

**MATERNAL KNOWLEDGE AND PRACTICES RELATED TO ANAEMIA
AND IRON SUPPLEMENTATION IN RURAL MALAWI: A CROSS-
SECTIONAL STUDY**

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ABSTRACT

Anaemia is a leading cause of maternal morbidity, mortality and poor birth outcomes in developing countries. In Malawi, education on anaemia and provision of prophylaxis iron supplements during pregnancy are key strategies that are used to reduce the high prevalence of anaemia in this population. Therefore, as part of Surveillance of Micronutrient Programmes in Malawi, a cross-sectional study was done to assess maternal knowledge and practices related to anaemia and iron supplementation in rural areas. A total of 629 (mean age 27.9 years) randomly selected women were interviewed in the Northern, Central and Southern regions using a pre-tested questionnaire. The data were entered in EpiInfo 6.04d and analyzed in SPSS 9.0 for Windows. The results showed that 96.6% of the women were aware of anaemia, with at least two thirds knowing its causes, ways of prevention, and treatment. As expected, health facilities are the primary source of iron supplements (97.1%). On whether or not pregnant women actually take the supplements, the study found that 22.5%, 29% and 33.8% of women from the Central, Northern and Southern regions, respectively reported taking the supplements for one month only during their most recent pregnancy ($\chi^2=6.79$, $p=0.009$). Overall, about 9% reported taking the supplements throughout pregnancy, but the proportion was higher (22.5%) in the Central than the Southern (2.5%) and Northern (0.5%) regions. The single most important reason for non-compliance was nausea (43.6%), with 34.9% of those reporting nausea resorting to withdrawal. On a positive note, 47.4% of women from the Southern region reported taking the supplements with *nsima* (stiff maize gruel) to overcome nausea. Therefore, this study shows that Malawi's efforts to increase awareness on anaemia in women of reproductive age in rural areas are largely effective. However, non-compliance with iron supplementation is a big challenge which requires strategic planning and implementation of ways to ensure that pregnant women consistently take iron supplements throughout pregnancy.

Key words: anaemia, knowledge, iron, Malawi, pregnancy.

INTRODUCTION

Globally, anaemia and iron deficiency anaemia affect an estimated 3.5 billion people [1], with 110,000 annual maternal deaths attributable to iron deficiency anaemia [2]. In Africa, at least 50% of pregnant women are anaemic [1], putting them at greater risk of mortality, prenatal and perinatal infant loss, and premature birth [3]. Physical and cognitive losses due to iron deficiency anaemia cost developing countries up to 4.05% losses in gross domestic product per annum [4], thereby stalling social and economic development.

In Malawi, hospital- and population-based surveys have shown that anaemia is prevalent in 54 – 92% of pregnant women depending on area of residence and season of the year [5], and is likely to be associated with the high (984 per 100,000) maternal mortality rate [6]. According to the World Health Organization, prevalence of anaemia that exceeds 40% in any population group is an indicator of a public health problem [3], for which Malawi qualifies.

Several factors are associated with anaemia in African pregnant women, which include chronic inflammation [7], high incidence of malaria [8], low serum ferritin, folate and retinol, and HIV infection [9]. In order to minimise the socioeconomic and health insults associated with anaemia, the Malawi Ministry of Health recommends daily supplementation of elemental iron (60 mg) and folic acid (0.5 mg) to all pregnant women throughout pregnancy, and six months post partum [5].

While iron supplementation is an efficacious intervention in improving birth weight [10] and haemoglobin status [11, 12], its effectiveness in the wider population remains problematic [11, 13]. In part, this is due to poor compliance and irregular intake of the supplements [3, 14]. Between 1999 and 2004, Malawi aimed to improve women's knowledge on anaemia, and supplement at least 90% of pregnant women with iron in their most recent pregnancy [5]. Therefore, this paper describes maternal knowledge and practices related to anaemia and iron supplementation, which were studied as part of a nation-wide Surveillance of Micronutrient Programmes in Malawi. The results are expected to enlighten programme managers and policy makers on key programmatic issues.

MATERIALS AND METHODS

Study area and population

The data used in this study were collected as part of Surveillance of Micronutrient Programmes in Malawi, in which cross-sectional surveys are periodically conducted, primarily targeting subsistence farming households in agricultural development divisions (ADDs). Malawi has eight ADDs, which are the major ecological zones within which agricultural programme planning and implementation are done. Each ADD consists of several rural development projects (RDPs), each of which consists of extension planning areas (EPAs). The EPAs are the smallest units of operation in the hierarchy of the Ministry of Agriculture, and are manned by a cadre of front-line

extension workers who have been trained in agriculture, natural resources, home economics, and related disciplines.

From the eight ADDs, a multistage cluster sampling technique was used to randomly sample RDPs (stage I), EPAs (stage II), and households (stage III). In the Northern region, six EPAs were randomly selected, and 10 in each of the Central and Southern regions. Five clusters were then selected from each EPA in the North, whereas three clusters were selected in each EPA in the Centre and South. This resulted in 30 clusters per region, and seven households were randomly selected from each cluster. The inclusion criteria were: being resident in the sampled area; having at least one child aged 6 – 59.9 months; being randomly selected; giving verbal consent to be interviewed on a wide range of nutrition issues related to micronutrients; and accepting that children's anthropometric measurements should be taken. Therefore, a total of 629 women (mean age 27.9 years) were interviewed.

Survey arrangements

Three teams of enumerators were recruited and trained, and were responsible for administering a pre-tested household questionnaire under the supervision of nutritionists (the authors) from the University of Malawi. The household questionnaire covered issues of vitamin A, iodine and iron with respect to knowledge and practices. All filled questionnaires were checked for completeness on a daily basis.

Data analysis

The data were entered in Epi Info 6.04d (Centers for Disease Control and Prevention, Atlanta, Georgia) and analysed in the Statistical Package for Social Sciences (SPSS) for Windows 9.0 (SPSS Inc., Chicago, Illinois). Proportional differences on selected variables were determined using χ^2 , and the critical value for statistical significance was set at $p < 0.05$.

Ethical approval

The study was approved by the Ministries of Health and Agriculture in Malawi. All respondents gave informed verbal consent to participate in the study, and there were no refusals.

RESULTS

Demographic characteristics of the respondents and their households

A total of 629 households were interviewed, whose demographic characteristics are shown in Table 1. Overall, the majority of the respondents were married, with nine in ten households headed by men. There were, however, regional differences in that a greater proportion of households (18.2%) in the Southern region were headed by women compared to other regions ($\chi^2=35.11$, $p<0.0001$). The mean age of the respondents was 27.9 years, and respondents from the North were likely to have more years of formal education than their Central and Southern region counterparts. Overall, the majority (46.6%) of the respondents had attained 5 – 8 years of formal education, and only 1% had post-secondary education.

Knowledge about anaemia

A large majority of the women (96.6%) knew about anaemia, and most of them correctly indicated its signs, causes, prevention and treatment (Table 2). Inadequate food intake and diseases such as malaria were identified as the leading causes of anaemia. In terms of prevention, 78.5% indicated that eating adequate amounts of food is a means of preventing anaemia, whereas iron supplementation and blood transfusion were spelt out as the main ways of treating anaemia.

Sources, intake and reasons for taking iron supplements during pregnancy

More than three quarters (78.5%) of the women reported taking iron supplements during their last pregnancy, with a significantly lower proportion ($\chi^2=39.65$, $p<0.00001$) of women in the Central region (64.7%) than the North (89.4%) and the South (81.3%). The reasons for taking iron supplements are presented in Table 3. At least nine in ten women knew why they were given iron supplements, which was to prevent anaemia.

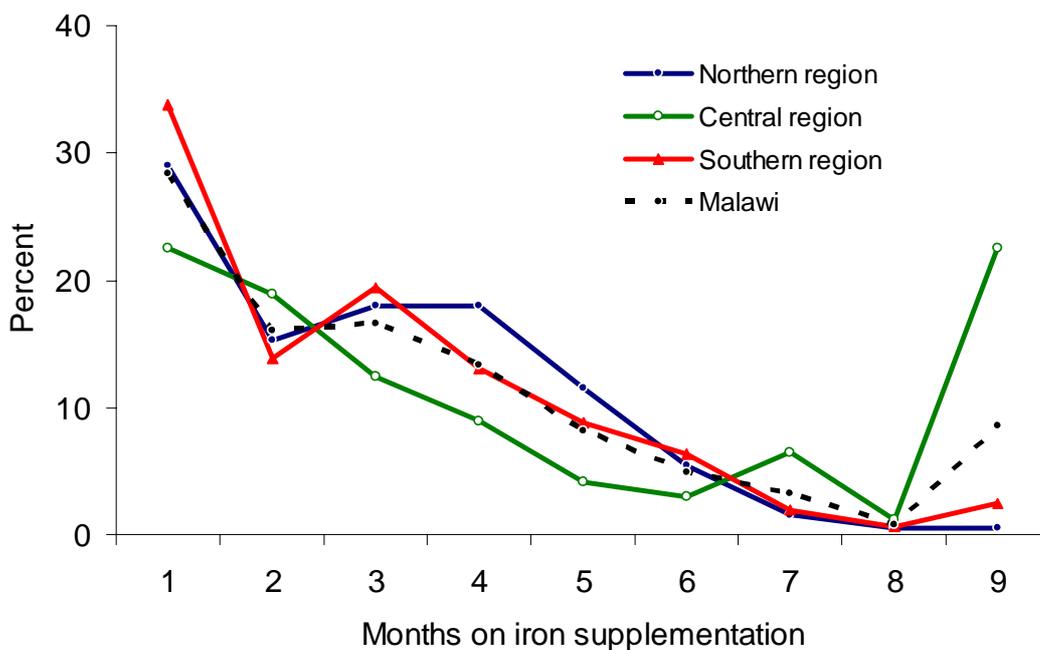
Normally iron supplements are supposed to be taken daily during pregnancy until the sixth month post partum [5]. Of those who reported to have taken the supplements, 92.3% had taken them on a daily basis, with fewer women from the North than the Centre and the South ($\chi^2=9.59$, $p=0.008$) (Table 3).

Almost all women (97.1%) indicated that they received the supplements from health facilities, with very small regional variations (North, 96.8%; Centre, 96.3%; South, 98.3%; $p>0.05$). Traditional birth attendants provided 1.5% of the supplements, while 1.4% were provided by friends and neighbours. Overall, 20.7% of the respondents had experienced problems with the supplements. Nausea was the commonest problem, with 43.6% of the women indicating that they took other medications to overcome it, while 34.9% abandoned the supplements altogether. Interestingly, 47.4% of women from the Southern Region reported taking the supplements with *nsima* (a cereal or cassava-based cooked stiff-porridge that is frequently consumed in Malawi) to overcome the nausea (Table 4). Such a strategy was uncommon in the Northern region (6.3%), and was not reported in the Central region.

Intake of iron supplements during the last pregnancy

Respondents were asked to indicate the number of months they took iron supplements during their last pregnancy. Overall, only 8.5% of the women took the supplements for 9 months. At regional level, 22.5%, 29%, and 33.8% ($\chi^2=6.79, p=0.009$) of women from the Central, Northern and Southern regions, respectively, reported taking the supplements for one month, with a consistent decline in the proportion of women who reported taking the supplements across the span of pregnancy in all the three regions (Figure 1). However, the proportion of women who reported taking the supplements for nine months increased in the Central and Southern regions. Although women from the Central region had the lowest coverage in the first month, they registered the highest proportion (22.5%) of those who reported taking the supplements for nine months.

Figure 1: Intake of iron supplements during the last pregnancy



DISCUSSION

As in most developing countries, anaemia is a significant problem of public health concern in Malawi, where it affects 54 – 92% of pregnant women [5]. To curb the situation, the Ministry of Health and its partners implement four strategies: iron and folate supplementation; fortification of commonly consumed foods with iron and vitamin C; dietary diversification to include iron, vitamin C-rich, and animal-source foods; prevention, control and treatment of parasitic infections such as malaria, hookworms and schistosomiasis [5]. In this study, the aim was to assess knowledge and practices of women of reproductive age, on anaemia and iron supplementation.

Among other findings, the study showed that the levels of knowledge of anaemia were almost universal (Table 2), which meets the target (95%) set by the Ministry of Health [5]. This suggests that the strategies that were put in place to increase awareness on anaemia were effective in reaching out to rural women. These include dissemination of information via antenatal and under-five clinics, public radio, and community development meetings conducted by extension workers [5]. Evidently, most women were able to correctly identify the causes of anaemia (Table 2), and at least nine in ten correctly indicated reasons for a pregnant woman to take iron supplements (Table 3). Awareness is an important step that is expected to influence change, cognizant of the fact that not all knowledge leads to appropriate behavioural changes. While these results would be encouraging to policy makers and programme managers, effort should be made to maintain the high levels of awareness.

It was noted in the present study, that too many women do not take iron supplements for the entire duration of pregnancy. As shown in Fig. 1, the highest reported period during which most women took the supplements was one month, with only about a tenth of them taking the supplements for nine months. Since we did not investigate the actual number of months that the women attended antenatal clinics, it is not possible to determine whether or not the women complied within the period that they actually attended antenatal clinics. However, since 34.9% of the women reported that they stopped taking the supplements primarily because of nausea, and considering that many women start antenatal clinics late [15], it is logical to conclude that most pregnant women do not take the full course of iron supplements. This should be of great concern to policy makers and programme managers, prompting the need to find ways of increasing antenatal clinic attendance, and intake of iron supplements throughout pregnancy. Pharmaceutical companies should consider manufacturing iron supplements that do not cause nausea in order to increase compliance.

This being a cross-sectional study in which retrospective information was sought, the results are likely to be affected by memory lapses. Recollecting past practices is generally problematic; however, the results may suggest two main issues. Firstly, that women of reproductive age may not consider themselves at-risk, hence they may not seek antenatal care, including iron supplementation. While it is acknowledged that distance to health centres is often a deterrent, a large study done in the Southern region of Malawi showed that more than nine in ten women living within 5 km of a hospital attended antenatal clinics on average five times during pregnancy [15].

Therefore, apart from long distance, there are likely to be other reasons why pregnant women may not seek antenatal care, and such reasons need to be investigated.

Secondly, the present results may reflect the inadequacy of health services to cater for antenatal needs. In a study of Chilomoni Health Centre in Blantyre, Lule and colleagues found that 68% of the women were unlikely to use the facility due to poor services, including drug shortage, long waiting times, poor laboratory services, and having been prevented by family members [16], apparently due to stronger beliefs in traditional treatments. Such deterrents may be applicable to the findings in this study. Therefore, although women's awareness on anaemia is almost universal in Malawi, increasing knowledge should be accompanied with ways of ensuring that pregnant women adopt healthful practices. This would help to reduce the prevalence of anaemia, whose consequences include increased risk of maternal mortality, prenatal and perinatal infant loss, and premature birth [3], as well as substantial economic losses [4]. In the absence of positive behavioural change such as intake of iron supplements during pregnancy, increased awareness on anaemia is likely to have little or no impact in reducing the prevalence of anaemia in this population.

One in five women (20.7%) reported that they experienced problems with iron supplements, mostly nausea (43.6%). This is in agreement with a previous Tanzanian study, which reported that 22% of pregnant women who were taking conventional iron supplements experienced side effects, primarily nausea [17]. As a consequence of the side effects, slightly over a third (34.9%) of women in the present study reported that they stopped taking the supplements altogether. By stopping to take the supplements means that anaemia prevention and treatment are compromised. On ways to overcome the nausea, the study found that 47.4% and 6.3% of women from the Southern and Northern regions, respectively reported taking the iron supplements with *nsima*. The high proportion of women in the Southern region who use *nsima* to overcome nausea suggests that the strategy could be effective. Therefore, this strategy (perhaps including the use of other foods) should be investigated and documented so that if indeed it is effective in the wider population, then it can be incorporated in nutrition education in Malawi.

Among women who reported to have taken the iron supplements, the study found that 92.3% of them had taken the supplements on a daily basis for their respective periods of time. This suggests that there is potential for pregnant women to comply with the iron supplementation regimen, more so if issues pertaining to side effects, particularly nausea, were overcome. As indicated by other women, taking the iron supplements together with *nsima* was an effective strategy for them.

Attempts to increase compliance through weekly, as opposed to daily iron supplementation have shown that pregnant women comply better with a weekly supplementation regimen (104%) than daily supplementation (68%) [12]. In Malawi, the risk of developing anaemia during pregnancy is high; hence there is a need for an effective high-compliance supplementation strategy. To that effect, local studies should be undertaken to determine optimal levels of supplementation which can

confer high compliance, yet be effective in reducing the prevalence of anaemia in this population.

While educating pregnant women should be an ongoing intervention to increase awareness and improve compliance with supplementation, there is a need to scale up other complementary strategies (fortification, dietary diversification, and reduction of infections). Such an approach is likely to diversify the sources of iron, as well as minimise iron losses. Furthermore, close family members could be an opportunity for encouraging compliance with iron supplementation among the women, considering that family members potentially influence health-seeking behaviours of women [16]. Therefore, nutrition and health messages should also be purposefully targeted at other family members.

Our study had several major limitations. Firstly, we did not investigate parity of the mothers, which may have implications on compliance with iron supplementation. Secondly, the cross-sectional nature of the survey was not ideal for collection of data on compliance of iron supplementation based on the actual number of supplements taken during pregnancy. Lastly, the first micronutrient surveillance did not investigate some important anaemia-prevention strategies such as presumptive treatment of malaria with sulfadoxine pyrimethamine, and the uptake of insecticide-treated bed nets.

CONCLUSION

It is evident from the present study that Malawi's efforts to increase awareness on anaemia in pregnant women are largely effective since the set targets have been met. However, only a negligible proportion of women take iron supplements throughout pregnancy, with about one quarter taking them only for one month. There is a need for stakeholders to continue to educate women on anaemia and its consequences. In addition, stakeholders should pay attention to other sources of iron such as fortified and animal-source foods to complement iron supplementation, whose compliance is currently poor. Research is needed to determine the potential of using dietary strategies to overcome nausea (the single most important reason for non-compliance), as well as establish more compliant, yet effective supplementation regimens for low-resource settings.

Table 1: Percent (%) distribution of demographic characteristics of respondents and their households by region

Characteristics	Region			All regions (n=629)
	North (n=210)	Centre (n=210)	South (n=209)	
Marital status				
Single	4.8	1.9	5.8	4.2
Married (monogamous)	69.0	75.1	71.2	71.8
Married (polygamous)	18.6	16.3	9.1	14.7
Separated/divorced	3.8	5.3	11.1	6.7
Widowed	2.4	1.5	2.9	6.8
Head of household				
Mean age (years)	34.8	32.9	32.8	33.5
Male	93.7	97.6	81.8	91.0
Age of respondents				
Mean (years)	27.9	28.2	27.5	27.9
Categories				
<20	0.5	1.0	0	0.5
20-29	31.6	38.2	36.3	35.4
30-39	32.5	34.5	34.5	33.8
40-49	18.8	17.5	10.8	15.7
50-54	2.6	2.0	4.3	3.0
>55	4.1	1.5	2.0	2.5
Don't know	2.1	4.6	11.9	6.2
Education level				
None	4.8	23.8	18.2	15.6
Standard 1-4	12.9	34.3	30.6	25.9
Standard 5-8	63.3	36.2	40.2	46.6
Junior secondary school	13.3	2.4	7.2	7.6
Senior secondary school	4.3	0.5	0.5	1.8
Above secondary school	1.0	1.0	1.0	1.0
Other	0.5	1.9	2.4	1.6
Ability to read and write				
Able to read only	3.3	5.3	4.8	4.5
Able to write only	2.4	0.5	1.0	1.3
Able to read and write	77.1	49.8	57.4	61.4
None	17.1	44.5	36.8	32.8
Household size				
≤3 people	0	0	0.5	0.2
4-6 people	38.6	40	34.5	37.7
7-9 people	41	39	36.4	38.8
≥10 people	20.4	21	28.6	23.3

Table 2: Knowledge and practices related to anaemia by region (%)

Response	Region			All regions (n=629)
	North (n=210)	Centre (n=210)	South (n=209)	
Women who had heard of anaemia	98.1	94.7	97.1	96.6
Signs of anaemia*				
Paleness around gums	87.0	94.0	86.5	89.2
Dizziness	30.0	21.5	16.5	22.7
Chronic fatigue	27.5	24.0	36.0	29.8
Anorexia	3.0	64.5	3.0	3.5
Shortness of breath	21.0	13.0	11.0	15.0
Other ¹	43.0	29.5	40.0	37.5
Don't know	0.5	1.0	5.0	2.2
Causes of anaemia*				
Inadequate food intake	81.0	61.0	56.5	66.2
Illness	32.0	36.0	12.0	26.7
Malaria	26.0	24.0	21.2	23.7
Bleeding	9.0	9.0	7.0	8.3
Heavy work	6.5	4.5	8.5	6.5
It runs in the family	1.0	2.0	1.0	1.3
Eating immature sugarcane	0.5	0	0	0.2
HIV/AIDS	1.0	0	1.5	0.8
Worm infestations	1.5	0.0	0.5	0.6
Other ²	22.0	4.5	14.5	13.7
Don't know	7.0	12.0	16.5	11.8
Can't remember	0.0	0.0	0.5	0.2
Prevention of anaemia in pregnant women*				
Eating adequate amounts of food	92.0	78.0	65.5	78.5
Reducing physical work	19.5	21.0	14.0	18.2
Treating worms	0.5	0.5	0.0	0.3
Other ³	40.0	35.5	44.5	40.0
Don't know	2.5	7.5	6.0	5.3
Treatment of anaemia*				
Taking iron supplements	84.5	31.0	80.5	65.3
Receiving blood	51.5	84.5	53.5	63.2
Other ⁴	39.0	41.5	26.5	35.7
Don't know	3.0	4.5	5.5	4.3

*Multiple responses were recorded

¹Oedema, frequent illnesses and drowsiness

²Home deliveries, malnutrition, frequent births, monotonous diet, menstruation, sunlight

³Child spacing, preventing HIV/AIDS, eating meats, taking orange squash, visiting a health clinic when ill

⁴Eating tomatoes, meat, drinks, vegetables, whole maize meal porridge, having adequate rest after hard work

Table 3: Sources, frequency and reasons for taking iron supplements by region (%)

Response	Region			All regions (n=629)
	North (n=210)	Centre (n=210)	South (n=209)	
Sources of iron supplements				
Clinic	96.8	96.3	98.3	97.1
Traditional birth attendants	1.1	2.9	0.6	1.5
Other ¹	2.2	0.7	1.2	1.4
Frequency of taking iron supplements				
Daily	88.1	96.3	92.4	92.3
Weekly	4.9	0	0.6	1.8
Monthly	1.6	0	0.6	0.7
Other ²	5.4	3.7	6.4	5.2
Reasons for taking iron supplements				
To increase blood levels	95	89.2	95.8	93.4
To avoid losing blood during delivery	1.6	0.8	0	0.8
For proper growth of the child	1.1	0	0.6	0.6
Because of illness	0	3.3	0.6	1.3
Not told reason for taking iron tablets	2.2	6.6	3.0	3.9

¹Elderly women, friends and neighbours

²Two or three times a day

Table 4: Action taken to overcome nausea experienced with iron supplements by region (%)

Action taken to overcome nausea	Region			
	North (n=210)	Centre (n=210)	South (n=209)	Total (n=629)
	%	%	%	%
Taking other medications	43.8	55.6	31.6	43.6
Stop taking supplement	50.0	38.9	15.8	34.9
Take with <i>nsima</i>	6.3	0	47.4	5.3
Did nothing	0	5.6	5.3	3.6

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