interviewer triangulation to offset threats to validity inherent in using a single interviewer (Maxwell 2013). The triangulation validation strategy was also employed by using multiple data analysts to review the data.

Results

Study results are presented according to sample characteristics, individual experiences with IFA supplements, knowledge of IFA supplementation and the health-service and social environment on IFA supplementation utilization. Participant quotes are identified by participant type (i.e. pregnant woman or healthcare worker) and age.

Sample characteristics

The mean age of pregnant women was 26 years (range 18–36 years), and most were of Shona ethnicity (95.8%). Most women were in married monogamous relationships (87.5%) and had a high school education between Form 1 and 4 (91.7%), half were Christian Protestant, two-thirds were dependent on their partner for income and three-quarters had a previous pregnancy. The average gestational age at initial ANC visit was 6 months, while the average gestational age at time of interview was 8 months (Table 1).

Healthcare workers had a mean age of 45 years (range 32–54 years) and were predominantly women (92.9%). Healthcare worker positions were registered nurse and midwife (42.9%), midwife (50.0%) and state-certified nurse (7.1%) who had held their positions for on average 13 years (Table 2).

Individual experiences with iron and folic acid supplements

Most pregnant women in this study liked the size of the IFA tablet and were happy that it was one combination pill as opposed to two separate pills. Most did not mention anything negative about the taste or smell of the tablets.

Table 1. Socio-demographic characteristics of IFA supplementation study participants: pregnant women ($n = 24$)

Pregnant women ($n = 24$)	
Characteristics	n (%)
Age	
Mean age (years)	26
Age range (years)	18–36
Race	
Black	24 (100)
Ethnicity	
Shona	23 (95.8)
Ndebele	1 (4.2)
Marital status	
Married monogamous	21 (87.5)
Married polygamous	3 (12.5)
Highest education level	
High school (Form 1–4)	22 (91.7)
High school (Form 5–6)	2 (8.3)
Religious affiliation	
Apostolic	7 (29.2)
Catholic	2 (8.3)
Protestant	12 (50.0)
Pentecostal	3 (12.5)
Main source of income	
Formally employed	2 (8.3)
Self-employed	2 (8.3)
Cross border trading	2 (8.3)
Dependent on partner	16 (66.7)
None	2 (8.3)
Prior pregnancies (including miscarriages and stillbirths)	
Yes	18 (75.0)
No	6 (25.0)
Average months pregnant at first ANC visit and at first receipt of IFA	6
Average months pregnant at time of interview	8

Self-report measures for all SES data. Form 1–4 equivalent to the first four grades of high school (ages 11–16 years). Form 5–6 equivalent to the last two grades of high school (ages 16–18 years). ANC, antenatal care; IFA, iron and folic acid.

Forgetting to take iron and folic acid

A reason for non-utilization among some pregnant women was forgetting to take the tablets. A pregnant woman explained, “Sometimes, I forget. I want to take them every day, but sometimes I go to work at night so I forget” (Pregnant woman, 31 years).

Side effects

Most pregnant women reported experiencing side effects, which had mostly negative implications on utilization of IFA supplementation. Side effects included

Table 2. Socio-demographic characteristics of IFA supplementation study participants: healthcare workers ($n = 14$)

Healthcare workers ($n = 14$)	
Characteristics	n (%)
Age	
Mean age (years)	45
Age range (years)	32–54
Gender	
Male	1 (7.1)
Female	13 (92.9)
Race	
Black	14 (100)
Ethnicity	
Shona	14 (100)
Position	
Registered nurse and midwife	6 (42.9)
Midwife	7 (50.0)
State certified nurse	1 (7.1)
Number of years in position	
Average	13
Range	1.5–26

IFA, iron and folic acid.

nausea, vomiting, constipation, blackened stool, and dark urine. Although less commonly stated, increase and decrease in appetite were also described as reasons for not adhering to the IFA regimen with a pregnant woman stating, “If I don’t feel like eating that day I don’t take them because they make me feel hungry” (Pregnant woman, 25 years). Another pregnant woman described, “If I take them in the morning, I spend the whole day without appetite and wanting to vomit” (Pregnant woman, 23 years).

The side effects could be compounded by comorbidities such as HIV/AIDS, with a healthcare worker describing:

So we have cases of women who are HIV positive and they are already taking tablets for that and those tablets have their own side effects. So to add additional side effects because they are taking these (IFA) tablets for the most part, they may not want to take them. (Healthcare worker, 54 years)

Knowledge of iron and folic acid supplementation

Blood-enhancing tablets

The IFA tablets described by participants were dark red in colour and contained ferrous fumarate (182.4 mg,

equivalent to 60 mg of elemental iron) and 0.46 mg of folic acid. Tablets were introduced to pregnant women during their first ANC visit, and each pregnant woman received the tablets in a clear packet containing 30 tablets labelled with the tablet name and dosage. The common dosage was one tablet daily until delivery and pregnant women could refill their tablets at each subsequent ANC visit. If pregnant women tested positively for iron-deficiency or anaemia, a test that was available in these clinics, they were given a higher dosage of two to three tablets daily or they were referred to a local hospital for further testing. At the time of the interviews, healthcare workers reported that IFA supplements were fully stocked in both study clinics.

Participants described iron deficiency anaemia as having ‘low blood’ and the IFA supplements as ‘blood-enhancing tablets’. Folic acid was encompassed in this definition, and there was no local name to describe folic acid. Participants associated IFA tablets with their ability to increase blood while enhancing it with nutrients.

Misconceptions

Misconceptions about IFA supplementation contributed to non-utilization, and stemmed from lack of understanding about the components and effects of the supplements. When asked, most pregnant women did not know that folic acid was in IFA tablets, and none knew its purpose. They said that the healthcare worker did not talk about folic acid or that they could not remember them talking about folic acid. A pregnant woman said, “We were just told to take these tablets. They are blood-enhancing tablets, once per day. They did not explain a lot” (Pregnant woman, 22 years).

Although all healthcare workers were knowledgeable about IFA supplementation, they acknowledged that they did not describe the purpose of folic acid to the pregnant women stating, “In most cases we do not explain. We just take them as one and the same thing...they are blood-enhancing tablets; and it will end like that. It is very rare for us to distinguish between ferrous sulphate and folic acid” (Healthcare worker, 46 years). Another healthcare worker explained, “We do describe and tell them the contents of the tablet, but sometimes it’s a bit difficult to really explain it in Shona. If you want to explain it in English,

sometimes our community won't be able to understand it" (Healthcare worker, 32 years).

Misconceptions arose about the type of medication the pregnant women were taking. A healthcare worker explained:

Someone actually asked me, "Nurse, you said these are blood-enhancing tablets, are people at home supposed to know about this? Because those people on antiretroviral drugs also take these tablets, is it not the case that if people see me taking these tablets they will assume that I also take antiretroviral drugs?" The point is that a person will not take them; she would just put them aside or even throw them away because they are afraid of the people they live with such as aunts and in-laws. They might think the tablets are antiretroviral drugs. (Healthcare worker, 46 years)

Pregnant women were worried about people thinking that they were taking HIV medications, so they would take their IFA tablets in secret or stop taking them altogether.

Healthcare workers believed that pregnant women did not understand the possible effects of taking the tablets, which led them to associate the negative side effects with the supplements being ineffective. A healthcare worker explained, "Their perception is like they don't fully believe in the iron tablet because they think it causes problems for them once they are constipated or once they start passing the darkened stool" (Healthcare worker, 50 years).

Limited access to nutrition information

Most pregnant women reported not having an avenue through which they received nutrition information. Some pregnant women described receiving nutrition information at the clinic from nurses or reading charts posted on clinic walls. A pregnant woman reported receiving nutrition information from her husband stating, "I do not go anywhere but I rely (on) my husband (who) brings me pamphlets about nutrition for pregnant women from his work place" (Pregnant woman, 23 years). Some pregnant women did not receive nutrition information when they came for ANC with a pregnant woman stating, "They did not talk about diet" (Pregnant woman, 27 years).

Pregnant women who reported receiving nutrition information during ANC described iron-rich foods that they said were beneficial for women with low blood

that included dark leafy vegetables, chicken livers and root vegetables. A pregnant woman described healthcare workers telling her, "You should eat a balanced diet, mostly green leafy vegetables, liver and potatoes, sweet potatoes, carrots and drink a lot of water" (Pregnant woman, 25 years).

Contrary to pregnant women's descriptions, all healthcare workers described providing nutrition information to pregnant women during ANC, with a healthcare worker stating:

We also should encourage our women to consider their diet seriously because it cannot be the tablets alone that are important...her diet should also be rich in iron. However, because some would not know about it, they will concentrate on taking blood-enhancing tablets without considering the issue of diet. (Healthcare worker, 43 years)

Healthcare workers described that one reason they shared information about iron-rich foods to eat during pregnancy was because pregnant women were consuming white sand or 'daga', which is usually found on trees, and some pregnant women associated this white sand consumption with iron deficiency. A healthcare worker stated:

Some of them want to eat daga...Someone was saying that that is a sign of iron deficiency. We tried to tell them to leave the daga because it causes constipation...and you don't know where it comes from... We try to tell them about a diet to eat pumpkin leaves, spinach, liver so that it helps them boost their iron levels and also it will keep them healthy. (Healthcare worker, 39 years)

A healthcare worker described that at times they handed out nutrition-related print materials, but they were out of stock. They did not have nutrition print materials specific to IFA supplementation. When asked about distributing nutrition print materials to pregnant women attending ANC, a healthcare worker acknowledged, "Yeah at times we do that is if we have them. And we also have posters for them so that when they are sitting they can read about diet, immunization and everything, but for iron and folic acid, I have not seen them" (Healthcare worker, 39 years).

Risks and benefits of supplementation

Knowledge of risks and benefits of supplementation influenced most pregnant women to adhere to their

IFA supplementation regimen. A pregnant woman explained:

The other issue is that we should be given enough information; like whether or not we should take them before or after eating...If you have the information you will persevere because with anything good, there are side effects...I want him/her (healthcare worker) to tell me their exact function in my body and their importance to me and my child as well as the way I should take them. (Pregnant woman, 23 years)

Most pregnant women explained that healthcare workers described the benefits and side effects of taking the IFA tablets. The benefits described included increased blood, reduced risk of negative effects with blood loss at delivery, increased strength, reduced craving for white sand (daga) and health of mother and baby. Side effects that the pregnant women described the healthcare worker explaining included blackened stool, dark urine, nausea and vomiting.

Healthcare workers described the benefits of taking the IFA tablets that they shared with pregnant women, which included increased blood, lower possibility of post-partum haemorrhage and for the baby's health. A healthcare worker stated:

We tell them that now they are two so the mother needs more blood to be able to take care of the baby as well and when they deliver most likely they will lose a lot of blood so we will be trying to make sure that they have a lot of blood to begin with for delivery and for the baby. (Healthcare worker, 39 years)

The side effects that healthcare workers described sharing with pregnant women included blackened stool, dark urine, constipation, nausea and vomiting. Healthcare workers stated that they encouraged pregnant women to take their tablets with food to counter side effects stating, "To avoid nausea, they should take the tablet with food. The tablets cause nausea, so in most cases it is better if you take them whilst eating sadza (maize staple food)" (Healthcare worker, 38 years). Healthcare workers emphasized that the pregnant women should take their IFA tablets at the same time every day and drink lots of fluids to counter side effects such as constipation.

Fear of negative health complications with non-utilization

Most pregnant women described fear of losing blood during delivery as a driving force for taking IFA tablets as prescribed. A pregnant woman stated, "I take the tablets because I am scared that when I deliver and I lose a lot of blood and I wasn't taking my tablets I may not be strong enough" (Pregnant woman, 22 years). Some pregnant women highlighted that excessive bleeding at delivery brings about an added cost for a blood transfusion, with a pregnant woman describing, "I take them so that when I deliver, I will not lose a lot of blood because buying the blood will be expensive" (Pregnant woman, 28 years).

Shared blood between mother and fetus and health of the fetus were a common response as to why pregnant women were utilizing the IFA supplements, with a pregnant woman describing, "I was just told that the fetus uses that blood, so you would think that the fetus would be in trouble if there is a shortage. I am afraid of that...you will be thinking about your child and this encourages you to take them properly" (Pregnant woman, 22 years).

Health-service and the social environment on iron and folic acid supplementation utilization

Influences on IFA supplementation utilization were found at the structural level with delayed entry or non-uptake of ANC services and social environment influences. The following is a detailed description of these influences.

Delayed entry or non-uptake of antenatal care services

All pregnant women described their introduction to IFA supplementation occurring at their initial ANC visit, which is termed a booking in this context. The majority of pregnant women described attending their initial ANC visit at between 5 and 6 months pregnant. Healthcare workers emphasized the need to educate pregnant women about attending their initial ANC visit earlier in their pregnancy for IFA supplementation effectiveness with a healthcare worker explaining:

These women need to be educated that they should book early because if they book early...maybe they will be able to start the folic at an earlier stage... You find, I don't know

whether it is our culture or not, or maybe it's because of socioeconomic problems, you find someone books at 38 weeks, next week delivers, or maybe we will have given them a packet for 28 days obviously most of the time they do not finish. (Healthcare worker, 39 years)

The healthcare workers discussed the high number of women who deliver babies in the clinic without attending an ANC visit. A healthcare worker explained:

What we see is we have a lot of unbooked cases so those unbooked cases at times they give us problems or it's an unbooked and they deliver at home...Maybe she bled a lot...When we see her she will have anemia because of the bleeding that occurred. I think people should be educated that they need to deliver at clinics... because when BBA (born before arrival) occurs, we cannot account for it because it occurred at home. (Healthcare worker, 39 years)

These unbooked deliveries and 'born before arrival' cases mean that pregnant women probably have not received IFA supplements because all women in the study were introduced to the supplements during their initial ANC visit.

Healthcare worker recommendation for iron and folic acid supplementation

A common response from most pregnant women concerning why they took their IFA tablets was healthcare worker recommendation. The pregnant women valued the opinions of the healthcare workers and affectionately called them 'grandmother' and 'grandfather'. A pregnant woman said, "They told me and I follow instructions...they know what they will be doing" (Pregnant woman, 36 years). Another added, "The blood-enhancing tablets I take them because they are good in that they make it so that we have enough blood in our body since this is what the healthcare worker said. Also, what is promoted at the clinic are things that are good" (Pregnant woman, 30 years).

Social norms among pregnant women

Most pregnant women acknowledged that most of what they heard from 'other' pregnant and previously pregnant women were negative comments about side effects and tablets not functioning as prescribed. A pregnant woman described, "Most people that I talk to have problems with the tablets; people do not like them

and they do not take them even when they receive them...they say, "I lose appetite when I take them". I hear many people saying that" (Pregnant woman, 23 years). Healthcare workers identified how 'others' mostly negatively influenced pregnant women's utilization of IFA supplementation. A healthcare worker described:

The problem is that we teach them, but they have their own teachers. There are those who have delivered a long time ago and they say, "Do not take them, they do not help with anything". Or some will say, "I took them and they make me vomit". Then by the end of the day they don't take the tablets. So it's their conversations with others which disrupt our efforts. (Healthcare worker, 54 years)

Social support from family members

Views and support from husbands, mothers, mothers-in-law, sisters and other family and friends were important in most pregnant women utilizing and adhering to IFA supplementation. Pregnant women spoke about how 'others' positively influenced their utilization of IFA supplementation with a pregnant woman stating:

My husband. He is the one who is strict when it comes to tablets. When I told him that they are blood-enhancing tablets, he said it is a must that I take them because I have a problem of low blood in the body... My mother-in-law actually encourages me. She argues that I should get more (tablets) if it is possible. (Pregnant woman, 22 years)

Healthcare workers described needing to educate the community about IFA because they also influence pregnant women's beliefs and attitudes concerning the supplements. Healthcare workers described a community that includes partners, aunts, friends, community leaders, mothers and mothers-in-law. The community could then advocate to encourage uptake and utilization of IFA among pregnant women. A healthcare worker stated:

What I see and believe in, is that knowledge is the important thing. If all of them know why they are taking tablets, including aunts, it leads to a great improvement on tablet uptake. However, the information is too little for them to have it, especially when they are at home. The aunts may not have the information...they would think that she is on ART (antiretroviral therapy). So, if the aunts have that knowledge beforehand they will actually encourage the pregnant women to take the tablets. Maybe information

dissemination is what is needed. Maybe the information can be aired on radio or television for aunts to know...men should participate in it, and they should be informed that their wives will be taking blood-enhancing tablets. (Healthcare worker, 43 years)

Discussion

Utilization of IFA supplementation by pregnant women in Harare was grounded in experiences with and knowledge of IFA supplements and the health-service and social environment. Reasons for low utilization included forgetting to take IFA, side effects, misconceptions about IFA supplementation, limited access to nutrition information, delayed entry or non-uptake of ANC services and social norms of pregnant women for IFA supplementation. Utilization was enhanced by knowledge of risks and benefits of supplementation, fear of negative health complications with non-utilization, family support and healthcare worker recommendation for IFA supplementation. Studies conducted in other developing countries identified both similar and different reasons for utilization, with low utilization resulting from inadequate supply of micronutrients, lack of knowledge, side effects and difficult access and underutilization of ANC services, while utilization was enhanced by improved health for mother and baby, less fatigue, and improved appetite (Galloway & McGuire 1994; Galloway *et al.* 2002; Seck & Jackson 2008; Nisar *et al.* 2014).

The influence that the health-services and social environment has on utilization of IFA supplementation emphasizes the need to engage aspects of the structural environment that go beyond the individual to improve utilization of IFA supplementation (Cohen *et al.* 2000). For example, ANC was a key influencer in IFA supplementation uptake and utilization because this was where women received the supplements. If pregnant women do not attend ANC or delay the initial or subsequent ANC visits, they are less likely to take or adhere to IFA supplementation. In Zimbabwe, the median months pregnant at initial ANC visit is 5.3 months, and the pregnant women in our study reported attending their initial ANC visit on average at 6 months (ZDHS 2012). Considering that IFA supplements are more effective when taken

throughout the duration of pregnancy, addressing uptake and attendance at ANC is an important way to improve utilization of IFA supplementation, in addition to extending IFA supplementation to those not attending ANC.

On a family level, husband support for supplementation was identified as positively influencing utilization, which was also a finding in Nigeria where husband support improved women's motivation to adhere to iron supplementation (Ejidokun 2000). On a community level, a systematic review of social determinants of iron supplementation among women of reproductive age conducted by Nagata and colleagues (2012) identified the importance of community mobilization, community organizations such as women's groups and social networks in iron supplementation utilization, and emphasized involving and sensitizing these groups to increase support for supplementation. Including pregnant women's social networks in community-based efforts to improve IFA supplementation has potential to increase utilization of IFA supplementation among this population.

Individual influences on IFA utilization identified in this study such as misconceptions concerning IFA supplementation and limited nutrition knowledge highlight the need for approaches that bridge the knowledge gap around IFA supplementation. These approaches should begin pre-pregnancy in the time before a woman contemplates or becomes pregnant (Whitworth & Dowswell 2009; Bhutta *et al.* 2013). This is especially important in countries like Zimbabwe where there is low or late utilization of ANC services which this study identified as the main source of education on and distribution of IFA supplements. We need to provide and improve nutrition programming targeting pregnant and non-pregnant women in developing countries like Zimbabwe in addition to extending this education to members of their social networks who could potentially aid in pregnant women not forgetting to take IFA. We also need to explore how IFA supplementation affects pregnant women with HIV. Although availability of IFA supplements was not identified as an influence on IFA utilization, it still needs to be addressed because there were stock-outs of supplements in one of the study clinics during another study we conducted the following year.

Strengths of this study include the use of in-depth interviews and the inclusion of healthcare workers in the study sample. Study limitations include interviewing neither pregnant women not seeking ANC services nor family members. Although our results cannot be generalized to all pregnant women in Harare, this study is an important step in assessing and documenting perspectives on utilization of IFA supplementation in pregnancy.

Conclusion

This study advances understanding of utilization of IFA supplementation among pregnant women in Zimbabwe, and highlights needs to strengthen efforts to improve maternal micronutrient status. Future approaches to improve maternal IFA supplementation utilization in Zimbabwe should address individual and structural environmental factors that begin before and continue throughout pregnancy. These approaches should reach those not currently seeking ANC with the long-term goal of reducing maternal and child morbidity and mortality related to micronutrient deficiencies.

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Conflicts of interest

The authors declare that they have no conflicts of interest.

Contributions

CBT and LAI were responsible for the design of the study. CBT, LAI and CEB were responsible for the development of data collection tools. CBT coordinated and conducted data collection activities. CBT, CEB and EAF analysed the data. All authors contributed to the writing of the manuscript.

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