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A qualitative assessment of barriers to iron and folic acid supplementation among pregnant women in Botswana

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Abstract

Background Antenatal iron and folic acid (IFA) supplementation remains an effective strategy in the prevention of maternal anemia and low birthweight and is universally recommended by WHO. However, uptake of IFA has varied globally due to challenges with acceptability, supply and distribution, counselling and knowledge, and access to health services. In Botswana, nearly one-third of pregnant women engaged in antenatal care do not receive IFA, despite it being standard of care. The objectives of this study were to assess knowledge of and barriers and facilitators to IFA supplementation before and during pregnancy.

Methods We conducted qualitative interviews with two key stakeholder groups at two different levels—the individual level (pregnant women) and the service delivery level (health care providers). Here, we present results from interviews with pregnant women at two representative antenatal clinic sites in Botswana in 2022.

Results Pregnant women were motivated to be healthy and were knowledgeable about the benefits of supplementation during pregnancy to mothers and their infants; however, women knew more about the benefits of iron than folic acid. Most women were in favor of receiving IFA supplementation prior to pregnancy and receiving fortified foods. Several key barriers were identified: lack of supplement availability in the clinics, poverty, side effects, number of tablets, and adherence. Approaches to overcome these barriers included improving supplement availability, improving health education, increasing supply of nutritious and fortified foods, backyard gardens, and increasing family and monetary support.

Conclusions Our study identified a need to 1) increase the availability of supplementation at antenatal clinics and 2) improve education regarding supplementation to include information about the benefits of folic acid and other micronutrients. Implementation research is needed to ascertain whether increasing supply and improving education could increase utilization of supplementation during pregnancy, with the ultimate goal of improving maternal and infant outcomes.

Keywords Iron, Folic Acid, Antenatal Supplementation, Barriers and Facilitators, Pregnancy

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Background

Globally, pregnant women are at high risk of iron and folate deficiency due to increased requirements of these micronutrients during pregnancy. Deficiencies in iron and folate are drivers of maternal anaemia, a major global public health problem estimated to affect 37% of pregnant women worldwide [1]. The burden of maternal anaemia is greatest in low- and middle-income countries (LMICs) in Africa and Asia [1], and anemia is a known risk factor for preterm delivery, small for gestational age, and maternal and child mortality [2–6]. Iron and folic acid (IFA) supplementation during pregnancy is a low-cost, evidence-based intervention to reduce maternal anaemia, low-birthweight, and preterm birth [7, 8]. Further, folic acid supplementation in the periconception period can prevent more than 50% of neural tube defects [9, 10]. The World Health Organization (WHO) recommends daily IFA supplementation during pregnancy to prevent these adverse outcomes [7] and targets to reach a 50% reduction of anaemia in women of reproductive age by 2025 [11]. Progress in reducing the prevalence of anaemia in LMICs has been slow [1]. In Botswana, the prevalence of anaemia among pregnant women has remained stagnant at 31% from 2010 to 2019 [12].

Despite strong evidence supporting IFA during pregnancy, the impact of IFA interventions has varied due to differences in acceptability, supply and distribution, counselling and knowledge, and access to health services, with inadequate supply identified as one of the major barriers [7, 8, 13–18]. In Botswana, IFA supplementation during pregnancy is standard of care. IFA is prescribed by antenatal clinic pharmacies to pregnant women receiving antenatal care, and antenatal care is provided at no cost to all citizens. However, there are significant gaps in implementation of IFA strategies countrywide, and IFA is not widely available to women prior to pregnancy. While the proportion of pregnant women receiving IFA has increased over the past decade, more than one-third of pregnant women engaged in antenatal care do not receive any formulation of IFA, and there is evidence that progress slowed as a result of the COVID-19 pandemic [19]. This finding highlights the importance of engaging pregnant women, providers, and government and community stakeholders to support micronutrient supplementation [20, 21]. Further, staple foods are not routinely fortified with IFA in Botswana [22, 23], and there is currently no mandatory national folic acid fortification program. Food insecurity and undernourishment remain prevalent [24].

Previous studies have examined barriers and facilitators to IFA supplementation in Africa and Asia; however, many of these studies focused on compliance and associated factors [13, 17, 25], many were restricted to pregnancy and did not include perspectives on the pre-pregnancy period [13, 17, 25–28], and few were conducted during or after the COVID-19 pandemic [28] during which key barriers and facilitators may have changed. In addition, understanding the context-specific perspectives of pregnant women and assessing potential gaps in knowledge via in-depth qualitative interviews is critical to inform and strengthen local and national efforts to address the gaps in IFA implementation strategies, with the overall goal of reducing maternal anaemia and adverse birth outcomes. To address this need and inform future implementation studies, we conducted face-to-face in-depth qualitative interviews with pregnant women, providers, and other stakeholders in Botswana to assess knowledge of and barriers and facilitators to IFA supplementation before and during pregnancy. Here, we present findings from interviews with pregnant women (findings from interviews with health care providers are reported elsewhere). The specific objectives were to assess knowledge of nutrition and supplementation in pregnancy, to identify pregnant women's views on barriers to supplementation with IFA during pregnancy (both in terms of access and utilization), to ascertain approaches to overcome the identified barriers and challenges, and to assess interest in receiving foods fortified with iron and folic acid.

Methodology

Design and methods

Study design

The study employed a non-randomized purposive qualitative design to enable the researchers to understand and describe knowledge of and barriers and facilitators to IFA supplementation. The study focused on two key stakeholder groups at two different levels—the individual level (pregnant women) and the service delivery level (health care providers). Here, we present the methodology and findings from the face-to-face in-depth interviews with pregnant women.

Study sites

The study was conducted at two antenatal clinics, one in the Southern (Tlokweng) and another in the Northern (Palapye) region of Botswana. The Kediretswe clinic in Palapye serves pregnant women from rural villages surrounding Palapye, while the Tlokweng main clinic serves those from semi-urban and urban environments near the capital city of Gaborone. Site selection was facilitated by the District Health Management Team (DHMT). The DHMT was asked to guide the team toward large antenatal care sites, serving diverse populations that are representative of the pregnant population in Botswana. The clinics selected provide antenatal care to more than 80 pregnant women each month.

Recruitment and consent

We recruited pregnant women who registered and attended at least one antenatal care (ANC) visit at the selected clinics. Pregnant women were recruited at the two antenatal clinics when they came for their regular ANC visits. We chose to recruit pregnant women rather than postpartum women because our goal was to collect information about current experiences while pregnant. Recruiting pregnant women from two clinics with distinct catchment areas provided the researchers with a diverse study sample with potential variation in access to supplementation. Potential participants were approached at the end of their clinic visit by female research assistants fluent in both English and Setswana. They were informed about the study and were asked if they would volunteer to take part in the study. Women who declined participation were asked about the reasons for declining.

Pregnant women willing to take part in the study were directed to a private room where the interview took place. Participants then provided verbal consent to participate and for the interview to be audio recorded. Verbal consent was adopted to enhance understanding of the research and the research assistant signed the consent form to ensure documentation. The consent process described the purpose of the study and the reason for the information being collected. Participants were informed that they could decline or withdraw participation at any point during the interview without compromising their future medical care. The consent conversation took place in either Setswana or English, according to the preference of the individual participant. All study participants were compensated for their time in the study in the amount of 50 Pula and compensation was approved by the ethics committee.

Sample size

We hypothesized that a sample size of 20 participants would be sufficient to reach thematic saturation [29, 30]. Recruitment took place between January and March 2022. A total of 29 (29) pregnant women were approached and asked to participate in the study (16 in Kediretswe clinic and 13 in Tloweng main clinic in Tlokweng). Of these, twenty (20) pregnant women (10 in Kediretswe clinic and 10 in Tlokweng main clinic) agreed to participate in the study. Reasons for declining included time constraints and needing to quickly go back home or to work. One individual indicated a lack of interest in participating in the study.

Data collection

A semi-structured interview guide was developed by the research team based on the objectives of the study (Appendix 1). All interviews were conducted in-person in English or Setswana. One research assistant conducted all interviews in Tlokweng main clinic and the second research assistant conducted all interviews in Kediretswe clinic. Research assistants were trained on the protocol, interviewing skills and ethics over a two-day training workshop and both had at least a bachelor's degree. The study coordinator met with the research assistants before the interviews began to review the interview approaches and was present during the first interviews at each site to provide feedback and ensure that interviewers were aligned in their approaches. Interviews were conducted in a private location and audio recorded and lasted between 30 and 45 min. Interview recordings were first transcribed and then translated into English by the study coordinator.

The key interview domains are shown in Table 1 and included: (1) maintaining a healthy pregnancy, (2) knowledge of nutritious foods and supplements, (3) receipt of supplement and nutrition education, (4) supplement use prior to and during pregnancy, (5) interest in receiving supplements before pregnancy and fortified foods, (6) barriers to using supplements during pregnancy, including access and utilization (e.g., side effects and competing priorities), and (7) potential approaches to overcome barriers. Demographic information was also collected, including gestational age, parity, marital status, employment status, and how participants traveled to the clinic on the day of the interview.

Data management and quality

During data collection, the research assistants at each site were supervised by the study coordinator. At the end of each interview, the recorded data were forwarded to the coordinator who listened to the tape recordings and provided feedback to the research assistants on areas where improvements were needed.

Ethical considerations

All personnel involved in the conduct of this study had completed Human Subjects Protection Training [31, 32]. The study coordinator made sure that, throughout the study, all relevant ethical principles for conducting interviews with the relevant stakeholders were observed. Key ethical principles observed by the research team included being sensitive to beliefs, manners, and customs of participants, acting with integrity and honesty with participants, ensuring a respectful communication and contact with participants, protecting the anonymity and confidentiality of individual information, and obtaining informed consent from everyone interviewed. Participants were given the liberty to not answer questions they

Table 1 Key interview domains and corresponding interview questions

Domain	Question Stems
Maintaining a healthy pregnancy	*"Could you tell me about some of the things you can do during pregnancy for your health and the health of your baby?"*
Knowledge of nutritious foods and supplements	*"What are some of the benefits of taking prenatal vitamins during pregnancy"* *"Can you give me some examples of types of foods that are rich in iron or folic acid?"* *"Do you eat any of the foods on this card? Why or why not?"*
Receipt of supplement and nutrition education	*"Has your doctor or nurse talked to you about prenatal vitamins like these?"* *"Have you ever attended any health education classes about nutrition? What were you taught?"*
Supplement use prior to and during pregnancy	*"Are you taking prenatal vitamins?"* *"Did you ever take any vitamins like these before you were pregnant? If yes, how did you get them?"*
Interest in receiving supplements before pregnancy and fortified foods	*"Would you be interested in taking vitamins before pregnancy if you could access them?"* *"Would you be open to receiving foods fortified with iron and folic acid?"*
Barriers to using supplements during pregnancy	*"For you, what are some of the challenges to taking a daily vitamin during pregnancy?"* *"Do you ever find that there is not enough to eat for you or your family?"* *"Is there anything else you would like to tell me about challenges you have faced getting multivitamins or nutritious food during pregnancy?"*
Potential approaches to overcome barriers	*"What would make it easier to take a daily vitamin during pregnancy?"* *"What has been helpful in dealing with challenges getting multivitamins or nutritious food during pregnancy?"*
Demographics	*"How far along in this pregnancy are you? "* *"Is this your first pregnancy?"* *"Are you married, single, or divorced?"* *"Are you employed?"* *"Did you have to miss work or arrange for childcare?"* *"Can you tell me about how you got to the clinic today? How long did it take?"*

Complete interview guides, including question probes, are available in the Appendix

did not feel comfortable answering and could withdraw their participation at any point during the interview.

Data analysis

Interviews were transcribed verbatim and translated into English. Two members of the study team (PK and EC) reviewed all English transcripts to gain a better understanding of the content prior to data analysis. Data were then organized using ATLAS.ti. Major themes were identified prior to data analysis, taking into consideration the common trends, patterns, and ideas that appeared repeatedly throughout the data. Using ATLAS.ti, data analysis followed a content analysis method of uncovering key insights and patterns in the data, ultimately identifying core themes and codes [33, 34]. Relationships between codes and themes were summarized in an overview table.

Rigor

To ensure trustworthiness we employed some of Lincoln and Guba's criteria for ensuring the qualitative study rigor for credibility, dependability, and confirmability [35]. According to Lincoln and Guba, credibility is the confidence in the truth value of the data and interpretations of them [35]. At the end of the interview researchers allowed women to listen to recorded interviews and were given an opportunity to add or clarify what they had said. The four women who listened to the recordings indicated that they were satisfied with the recordings and did not have anything to add. Dependability of the data was demonstrated through the research assistants' engagement with the women's experiences as they interviewed them. Participants were enthusiastic to share their experiences and challenges related to the use of IFA and this gave us the confidence in the analysis and interpretation of the data. Confirmability was assured by the research coordinator who listened to the recordings to ensure that the findings were not due to the researcher assistants' biases.

Results

Socio-demographic characteristics of the participants

Table 2 shows the socio-demographic characteristics of the 20 pregnant women included in the study. Gestational age ranged from 16 to 36 weeks and 40% of all participants were employed. Most participants had previously been pregnant (75%) and were single (90%). Half (50%) of the women had walked to the clinic to receive antenatal care on the day of the interview. Characteristics of the study participants varied by site. Compared to women attending the Kediretswe clinic in Palapye, women attending the Tlokweng main clinic in Gaborone were farther along in their pregnancy (median [IQR]: 32 [25–35] weeks versus 28 [21–31] weeks), were more

Table 2 Socio-demographic characteristics of the 20 pregnant women included in the study

Characteristics		Number (%)
Gestational age	16 weeks	1 (5%)
	20 weeks	4 (20%)
	24 weeks	2 (10%)
	28 weeks	4 (20%)
	32 weeks	5 (25%)
	36 weeks	4 (20%)
Number of previous pregnancies	0	5 (25%)
	1	5 (25%)
	2	7 (35%)
	3	1 (5%)
	4	2 (10%)
Marital status	Single	18 (90%)
	Married	1 (5%)
	Divorced	1 (5%)
Employment status	Employed	8 (40%)
	Not employed	12 (60%)
Travel to antenatal clinic	Walking, 30 min or less	6 (30%)
	Walking, more than 30 min	4 (20%)
	Taxi, public transportation, or private car	10 (50%)

likely to be pregnant for the first time (50% versus 0%), and were more likely to be unemployed (80% versus 40%).

Domain 1. Maintaining a healthy pregnancy

Pregnant women were asked to share what they do during pregnancy for their health and the health of their unborn babies. Women in Palapye and Tlokweng indicated that they ate foods rich in nutrients, including vegetables, beans, fruits, and molasses, and that they exercised, drank water, got enough rest, and refrained from alcohol and smoking. These activities were highly regarded for the benefit of their unborn babies.

> *When you are pregnant you do not only cater for yourself only, but for you and the unborn baby – Pregnant Woman, Palapye*

Participants were aware that, while these healthy practices were important, some should be done in moderation. One participant in Tlokweng cautioned against vigorous exercise during certain stages in pregnancy.

> *With exercise there is a certain stage when you can exercise, you cannot just be busy the first month – Pregnant Woman, Tlokweng*

Domain 2. Knowledge of nutritious food and supplements

When asked to provide examples of foods rich in iron or folic acid, most women described food they believed to be nutritious in general rather than foods specifically rich in iron or folic acid. Common foods mentioned in both Palapye and Tlokweng included spinach, cucumbers, cauliflower, bananas, grapes, watermelon, liver, fish, beans, red meat, sorghum, millet, beetroot, spleen, broccoli, peanuts, chicken, eggs, and milk. Women showed high levels of knowledge about nutritious foods and were able to give examples of foods rich in iron such as liver, eggs, and fish. The majority did not know about foods containing folic acid.

> *I have no idea about folic acid – Pregnant Woman, Primigravida, Tlokweng*

> *I do not know about folic acid, I do not know if fizzy drinks are included since you talk about acid they may be part of food rich in folic acid – Pregnant Woman, Multigravida, Palapye*

Participants were shown a picture card of foods rich in iron and folic acid (Appendix 2) and were asked to identify foods they ate from the card. Generally, participants indicated that they ate most of the foods on the card that contained iron and folic acid. However, most women did not eat seafood, stating that they did not like it, that they found seafood too expensive, or that they were afraid of eating seafood. Botswana is a landlocked country, and most seafood is imported.

> *As for the prawns... I do not like the look of them, they make me have nausea – Pregnant Woman,*

Palapye

As for seafood, no I fear seafood – Pregnant Woman, Palapye

I do not like seafood and it is also expensive – Pregnant Woman, Palapye

While the majority of pregnant women in Palapye stated that they did not like seafood, one participant mentioned that she ate seafood to increase water in her body.

In response to the question about the benefits of taking prenatal vitamins, pregnant women highlighted several benefits: (1) Prenatal vitamins are good for the health of the pregnant woman and the unborn child and can prevent the child from illnesses like diarrhea and flu; (2) Prenatal vitamins help in the development of the child's body and heart, leading to optimal birthweight; (3) Iron increases blood supply and hemoglobin, and helps prevent complications during birth, especially when there is increased blood loss; (4) Prenatal vitamins help women to have energy and to carry the pregnancy to full term; (5) Prenatal vitamins help one to eat well and for the baby to grow well; and that (6) Prenatal vitamins provide necessary nutrients. Although women were knowledgeable about benefits of supplements, they were more knowledgeable about iron compared to folic acid.

Iron boosts the blood as the baby's circulatory system needs blood to develop. Iron also increases blood, so we cater for delivery so that even when you lose blood there is some left to sustain the body. That's what I know about iron supplements. As for folic acid I really have no idea– Pregnant Woman, Primigravida, Tlokweng

I have low blood and even experience some dizziness, so they help me a lot – Pregnant Woman, Multigravida, Tlokweng

Another participant indicated that iron helped her with anemia.

My blood was very low last week. It was 9.8 but now it has improved. I was scared after I learnt of some pregnant women who died because of low blood, so I was motivated to take action and I make sure I take them – Pregnant Woman, Multigravida, Palapye

Women rarely mentioned benefits of folic acid, and some mentioned specifically that they lacked knowledge of the benefits of folic acid. No women directly mentioned prevention of neural tube defects as a benefit of folic acid.

Iron helps increase blood in the body…As for folic acid I don't have an idea – Pregnant Woman, Multigravida, Tlokweng

Domain 3. Receipt of supplement and nutrition education

The majority of pregnant women (90%) at both sites indicated that a doctor or nurse talked to them about prenatal vitamins and that they highlighted the importance of taking them.

When I first registered, when I was three months pregnant, this was the first thing the nurses talked to me about. They told me that as I was starting this pregnancy journey, they will give me these supplements that would help to increase my blood, as we all know that I share everything with the baby, including blood. During birth a pregnant woman can lose a lot of blood and these supplements help prevent, in cases where the mother bleeds a lot, her from losing her life, as they increase the amount of blood in the body. During pregnancy women may faint due to low blood in their bodies and the supplements protect this as they increase blood flow – Pregnant Woman, Multigravida, Palapye

Domain 4. Supplement use prior to and during pregnancy

The majority of pregnant women (90% in Palapye and 80% in Tlokweng) had never taken supplements before pregnancy, with lack of knowledge about their benefits the most cited reason.

I have never taken them because I did not know them, this is my first time to see them – Pregnant Woman, Multigravida, Palapye

During pregnancy, many women said they were taking supplements like iron, folic acid, vitamin C and multivitamins.

I am taking folic acid and multi-vitamin, as for iron tablets there has been a shortage of them from the clinic… I take one pill from each, once a day... I started taking them when I was four months pregnant, when I registered my pregnancy – Pregnant Woman, Multigravida, Palapye

However, many women mentioned that supplements were not available at antenatal clinics and that they ended up going to private pharmacists to buy them. One participant lamented that there were no supplements at the clinic and that they were never told why supplements were not available.

Yes, there is shortage of tablets. It has been three weeks since they have not been available. They do

not tell us what the problems are. They just tell us that they are not here at Kediretswe clinic, and they advise us to go to other health facilities but still we do not find them there and we end up buying them from the chemist because I really need iron tablets as I am very anemic– Pregnant Woman, Multigravida, Palapye

While some pregnant women stated that they bought supplements when they were not available in the public clinic, those without money were not able to do so.

I am not taking any of the three [supplements]… The problem is sometimes they get finished when I do not have money and that way, I will miss them and just wait for the time I get money and go and buy them– Pregnant Woman, Palapye

Domain 5. Interest in receiving supplements and fortified foods

Most women said they would be interested in receiving supplements before pregnancy, mentioning that this would help with concerns about anemia and weight. All (100%) women indicated that they would be interested in taking supplements prior to pregnancy if they could access them, and all (100%) women said they would be interested in receiving fortified foods, stating that this would be helpful given the costs of nutritious foods. Example responses to this question showing pro, con, and mixed perspectives are shown in Table 3.

Domain 6. Barriers to using supplements during pregnancy

Pregnant women highlighted several barriers to taking daily vitamins during pregnancy, which are detailed in Table 4. Most participants indicated that the major challenge faced is access – specifically, that supplements are unavailable at the public clinic.

"When we come to the clinic, we find that they are out of stock, like now I could have long started but found out they were out of stock" – Pregnant Woman, Tlokweng

Lack of money to purchase supplements and nutrient-rich foods was also a major barrier. Foods such as Tsabana, a mixture of sorghum and soya commonly provided for young child nutritional supplementation, were considered by some to be helpful for pregnant women as well. Some women in Palapye indicated that they were not given fortified food such as Tsabana to help them with supplementation even though they could not afford either supplements or food rich in iron and folic acid.

As for food rich in supplements they do not give us even if the tablets are not available. I even asked the nurses why they do not give us Tsabana. The answer was they only give foods rich in supplements when you are weak or your blood shows that you do not have enough nutrients – Pregnant Woman, Palapye

In contrast, most pregnant women in Tlokweng indicated that they were given Tsabana when supplements were not available.

Table 3 Perspectives on receiving supplements and fortified foods

	Key Quotations
Receiving supplements before pregnancy	
In favor	*"I would be interested in taking them before pregnancy because sometimes you may not be aware of some nutritional deficiencies which can affect your baby when you get pregnant. They would prepare my body before pregnancy" – Pregnant Woman, Palapye* *"Now that I know how they can benefit me I would take them" – Pregnant Woman, Palapye* *"I am taking HIV medication and sometimes I lose a lot of weight. So I would not mind taking them as they will help me gain weight" – Pregnant Woman, Tlokweng*
Opposed or mixed	*"I would, but it would be hard to take them as I do not like tablets" – Pregnant Woman, Tlokweng*
Receiving fortified foods	
In favor	*"Most vegetables and fruits, especially those expensive ones, we cannot afford to buy them. I take it that I am not the only one who is not able to get them" – Pregnant Woman, Palapye* *"I fail to eat some food as they are expensive to buy…eating nutritious food is a struggle as I fail to get money to buy them" – Pregnant Woman, Palapye* *"Yes, I would be open to receiving them. Yes, I eat them. I am not ashamed to get them" – Pregnant Woman, Palapye* *"Yes, I would be open to that, very much, as I have mentioned I have low blood (anemia) so I want to take anything that could help me boost my blood" – Pregnant Woman, Palapye* *"Yes, I would be open to receiving them. I used to be given Tsabana, cooking oil and beans, but for now it has now stopped" – Pregnant Woman, Tlokweng* *"I would be happy to receive them. Yes, I would be happy to receive Tsabana. It is very healthy and children who are given Tsabana look healthy." – Pregnant Woman, Palapye*

Table 4 Key barriers and facilitators to IFA supplementation for pregnant women

Barrier	**Key Quotations**
Supplements unavailable and inaccessible	"*When we come to the clinic, we find that they are out of stock, like now I could have long started but found out they were out of stock… [The nurses] only encouraged me to buy molasses" – Pregnant Woman, Tlokweng* *"[Supplements] are not accessible at our clinic. If I get them, I will take them regularly" – Pregnant Woman, Palapye* *"No, they have never talked to me about them. They just told me that I have low blood and gave me a list of food to eat and increase my blood as there are not tablets in clinics and hospitals" – Pregnant Woman, Palapye* *"Yes, there is a shortage of tablets. It has been three weeks since they have not been available. They do not tell us what the problems are. They just tell us that they are not here at Kediretswe clinic, and they advise us to go to other health facilities but still we do not find them there and we end up buying them from the chemist because I really need iron tablets as I am very anemic" – Pregnant Woman, Palapye*
Poverty	"*Yes, it happens a lot, we are born in a family of seven and we have kids too so we are a big family. So, food ends before month end. We suffer here and there because even though my other siblings work, they do not help with food. It is a challenge as my salary is not enough to feed all of us. I take care of my mother too. It is hard." – Pregnant Woman, Palapye* "*Yes, there are challenges. You may find that you are not working and relying on the boyfriend but through the pregnancy he decides to end things and you must go back to your parents and it's hard to get food." – Pregnant Woman, Tlokweng* *"As for food rich in supplements they do not give us even if the tablets are not available. I even asked the nurses why they do not give us Tsabana. The answer was they only give foods rich in supplements when you are weak or your blood shows that you do not have enough nutrients" – Pregnant Woman, Palapye*
Side effects	*"Sometimes I would forget, and sometimes they bore me, the multi-vitamin smells so bad. I ended up dissolving it in my juices so it's easier to take them" – Pregnant Woman, Palapye* *"Yes, especially the iron tablets, after taking it I became nauseous, but I did not vomit like I heard some people saying. I continued taking them but now when I take them, I do not experience any side effects" – Pregnant Woman, Tlokweng*
Number of tablets/supplements	"*Eish!* If it was only one tablet, now they are many, swallowing them is a challenge. Yes, taking the tablets is a challenge even though you know the benefits" – Pregnant Woman, Palapye*
Adherence	"*Sometimes I forget and take a day or two without taking them, but I never went more than three days without taking them" – Pregnant Woman, Tlokweng* *"I never experienced any problems. I take them according to what I was told and have never had a problem" – Pregnant Woman, Palapye*
Facilitator	**Key Quotation**
Improving availability of supplements	"*The hospitals and clinics should make sure that the supplements are always accessible to the pregnant women, as some usually give up and get discouraged when they are told they are finished when they need them. They should be made available all the time" – Pregnant Woman, Palapye*
Improving health education	"*[Pregnant women] can be taught about the benefits of eating nutritious food" – Pregnant Woman, Tlokweng*
Increasing supply of nutritious and fortified foods	*"Something that can help is for the clinic to ensure that nutritious food is readily available and distributed to us when we come for check-ups" – Pregnant Woman, Palapye* *"Most pregnant women like Tsabana since it does not have too much smell, so they can be given Tsabana at the clinics" – Pregnant Woman, Tlokweng*
Backyard gardens	*"Mine is not a challenge, but an encouragement to pregnant women that we as pregnant women we should not depend on the government to give us food. We can start planting our own vegetables at home, backyard gardens so that help ourselves with good nutrients." – Pregnant Woman, Palapye* *"After harvesting you eat some and sell them and use the money to buy some food like liver." – Pregnant Woman, Tlokweng*
Support from family	*"What helped me was a supportive family. They ask me what I would like to eat and if I do not have money, they buy it for me. Having a supportive family helps a lot." – Pregnant Woman, Palapye*
Monetary assistance	*"Maybe pregnant women can also be given food too or be given money to buy supplements even though with money, the challenge may be that some pregnant women may use the money to buy other things, not food with high nutrients". – Pregnant Woman, Palapye*

* An exclamation used to express surprise, agreement, or disapproval

In addition to access, utilization (e.g., side effects and compliance) was also a barrier. Side effects from supplements were reported in many women (30% in Tlokweng; 40% in Palapye). Common side effects reported included nausea, vomiting, and constipation, all of which were attributed to iron. These side effects were reported to be common during the first trimester but were reduced as the pregnancy progressed. Side effects were considered minor by most of the participants, though some women stopped taking them for other reasons.

I am not sure if feeling hungry is a side effect of multivitamins, but when I took them they made feel hungry... Because sometimes I did not have money to buy food, I stopped taking them – Pregnant Woman, Palapye

In addition to side effects, some women were concerned about the number of tablets given. Some women preferred to be given tablets with combined nutrients like a combination of iron and folic. In some cases, participants linked identified barriers with nonadherence. When asked about their adherence, the majority of pregnant women indicated that they did not have any problems taking the supplements regularly. Some of those who indicated that they were not adherent stated that they were nonadherent because they did not have money to buy the supplements or because of forgetfulness.

The problem is sometimes they get finish when I do not have money and that way, I will miss them and just wait for the time I get money and go and buy them – Pregnant Woman, Palapye

Domain 7. Potential approaches to overcome barriers

Pregnant women highlighted several approaches that would make it easier for them to take daily vitamins during pregnancy. These are listed in Table 4 and include improving availability of supplements and improving health education. Participants also highlighted that it was their responsibility to make sure that they adhered to taking supplements.

Provision of nutritious foods like Tsabana was perceived to be the best way to increase the likelihood that pregnant women receive micronutrients even when supplements are out of stock. One participant lamented that there was unfair distribution of Tsabana as it was given only to those who looked thin and weak and not to pregnant women who looked healthy. Women suggested that the clinic should ensure that fortified food was readily available and distributed to all pregnant women when they came for their monthly check-ups and not only given to some pregnant women.

However, several participants described using backyard gardening or support from family to meet their nutritional needs. Women described how their family members helped them deal with adherence challenges. They indicated that family members could remind them to take their supplements or assisted them with nutritious food. While some women suggested that pregnant women could be given money to buy food, others cautioned that some women might use the money for other things and not buy the needed foods or supplements.

Discussion

We conducted in-depth qualitative interviews with 20 pregnant women at two antenatal clinics in Botswana, representing urban and rural geographic locations, with the overall goal of understanding barriers and facilitators to IFA supplementation during pregnancy. We found that, in general, pregnant women in Botswana were motivated to be healthy during pregnancy and were knowledgeable about the benefits of receiving supplementation during pregnancy, though women tended to know more about benefits of iron than benefits of folic acid. Most women were in favor of receiving supplementation with IFA prior to pregnancy and all were open to receiving fortified foods. We identified several barriers to using supplements during pregnancy. The most often cited barrier was access – specifically, that supplements were not available in the public sector. Additional barriers included poverty, side effects, number of tablets/supplements, and adherence. Potential approaches to overcome these barriers included ensuring that supplements are consistently available in public clinics, improving health education, increasing supply of nutritious and fortified foods, backyard gardens, and increasing family and monetary support.

Our findings are consistent with previous studies that have identified inadequate supply as one of the major barriers to successful IFA supplementation in other parts of Africa and in Asia [17, 18, 26]. Previous studies have also found that women are generally knowledgeable about the benefits of IFA supplementation, that knowledge and counselling on side effects and benefits and family support are important drivers of IFA adherence [13, 17, 27, 28], and that pregnant women are motivated to adopt healthy lifestyles [36]. While poor adherence is often one of the major reasons cited for poor IFA response [8, 13, 25], our results indicate the majority of women would be amenable to supplementation if it were available. Our findings are also consistent with studies conducted during the COVID-19 pandemic that found increases in stock-outs of medicines and supplements [19, 37]. Planting of backyard gardens has been identified as an effective intervention to decrease poverty and improve food security and food diversity [38, 39].

Our results should be interpreted in the context of several limitations. First, we conducted qualitative interviews with pregnant women receiving antenatal care at two clinics in Botswana—Tlokweng and Palapye. As such, our findings may not be generalizable to other areas of Botswana, where knowledge, perceptions, barriers, and facilitators may differ. Importantly,

our study did not include women without access to antenatal care, who likely face a distinct set of barriers to IFA supplementation that may overlap with barriers to receiving care. It is also possible that women with more time constraints were less likely to agree to participate in our study, and so we could have missed key barriers by excluding such participants. Second, we conducted this study in the first three months of 2022, a period in which the prevalence of COVID-19 infection and precautions remained high. It is possible that this context could have influenced the interviews. Stock-outs of supplements and medicines were known to be of critical concern during the pandemic, and it is possible that we may have uncovered additional barriers to supplementation if the issue of stock-outs had not been so prevalent at the time. Finally, while we identified stock-outs as a major barrier to IFA supplementation, future work is needed to understand the supply chain issues from a macro level.

Based on our study findings, we propose four recommendations. First, education on the benefits of supplementation should include information about the benefits of iron, folic acid, and other micronutrients, as well as side effects and approaches to deal with side effects. Antenatal clinics could provide this education to pregnant women. Second, communication between providers and pregnant women to problem-solve when supplements are out of stock should be improved. Third, reducing the number of tablets and giving out combined tablets versus single tablets, for example combined folic acid and iron, or a single multiple micronutrient supplement (MMS), rather than single iron and single folate, may improve adherence. This finding supports recent initiatives to move towards providing MMS to pregnant women. While MMS is still not universally recommended by WHO (the recommendation on MMS in pregnancy has changed from 'not recommended' to 'recommended in the context of rigorous research') [40], findings from randomized [41, 42] and observational studies [19] suggest MMS reduces the risk of adverse birth outcomes and can be cost-effective [43–45], and many programs are now providing MMS to pregnant women [46]. Fourth, community and public health education on the benefits of supplements before pregnancy and the importance of a healthy diet before and during pregnancy that includes foods rich in iron and folic acid should be strengthened.

In conclusion, we found that pregnant women in Botswana are generally amenable to supplementation with IFA but face many barriers to timely and continuous supplementation. Our study identified a need to 1) increase the availability of supplementation at antenatal clinics and 2) improve education regarding supplementation. Implementation studies are needed to test whether interventions to reduce barriers, such as increasing available supply of supplements and improving education, could increase utilization of supplementation prior to and during pregnancy, and ultimately improve maternal and infant outcomes.

Supplementary Information

The online version contains supplementary material available at https://doi.org/10.1186/s12889-024-20685-5.

Supplementary Material 1.

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Authors' contributions
PK, RS, and ECC designed the study. Qualitative analyses were conducted by PK. PK and ECC prepared the first draft of the manuscript. PK, MD, RZ, GM, JM, MM, JM, SL, LM, EL, RS, and ECC participated in editing the manuscript and approved the final version for submission. The corresponding author had full access to all data and had the final responsibility for the decision to submit for publication.

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Data availability
The datasets used and analyzed during the current study may be available from the corresponding author on reasonable request.

Declarations

Ethics approval and consent to participate
The study was approved by the Institutional Review Board at the University of Pennsylvania Perelman School of Medicine and by the Human Research Development Council (HRDC) in Botswana. All personnel involved in the conduct of this study had completed Human Subjects Protection Training. The study coordinator made sure that, throughout the study, all relevant ethical principles for conducting interviews with the relevant stakeholders were observed. Key ethical principles observed by the research team included being sensitive to beliefs, manners, and customs of participants, acting with integrity and honesty with participants, ensuring a respectful communication and contact with participants, protecting the anonymity and confidentiality of individual information, and obtaining informed consent from everyone interviewed. Participants were given the liberty to not answer questions they did not feel comfortable answering and could withdraw their participation at any point during the interview.

Consent for publication
Not applicable.

Competing interests
The authors declare no competing interests.

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