Counselling on iron and folic acid supplementation (IFAS) is associated with improved knowledge among pregnant women in a rural county of Kenya: a cross-sectional study [version 1; peer review: 2 approved with reservations, 1 not approved]

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Abstract
Background: The demand for iron and folic acid, is greatly increased during pregnancy. The high demand is not met through diet due to insufficiency or reduced bioavailability of nutrients among women from low income countries. Thus, iron and folic acid supplementation (IFAS) is a promising interventional strategy for control of anaemia during pregnancy. Kenya adopted the global IFAS intervention with a target of 80% coverage by 2017, however, the compliance remains low. Increasing awareness, counselling, communication and community education on IFAS have improved compliance among pregnant women. Thus, we aimed to determine: availability, practices, and content of IFAS counselling on knowledge of antenatal mothers attending health facilities in Kiambu County, Kenya.

Methods: A cross-sectional study involving 364 pregnant women aged 15-49 years attending antenatal clinic. A two stage cluster sampling, including one sub-county and five public primary health facilities were used. A pre-tested structured questionnaire consisting of socio-demographic data, maternal knowledge and counselling on IFAS was used. An observation checklist was used to observe practices and content of antenatal counselling session in each facility. Data was analysed using STATA in which descriptive and inferential statistics were computed.

Results: Of 364 respondents, less than half (40.9%) scored high on knowledge on IFAS. Women who were counselled on duration of IFAS intake, side effects, and their mitigation were more likely (p <0.005) to have high IFAS knowledge. Although all the health facilities had varied IFAS posters displayed, none had key IFAS counselling documents. Content of counselling substantially contributed to high level of knowledge on IFAS among pregnant women. Counselling information on the duration of IFAS supplementation, IFAS side effects, and their management are the predictors of IFAS knowledge among pregnant women. This underscores the need to strengthen focused and targeted IFAS counselling for pregnant women to improve compliance and pregnancy outcomes.

Conclusion: Content of counselling substantially contributed to high level of knowledge on IFAS among pregnant women. Counselling information on the duration of IFAS supplementation, IFAS side effects, and their management are the predictors of IFAS knowledge among pregnant women. This underscores the need to strengthen focused and targeted IFAS counselling for pregnant women to improve compliance and pregnancy outcomes.
Keywords
Pregnancy, Iron and folic acid supplementation, Knowledge, Counselling information, Anaemia

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Introduction

Nutritional status during conception and pregnancy is a predictor of maternal and infant outcomes. Pregnancy increases metabolic activity including demand for macro and micro nutrients, particularly iron and folic acid. The levels of body stores for most critical nutrients, particularly iron and folate, are usually suboptimal by the time of conception among most women in developing countries, thus their requirement is greater resulting in a need for supplementation. This implies that a slight decrease in haemoglobin levels in pregnant women can cause anaemia which can result in severe and often fatal consequences especially if not addressed early. The consequences include increased risk of mortality, morbidity, postpartum haemorrhage, and poor birth outcomes, including foetal growth retardation, preterm births and low birthweight.

Anaemia in pregnancy is a leading cause of global burden of disease with iron deficiency anaemia being responsible for more than half of the cases. The global prevalence of anaemia in pregnancy ranges from 41.8-43.8% with the greatest (61.3%) burden being found in Africa then South East Asia at 52.5%. Africa has the highest prevalence of anaemia among both pregnant and non-pregnant women while Asia has the largest absolute number of women with anaemia, forming 38% of the global total. In Kenya, anaemia in pregnancy remains a public health problem, with the prevalence being persistently high, currently at 55.1% resulting in estimated 10% maternal deaths and 20% perinatal deaths.

Iron and folic acid supplementation (IFAS) is one of the most affordable and effective global intervention strategy for control of anaemia in pregnancy with resultant benefits of reduced maternal-child morbidity and mortality. This is necessitated by the fact that the high body’s nutrient demand in pregnancy is not met by regular diet because of insufficient amounts and/or low bioavailability in diets. Following the WHO guidelines, Kenya adopted IFAS programme targeting to achieve 80% coverage by 2017. Indeed, the IFAS tablets are currently routinely provided through all public health facilities during antenatal care, free of charge for daily use throughout pregnancy. However, the government’s effort to provide IFAS for free notwithstanding, compliance remains low over the years. Reports show that only about 8% pregnant women take IFAS for more than 90 days. Studies indicate that poor compliance hinders IFAS success with subsequent poor maternal-child outcomes.

Many factors are substantially attributed with the non-use of IFAS including: ineffective management, limited funding, stock-outs, maternal age, maternal literacy, spouse literacy, wealth index, frequency of antenatal care (ANC), comprehensive knowledge of anaemia, and quality of counselling on IFAS during pregnancy, among others. At the heart of these factors lies lack of demand from health sectors and beneficiaries. Studies have shown that increasing awareness on IFAS, appropriate counselling, focused communication and community education among pregnant women improve IFAS compliance. Information and training on importance of supplementation during pregnancy is associated with better IFAS utilization in terms of longer duration and increased compliance, eventually leading to more effective supplementation. There is need to develop appropriate counselling strategies to address this poor compliance. Kenyan studies have shown limited knowledge about anaemia or the importance of taking IFAS. Information on the quality of counselling in association to maternal knowledge on IFAS in Kenya is scarce. Thus, the aim of this study was to: (1) determine availability of IFAS counselling documents in health facilities (2) assess practices and content of IFAS counselling information provided to antenatal women in health facilities and (3) determine the association between content of counselling information and level of maternal knowledge on IFAS.

Methods

This was a cross-sectional study conducted between June and October 2016 involving 364 pregnant women, from Kiambu County, Kenya. Using two stage cluster sampling, one Sub-County and five of its major public health facilities were selected for the study. The Sub-County was selected on the basis of having existing functional (active) community units. The study population consisted of all pregnant women who attended antenatal care in the selected health facilities who were: aged 15–49 years, below 33 weeks in their pregnancy gestation, not suffering from any chronic illness and who provided informed consent to participate in the study.

A structured pretested interviewer-administered questionnaire (Supplementary File 1) consisting of 26 closed ended questions including: 11 on socio-demographic data, 9 on maternal knowledge and 4 on counselling content on IFAS, was used. In addition, an observation checklist (Data set 2) was used to evaluate counselling practices and content of information covered during an antenatal counselling session as well as availability of IFAS counselling documents in each health facility. The outcome was maternal knowledge on IFAS. The predictors of maternal IFAS knowledge were: socio-demographic characteristics, practices and content of counselling on IFAS. Availability of counselling documents was an effect modifier.

To address any potential bias, training of four research assistants was done at Kiambu level 5 hospital where the research questionnaires were pretested and their quality improved to ensure they were able to test what was intended. The trained research assistants administered questionnaires to all pregnant women who met the inclusion criteria and consented to participate in the study. Filling of the observation checklist was done by the researcher. To control for Hawthorne effect, discretion was applied whereby the investigator did not out-rightly inform the nurse that she was being observed but rather objectively recorded details of the counselling session on a notebook then immediately after filled the checklist objectively by stepping out of the antenatal room.

In regard to analyses, maternal knowledge was computed by summing up all relevant 40 Likert scale items (5 on benefits, 7 on possible side-effects of IFAS, 6 on managing side effects, 6 on effects of iron/folate deficiency, 7 on features of anaemia, 7 on dietary sources that increase blood levels, one item on...
frequency and one item on duration of IFAS). A correct answer for each item was scored as “1” and ‘0 for the incorrect response. All the scores for each participant were summed up and the participants’ level of knowledge was then classified as either high or low using the median as the cut-off point: high IFAS knowledge included all scores above the median value and low IFAS knowledge included all scores below the median value. The frequencies of the observation checklist items were entered and data summarized into percentages. A cross tabulation of the data was then carried out against socio-demographic characteristics and content of counselling information offered at health facilities to determine their relationship.

Data from questionnaires was entered into SPSS version 20.0 and exported to STATA version 13.0 then the descriptive and inferential statistics were computed (Dataset 1). Eight of the questionnaires had missing data and were not included in the analysis. Univariate and multivariate binary logistic regression analysis was performed in order to identify the association between maternal IFAS knowledge and content of counselling information. All variables with P<0.05 during the univariate analysis were fitted in the multivariate analysis to identify variables independently associated with maternal IFAS knowledge. A 95% CI with respective odd ratios was used to assess the statistical significance of association among variables. The significance level was set p <0.05. Descriptive statistics and binomial exact 95% confidence interval (95%CI) of proportions were used for reporting.

Ethical approval of the study protocol was sought and granted by Kenyatta National hospital/University of Nairobi Ethics and Research Committee (KNH-ERC/A/90 protocol number – P706/11/2015). Research permit was obtained from the National Commission for Science, Technology and Innovation (NACOSTI/ P/18/81499/2231). Authority to conduct the study was obtained from Kiambu County, Lari Sub-county authorities and health facilities involved. All study participants provided verbal and written informed consent. The STROBE cross sectional reporting guidelines were used for reporting (Supplementary File 2).

Results
Socio-demographic characteristics and knowledge on IFAS among respondents

Of the 364 respondents, 67.7% were aged 19–29 years, with the mean age of 25 years. Whereas 37.4% of the respondents had attained upper primary education, only 40.4% had completed secondary education and beyond. A majority (84.1%) of the respondents were married, and had 1–2 children (77.6%).

Regarding economic activity, the respondents reported being housewives (27.4%), self-employed (25.1%), casual labourers (22.4%), and on formal employment (28%), respectively. Furthermore, only 7.8% of them reported earning more than 100 USD per month.

The level of knowledge on IFAS among respondents was varied, with only 40.9% scoring an overall high. The distribution of the scores was approximately normal with mean 6.24 (SD=3.64) and median 6.00. About two-thirds (67.3%) of them had heard of IFAS. Among those who scored high for IFAS knowledge, the highest percentage was among those on formal employment (70%) and aged above 40 years (66.7%) (Table 1).

Availability of IFAS counselling documents at the health facilities

All health facilities displayed diverse posters with information about IFAS at different service delivery points. Among the five facilities, only two displayed the IFAS national policy guidelines, while none had IFAS information, communication and education (IEC) materials, including health workers’ counselling guides, mothers’ calendars or brochures/leaflets on IFAS, among others (Figure 1 and Dataset 2).

Observed counselling practices and content of information on IFAS at health facilities

A provider-client interaction observed during antenatal counselling session revealed that health care providers provided IFAS services to all pregnant women without discrimination, regardless of their haemoglobin levels. Verification of IFAS utilization and recording of IFAS services was done in all the health facilities. However, evaluation on the comprehension of the counselling content provided to clients only took place in one facility. Furthermore, counselling women on side-effects of IFAS and their management was only done in one facility. Despite the universal provision of IFAS to all antenatal women, they were not given information on the causes, features or consequences of anaemia in any of the health facilities. Moreover, the counselling did not include; the enhancers/inhibitors of iron/folate absorption, and the fact that there is increased nutritional requirement during pregnancy, in any of the health facilities (Figure 1 and Dataset 2).

Relationship between IFAS counselling content and maternal knowledge on IFAS

The proportion of pregnant women provided with counselling information on various aspects of IFAS is shown in Figure 2. While most (80%) of the women were informed of the benefits of IFAS, half (50%) were informed on supplementation duration, a third (32%) on side-effects and only 16% on management of side-effects. The content of IFAS counselling was associated with the level of maternal IFAS knowledge. Among the respondents who received information on the benefits of IFAS, only 58.2% scored high for IFAS knowledge. However, those counselled on the side effects and the duration of IFAS supplementation demonstrated high knowledge scores of 83.1% and 77.5%, respectively. In addition, respondents who received information on the management of IFAS side effects demonstrated the highest (95%) knowledge score (Figure 3).

Further analysis with multivariate logistic regression revealed that counselling on the duration of IFAS supplementation, its side effects and their management were the predictors of maternal IFAS knowledge. Respondents counselled on the duration of IFAS supplementation were 6.3 times more likely (AOR=6.27; 95%CI, 3.24 – 12.16; P<0.001) to have high knowledge scores. Furthermore, counselling information on IFAS that included side effects was more likely (AOR=4.5; 95%CI,
Table 1. Socio-demographic characteristics and level of knowledge on iron and folic acid supplementation (IFAS) among respondents.

| Socio-demographics Characteristics | Overall n (%) | Low n (%) | High n (%) |
|-----------------------------------|--------------|----------|-----------|
| **Age in years (n=356):**         |              |          |           |
| ≤ 18                              | 28 (7.9)     | 23 (82.1)| 5 (17.9)  |
| 19 – 29                           | 241 (67.7)   | 151 (62.7)| 46 (54.8) |
| 30 – 39                           | 84 (23.6)    | 38 (45.2)| 46 (54.8) |
| 40 – 49                           | 3 (0.84)     | 1 (33.3)| 2 (66.7)  |
| **Marital Status(n=364):**        |              |          |           |
| Married                           | 306 (84.1)   | 173 (56.5)| 133 (43.5) |
| Single                            | 54 (14.8)    | 39 (72.2)| 15 (27.8) |
| Widow/Separated/Divorced          | 4 (1.1)      | 3 (75.0)| 1 (25.0)  |
| **Education Level (n=361):**      |              |          |           |
| Lower primary                     | 8 (2.2)      | 3 (37.5)| 5 (62.5)  |
| Upper primary                     | 135 (37.4)   | 86 (63.7)| 49 (36.3) |
| Secondary incomplete              | 72 (19.9)    | 44 (61.1)| 28 (38.9) |
| Secondary complete                | 125 (34.6)   | 67 (53.6)| 58 (46.4) |
| Tertiary                          | 21 (5.8)     | 12 (57.1)| 9 (42.9)  |
| **Occupation (n=362):**           |              |          |           |
| Formal employment                 | 10 (2.8)     | 3 (30.0)| 7 (70.0)  |
| Self-employed                     | 91 (25.1)    | 51 (56.0)| 40 (44.0) |
| Casual labourer                   | 81 (22.4)    | 54 (66.7)| 27 (33.3) |
| Housewife                         | 99 (27.4)    | 53 (53.5)| 46 (46.5) |
| Students                          | 11 (3.0)     | 9 (81.8)| 2 (18.2)  |
| Unemployed                        | 55 (15.2)    | 36 (65.5)| 19 (34.6) |
| Farming                           | 15 (4.1)     | 7 (46.7)| 8 (53.3)  |
| **Number of children (n=237):**   |              |          |           |
| 1 – 2                             | 184 (77.6)   | 101 (54.9)| 83 (45.1) |
| 3 – 4                             | 46 (19.4)    | 23 (50.0)| 23 (50.0) |
| 5+                                | 7 (3.0)      | 3 (42.9)| 4 (57.1)  |
| **Average income (n=351):**       |              |          |           |
| ≤ 10,000                          | 325 (92.6)   | 199 (61.2)| 126 (38.8) |
| Above 10,000                      | 26 (7.4)     | 10 (38.5)| 16 (61.5) |
| **Overall maternal IFAS knowledge** | 364 (100)   | 215 (59.1)| 149 (40.9) |

2.01 – 10.07; P<0.001) to contribute to high knowledge scores among the respondents. The respondents who were counselled on management of IFAS side-effects were 10.3 times more likely (AOR=10.31; 95%CI, 2.10 – 50.59, P=0.004) to have high knowledge scores compared to those who were not counselled. However, respondents who were counselled on the benefits of IFAS, did not show any statistical (AOR=1.48; 95%CI, 0.63 – 3.51, P=0.368) difference on the knowledge score compared to those not counselled (Figure 3).

Discussion
Our findings showed: (i) less than 50% of the pregnant women had high IFAS knowledge level; (ii) apart from IFAS posters, other counselling guides were scarcely available in the health facilities; (iii) the content of counselling determined the level of IFAS knowledge. This underscores the need to strengthen implementation of counselling for the pregnant women regarding nutrition and its importance on pregnancy outcome. Health care providers (HCPs) should be supported by the health systems to escalate counselling of pregnant women every time they meet them.

The findings reveal that less than half of the pregnant women had high IFAS knowledge level despite about two-thirds (67.3%) having heard of IFAS. This is associated with lack of individualised message sharing and counselling of pregnant women on IFAS by the HCPs. In addition, emphasis on the critical role IFAS plays in pregnancy may be lacking, including support for the women with tools such as brochures. This reveals that many pregnant women do not have the details about IFAS. This could also mean that we have a huge number of women who are either ignorant of IFAS or who do not know the name of the supplements given to pregnant women. This is evidenced by observation performed during the counselling session where the nurse informed the mother the purpose of the supplement but not its name. Similar findings have been reported with folic acid knowledge studies in Pakistan (43%)35 and the United Arab Emirates where, even though 79.1% had heard of folic acid, 46.6% had accurate knowledge on role of folic acid36. This calls for more appropriate strategies to give mothers detailed IFAS information of why, when and how, beginning with actual names, importance, supplementation duration, maintaining supplementation, side-effects/challenge, and more importantly how to
Figure 1. Observed counselling practices and content of counselling information provided. These are the counselling practices and content of counselling information provided to pregnant women by health care providers, as observed during an antenatal counselling session at each health facility, by the researcher.
handle these side-effects/challenges, to increase maternal knowledge on IFAS and its compliance.

Though IFAS counselling was provided in all facilities and varied IFAS posters displayed at different service points, the national policy guidelines were available in only two out of the five health facilities, while health workers’ counselling guides, IFAS calendars and brochures/leaflets were not available in any of the health facilities. This may have led to non-standardized counselling between health facilities as well as incomplete and ineffective counselling for mothers. This is evidenced by the findings of the counselling session observed where it was only

**Figure 2. Content of counselling information provided on iron and folic acid supplementation (IFAS).** This refers to the proportion of pregnant women counselled on various aspects of the content of IFAS counselling information, according to the women's interviews.
one health facility where counselling information was provided on the side-effects of IFAS, their management, and evaluation of comprehension of counselling content for the client was conducted. Health education plays a key role in determining uptake of health interventions. However, their effectiveness is hampered by lack of relevant guides and job aids. Health workers need to be provided with requisite skills, especially counselling and interpersonal skills, and job aids to provide effective health education to clients. These include policy and counselling guides to ensure standardized health messages. These guides should be regularly updated and availed on time for them to be useful. As part of health education, materials for mothers to take home should also be provided for their references.

Despite the universal provision of IFAS to all antenatal women, they were not counselled on the causes, features or consequences of anaemia. Moreover, counselling information on; the enhancers/inhibitors of iron/folate absorption, and the fact that there is increased nutritional requirement during pregnancy, was not provided in any of the health facilities. This is consistent with report that up to 90% of maternal anaemia results from inadequate intake of bioavailable dietary iron particularly

**Figure 3. Relationship between counselling information and level of iron and folic acid supplementation (IFAS) knowledge.** The proportion of pregnant women provided with IFAS counselling information on: benefits, supplementation duration, side-effects and management of side-effects were tabulated against the level of IFAS knowledge. For each content of counselling information provided, the level of IFAS knowledge was scored and categorised as high and low, both adding up to the total 100% of the respondents who were counselled on each specific content of counselling information.
in developing countries. It is therefore important to have pregnant women properly counselled on the food interactions and practices to enhance proper food choices that promote iron and folate absorption. This non-standardized counselling in health facilities resulting from lack of counselling guides may in turn have contributed to low level of IFAS knowledge and compliance found in studies among respondents whose primary source of information was health care providers. Accompanying communication with supplementation greatly improved compliance and decreased anaemia prevalence among adolescents in Tanzania. Limited knowledge/lack of information among health care providers in many aspects of education and counselling reported in Kenya is a set-back that adversely affects IFAS utilization and needs to be addressed.

As far as content of IFAS counselling in relation to maternal knowledge is concerned, except those informed on benefits, all the other counselling aspects showed a very high difference among those who had low and high IFAS knowledge. Experiencing side-effects is one of the reasons for low IFAS compliance. As most women stop taking iron-folate tablets due to side effects, it is important that pregnant women are effectively counselled and provided with accurate, detailed information on the side-effects and how to effectively manage them to ensure adherence to IFAS. Lack of counselling on the side-effects could be due to either lack of information by HCP or their wrong attitude. While some HCP may imagine that by mentioning side-effects of IFAS, pregnant women will not take the supplements, on the contrary, detailed counselling on the same yielded higher levels of knowledge. If women are counselled on the expected side-effects and their management and reassured they will subside with time, they are less likely to react negatively to side-effects. This was evidenced in an Indonesia study where women were not bothered by side-effects because they had been warned of their likely occurrence. This contrasts many studies that have shown side-effects as a major hindrance to IFAS compliance. Realistically, it seems like the actual problem is the quality of counselling. Thus, it is important that HCP should be well informed to enable them provide women with relevant information and conduct effective, quality counselling on IFAS to ensure compliance. This can be implemented by formally involving community health workers more in the IFAS programme for closer follow-up and counselling of the pregnant women at community level, as demonstrated in other studies.

This study relied heavily on verbal reports on IFAS, which may have introduced some recall bias and subjectivity. However, this challenge was circumvented through proper training of interviewers and double questioning that enabled identification of any inconsistencies in the reports. The study involved pregnant women who are under high hormonal influence leading to mood changes as well as pregnancy associated fatigue which may affect response and consistency. This was mitigated through message sharing, clarification, reassurance and psychosocial support of the respondents. Furthermore, participation in the study was purely voluntary and respondents were asked whether they were comfortable answering the questions and they were at liberty to discontinue. This ensured that their rights were respected and was in compliance with the ethical requirement of non-coercion. Finally, generalizations of the study findings to other areas may be difficult since the study involved one sub-county.

Conclusion
Content of counselling substantially contributed to high levels of knowledge on IFAS among pregnant women. Counselling information on the duration of IFAS supplementation, IFAS side effects and their management are the predictors of knowledge on IFAS among pregnant women. This underscores the need to strengthen focused and targeted counselling for women attending antenatal clinic to improve compliance and pregnancy outcomes.

Consent
Verbal and written informed consent was provided by all the study participants before recruitment into the study.

Data availability
The data underlying this study is available from Open Science Framework Dataset 1: Knowledge and counselling, Dataset 2: Observation checklist-counselling. DOI https://doi.org/10.17605/osf.io/x8tj3. This dataset is available under a CCO 1.0 Universal license

Dataset 1. Counselling information and knowledge on iron and folic acid supplementation (IFAS)
This is the data set used for analysis using STATA version 13. It contains the information on socio-demographic information of study respondents, IFAS knowledge and counselling information, as per the attached questionnaire (Supplementary File 1).

Dataset 2. Observation checklist: counselling practices and content of information
This data set contains a table showing the counselling practices and content of counselling information, as observed during an antenatal counselling session, as well as availability of iron and folic acid supplementation (IFAS) counselling documents in each health facility.

Competing interests
No competing interests were disclosed.

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Supplementary material
Supplementary File 1: Study questionnaire.
Click here to access the data.

Supplementary File 2: Completed STROBE reporting checklist.
Click here to access the data.

References
1. Gunaratna NS, Masanja H, Mrema S, et al.: Multivitamin and iron supplementation to prevent periconceptional anemia in rural Tanzanian women: a randomized, controlled trial. PLoS One. 2015; 10(4): e0121552. PubMed Abstract | Publisher Full Text | Free Full Text
2. Mulambah CS, Siamba DN, Ogutu PA, et al.: Anaemia in pregnancy: Prevalence and possible risk factors in Kakamega County, Kenya. Sci J Public Health. 2014; 2(3): 216–222. Publisher Full Text
3. Mohajan HK: Food and Nutrition Scenario of Kenya. American Journal of Food and Nutrition. 2014; 2(2): 28–36. Reference Source
4. MoH: IFAS Dialogue guide for health care providers. Division of Nutrition ed. Nairobi; 2012. Reference Source
5. Elder LK: Issues in programming for maternal anaemia. Mother Care. 2000. Reference Source
6. Kindusa A, Anjum J, Sangolli HN, et al.: Improving adherence to oral iron supplementation during pregnancy. Australas Med J. 2010; 3(5): 281–290. Publisher Full Text
7. Waweru J, Mugenda OM, Kuria E: Anaemia in the context of pregnancy and HIV/AIDS: a case of Pumwani maternity hospital in Nairobi Kenya. Afr J Food Agric Nutr Dev. 2009; 9: 748–763. Publisher Full Text
8. USAID: SPRING NUTRITION TECHNICAL BRIEF: A simple method for making a rapid, initial assessment of the consumption and distribution of iron-folic acid supplements among pregnant women in developing countries. 2014. Reference Source
9. MoH: National Iron and Folic Acid Supplementation; Communication Strategy, 2013-2017. Division of Nutrition ed. Nairobi; 2013. Reference Source
10. MoH: National Policy Guideline on combined iron and folic acid (IFA) supplementation for pregnant mothers in Kenya. Division of Nutrition ed. Nairobi; 2013. Reference Source
11. MoH: Accelerating reduction of iron deficiency anaemia among pregnant women in Kenya: Plan of action 2012-2017. Division of Nutrition ed. Nairobi; 2012. Reference Source
12. Müngen E: Iron supplementation in pregnancy. J Perinat Med. 2003; 31(5): 420–426. PubMed Abstract | Publisher Full Text
13. WHO: Guideline: Daily Iron and Folic Acid Supplementation in Pregnant Women. Geneva: World Health Organization; 2012. PubMed Abstract
26. Muro GS, Gross U, Gross R, et al.: Increase in compliance with weekly iron supplementation of adolescent girls by an accompanying communication programme in secondary schools in Dar-es-Salaam, Tanzania. Food Nutr Bull. 1999; 20(4): 435–444. Publisher Full Text

27. Pal PP, Sharma S, Sarkar TK, et al.: Iron and Folic Acid Consumption by the Ante-natal Mothers in a Rural Area of India in 2010. Int J Prev Med. 2013; 4(10): 1213–1216. PubMed Abstract | Free Full Text

28. Yekta Z, Ayatollahi H, Pourali R, et al.: Predicting Factors in Iron Supplement Intake among Pregnant Women in Urban Care Setting. J Res Health Sci. 2008; 8(1): 39–45. PubMed Abstract

29. Maina-Gathigi L, Omolo J, Wanza P, et al.: Utilization of folic acid and iron supplementation services by pregnant women attending an antenatal clinic at a regional referral hospital in Kenya. Matern Child Health J. 2013; 17(7): 1236–1242. PubMed Abstract | Publisher Full Text

30. Aguyoyo VM, Koné D, Bamba SI, et al.: Acceptability of multiple micronutrient supplements by pregnant and lactating women in Mali. Public Health Nutr. 2005; 8(1): 33–37. PubMed Abstract | Publisher Full Text

31. Gathigi LN: Factors Influencing Utilization of Iron and Folic Acid Supplementation Services among Women Attending Antenatal Clinic at Nyeri Provincial Hospital Kenya. Jomo Kenyatta University of Agriculture and Technology. TRIMND: 2011. Reference Source

32. Juma M, Oiyé SØ, Konyole SO: Predictors of optimum antenatal iron-folate supplementation in a low resource rural set-up in Eastern Kenya. J Public Health Epidemiol. 2010; 7(1): 337–345. Publisher Full Text

33. Kamau M: Iron and folic acid supplementation among pregnant women. 2018. Data Source

34. von Elm E, Altman DG, Egger M, et al.: Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) statement: guidelines for reporting observational studies. BMJ. 2007; 335(7624): 806–808. PubMed Abstract | Publisher Full Text | Free Full Text

35. Hisam A, Rahman MU, Mashhadi SF: Knowledge, attitude and practice regarding folic acid deficiency: A hidden hunger. Pak J Med Sci. 2014; 30(3): 583–588. PubMed Abstract | Publisher Full Text | Free Full Text

36. Al-Hossani H, Abouzeid H, Salah MM, et al.: Knowledge and practices of pregnant women about folic acid in pregnancy in Abu Dhabi, United Arab Emirates. East Mediterr Health J. 2010; 16(4): 402–407. PubMed Abstract | Publisher Full Text

37. Alam A, Rasheed S, Khan NU, et al.: How can formative research inform the design of an iron-folic acid supplementation intervention starting in first trimester of pregnancy in Bangladesh? BMC Public Health. 2015; 15: 374. PubMed Abstract | Publisher Full Text | Free Full Text

38. Matri E, Pied E, Galloway R, et al.: Improving Iron-Folic Acid and Calcium Supplementation Compliance through Counseling, Reminder Cards, and Cell Phone Messages in Kenya. Maternal and Child Health Integrated Program (MCHIP); 2017. Reference Source

39. Nisar YB, Alam A, Aurangzeb B, et al.: Perceptions of antenatal iron-folic acid supplements in urban and rural Pakistan: a qualitative study. BMC Pregnancy Childbirth. 2014; 14: 344. PubMed Abstract | Publisher Full Text | Free Full Text

40. Fiedler J, D’Agostino A, Sunununtasuk C: A rapid initial assessment of the distribution and consumption of iron–folic acid tablets through antenatal care in Nepal. Arlington, Virginia, JSI Research and Training Institute, Strengthening Partnerships, Results and Innovations in Nutrition Globally (SPRING), 2014 Sep.; 2014; 12. Reference Source

41. Nisar YB, Dibley MJ, Mir AM: Factors associated with non-use of antenatal iron and folic acid supplements among Pakistani women: a cross sectional household survey. BMC Pregnancy Childbirth. 2014; 14: 305. PubMed Abstract | Publisher Full Text | Free Full Text

42. Taye B, Abeje G, Mekonen A: Factors associated with compliance of prenatal iron folate supplementation among women in Mecha district, Western Amhara: a cross-sectional study. Pan Afr Med J. 2015; 20: 43. PubMed Abstract | Publisher Full Text | Free Full Text

43. Aguyoyo VM, Koné D, Bamba SI, et al.: Acceptability of multiple micronutrient supplements by pregnant and lactating women in Mali. Public Health Nutr. 2005; 8(1): 33–37. PubMed Abstract | Publisher Full Text

44. Gebremedhin S, Samuel A, Mam G, et al.: Coverage, compliance and factors associated with utilization of iron supplementation during pregnancy in eight rural districts of Ethiopia: a cross-sectional study. BMC Public Health. 2014; 14: 607. PubMed Abstract | Publisher Full Text | Free Full Text

45. Nisar YB, Alam A, Aurangzeb B, et al.: Perceptions of antenatal iron-folic acid supplements in urban and rural Pakistan: a qualitative study. BMC Pregnancy Childbirth. 2014; 14: 344. PubMed Abstract | Publisher Full Text | Free Full Text

46. Shivalli S, Srivastava RS, Singh GP: Trials of Improved Practices (TIPs) to Enhance the Dietary and Iron-Folate Intake during Pregnancy- A Quasi Experimental Study among Rural Pregnant Women of Varanasi, India. PLoS One. 2015; 10(9): e0137736. PubMed Abstract | Publisher Full Text | Free Full Text

47. Titaesy CR, Dibley MJ: Factors associated with not using antenatal iron/folic acid supplements in Indonesia: the 2002/2003 and 2007 Indonesia Demographic and Health Survey. Asia Pac J Clin Nutr. 2015; 24(1): 162–76. PubMed Abstract | Publisher Full Text
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Jacob K. Kariuki
School of Nursing, University of Pittsburgh, Pittsburgh, PA, USA

The stated aims of the study are timely and very appropriate. Below are some of the issues that need to be addressed:

1. In the methods section the authors are already outlining the predictors and effect modifier of maternal IFAS knowledge. These data belong to the results section since you could not have known this apriori. The methods section should focus on discussing how the study and analyses were done.

2. Using your sample median as the cut off for IFAS knowledge is a major flaw in the analysis. Consider redoing your analyses using a literature based cut off. You can do this by referencing a well designed study on the topic.

3. The methodology section does a good job describing how the regression analyses were done. It would have been also helpful to see a description of the protocols that were used to determine availability of IFAS counselling documents in health facilities since this was the first objective of the study. The checklist you have provided in the supplemental material simply solicits the opinion of the study participants about the availability of the resources. Under dataset 2, you allude to an observation by the researcher during antenatal visit. While this observation would help verify if the counselling documents are used, it may not determine if the documents are available in the facility. It is very important to be clear if you did any objective audit.

4. Under results, it would be helpful to see if awareness varied by parity and prior antenatal visits. Since participants above 40 yrs reported more awareness, one is tempted to ask why? The statistics you have in Table 1 are not helpful because they reference the sample median. After addressing the issues raised under methodology, analysis that includes parity could help reveal any confounding due to previous antenatal visits. It also helps to test the significance of the differences.

5. Under results, you present the results of observed counselling practices, but there is no information about how many observations were done and how they were distributed across facilities since you employed cluster sampling. Figure 1 is not very informative.
6. It is appropriate to examine the relationship between knowledge and other factors included in the regression, but it is important to emphasize that the results do not infer causation. Consider adding this to the limitations of the study.

7. Consider reframing your discussion around the 3 aims of the study. That will make it more coherent with the rest of the study.

Overall thoughts: This paper addresses an important topic in a region that is understudied. Addressing the flaws identified above will improve its quality and contribution to science.

Is the work clearly and accurately presented and does it cite the current literature?  
Yes

Is the study design appropriate and is the work technically sound?  
Yes

Are sufficient details of methods and analysis provided to allow replication by others?  
Partly

If applicable, is the statistical analysis and its interpretation appropriate?  
Partly

Are all the source data underlying the results available to ensure full reproducibility?  
Partly

Are the conclusions drawn adequately supported by the results?  
Partly

**Competing Interests:** No competing interests were disclosed.

**Reviewer Expertise:** Cardiovascular Disease Prevention; Population Health and Health Policy

I confirm that I have read this submission and believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard, however I have significant reservations, as outlined above.
Anselimo Makokha
Department of Food Science and Technology, Jomo Kenyatta University of Agriculture and Technology (JKUAT), Nairobi, Kenya

The title should mention the specific county.

Since the study is essentially testing the association between counseling of the mothers and knowledge level of IFAS, the design should have included the experimental group who received the counseling and a control group who did not receive the counseling. Otherwise it becomes difficult to determine if any changes in the knowledge status were not due to chance. The methods should also include what the minimum sample size was and its basis. Further how the counseling was done is not comprehensively described, including for what period and how frequently. The sub county and the five public health facilities where the study was carried out should be identified.

In the Results (Par.2), if the cut off for high or low knowledge level was the median of the scores, then there should have been an equal number of those who scored high and those who scored level knowledge level. However, it is reported that only 40.9% scored high level. This needs explanation. Irrespective of the explanation, choice of the median as the cut off point to classify knowledge level may be inappropriate as it will simply divide the group into two equal parts, and may not reflect the true status of knowledge level.

Without a control group the conclusion that counseling information on certain aspects of IFAS was a predictor of knowledge on IFAS may not be valid.

Despite this observations the paper may still be suitable for indexing if it focuses simply on a cross sectional study of the knowledge level of IFAS for women who had received counseling, without attempting to establish the effect of counseling on knowledge level of IFAS since there was no control group.

There are also some grammatical mistakes in the manuscript.

Is the work clearly and accurately presented and does it cite the current literature? Yes

Is the study design appropriate and is the work technically sound? Partly

Are sufficient details of methods and analysis provided to allow replication by others? Partly

If applicable, is the statistical analysis and its interpretation appropriate? Partly

Are all the source data underlying the results available to ensure full reproducibility? Partly

Are the conclusions drawn adequately supported by the results? No
Competing Interests: No competing interests were disclosed.

Reviewer Expertise: Human nutrition, public health nutrition, micronutrient deficiencies

I confirm that I have read this submission and believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard, however I have significant reservations, as outlined above.

Author Response 18 Dec 2018
Mary Kamau, University of Nairobi, Nairobi, Kenya

Thank you very much for taking your time to review my manuscript. I highly appreciate your comments. I will work on them.

Once again, thank you!

Competing Interests: No competing interests

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Jacqueline K Kung’u
Nutrition International, Nairobi, Kenya

Introduction
The central theme of this study is counselling. What is definitely missing in this introduction is the role of behaviour change and communication strategies including counselling on health outcomes including maternal knowledge. The authors need to include a paragraph on this in the introduction.

1. Importance of contextually tailored strategies - what strategies exist in Kenya? Are they evidence/research based and are they integrated within programs.

2. What are the clear BCC/Counselling goals and objectives and are they achievable within programs - find studies that have reported this.

3. What affects delivery of BCC/Counselling e.g. availability of IEC material, training, motivation, workload of the health worker etc - find studies that have reported this.

Methods
- Provide a brief description of what a functional community unit means and implications to this study.
• Was the tool used generic tool or was it developed specifically for this study. If the latter then a brief description is required to qualify it and for replication of other studies. What were the considerations in developing it, do we know its reliability etc.
• If the tool used was developed for this study I want to suggest that there is a lot missing to qualify the methods – the authors need to include a factor analysis based on principal component extraction followed by varimax rotation to examine the structure of the items in the scale used.
• Internal consistency of the scale should be investigated through Cronbach’s alpha coefficient.
• If the questionnaire is reliable, no item should cause a substantial decrease in the alpha value. Cronbach’s alpha reliability coefficient ranges between 0 and 1; the closer the Cronbach’s coefficient is to 1, the greater the internal consistency of the items in the scale. A coefficient ≥0.7 is considered acceptable.

Please consult a statistician for this analysis - it will make the paper stronger. Otherwise as is there are glaring gaps in the analysis.

Discussion
• Begin by describing the ideal situation in a Kenyan health facility in terms of IEC and BCC material for IFAS and what the health worker is required to do during the encounter with the mother. This then sets the stage for your findings.
• Make sure that everything being discussed is a finding from your study and there needs to be a clear distinction between a study finding and an inference being made.
• Some incorrect statements e.g, mother may not know the actual name but may relate with a name in language that the mother is familiar with or some studies show that the women may not know the name but if you describe IFAS as the medicine that adds blood during pregnancy - a lot more women can identify. Therefore it’s very important how the question was asked.

Conclusion
The cross sectional design of this study cannot infer this so this statement is definitely erroneous “Content of counselling substantially contributed to high levels of knowledge on IFAS among pregnant women”. What I would rather you say is that....There was an association between the content of counselling and high knowledge.... you cannot infer causality.

Is the work clearly and accurately presented and does it cite the current literature?
Partly

Is the study design appropriate and is the work technically sound?
Yes

Are sufficient details of methods and analysis provided to allow replication by others?
No

If applicable, is the statistical analysis and its interpretation appropriate?
Partly

Are all the source data underlying the results available to ensure full reproducibility?
No

Are the conclusions drawn adequately supported by the results?
Partly
Competing Interests: No competing interests were disclosed.

I confirm that I have read this submission and believe that I have an appropriate level of expertise to state that I do not consider it to be of an acceptable scientific standard, for reasons outlined above.

Comments on this article

Author Response 15 Mar 2019

Mary Kamau, University of Nairobi, Nairobi, Kenya

Dear reviewers,
I have addressed all the comments raised by all reviewers after extensive consultation with statisticians, which has taken quite a while. I have included a table on all responses made to the reviewer’s comments in the revised manuscript, as a supplementary file.

Thank you for your academic support.

Competing Interests: None