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CHAPTER FOUR

Assessing the Implementation Fidelity of the Maternal Nutrition Intervention Programme in Rural Kenya

Assessing the Implementation Fidelity of the Maternal Nutrition Intervention Programme in Rural Kenya

Abstract

Introduction

While many antenatal care programs in low and middle-income-countries implement nutrition intervention strategies, the effectiveness of these interventions in improving maternal nutrition status has been inadequate. Lack of implementation fidelity can weaken outcomes, rendering potentially useful interventions largely ineffective. This study aims to acquire insight into the degree to which the Kenyan nutritional guidelines during pregnancy have been implemented as intended and which factors have constrained programme implementation.

Methods

Data was collected in rural Uasin Gishu County in the western part of Kenya through document analysis, questionnaires among programme recipients (n=188) and semi-structured interviews with programme implementers (n=6). Themes emerging from data are critically discussed using a conceptual framework based on programme theory and the programme implementation fidelity framework.

Results

Coverage of maternal nutrition interventions is widespread. However, content, frequency and participant responsiveness does not fully cover all the intended components. Late initial bookings to antenatal care, drug stock shortage, staff shortage and long queues, anticipated or experienced side effects of the pills were established to be the main challenges to implementation fidelity. Anticipated health consequences and instructions by the health officer were established to be motivations for adherence to supplements.

Conclusions

Implementation fidelity in maternal nutrition intervention was generally poor. There is need to emphasise maternal nutrition more in community-based outreach intervention programs, to make use of community-based health workers and to strengthen school training curriculum to incorporate maternal nutrition topics.

Key words

Maternal nutrition, pregnancy, programme evaluation, implementation fidelity, Kenya

4.1 Introduction

Maternal nutrition is a key determinant of maternal, new-born, and child health (MNCH) outcomes. Nutrition is more critical during pregnancy because it lays the foundation for a successful outcome of pregnancy, lactation, survival and development of infants and children. Maternal nutritional deficiency prior and around pregnancy makes the placenta fail to develop fully: therefore it cannot optimally nourish the foetus and this has been associated with intrauterine growth retardation (IUGR), still-birth, low birth weight (LBW) and pre-term delivery conditions [1–7]. Babies born underweight, pre-term or with IUGR have increased risk of neo-natal mortality; the rate is estimated to be 2.6 million per year globally [8]. Pregnant women who are underweight or overweight, or who have deficiencies in particular micronutrients, experience more complications during pregnancy and delivery [9–11].

Maternal malnutrition is a global problem and is more prevalent in low- and middle-income-countries (LMICs). In Kenya, many pregnant women have poor nutritional status, with 42% of pregnant women suffering from anaemia [11] and 12.3% of women of reproductive age having a BMI of less than 18.5 [12]. Low birth weight (<2500g), one of the best composite indicators of short- and long-term undernutrition in women – affects one in ten new-borns in Kenya [12]. Anaemia in pregnancy contributes to high rates of intrauterine growth retardation (IGR) and premature birth, increased complications of post-partum bleeding and greater risk of maternal mortality [1,2,4,5,13].

Malnutrition is a complex problem which is caused by a wide range of factors such as severe food insecurity, political instability and lack of access to quality healthcare. In Kenya, agriculture is the backbone of the economy and central to the government’s development strategy, but agricultural productivity has been stagnating due to persistent droughts and floods [14]. In addition, Kenya has one of the world’s highest rates of population growth; the population has tripled in the past 35 years, straining the country’s resources [12–13]. Similarly, since the legalization of multiparty politics in 1990, politically motivated ethnic conflicts have frequently been experienced in Kenya, mostly after the national elections [16]. The last and most severe ethnic violence was witnessed in 2007-2008 following the contested presidential election result which was mainly between Kalenjin and Luo on one side and the Kikuyu. During this time, over 1,200 people were killed and 300,000 displaced and this was more rampant in the Kenya’s great rift region, the area chosen for this case study and where much of Kenya’s farm produce originates [17]. These conflicts often increase food and nutrition insecurity in the country. They not only affected food availability, but also accessibility and utilization of food. Lack of good governance and political will have obstructed the government in providing basic social and health services and decent living conditions in Kenya thus worsening nutritional security [18]. All these factors have contributed to high costs of domestic food production and low purchasing power among families. As a result, Kenya continues to face severe food insecurity, leaving people, especially women and children, particularly vulnerable to poverty and malnutrition.

The Government of Kenya has acknowledged the problem of malnutrition and is committed to reducing hunger and to achieve good nutrition for the optimum health of all Kenyans as a fundamental human right [19]. providing special nutrition interventions for certain vulnerable groups such as children and pregnant women through its National Food and Nutrition Security Policy [20].

Since 2001, maternal nutrition interventions in Kenya were being implemented within the framework of the Kenya Reproductive Health strategy (1997-2010) using the World Health Organization (WHO) Focused Antenatal Care (FANC) strategy. FANC put in place a National Reproductive Health Programme that sought to expand on the achievements of the Maternal Child Health/Family Planning (MCH/FP) programme that had been functioning since 1967. The goal of the programme was to provide a comprehensive and integrated system of reproductive health care that offers a full range of services by the Government, NGOs and the Private Sector. In the FANC care package, nutrition education and counselling are the main strategy to improve the nutritional status of women during pregnancy. The counselling is focuses on a healthy diet by increasing the diversity and amount of foods consumed, keeping physically active during pregnancy to stay healthy and to prevent excessive weight gain during pregnancy, health promotion and disease prevention and nutrition supplementation, healthy lifestyles and diet and support and care in the home.

In 2013, the Maternal Infant and Young Child Nutrition (MIYCN) policy for health workers was introduced [21]. This is anchored in WHO's *the Essential Nutrition Actions: Improving maternal, newborn, infant and young health and nutrition* [22]. In the MIYCN Program, nutrition education and counselling still remain the main strategy to improve the nutritional status of women during pregnancy. The strategy focuses primarily on promoting a healthy diet by increasing the diversity and amount of foods consumed, promoting adequate weight gain through sufficient and balanced protein and energy intake and promoting consistent and continued use of micronutrient supplements, food supplements or fortified foods.

Studies have confirmed that with effective implementation and compliance to these intervention packages, maternal nutrition is improved. Available evidence suggests that nutrition education and counselling may support optimal gestational weight gain (i.e. neither insufficient nor excessive), reduce the risk of anaemia in late pregnancy, increase birth weight and lower the risk of preterm delivery [23], reduce infant and child mortality, improve physical and mental growth and development and improve maternal health and pregnancy outcome [3,24–28].

Despite the proven efficacy of maternal nutrition education and counselling, the outcome in addressing maternal malnutrition and associated health indicators has been less successful than anticipated: globally, Kenya is currently among the 10 countries that experience the most neonatal deaths. Here, high levels of under-nutrition, particularly stunting, have persisted for decades. The levels of wasting and stunting have remained unaltered for about 20 years at between 6% and 7% for wasting and 30% and 35% for stunting. Although Kenya has made significant strides in reducing neonatal, infant, child, and under-5 mortality, one in every 26 Kenyan children will die before reaching 1 year of age and one in every 19 will not survive to their fifth birthday [11,12,29].

The major reason for programme failure even among well-designed programs is the failure to implement with fidelity. Studies have shown that effective interventions typically yields diminishing returns, regardless of their success during a demonstration period, due to failure to implement with fidelity [30–32]. A meta-analysis of 500 studies from various fields showed that programs with better implementation had mean effect sizes two to three times larger than those with poor implementation [32].

Therefore, this study aims to acquire insight into the degree to which the MIYCN nutritional guidelines during pregnancy have been implemented as intended and which factors have constrained programme implementation fidelity. Implementation research is one of the most important and at the same time most neglected aspects of programme evaluation research. Rather, outcome/impact evaluations have become the norm for most researchers, especially those studying maternal nutrition intervention programs in Kenya [33–35]. Such results provide information on what happened as a result of the programme without a clear picture of how it happened, and without sufficiently illuminating the reasons behind the success or failure of interventions. Obtaining a clear picture of how a programme was implemented not only allows programmers to more confidently link programs to observed outcomes, but also provides important information on how programs should be designed and implemented in future to produce positive results [36,37]. Implementation research also improves the ability to identify and disseminate best programme practices. The few studies that have focused on implementation fidelity of nutritional programs, particularly in LMICs, mainly assessed participant responsiveness to the programme and left out other elements of fidelity (see below) [38–43].

4.2 Programme context

This study assesses implementation fidelity of Kenya’s National Maternal, Infant and Young Child Nutrition (MIYCN) policy for health workers [21]. The MIYCN policy’s main goal is to improve the nutritional status, health, growth and development and the survival of infants and young children in Kenya, through optimal feeding practices and improved maternal nutrition. The MIYCN document operationalizes the maternal nutrition policy objectives by providing guidelines for service providers on day-to-day implementation of the national and global recommendations on maternal and child nutrition care and support at all levels of operation for optimal health of the target populations in Kenya. It provides nutrition interventions for women at different stages (pre-natal, antenatal, postpartum and continued care) and infants and children from conception to five years of age. Specific objectives are to:

1. Strengthen maternal nutrition assessment and counselling within the healthcare system
2. Strengthen and advocate for the uptake and utilization of iron and folate supplements among women of reproductive age and postpartum Vitamin A supplementation
3. Promote appropriate maternal nutrition practices in emergency situations, including Integrated Management of Acute Malnutrition (IMAM) support for pregnant and lactating mothers
4. Promote maternal nutrition interventions for all HIV positive mothers
5. Strengthen integration of maternal nutrition interventions for pregnant and lactating women with existing maternal, new-born and child, youth and adolescent health and related services.

In this study we focus on the first two objectives. Below we elaborate on the policy implementation guidelines for these two objectives:

Policy guideline 1: To achieve objective one, all pregnant women should have access to and should be knowledgeable about the need for an adequate and nutritious diet through nutritional training and counselling. They should be encouraged and supported on how to cope with the food-related problems during pregnancy, including morning sickness, constipation and heartburn.

Policy guideline 2: This policy guideline aims at achieving objective two of MYICN programme. Under this policy, programme implementers should provide and promote intake of Iron and Folic Acid (IFAs) through antenatal care services and support other strategies to address maternal anaemia. Recommendations and key messages for this policy guideline include:

- Encourage mothers to take Iron tablets to prevent anaemia daily for the duration of pregnancy irrespective of their haemoglobin levels (60mg of iron and 400 µg folic acid every day).
- Encourage mothers to continue to take 400 µg of folic acid daily around the time of conception to significantly reduce the incidence of neural tube defects. Folate supplementation should be started in the first trimester of pregnancy to prevent birth defects.
- Provide information on possible side effects and how to avoid them when taking IFAs supplements
- Provide nutritional counselling practices that promote iron-rich diet and absorption.

Policy guideline 3: Under objective one. Programme implementers should support optimal maternal nutrition through healthy weight gain during pregnancy and lactation. Implementers are recommended to:

- Counsel mothers on adequate weight gain during pregnancy
- Monitor weight gain of all mothers attending ANC throughout pregnancy.
- Provide the counselling and support to pregnant women with inadequate or excess weight gain.

MIYCN interventions have been implemented through FANC and are offered free of charge in all Kenyan government hospitals as part of routine ANC services. Effective implementation of these interventions is expected to result in reduced mortality, anaemia, micronutrient deficiency, low birth weight, neural tube defects and obesity.

However, it has been indicated that even though nutritional interventions for pregnant women in public health facilities are in place throughout Kenya the country, coverage targets have not been met and compliance (e.g compliance to IFAs) is very low. According to the 2014 Kenya Demographic Health Survey data [11], only 8% of pregnant women took iron tablets for 90 or more days during their last pregnancy as recommended by World Health

Organization (WHO) [44]. Thirty percent of women did not take iron supplements at all during their last pregnancy [11] while 55% of Kenyan pregnant women are estimated to be anaemic [2]. This undoubtedly questions the implementation fidelity of MYCIN policy implementation guidelines. There is therefore a pressing need to examine implementation processes in Kenya and to understand whether the programme is being implemented as intended.

4.3 Conceptual framework

We adopted programme theory to meet the main objective of this study. Programme theory as defined by Bickman is the construction of a plausible model of how a programme is supposed to work [45]. It involves the construction of a causal model linking programme inputs and activities to a chain of intended or observed outcomes and then using this model to guide the evaluation. There is no uniform way of developing such models because each is developed for a particular programme and does not represent the “off-the-shelf” use of a single established social science theory [45].

We also use a programme implementation fidelity framework. Implementation fidelity (also termed programme integrity) is defined as the degree to which programs are implemented as intended [37,46]. To assess implementation fidelity, five main dimensions can be identified in literature:

- (1) *Adherence* – whether a programme service or intervention is being delivered as it was designed or written
- (2) *Dosage* (dosage delivered) *and exposure* (dosage received) – whether the frequency and duration of the intervention is as full as prescribed by its designer and to all people who should be participating in or receiving the benefits of intervention
- (3) *Quality of delivery* – how well the staff delivers a program
- (4) *Participant responsiveness* – how far participants respond to or are engaged by the intervention
- (5) *Programme differentiation* – identifying unique features of different components or programs and identifying which elements of programmes are essential and without which the programme will not have its intended effect.

Carroll et al., [46] further grouped these five elements of fidelity into two as either *adherence to intervention* or *moderating variables*. They conceptualized adherence to include: content, frequency, duration and coverage as the central measures of fidelity. Quality of delivery, participant responsiveness and several other factors were considered as moderators. We adopted their categorization of a programme fidelity framework as our core guiding principles in operationalizing our study variables. We also adopted two of their moderators: participant responsiveness and quality of delivery.

For this study, the conceptual interpretation of the programme theory and two core components of implementation fidelity – adherence and moderating variables – was guided by MIYCN implementation guidelines and messages as indicated in Figure 4.1. This figure became a guiding tool in the design of research instruments, data analysis and interpretation of the results.

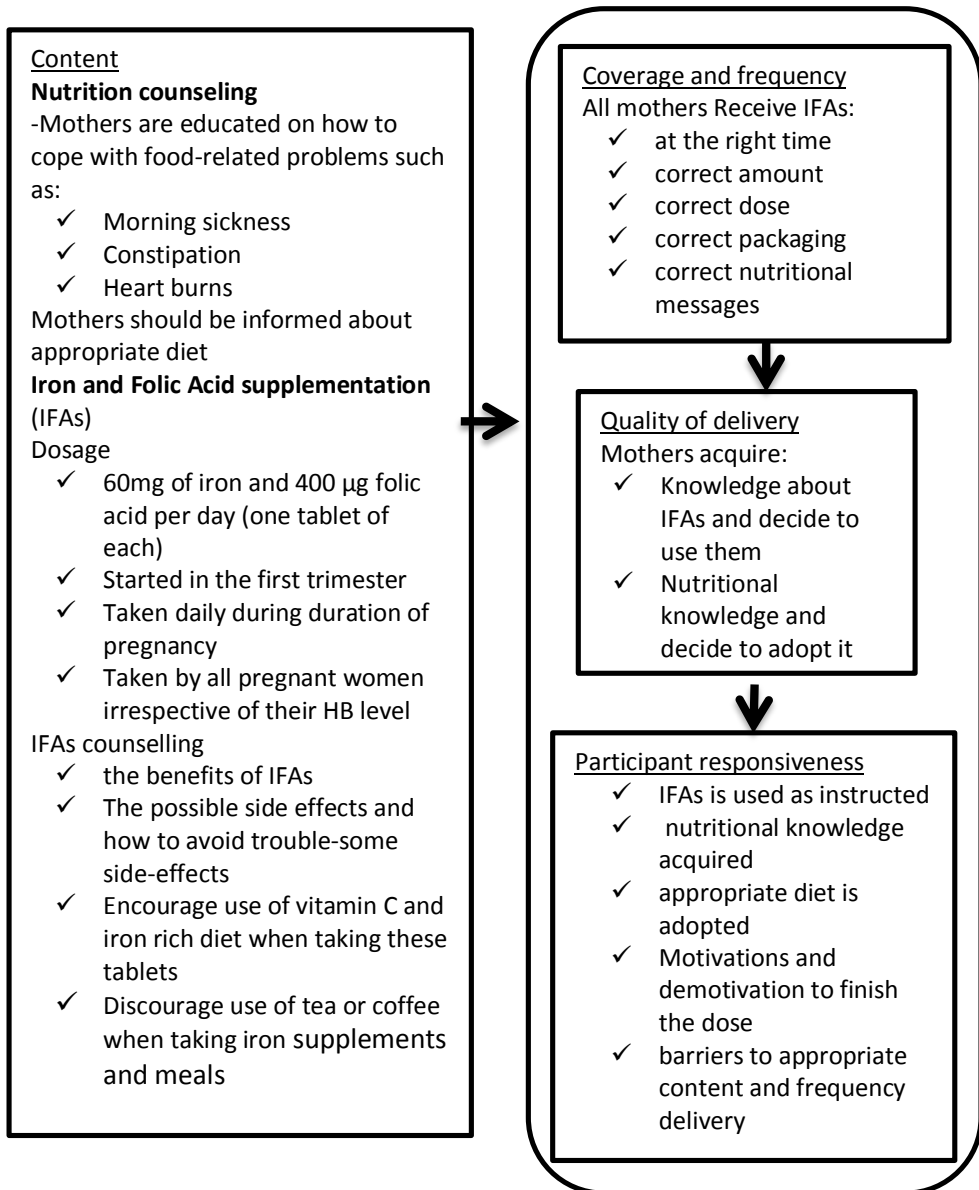


Figure 4.1. Programme theory of process pathways to maternal nutrition intervention

4.4 Methods

4.4.1 Research design

An institution-based descriptive cross-sectional survey was conducted from November 2016 to April 2018 using qualitative and quantitative methods of data collection including a questionnaire among programme recipients combined with semi-structured interviews with programme implementers.

4.4.2 Study setting and sampling procedure

This study is part of broader research investigating the social cultural context of nutrition in pregnancy in rural Uasin Gishu County in the western part of Kenya. Uasin Gishu whose headquarters is Eldoret town, is one of the 47 counties of Kenya. It is predominantly inhabited by the Kalenjin who are the third largest ethnic community out of the 42 ethnic communities in the country [11]. The predominant settlement pattern in Uasin Gishu County is rural (64.1%). With exception of Nairobi county, the settlement of other counties in Kenya is predominantly rural and rely on Agriculture for food and livelihood [15]. According to the Kenya Demographic and Health Survey (KDHS) [11,12], malnutrition in Kenya is highly prevalent in the rural areas hence the reason why this study was rural-based. MYICN recommends universal access to facilities for interventions. However, rural communities are confronted with infrastructural challenges such as long distances to a health facility and poor roads impeding access to health facilities and thus compromising health outcomes [47,48]. They also face poor basic amenities such as clean drinking water, inadequate health facilities and health personnel [47]. In that sense Uasin Gishu County is rather typical rural-based county in Kenya.

In total, there are 171 health facilities in Uasin Gishu County out of which 90 are government owned. Most of these facilities, especially the private facilities and hospitals, are concentrated within the county headquarters [49]. Uasin Gishu County is administratively subdivided into six sub-counties namely: Turbo, Soy, Ainabkoi, Moiben, Kapseret and Kesses. Each sub-county has one sub-county hospital which is the largest facility in the rural areas and serves as a referral hospital for that locality. A sub-county hospital is normally equipped with one medical doctor, nurses, clinicians, a delivery room and maternity wards. However, these sub-county hospitals do not provide maternal services for high-risk women or deliveries that may require surgery, blood transfusion or ICU facilities. Instead, they refer such cases to the county referral hospital of which there is only one. Other health facilities available in the rural areas include: health centres (headed by a clinical officer), and dispensaries (headed by nursing officer) which only offer ANC services for normal pregnancies and are not equipped to attend deliveries.

The study subjects were selected from the six sub-county hospitals. Data were collected from the programme recipients, in this case mothers attending ANC reappointments and Post Natal Care (PNC) within one month of birth. Pregnant women and postnatal women seeking care between March and June 2017 were enrolled. Only Kalenjin women who had at least one prior visit to an ANC during the current pregnancy or post-natal care within one month were included. The number of women seeking care in the previous six months was determined by reviewing maternal-care registration records. This was used to estimate the number of women who would be attending the clinic during the period when the study was

to be implemented. From the hospital records, approximately 60-240 women seek maternal care per month in each of the six sub-county hospitals. On average, a total 795 women were seen per month in these hospitals. Systematic sampling technique was used to select study participants whereby every second woman who met the inclusion criteria was recruited until the minimum desired sample size of 188 was attained. This selection criterion excluded the following women: non-Kalenjin, pregnant and visiting ANC for the first time, unable or unwilling to participate.

4.4.3 Data collection

An interviewer administered questionnaire, containing closed and open-ended questions, was used to collect qualitative and quantitative data from the sampled respondents. The conceptual framework guided the design of research instruments and data collection approaches. Prior to the study, a detailed literature search was conducted to understand programme theory and guidelines and intervention strategies that are used in the implementation process. The framework was operationalized as follows.

Adherence: Adherence was measured with the four components of Carroll et al's model: coverage, content, frequency, and duration. To assess *coverage*, the number of respondents who ever turned up for interventions at a health facility during their recent pregnancy was determined. To evaluate whether interventions were delivered with the correct *content* as planned, the actual interventions received by these women based on MIYCN guidelines requirements was assessed. The checklist indicators in this case include: general nutritional counselling, issuing iron and folic acid supplements (IFAs), and counselling on (a) how to deal with nutritional pregnancy related complications, and (b) uses of IFAs, including how to avoid troublesome side-effects of IFAs and how to increase IFAs absorption rate. Thus the respondents were asked whether they received each of these intervention strategies. The answers were validated by counterchecking information recorded in their appointment cards. We could collect information on *frequency* from the recently delivered women. *Frequency* was calculated based on the number of times these women turned up for interventions at the health facility during their current gestation period and received the stated interventions. Self-reporting adherence assessment was adopted based on the total supplements issued in the prior ANC visits. Self-reporting adherence was validated by counting the remaining pills if any. The number of pills and the number of times issued was also validated by reading the recorded figures in the respondents' clinic appointment cards. Attending at least four appointments and receiving a minimum 30 IFAs on each appointment as recommended by WHO was considered a cut-off for adequate adherence [22]. *Duration* of an intervention could not be determined as it was not included in the standard programme guidelines. Instead, the stage of pregnancy at which intervention was introduced was identified to be an important indicator and was adopted in this study.

Moderating variables: Moderating variables comprised two components of Carroll et al's model: participant responsiveness and quality of delivery.

To assess *participant responsiveness*, we used a number of indicators, including ANC attendance. For IFA supplementation, we asked them if they finished the dose that was issued during the previous appointments and we validated this by physical count of the remaining pills. According to Carroll et al. it is also important to investigate the reasons for

non-compliance, not only by the individuals receiving the intervention, but also by those responsible for delivering the intervention. If the implementers are not committed to the intervention, then the responsiveness of individuals may be affected [46]. In this case, open-ended questions were included in the questionnaire of the programme recipients to establish the bottlenecks and strengths of the programme including: motivations and challenges for compliance to the supplements, sources of nutritional training and counselling other than the staff at the health facility. Further informal discussions were conducted with the programme implementers to establish the challenges to effective implementation of the program.

Quality of delivery that is, the quality by which nurses implement the elements of the program, were assessed by determining the extent to which the recipients received the IFAs, as well as the knowledge of the programme recipients on the specific interventions that they received (in this case knowledge on importance of IFAs, dosage prescribed for IFAs and side effects).

Key informant interviews (KII) with intervention implementers (nursing officers in charge of Maternal and Child Health (MCH) or whoever was on duty in the MCH section) were conducted to acquire information on programme theory and intervention implementation as well as to obtain advice on survey design. They were also interviewed on the challenges they face in the implementation of MYICN program. In total there were six key informants who were selected from each of the six sub counties.

Data were collected in Swahili (national language) by the first author and two trained social science graduate research assistants supervised by the first author. Two days theory and practical training regarding the objectives of the study and ways of administering the questionnaire were given to the data collectors by the first author. The prepared questionnaire was pre-tested prior to the actual data collection in one of the health facilities that was not included in the main survey. The questionnaire was edited and checked for completeness daily and before the data entry. The first part of the questionnaire assessed the socioeconomic and demographic status, anaemia status, initial access and frequency of utilizing ANC and nutritional services. The second section of the questionnaire assessed and measured the five components of the implementation fidelity framework. Responses were audio recorded for clarity and accuracy of the responses [50] and part of these were transcribed to get relevant quotes that are captured in the results section.

4.4.4 Data analysis

Collected data were edited, coded, entered in Excel and exported to SPSS version 23. These were analysed to establish descriptive statistics such as frequency, percentage and mean which were used to describe studied variables. The first author performed the data coding and entry. The recordings were transcribed verbatim and translated into English with each participant being identified with a pseudonym, and these are used as narratives in the results section. With the help of MAXQDA 12.3.2 software, both notes and voices were further coded into themes and sub-themes based on the conceptual framework presented in Figure 1 as the initial coding guide. Researchers with different backgrounds provided input in the analysis to increase its validity [51].

4.4.5 Ethical considerations

Research clearance approval was obtained from the National Commission for Science, Technology and Innovation (NACOSTI/P/15/2335/5353; 2-Apr-2015). NACOSTI is a state corporation with the overall mandate to review and approve research studies involving humans. For this qualitative study, additional permission was obtained from the Uasin-Gishu County Director of Health, the County Commissioner and the County Director of Education. Institutional approval was obtained from the Moi University (Kenya) and the Vrije Universiteit Amsterdam (Netherlands) to undertake this research. No further approval from a separate ethical review board was considered necessary by NACOSTI and the other institutions, based on the laws pertaining in both countries. All study respondents provided written consent to participate in the study. Participants were informed they could withdraw from the study at any moment without giving reason and their data would be used anonymously. The confidentiality of information was maintained by excluding personal identifiers (which are used in the narrative quotes) and by conducting the interview in a private place. Informed consent from adolescents below 18 years was guided by Fisher et al's (2003) recommendation that unlike younger adolescents, those over 16 can make informed decisions as well as adults [52]. The consent forms were read out to the adolescents in the presence of a legal guardian/parent and informed assent was sought from minors, while legal guardians/parents gave written informed consent.

4.5 Results

Presentation of the research findings follows the process pathways laid out in the programme theory (Fig. 1) and is divided into Carroll et al's main dimensions of programme implementation fidelity evaluation: *adherence* which covers coverage, content, and frequency to an intervention and *moderating variables* which covered participant responsiveness and quality of delivery. Programme differentiation is integrated in the participant responsiveness and quality of delivery. For each step in the pathway we present quantitative and qualitative results. All data describing the social-demographic and health profile and implementation integrity of MYICN intervention were summarised using descriptive statistics and these are presented in Tables 4.1, 4. 2 and 4.3.

4.5.1 Social demographic characteristics of the respondents

In total, 188 women were interviewed of which 54% were pregnant and 46% were postnatal mothers. The mean gestational age of the respondents was 25.5 years old and the majority (85%) were married with multigravida (62%). Almost half (44%) of these women had primary education and three quarters (75%) worked in informal sectors either as farmers, housewives or small-scale entrepreneurs. Out of those women who were tested for Haemoglobin, 27% were anaemic (<11g/dl) and the mean HB status was 9.97g/dl. These findings are presented in Table 4.1.

Table 4.1 Demographic and health profile of the Respondents

Indicator	Characteristics of women	Distribution (n)	Percentage (%)	Mean
<i>Selected demographic characteristics of the respondents (n=188)</i>	Maternal status			
	Pregnant	102	54	
	Recently delivered (RDM)	86	46	
	Age of the respondent			
	15-19	15	8	
	20-24	79	42	
	25-29	59	31	
	30-34	22	12	
	35-39	10	165	
	≥40	3	2	
	Mean age			25.5
	Educational level			
	Primary	82	44	
Secondary	75	40		
Post-secondary	31	16		
Mean educational level				
Occupation				
Farmer	74	39		
Housewife	24	13		
Casual labourer	6	3		
Business	44	23		
Student	27	14		
Salaried	13	7		
Marital status				
Never married	28	15		
Married	160	85		
Gravida				
Primigravida	72	38		
Multigravida	116	62		
Prevalence of anaemia among the participants	HB examination (n=186)			
	Not tested for HB	26	14	
	Tested for HB	162	86	
	Mean haemoglobin concentration (g/dl¹) (n=162)			
	Severe anaemia (<8)	6	4	
	Moderate anaemia (8-9.99)	16	10	
	Mild anaemia (10-10.99)	22	13	
	11-11.99	45	28	
12-12.99	48	30		
≥13	25	15		

¹ grams per decilitre

4.5.2 Adherence

The first component in Carroll et al's framework of implementation fidelity is adherence to the intervention; implementation coverage, content and frequency of MYICN programme with the exclusion of duration are presented in Table 4.2.

Coverage

Coverage for this study was based on the population covered by the intervention. As per the MYICN programme requirements, the intervention should cover all pregnant women across the country irrespective of their nutritional status. However, since MYICN is implemented as an ANC integrated programme in government health facilities; it is only accessed by those women who seek routine Antenatal Care (ANC) services in these facilities. In Kenya, 96% of pregnant women access ANC services at least once [14]. All respondents except two had accessed ANC services at some point during their pregnancy period, slightly higher than the national average (which is not surprising since we recruited women at health facilities). However, as per findings of this study, only 10% of the respondents accessed ANC services during their first trimester of pregnancy, a majority attended after five or six months. Furthermore, not all women who had accessed health facilities for ANC were provided with the interventions recommended by the MYICN program, thereby considerably reducing intervention coverage. Details are illustrated in the "content and frequency" section below.

Content and frequency

The MYICN interventions as a part of ANC were reported in at least 70% of women availing ANC (Table 4.2). The highest was iron supplementation (74%) and information on its usefulness (55%). The other the interventions were reported by less than half of the respondents. General nutritional counselling received least attention by programme implementers. Only 28% of the respondents reported to have received nutritional counselling on a general diet. Long queues was the main reason given by programme implementers for not providing nutritional counselling:

"We only provide nutritional counselling to those women who raise a nutritional concern or whose health is generally not good. Maybe their weight or HB is not adequate. Those who are HIV positive we refer them to AMPATH nutritionist for counselling. You cannot manage to provide individual counselling to everyone because they are too many and here you are providing so many services alone. Normally we are supposed to provide group nutritional education in the morning before we start attending to them. But as you saw, they report at different intervals and others report very late." (Nursing officer attending to women at the MCH)

"I was not given any nutritional advice so I assumed my health condition was good. You know if blood is not enough or they notice that your health is not good they will advise you on what to eat." (R31)

"On that day the queue was too long. So I was not given any nutritional counselling." (R18)

As a result, women reported to have acquired nutritional knowledge from several other sources, including other women, school and own experience (see also Table 4.3).

Nutritional supplementation is the main focus of MIYCN interventions. Mothers are supposed to be encouraged to take iron/folate tablets to prevent anaemia daily during the duration of pregnancy irrespective of their haemoglobin levels (60mg of iron and 400 µg folic acid every day). Mothers should receive a minimum of 120 pills of iron and 120 pills of folic acid (four months' supply). However, despite the fact that 45% had made four or more ANC appointments, less than 10% received more than 90 pills during the entire period of their pregnancy. This is a clear indication that women are not supplied with IFAs in every ANC appointment as recommended by MYICN.

Table 4.2 Content and frequency

	Characteristics of women	Distribution (n)	Percentage (%)
<i>Interventions received: (n=186)</i>	<i>Supplements received (n=186)</i>		
	Received ferrous	138	74
	Received folic acids	88	47
	<i>Counselling received</i>		
	General nutrition information (n=186)	52	28
	Information on ferrous (n=138)	76	55
	Information on folic acid (n=88)	38	43
<i>Total ferrous pills received for the entire period of pregnancy (based on RDM*) (n=86)</i>	Never Received any	9	11
	<15	3	3
	30	35	42
	60	22	26
	90	13	15
	>90	3	3
<i>Total ferrous pills received for the entire period of pregnancy (based on RDM*) (n=86)</i>	Never received any	4	5
	<15	13	15
	30	41	49
	60	12	14
	90	9	10
	150	6	7

*Recently Delivered Mothers

Stock shortage was the major challenge that affected frequency of supplementation as mentioned by a key informant:

"Sometimes like now we have very few pills in the store and I don't foresee the possibility of receiving the stock any soon. In such circumstance, we prioritise those women whose HB is low. Others we give them half of the required dose at least to ensure equitable distribution." (nursing officer in charge of MCH)

This was confirmed by one of the respondents:

"They checked my blood (HB) and they found it was sufficient so I wasn't given any drugs (supplements)." (R24)

Other facilities did not have any stock at all:

"We have run short of stock for the past three months. It is more than four months now ever since we placed the order. In this case we prescribe supplements to the women and advise them to buy from the stores in the market.....With the county government, procurement process takes too long. It is neither guaranteed nor predictable on when to receive the stock after placing the order. When the health services were under the central government, receiving stock after three months of placing the order was guaranteed." (nursing officer in charge of a facility)

On the other hand, one key informant felt that too many drugs are not healthy to a pregnancy:

"You know these are chemicals: too much chemicals are not healthy to human bodies especially when pregnant. When a woman's HB is more than 13g/dl I don't see the need of pumping her with chemicals so in that case I don't issue the supplements." (Nursing officer working in MCH at a hospital)

4.5.3 Moderating factors

Participant responsiveness to the intervention and quality of delivery

We investigated the degree to which pregnant women embraced the interventions and this was measured by access to interventions, adherence to the intervention instructions and their understanding of the interventions. According to the MYICN guidelines, interventions should be initiated around the time of conception to increase their efficacy. Each woman is also expected to make at least four ANC appointments during the entire period of pregnancy. In this study, it was established that out of 186 women who availed ANC services only 10% initiated contact with the ANC within the first trimester and only 45% made four or more appointments during the entire period of pregnancy (based on the recently delivered women).

According to the self-reported adherence, 68% and 64% of the respondents finished the pills issued for ferrous and folic acid respectively during the previous appointments. Usefulness of the supplements (46% and 43% respectively) and obedience to the doctor's instructions (36% and 32% respectively) were the major motivating factors to complete the dose.

"I know during birth a woman loses a lot of blood. I had to finish taking them because I wanted to be on a safer side by having enough blood back-up." (R9)

"During my last birth, I underwent an operation and lost a lot of blood. I really had to finish the pills to ensure I have enough stock of blood for the next birth." (R30)

"Actually, I don't know its usefulness. Because it is issued by a learned informed doctor, I believed it must have some importance to a pregnancy so I decided to finish taking them." (R19)

"I don't know its usefulness. I just followed the doctor's instructions because he instructed me to finish taking them." (R26)

On the other hand, anticipated and experienced side effects were the major reason reported by more than 50% of the respondents for non-adherence.

"It leaves a bad lasting annoying smell in the throat when you take them. I just don't like taking them." (R7)

"My HB status was good so I did not bother taking them. You know how they are bad." (R18)

Others respondents gave other reasons, such as use of other (traditional) drugs or the perceived high number of pills:

"I was taking other drugs that I was given for preventing abortion. So I felt that the drugs have become too many and I decided to stop taking them first I finish the previous one which I felt were more important." (R1)

"My husband brought for me herbal medicine I decided not to mix taking both. I decided to finish the herbs first then I continue with the hospital pills." (R26)

"I did not finish them; they were too many. I gave birth but still many were left over." (R20)

Other motivational and demotivating reasons for adherence to the supplements are presented in Table 4.3.

For those who were supplied with supplements, the dosage prescribed to them was varying. Correct dosage of one supplement daily was reported by 83% and 57% of the respondents for Iron and FA respectively as indicated in Table 4.3. One of the key informants clarified the differences in dosage:

"... If tested HB status reads below 10 g/dl, we give a prescription of one pill three times a day, after one month we again test HB, if it has improved, we reduce the dose to one pill daily for the remaining months until birth" (nursing officer at a health facility)

However, there is a likelihood that differences in dosage are not clarified to the programme recipients and this tends to be confusing, hence affecting adherence. One pregnant respondent reported that:

"The first time when I came for ANC services the nurse gave me 30 pills and told me to take one pill per day. The second time I got a different nurse. She gave me so many pills and advised me to take one three times a day. I now got confused but I decided to follow the previous dose prescription. That is why you can see I still have so many unfinished pills." (R2)

Table 4.3. Participant responsiveness and quality of delivery

	Characteristics of women	Distribution (n)	Percentage (%)	Mean
<i>Coverage of interventions</i>	Did not access any ANC	2	1	
	Accessed health ANC	186	99	
Initial access to interventions	<i>Gestational age at first ANC visit (weeks) (n=186)</i>			
	<13 weeks	18	10	
	13-19.9	27	14	
	20-26.9	95	51	
	≥27	46	25	
	Average			23.4 Weeks
<i>Frequency of access to ANC services (based on RDM) Number of times (n=86)</i>	<i>Number of times (n=86)</i>			
	1	4	5	
	2	14	16	
	3	30	35	
	4	22	26	
	≥5	16	19	
<i>Adherence to the supplements issued in prior ANC visits</i>	Finished ferrous	94	68	
	Finished folic acid	56	64	
<i>Reasons for non-adherence to supplements</i>	<i>Ferrous (n=44)</i>			
	Side effects	25	57	
	Delivered before finishing	8	18	
	Drugs were too many	6	14	
	Haemoglobin was okay	3	7	
	Confusing dose	1	2	
	Was using traditional herbs	1	2	
	<i>Folic Acid (n=32)</i>			
	Side effects	19	59	
	Delivered before finishing	5	16	
	Haemoglobin was good	3	10	
	Drugs were too many	2	6	
	Made her sleep a lot	1		
	Forgetful	1		
	She stopped vomiting	1		
<i>Motivations for adherence to supplements</i>	<i>Ferrous (n=94)</i>			
	Its usefulness	43	46	
	Obeyed doctor's instructions	30	32	
	Was sick	12	13	
	It did not cause side effects	9	9	
	<i>Folic Acid (n=56)</i>			
	Its usefulness	24	43	

	Obeyed doctor's instructions	20	36
	Was sick	8	14
	Did not cause side effects	4	7
<i>Knowledge on Iron supplementation (uses) (n=138)</i>	Increases amount of blood of the mother	110	80
	I don't know	19	13
	Eliminates the urge of eating soil	5	4
	Development of the baby	4	3
<i>Knowledge on Folic Acid supplementation (uses) (n=88)</i>	I don't know	36	40
	Development of the baby	19	22
	Bone formation and strengthening	6	7
	Increases mother's amount of blood	5	6
	Improves mother's appetite	4	5
	Prevents the baby from developing deformities	4	5
	Multivitamins	3	3
	Gives energy to mother	3	3
	Anti-malaria	2	2
	Immunity booster	2	2
	Reduces heartburns	2	2
	Spine formation of the baby	2	2
	Prevents vomiting and nausea feelings	1	1
<i>Sources of general nutrition knowledge (n=188)</i>	own knowledge	6	37
		9	
	Other women	3	16.5
		1	
	Health officer	3	16
		0	
	Learned in school	2	11
		1	
	Experiences from previous pregnancy	1	7
		3	
Self and hospital	1	6	
	1		
School and hospital	7	4	
Other women and hospital	5	2	
Radio	1	0.5	
<i>Dosage prescribed Ferrous (n=138)</i>	one pill daily	83	60
	one pill three times a day	28	20
	one pill twice a day	17	12
	two pills once a day	6	4
	two pills three times a day	4	3
Dosage prescription Folic acid (n=88)	one pill daily	57	65
	one pill twice a day	15	17
	one pill three times a day	12	14
	two pills three times a day	4	4

A large majority of the respondents (80%) had correct knowledge on the importance of consumption of iron supplements, unlike folic acid supplementation where 40% of the

respondents did not understand the importance of taking it. Mixed responses on the importance of taking folic acid emerged as presented in Table 3.

"I know it helps in the development of the baby but I don't know how." (R66)

"It helps to relief heartburns. When I was taking them, it relieved my heartburns so I discontinued taking them." (R171)

"It helps one to sleep. I used to sleep a lot and that is why I stopped taking them." (R146)

"It reduces that urge of wanting to eat soil (pica)." (R170)

"It prevents malaria." (R151)

On the other hand, multiple sources of nutritional knowledge were reported by the respondents and this is likely to compete with hospital knowledge and may affect adherence. Only 16% of the interviewed respondents reported to rely on the knowledge acquired at the hospital. The highest number of the respondents rely on own-knowledge (37%) and the knowledge acquired either from other women relations (16%) or from school (11%) and others combined knowledge acquired from the several sources.

4.6 Discussion

The aim of the study was to assess the implementation fidelity of the on-going MYICN intervention programme and the constraints encountered, using the conceptual framework as visualized in figure 3.1.

Although the overall coverage level among the respondents amounted to 99%, which is slightly higher than the 96% of Kenya overall [11], the late initial access to the MYICN interventions impacts negatively on implementation fidelity. MYICN guidelines recommend interventions to be initiated around the time of conception or in the first trimester to enhance its effectiveness. However, the findings indicate a large percentage of women (90%) did not seek ANC during their first trimester. This percentage is higher than the 80.2% in Kenya overall [11]. Late booking of ANC is also a common trend in other parts of Africa [53–55] and this strongly affects frequency fidelity and effectiveness of interventions. Khadim (2007) established a correlation between early registration to ANC services and iron supplement consumption among pregnant women in Senegal [41].

Implementation fidelity of MYICN interventions was also evaluated through the content of services received and the kind of information mothers were given during their visit. The women we interviewed reported to have received at least all the components of MYICN intervention programme recommendations including nutritional counselling and supplementation. However, partial provision was reported in all the intervention components. Only iron supplementation was relatively high with 74% of the respondents being given iron supplements and 80% understood its usefulness. This was a higher

proportion compared to 47% who received folic acid, of which almost half (43%) did not have any idea about its usefulness while most others reported a wide variety of misconceptions. Lack of knowledge on folic acid supplements is common among pregnant women in LMICs for example in Croatia and Egypt where 48% and 53% of the respondents respectively did not know what FA is.

Frequency integrity was low, only 18% and 15% of the respondents received 90 or more iron and folic acid pills respectively during their entire pregnancy period. However, based on a standard dose of 60mg iron and 400 µg folic acid daily for six months, each woman should receive a minimum of 180 pills in the entire pregnancy period. Stock shortage was the main reported reason for low frequency supply of nutritional supplementation, a similar finding to a study in Nyeri County in Kenya [40].

Of those respondents that did receive nutritional supplements, not more than 68% completed taking the supplements that were issued to them in the previous ANC appointments. Side effects of the pills were the main reason reported for low compliance to IFAs in this study and in other studies in African counties [39,43,56]. This could be due to the fact that less than half of the respondents reported having received counselling related to IFAs. A similar finding was established in Nyeri County in Kenya where 58% received counselling information about IFAs [40]. Counselling on IFAs has been established in literature to have a significant association with adherence [38,41,57].

The fact that nutritional supplementation (IFAs) does not cover all pregnant women and that compliance to IFAs is relatively poor, points to the compelling and vital role of nutritional counselling to promote locally available, affordable micro-nutrient rich food sources. However, only 28% of our study population reported receiving counselling on diet during the previous ANC appointments. It was also established that nutritional counselling was only provided to those women whose health status was generally not good. This could limit the gains expected out of these sessions on nutritional knowledge that is critical in early stages of pregnancy to achieve greater impact on health. Only 16% of the respondents rely on nutritional knowledge acquired at the hospital. Most women (37%) rely on own knowledge regarding appropriate nutrition or knowledge acquired from other women and/or learned in school. A similar finding was established among the Ghanaian pregnant women whose knowledge about food was drawn from multiple sources, some of which were in line with hospital knowledge while others conflicted [58]. Knowledge acquired from local women in most cases tends to be restricted to low-cost dietary sources of micronutrients which are readily available in their environment due to cultural nutritional taboos [59,60].

The main reason reported by programme implementers for not providing nutritional counselling to all programme recipients was a long queue; a sure sign of a shortage of health workers. Considering that ANC services are provided free of charge in government health facilities, overcrowding is highly likely to be experienced especially in the rural areas. Studies

from low resource settings have also established the severe shortage of health workers hinder the capacity of health systems to deliver the required health services [61].

4.7 Conclusion

Implementation fidelity of MYICN intervention guidelines in Kenya is generally poor. This is mainly experienced in the content and frequency elements. Late initial booking to ANC, stock shortage, staff shortage (and resulting long queues) and side effects of drugs were established to be the main factors affecting implementation fidelity.

4.8 Recommendations

One of the factors affecting adherence to interventions in this study and other studies in Africa is the late initial booking to ANC services. Thus there is need to carry out investigations on the factors attributing to the late booking of ANC services.

Rather than targeting pregnant women who turn up for care at the health facilities, MYICN interventions should introduce community-based outreach programs and make use of community-based health workers. This will not only relief the crowded health facilities for effective implementation integrity, but will also reach out to those women who do not turn up for care services at the health facilities. This will improve coverage, content integrity and participant responsiveness. In additions it is important to strengthen the nutritional counselling component on general diet. This will promote the consumption of micronutrient-rich food sources available in the local environment and may substitute the shortage of nutritional supplements that is commonly experienced in the health facilities in the study area and other regions of the country.

Most women reported that they acquired nutritional knowledge from multiple sources; mainly from their own experience, school or other women. There is therefore a need to carryout investigations on the content and quality of the nutritional knowledge acquired from these sources, and to what extent these support or conflict with information based on the nutrition guidelines. In addition, would be interesting to investigate the advantages of targeting these women advisors in the community and empowering them to provide nutritional counselling to pregnant women, given their role as trusted sources of nutritional information. Furthermore, it is important to expound the curriculum in the schools in order to incorporate maternal nutritional training. Knowledge provided by women advisors and learning institutions will not only be more trusted by pregnant women, but will also reach out to women within their first trimester of pregnancy as recommended. Knowledge provided by elder women and schools will not only be more trusted by pregnant women but could also reach out to women within their first trimester of pregnancy as recommended by MIYCN program.

4.9 Limitations and strengths of the study

Data collected for this study was based on self-reported information collected directly from intervention participants using a checklist of the components of intervention protocols. Data collected based on self-reports provides important clinical information regarding the viability of the intervention during dissemination and is useful in designing future versions of the programme [30]. However, data based on self-report measures may have potential limitations related to validity and accuracy. Distortions in data may occur due to poor recollection by participants or biased feelings towards the implementer. This was countered by validating the responses with the information in the clinic appointment cards and seeking clarifications from programme implementers on issues that were not clear. On the other hand, data for this study only assessed adherence to the implementation of the core components of the program. It is also important for future studies to consider assessing the competence with which the practitioners deliver these other components.

The results of this study were based on the findings from rural Uasin Gishu County (the case selected for this study). However, the findings can be generalized to other rural areas in Kenya and other LMICs. Rural areas in most LMICs, are faced with common institutional and infrastructural challenges such as: staff shortage, shortage of drugs, late and infrequent access to ANC for interventions, reliance on multiple sources for nutritional knowledge, hence the findings of this study can be generalized to such settings.

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