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ARTICLE

Development and testing of a nutrition education tool on iron supplementation for pregnant women

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Background: Although iron supplementation may prevent iron deficiency anaemia (IDA) during pregnancy, a nutrition education tool highlighting the importance of iron supplementation during pregnancy is also important.
Objectives: The aim was to develop and test a nutrition education tool on iron supplementation for pregnant women.
Design: A cross-sectional study was conducted.
Setting: Mutare City Clinic, Manicaland province, Zimbabwe.
Subjects: Sixty-seven pregnant women in their second or third trimesters of pregnancy and attending Mutare City Clinic for antenatal care (ANC) participated in the study.
Outcome measures: The preferences of pregnant women regarding form, structure and content of the nutrition education tool were established using eight focus-group discussions (FGDs) in which 67 pregnant women participated. Three additional FGDs were conducted with another 28 pregnant women to assess the user-friendliness and acceptability of the developed tool.
Results: A pamphlet was the most preferred tool, with English being the most preferred language, along with some Shona phrases. Women wanted information on IDA, dosage, duration and side-effects of iron supplementation and iron food sources to be included in the pamphlet. The participants identified clinics, pharmacies and churches as ideal sites for dissemination of the tool.
Conclusions: A pamphlet on iron supplementation in simple English with some Shona phrases was the nutrition education tool most preferred by the pregnant women. Offering the pamphlet together with iron supplements to pregnant women could improve compliance with iron supplements. However, follow-up ANC consultations are important for effective implementation of all key messages in the pamphlet.

Keywords: awareness, iron supplementation, nutrition education tool, pregnant women, pamphlet

Introduction

Maternal iron deficiency is the most common micronutrient deficiency that is known to cause anaemia. Anaemia affects 40% of pregnant women globally, with the second highest prevalence of 46% in Africa.[1] Iron-deficiency anaemia (IDA) during pregnancy negatively impacts on maternal and foetal health and is associated with increased morbidity and foetal death.[2] Decreased iron stores in the infant may lead to impaired development.[3] Oral iron supplementation is the first line of treatment for patients with IDA.[4] However, a lack of knowledge concerning IDA and the importance of iron supplementation during pregnancy are reasons for poor use of iron supplements by pregnant women.[5] The use of iron supplements alone, without complementary nutrition education, may prevent pregnant women from using iron supplements optimally.[6] Nutrition education during pregnancy can lead to improved haemoglobin levels, improved dietary intake and nutritional knowledge on anaemia and iron-rich foods.[7] If pregnant women are aware of the importance of iron supplements, they are more likely to comply with taking iron supplements.[8]

It is recommended that adequate, specific and acceptable nutrition-related advice should be given to pregnant women at every ANC visit.[9] Simple nutrition education messages given to pregnant women using a holistic approach can improve knowledge regarding nutrition during pregnancy.[9] Pregnant women should be also be provided with information, education and communication (IEC) materials on iron supplementation, which they can always refer to as a reminder of the importance of iron supplementation during pregnancy.[10] Printed IEC materials include newspapers, flyers, banners, pamphlets, leaflets, brochures, flipcharts and posters.[11] Providing IEC materials to pregnant women has been found to improve knowledge on iron supplementation.[10,12] Pregnant women should be given detailed information on iron supplementation, including actual name, importance, supplementation duration, maintaining supplementation, side-effects and challenges.[10] It is also important for them to be informed about how to manage the side-effects and challenges that come with iron supplementation. This will eventually increase maternal knowledge on iron supplementation and its utilisation.[10]

The use of learning theories contributes to the effective development of adult education resources.[13] The adult learning theory known as andragogy, popularised by Malcolm Knowles, is an important theory for use by nurses.[14] Malcolm Knowles defined andragogy as 'the art and science of helping adults learn'.[14] Knowles made assumptions that adult learners have a well-established sense of self and move from dependency to increasing self-directedness. Past experiences of the adult learners play a pivotal role in their acquisition of new knowledge and previous mistakes are often the most valuable teacher.[14] According to Knowles, adult learning is purpose-driven and readiness to learn is driven by internal motivation rather than external factors.[14] Adult educators collaborate with adult learners to select methods and resources for instruction, then evaluate quality of learning experience and adjust, while assessing the need for further learning.[14] Therefore, the

effective use of andragogy may help nurses to develop educational resources, which will be useful to adult learners.[14]

A nutrition education tool developed to be used together with iron supplements during pregnancy may address IDA among pregnant women more effectively than the use of iron supplements alone. Therefore, this study aimed to develop and test a nutrition education tool on iron supplementation for pregnant women. It was anticipated that the provision of a nutrition education tool on iron supplementation together with iron supplements during pregnancy could possibly increase awareness regarding the importance of iron supplements among pregnant women, thus encouraging compliance with iron supplementation regimens.

Methods

Study design

A cross-sectional study was conducted.

Part one: determining preferences for a nutrition education tool

Sample selection

The study was conducted at Mutare City Clinic, which is in an urban area of Manicaland Province in Zimbabwe. Pregnant women were purposively sampled from all the pregnant women attending the Mutare City Clinic for ANC to participate in focus-group discussions (FGDs) by virtue of them being in their second or third trimesters of pregnancy. A total of 67 women met the inclusion criteria and were included in the study.

Focus-group discussions

In this study, eight FGDs were conducted to gather data on which nutrition education tool should be developed for pregnant women, the ideal language to use and important information to include in the tool. Eight FGDs were held to accommodate all 67 women who met the study inclusion criteria. The number of participants per group ranged from a minimum of 7 to a maximum of 11. In the current study, questions for the FGDs were generated prior to the study in English and were then translated into Shona. The FGD questions were formulated based on the study objectives. The Shona FGD questions were then translated back to English to check for accuracy in translation. To validate the questions and check for consistency in the FGDs, a pilot study was undertaken with six pregnant women who were also attending the same clinic for ANC. The pregnant women were recruited by nurses who worked in the ANC unit. To ensure that the six pregnant women did not participate in the main study, the ANC nurses first established that the gestation stages of the pregnant women were advanced and that they would have delivered by the time the main study would have been conducted. Pilot study findings revealed ambiguity in the question that sought to establish the ideal stage for issuing the nutrition education tool to pregnant women. Two options, 'end of first trimester' and 'beginning of second trimester', were almost the same. These options were both changed to read 'during the first trimester'.

Table 1: Form of nutrition education tool preferred by pregnant women ($n = 67$)

Form of nutrition education tool	*n*	%*
Booklet	4	6.0
Discussions/Talks	16	23.9
Drama/Role play	1	1.5
Flier	2	3.0
Internet	1	1.5
Newspapers	1	1.5
Pamphlet	33	49.3
Poster	2	3.0
Radio advertisements	4	6.0
Talk show	1	1.5
Telephone messages	1	1.5
WhatsApp	1	1.5

*Percentage of sample ($n = 67$).

The FGD sessions were conducted over six consecutive weeks, in a fixed designated area within the clinic premises, away from other clinic activities, but within easy reach of ANC nurses. Participants gave their written consent to participate before the FGDs commenced. The FGDs were facilitated by two trained research assistants. One research assistant audio-recorded the discussions, while the other facilitated the discussions. The researcher noted the non-verbal gestures during the FGDs. All the recordings were transcribed and translated into English. The translations were then cross-checked for accuracy.

Part two: determining acceptability and user-friendliness of the nutrition education tool

The second part of the study was conducted to pre-test the developed nutrition education tool and establish its acceptability and user-friendliness among pregnant women. Three FGD sessions were conducted, comprising 28 pregnant women altogether. A Developing and Assessing Nutrition Education Hand-outs (DANEH) checklist from the Academy of Nutrition and Dietetics Foundation was used to establish acceptability and user-friendliness of the nutrition education tool among pregnant women.[15] The 'Yes' and 'No' options on the checklist were filled in by the researcher with the help of two research assistants, after first transcribing data from the FGDs.

Ethics approval

Ethics approval was obtained from the University of KwaZulu-Natal, Humanities and Social Sciences Ethics Committee (Reference number: HSS/0369/016D). The Mutare City Council, Department of Health Services issued a letter of approval for the study to be conducted at Mutare City Clinic, in Manicaland province. Written consent was obtained from all the participants before they participated in the study. At the time of data collection, the age of consent in Zimbabwe was 16 years.[16] Therefore, 17-year-old participants were included in the study.

Statistical analysis

In this study, data collected from all FGDs were thematically analysed using the inductive analysis approach, based on the grounded theory.[17,18] Inductive or open-coding approaches enable themes and codes to be generated from qualitative data, in order to acquire deep understanding and appreciation of a social phenomenon.[17,18] In this study, pregnant women gave their input on the form of the nutrition education tool they most preferred, the language to be used and information to be included, through FGDs. Three main themes, with 11 sub-themes, were generated from all the FGDs with pregnant women and these were then integrated into a larger theoretical framework. Findings from all FGDs were then correlated to

express relationships on information needed when developing and testing a nutrition education tool.

Results

Part one: determining preferences for a nutrition education tool

A total of 67 pregnant women participated in eight FGDs. The participants were aged between 17 and 42 years. The highest number of participants ($n = 24$; 35.8%) were 21–25 years old and the lowest were between 36 and 42 years old ($n = 6$; 9.0%). They were either in their second ($n = 28$; 41.8%) or third ($n = 39$; 58.2%) trimester of pregnancy.

From the FGDs with pregnant women, preferences for various forms of possible nutrition education tools were noted (Table 1).

Almost half of the pregnant women ($n = 33$; 49.3%) indicated their preference for a pamphlet as a nutrition education tool. Another group ($n = 16$; 23.9%) preferred to have discussions or talks on iron supplements, while two other groups of equal size ($n = 4$; 6.0%) preferred the use of booklets and radio advertisements, respectively (Table 1). Some women who indicated their preference for discussions or talks commented in this way: 'it is good to talk so that we can ask each other in case I may not understand, rather than a poster or pamphlet. We can talk here at the clinic and give each other ideas.' Some other women highlighted that discussions were ideal because they were not limited to the clinic only, but could also be extended to churches and during funerals. 'In funerals, in communities, in churches through preachers and at home, people can talk. Others do not come to the clinic because their churches do not allow them.'

English was the most preferred language ($n = 27$; 40.3%) for use in the presentation of the developed nutrition education tool, followed by Shona ($n = 17$; 25.4%). Twenty women (29.9%) preferred the use of a combination of both the Shona and English languages. Only three women (4.5%) supported the use of Ndebele in the nutrition education tool (Table 2).

A pamphlet was the most favoured nutrition education tool, compared with 11 other possible tools. Therefore, a pamphlet was selected as the nutrition education tool to be developed. English and Shona were selected as the most ideal languages to use in the pamphlet.

Many ideas were given by pregnant women on the type of information to be included in the nutrition education tool. All women mentioned the need for information on iron-rich food sources encouraged during pregnancy, the importance and benefits of iron supplements, and the signs and symptoms of iron deficiency ($n = 67$; 100%). Very few pregnant women ($n = 6$; 9.0%) indicated the need for information on the importance of ANC, while 17 (25.4%) requested information on the factors that enhance the absorption of iron (Table 3).

Tables 4 and 5 summarise the findings from the FGDs held with participants on the development of a nutrition education tool on iron supplementation for use by pregnant women.

Table 2: Most appropriate language for use in the nutrition education tool ($n = 67$)

Language	*n*	%*
Shona	17	25.4
English	27	40.3
Shona/ English	20	29.9
Ndebele	3	4.5

*Percentage of sample ($n = 67$).

Part two: determining acceptability and user-friendliness of the nutrition education tool

The DANEH checklist was used to test the user-friendliness of the pamphlet for pregnant women. Twenty-eight pregnant women, separate from those in part one of the study, participated in three FGDs. There were 15 identified constructs, categorised into 5 main parts, that is, content, behaviour emphasis, traditional thoughtfulness, written word, as well as orderliness and readability of the content.[15] In this study, the DANEH checklist addressed the relevance and adequacy of information on iron supplements (Table 6). Information on the importance, dosage and duration of supplementation was also verified against the WHO guidelines.[19] Although the current study used the 2016 WHO Recommendations on Antenatal Care for a Positive Pregnancy Experience,[19] this has been updated to indicate that antenatal multiple micronutrient supplements, which include iron and folic acid, are recommended.[1]

A standard checklist must have at least 76% of the constructs positively scored.[21] In the current study, 12 out of 15 (80%) constructs were positive. The outcome of the checklist was that the majority of the 28 pregnant women who participated in the three FGDs were satisfied with the pictures of a healthy-looking pregnant woman and the iron-rich foods illustrated. The images were found to be clear, relevant and culturally sensitive as indicated by the following: 'specifying the names of foods in both English and Shona made it easy for women to identify and comprehend', 'some of the foods illustrated were also culturally recommended, for instance, pumpkin leaves, black-jack, liver, offal and cowpeas'. To address the three negative constructs, the font size in some parts of the pamphlet was increased, sub-headings were changed to bold font and the spaces around text and headings were increased.

In the second part of the study, concerning information to include in the nutrition education tool, the women said, 'it is good to include information on when they were supposed to commence and to eventually stop iron supplementation, as well as the recommended dosage per day'. Concerning the

Table 3: Information that pregnant women suggested should be included in the nutrition education tool ($n = 67$)

Types of information	*n*	%*
Iron-rich food sources encouraged during pregnancy	67	100
Eye-catching pictures of liver, offal, dark greens, red meat, poultry, pork	43	64.2
Importance and benefits of iron supplements	67	100
Dosage and frequency of taking iron supplements	48	71.6
Signs and symptoms of iron deficiency	67	100
Trimester requirements for iron	13	19.4
Importance of antenatal care check-ups	6	9.0
Onset of iron supplementation and duration	21	31.3
Side-effects associated with iron supplements	39	58.2
Factors that enhance the absorption of iron	17	25.4

*Percentage of sample ($n = 67$).

Table 4: Nutrition education tool and language most preferred by pregnant women

Discussion topics	Themes	Concepts	Responses	Quotes
Importance of nutrition education tools on iron supplementation for pregnant women	Willingness to accept a nutrition education tool	Form of nutrition education tool most preferred (pamphlet)	The pamphlet was the most preferred form of nutrition education tool. Most pregnant women cited that it was very portable to travel. It contains just enough information to inform the reader	'The size of a pamphlet makes it easy to travel with' 'Pamphlet is good because it has just enough information' 'A pamphlet encourages women to read and share with others' 'The pamphlet can contain all the required information and is very portable'
		Ideal language(s) to use in the nutrition education tool	English was the preferred language for many pregnant women, followed by Shona. Others felt that as Manicaland is a Shona-speaking province, Shona was not to be abandoned completely. However, the use of English helped overcome many ambiguities in Shona due to its many dialects. English is an international language enabling many to understand. Terms like 'anaemia' or 'haemoglobin' have no Shona translations, thus justifying the need for English in addition to Shona	'Mainly English and just a bit of Shona. No to Ndebele, because we are in Manicaland' 'English should dominate and Shona to follow' 'English is also ideal for foreigners who may visit the country' 'Mix Shona and English in the same document, but English should dominate' 'Those who do not understand Shona will use English. Let us use both Shona and English, but even when we use both languages, English should dominate because it is internationally recognised and different countries use it for effective communication' 'Shona is our indigenous language and is more easily understood. Almost every one of us here understands Shona'

quality of the printing paper, pregnant women indicated that, 'the paper that was used for printing is good and thin enough to be attached to the ANC booklets. The quality of ink is good, printing is clear and readable.' Thus, the nutrition education pamphlet proved to be acceptable and user-friendly to pregnant women. They were eager to take it home to share with other family members.

Discussion

Three major themes were derived from all the FGDs with pregnant women on what should be included in a nutrition education tool on iron supplementation, as well as testing for its acceptability and user-friendliness. The themes were willingness to accept a nutrition education tool by pregnant women, baseline information on the development of a nutrition education tool and dissemination of the nutrition education tool to

Table 5: Information that should be included in the nutrition education tool on iron supplementation for pregnant women

Discussion topics	Themes	Concepts	Responses	Quotes
Development of a nutrition education tool	Information to be included in the development of a nutrition education tool	(i) Benefits of iron supplements in pregnancy	All participants indicated the need for information on the importance of iron supplements during pregnancy. Pregnant women would be motivated to take iron supplements optimally	'What are iron supplements?'; 'We need to know why we take supplements'; 'To know their importance or reason for taking'
		(ii) Iron and vitamin C-rich foods	Iron and vitamin C-rich foods with pictures for easy identification, helps in creating awareness among pregnant women on the importance of iron	'Information on food that provide us iron'; 'Pictures of liver, meat, black-jack, oranges, dark greens, and fruit juices, is important';
		(iii) Dosage and duration of taking iron supplements	Most pregnant women were not sure of the dose and duration of iron supplementation. Therefore, information on the recommended dosage and duration was critical	'Time and duration of taking supplements is important'
		(iv) Effects of IDA	The tool needs to inform on the dangers of poor compliance with iron supplements. Thus, information on the signs, symptoms and effects of IDA would make the tool useful to pregnant women	'The tool must inform of the effects of IDA'
		(v) Management of side-effects	Side-effects can affect compliance with iron supplements. Thus, the tool should address management of side-effects	'We need information on how to use them optimally'

Table 6: DANEH checklist used to test the user-friendliness of the pamphlet among pregnant women.

	Factor	Yes	No
1.	Content/information		
	Current and accurate (dosage, onset, frequency, duration of iron supplements)	✓	
	Relevant for pregnant women	✓	
	Consistent with the World Health Organization guidelines	✓	
	Clear, simple and familiar language(s) (English and Shona)	✓	
	Cultural sensitivity	✓	
2.	Images		
	Clear	✓	
	Relevant	✓	
	Good use of colour	✓	
	Cultural sensitivity/socially acceptable	✓	
3.	Written text organisation		
	Easy to read font type and size		✓
	Size of texts and sequencing		✓
	Informative headings	✓	
	Space around text and headings		✓
4.	Printed version		
	Quality of printing	✓	
	Durability and quality of printing paper	✓	

pregnant women. Eleven sub-themes were generated from the three main themes (Figure 1).

The form of nutrition education tool preferred by most women was the pamphlet. A pamphlet is a small print product that contains detailed, standardised information on a single subject.[20–22] Pamphlets are usually written by experts for education purposes and may be tailored for specific audiences[20–22] Pamphlets can be easily stored, do not require any special equipment and can be used as a reference outside the hospital.[22] The positive effect of bright images on pamphlets helps encourage the audience to act in some way. Based on colour attention theory, the knowledge, attitudes and behaviour (KAB) model has been found to be effective in developing nutrition education tools such as pamphlets. The KAB model illustrates that changes in knowledge (K) lead to changes in attitudes (A), which subsequently leads to modifications in behaviour (B).[13]

Overall, the pamphlet should be given to pregnant women early during pregnancy, especially at the end of the first trimester or at their first contact with nurses at ANC visits. The pamphlet should be given together with iron supplements and nutrition education to enhance awareness concerning the importance of iron supplements during pregnancy.[6,9] English was the preferred language to use in the pamphlet because it is the official language used for communication in many countries and is internationally recognised. Even in Shona-speaking communities, there are sometimes barriers to effective communication due to different Shona dialects. Thus, English is used to clarify vague or ambiguous statements. Nutrition education tools need to be written in simple language, which is easy for the target audience to read and understand.[23] If the nutrition education tool is being designed and developed for adults, the use of adult learning theory is effective in ensuring development of adult education resources that are written in a language compatible with the users.[14]

Regarding the information to include in the nutrition education pamphlet, various ideas were put across, including information on the importance and benefits of iron supplements, dosage, duration and onset of supplementation. The signs and symptoms, side-effects associated with taking iron supplements, images of iron and vitamin C-rich foodstuffs were also included, in order to make the pamphlet informative. Compared with civic and cultural pamphlets, educational pamphlets are a valuable tool, commonly used in healthcare systems, and focus specifically on one topic.[21] Thus, in this study, the pamphlet was ideal for informing on the importance, benefits, use, dosage, as well as side-effects associated with the use of iron supplements by women during pregnancy.[19] Images were included in the pamphlet to complement written text and to enhance understanding of the information being presented. This was also done to augment comprehension because some

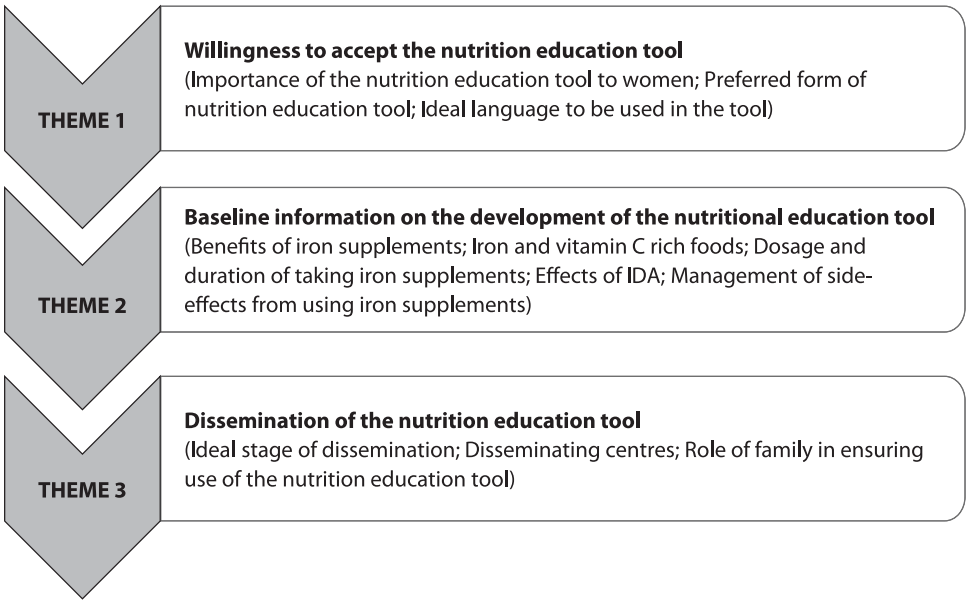

Figure 1: Major themes and sub-themes derived from all FGDs with pregnant women.

target audiences may better understand messages when they are given through diagrams or pictures, therefore images used in the pamphlets needed to be clear and relevant.[21–23]

Study limitations

Although other micronutrients are required in higher amounts during pregnancy, this study focused on iron only. The study was conducted only on pregnant women attending Mutare City Clinic, in Manicaland province, which is an urban setting. Thus, there was a limited inference for other provinces including rural areas in Zimbabwe, which may also be affected by maternal IDA. There was no consistency in the number of participants in the FGDs, as the number of ANC attendees each day determined the number of FGD participants.

Conclusion

A nutrition education tool in the form of a pamphlet, developed in simple English along with some Shona phrases, was most preferred by the pregnant women in this study. Information on the importance and benefits of iron supplements, onset, frequency, duration and correct dosage of iron supplementation, management of side-effects, pictures of iron and vitamin C-rich foods, as well as the signs and symptoms of IDA were included in the pamphlet. Offering the pamphlet together with iron supplements could improve awareness and motivate towards compliance and appreciation of the benefits of taking iron supplements during pregnancy. This study succeeded in developing a nutrition education pamphlet on iron supplementation for use by pregnant women attending Mutare City Clinic. However, follow-up consultations to ensure effective implementation of all aspects highlighted in the pamphlet are also required.

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