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ORIGINAL RESEARCH

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# Determinants of compliance to iron folate supplementation among pregnant women attending antenatal care in public health facilities of South West Ethiopia: A case-control study

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## Abstract

**Background:** The prevalence of anemia among pregnant women remains high globally, particularly in low-income settings. Iron and folic acid supplementation (IFAS) during pregnancy is the most widely employed strategy to alleviate adverse pregnancy outcomes. This study aimed to explore the determinants of compliance with iron supplementation in the study area.

**Aim:** To identify determinants of IFAS compliance among pregnant women attending antenatal care (ANC) in Mettu town, South West Ethiopia, in 2021.

**Methods:** A facility-based, unmatched case-control study was conducted from May to July 2021 with a total sample size of 344 (115 cases and 229 controls). Cases and controls were selected using systematic random sampling. Data was collected using a structured, pretested interviewer-administered questionnaire, entered into Epi-data software version 3.1, and exported to SPSS version 23 for analysis. Variables with $p < 0.25$ during bivariate analyses were entered into a multivariable logistic regression model. Then, variables with a $p < 0.05$ at 95% confidence interval (CI) were declared to be statistically significant determinants of IFAS. The odds ratio was used to indicate the strength of the association.

**Result:** Having Previous history of anaemia (adjusted odds ratio [AOR] = 5.8, 95% CI [2.5−13.6], $p < 0.01$), having good knowledge about IFAS (AOR = 3.3, 95% CI [1.7−6.7], $p < 0.001$), being a government employee (AOR = 5.2 [2.4−11.5], $p < 0.01$], and receiving counseling service during ANC (2.495% CI [1.3−4.7] $p < 0.01$) were among determinants of adherence to IFAS.

**Conclusions:** Maternal knowledge about IFAS, counseling about IFAS, occupation, and history of anaemia were found to be significantly associated factors with compliance with iron folate supplementation during pregnancy. This implies that adherence to IFAS can be improved through improving maternal knowledge about

importance of IFAS, quality counseling services and strengthening an overall ANC follow-up services.

KEYWORDS
compliance, Ethiopia, iron-folic acid, Mettu Town, pregnancy

## 1 | BACKGROUND

Anaemia is a global public health problem affecting nearly two billion people. The World Health Organization (WHO) has defined anaemia in pregnancy as a hemoglobin (Hb) concentration of less than 11 g/dL.[1,2]

The prevalence of anaemia remains high globally, particularly in low-income settings. Women of reproductive age and pregnant women are among the most vulnerable groups. The prevalence of anaemia was 29.6% in nonpregnant women of reproductive age, and it was as high as 40% among pregnant women.[3]

This is because the demand for iron and folic acid increases during pregnancy following the physiological adjustment imposed by pregnancy.[4] If left untreated, it contributes to adverse birth outcomes, including intrauterine foetal growth retardation, preterm delivery, low birth weight, and subsequent maternal and perinatal morbidity and mortality.[5,6] Reducing anaemia is an important component of achieving women's and children's health, and the second global nutrition target for 2025 calls for a 50% reduction of anaemia in women of reproductive age. Thus, to achieve the Global Nutrition Target and prevent these poor health outcomes, the WHO recommends all pregnant women take a standard dose of 60 mg of elemental iron along with 400 µg of folic acid daily for 6 months during pregnancy in areas where there is a moderate prevalence of anaemia and to continue for 3 months after delivery in areas where the prevalence of anaemia is over 40%.[7]

Globally, 70% of women didn't take iron and folic acid supplements during pregnancy. The overall pooled prevalence of compliance with iron and folic acid supplementation (IFAS) during pregnancy in sub-Saharan Africa was 39.2%. It extremely varies in Asia, ranging from 6.8% in Afghanistan to 75.9% in Cambodia.[8–10] Ethiopia is one of the low-income countries in sub-Saharan Africa with a high burden of anemia. In the study area, the prevalence of anaemia among pregnant women ranges between 8 and 35%.[11]

Studies have shown that nearly half (48%) of the pregnant women in Ethiopia did not take any iron-folic acid tablets during their most recent pregnancy, and among those who did, only 5% consumed them for more than 90 days.[12,13]

IFAS is the most widely employed strategy to alleviate iron deficiency, iron deficiency anaemia, and neural tube defects, both globally and nationally.[14]

As mentioned above, in Ethiopia, even though iron folate supplementation is an integral part of antenatal care (ANC) and is free of charge, compliance with IFAS is very low. Ethiopia has already adopted the WHO recommendations and applied the guidelines. However, only 42% of women who had ANC follow-up received iron supplements, and as few as 3.5% adhered to IFAS for the recommended days or more.[15,16]

Recent studies on this topic suggest that there were several reasons for noncompliance with IFAS, including inadequate supplies, poor quality tablets, lack of access, inadequate iron provision, malaria, and poor ANC and PNC service utilization.[17–21]

Therefore, one of the major problems with iron-folate supplementation in pregnancy is compliance. This highlights the necessity to examine the determinants of compliance with iron-folate supplementation in local contexts from multiple perspectives.[22,23]

The COVID-19 issue, ongoing civil conflict, and the devastating drought in Ethiopia are currently adding to these and other unmentioned limitations, all of which have constricted scarce resources and harmed the healthcare system. Few studies on the factors influencing iron supplementation in pregnancy have been done in the study region, and those that have been done have primarily focused on non-adherence. Therefore, this study aimed to explore the determinants of compliance with iron supplementation

## 2 | METHODS AND MATERIALS

### 2.1 | Study area and period

This study was carried out at Mettu, the capital of the Iluu Abbaa Boor zone in South West Ethiopia's Oromia Region. Mettu town, the zone's capital, is 600 km from the country's capital, Finfinnee/Addis Ababa. The Zone is a well-known coffee-producing area in the western part of the Oromia region, Ethiopia. Mettu Town has two public health facilities: Mettu Karl Referral Hospital and Mettu Health Center. The hospital serves around 1.5 million customers each year, including those referred from nearby regions such as Gambella Regional State and two zones of Southern Nation Nationalities and Peoples Regional State (Sheka and Kafa Zones). All pregnant women who visited prenatal care clinics during the study period and were given iron and folic acid tablets were deemed the source population. Cases were pregnant women who took at least four tablets of iron folic acid (IFA) supplementation per week, while pregnant women who took fewer than four tablets of IFA supplementation per week were used as controls.

### 2.2 | Eligibility criteria

The inclusion criteria defined for the cases and controls were Pregnant women who were attending ANC for at least 1 month

preceding the study period and receiving iron-folate supplementation were included in the study.

## 2.3 | Sample size and sampling procedure

The sample size was calculated by using the STATCALC command of Epi Info version 7 for an unmatched case-control study with the following assumptions: 95% confidence interval (CI), 80% power, and a case-to-control ratio of 1:2 by taking 22.8% of good knowledge of the benefits of iron and folic acid (proportion among exposed and nonexposed) with an adjusted odd ratio of 2.1 from previous studies.[24] The final sample size was 344 (115 cases and 229 controls). The sample size was proportionally allocated to Mettu Karl Specialized Hospital and Mettu Health Center based on their average patient flow (patient load) in the month preceding the real data collection. All pregnant women who had been visiting ANC clinics 1 month before the data collection period were screened for case and control definitions. Then cases and controls were selected using systematic random sampling with a kth of 3 for Mettu Karl Specialized Hospital and 2 for Mettu Health Center.

## 2.4 | Data collection tool and data collection procedure

A well-structured questionnaire was created following a thorough assessment of the literature,[6] pretested on 10% of the sample size at another health facility, validated for reliability (internal consistency), and utilized to gather data. The medical records of the pregnant women were reviewed using a checklist. The tool is prepared in English, translated into the local language, and translated back to English by different language experts to ensure its consistency.

## 2.5 | Data processing and analysis

Data were coded, entered into Epi Data version 3.1, and then exported to SPSS version 23 for analyses. Frequencies and cross-tabulations were used to identify missing values. A descriptive analysis was performed to describe the frequency distributions and percentages of the respondents' sociodemographic characteristics and other variables included in the study.

Bivariate logistic regression analysis was used to discover variables appropriate for multivariate logistic regression analysis.

Thus, variables having a $p$ Value of less than 0.25 were included in the final multivariable logistic regression model. Hosmer and Lemeshow's goodness of fit test was used to assess model fitness.

Finally, a $p < 0.05$ was used to establish statistical significance for the adjusted odds ratio (AOR) at 95% CI to assess the strength of the association.

## 2.6 | Operational definitions

Adherence to IFAS: According to this study Pregnant women are said to be "adherent" to IFAS if they took 65% or more of the recommended supplement, equivalent to taking the supplement at least 4 days a week for 3 months or more.[24]

Anaemia: In this study, the term anemia refers to a condition where the Hb level in the blood is less than 11 g/dL.[25]

Good knowledge of anaemia: Pregnant women were said to have good knowledge of anaemia if they responded to at least four questions correctly out of seven questions prepared to assess their knowledge of anaemia.

Good knowledge of IFAS: Pregnant women were said to have good knowledge of IFAS if they responded to at least three questions correctly out of questions prepared to assess their knowledge of IFAS.[26]

# 3 | RESULTS

## 3.1 | Sociodemographic characteristics of the respondents

A total of 344 pregnant women (115 cases and 229 controls) participated in the study, making the response rate 100%. The mean age of the respondents was 30 years, with a range of 19–49 years and a standard deviation of 5.5 years. About one-third of cases, 97 (33.8%), and two-thirds of controls, 190 (66.2%), were married. Regarding the educational status of respondents, 35 (44.9%) cases and 43 (55.1%) controls can't read or write. About 42 percent of cases and 55.8% of controls were employees, and about 38% of cases and 61.9% of controls were from urban areas (Table 1).

## 3.2 | Obstetric history and facility-related characteristics

From the total study participants visiting ANC, primigravida constitutes 22.5% of cases and 77.5% of controls, while multiparas constitute 31.2% of cases and 68.9% of controls. Likewise, among respondents who participated in this study, 61.4% of cases and 38.6% of controls had a history of anemia. About 26.1% of cases and 73.9% of controls travel less than 30 min to reach a health facility. Out of the total participants, 74 (38% of cases) and 120 (61.9%) of the controls had good knowledge of IFA (Table 2).

## 3.3 | Determinants of compliance with IFAS

Variables such as age, residence, gravidity, educational status, gestational age, knowledge about IFA, occupation, distance from a health facility, history of anaemia, stopping taking IFA due to side effects, not liking the taste of IFA, health provider counseling, and history of abortion were

**TABLE 1** Sociodemographic characteristics of the study participants, 2021 ($n$ = 344).

| Variable | Category | Frequency (%) | | |
|---|---|---|---|---|
| | | Case ($n$ = 115) | Control ($n$ = 229) | Total |
| Residence | Urban | 82 (38.1) | 133 (61.9) | 215 (62.5) |
| | Rural | 33 (25.6) | 96 (74.4) | 129 (37.5) |
| Maternal age | ≤20 years. | 10 (71.4) | 4 (28.6) | 14 (4.06) |
| | 21–34 | 75 (29.1) | 183 (70.9) | 258 (75) |
| | ≥35. | 30 (33.4) | 42 (66.7) | 72 (20.9) |
| Marital status | Married | 97 (33.8) | 190 (66.2) | 287 (83.4) |
| | Never married | 18 (31.6) | 39 (68.4) | 47 (13.6) |
| Educational status | Can't read and write | 35 (44.9) | 43 (55.1) | 78 (22.6) |
| | Read and write | 30 (51.7) | 28 (48.3) | 58 (16.8) |
| | Primary school | 29 (42.6) | 39 (57.4) | 68 (19.7) |
| | High school | 13 (27) | 35 (72.9) | 48 (13.95) |
| | Diploma and above | 8 (8.7) | 84 (91.3) | 92 (26.7) |
| Occupation of the mother | Employed. | 87 (42.1) | 110 (55.8) | 197 (57.2) |
| | Unemployed | 28 (19) | 119 (81) | 147 (42.7) |

identified as candidate determinants of IFA supplementation compliance during bivariate logistic regression analysis.

However, on multivariable logistic regression analysis, variables such as knowledge about IFA, occupation, history of anaemia, and health provider counseling were identified as independent predictors of maternal compliance with IFA supplementation.

Pregnant women with a previous history of anaemia were 5.8 times more likely to adhere to IFAS than pregnant women without anaemia history (AOR = 5.8, 95% CI [2.5–13.6], $p < 0.001$]. Likewise, pregnant women with good knowledge about IFAS were 3.3 times more likely to adhere to IFAS than pregnant women with poor knowledge (AOR = 3.3, 95% CI [1.7–6.7], $p$ <0.001) (Table 3).

Similar to this, employed pregnant women were five times more likely than their counterparts to comply with IFAS (AOR = 5.2 [2.4–11.5], $p < 0.01$). The odds of adhering to IFA were 2.5 times higher for those pregnant women who received counseling during their ANC visit (2.495% CI [1.3–4.7] $p < 0.01$) than for those who didn't (Table 3).

## 4 | DISCUSSION

Compliance with iron supplementation plays a major role in the prevention and treatment of iron-deficiency anemia. This study identified determinants of compliance (adherence) to iron folate supplementation among pregnant women attending ANC service at Mettu Karl specialized

**TABLE 2** Obstetric, pregnancy, and facility related characteristics among study participants in Mettu town, 2021.

| Variable | Category | Frequency (%) | | |
|---|---|---|---|---|
| | | Case ($n$ = 115) | Control ($n$ = 229) | Total |
| Gravidity | Primi-gravida | 16 (22.5) | 55 (77.5) | 71 (20.6) |
| | Multipara (II–IV) | 58 (31.2) | 128 (68.8) | 186 (54.1) |
| | Grand multipara (V+) | 41 (47.1) | 46 (52.9) | 87 (25.3) |
| Gestational age | First trimester | 14 (60.9) | 9 (39.1) | 23 (6.6) |
| | Second trimester | 88 (28.9) | 216 (71.1) | 304 (88.3) |
| | Third trimester | 13 (76.5) | 4 (76.5) | 17 (4.9) |
| History of Anemia | Yes | 54 (61.4) | 34 (38.6) | 88 (25.5) |
| | No | 61 (23.8) | 195 (76.2) | 256 (74.4) |
| knowledge about IFA | Good | 74 (38) | 120 (61.9) | 194 (56.3) |
| | Poor | 41 (27.3) | 109 (72.7) | 150 (43.6) |
| Distance (traveled) from a health facility (in minutes) | ≤30 min | 18 (26.1) | 51 (73.9) | 69 (20.1) |
| | >30 min | 64 (23.3) | 211 (76.7) | 275 (79.9) |
| Counseling on IFA | Yes | 65 (44.8) | 80 (55.2) | 145 (42) |
| | No | 50 (25.1) | 149 (74.9) | 145 (42) |
| Stop taking IFA because of side effect | Yes | 66 (44) | 84 (56) | 150 (44) |
| | No | 48 (24.9) | 145 (75.1) | 193 (56) |

**TABLE 3** Factors associated with compliance with IFA supplementation among pregnant women attending the ANC clinic at Mettu Karl Specialized Hospital and Mettu Health Center, Mettu Town, 2021.

| Variable | Category | Cases | Controls | COR (95% CI) | AOR (95% CI) | *p* Value |
|---|---|---|---|---|---|---|
| Maternal age in years | <20 | 10 | 4 | 1 | 1 | |
| | 21–30 | 75 | 183 | 0.16 [0.05–0.54] | 0.11 [0.02–0.49] | 0.4 |
| | >31 | 30 | 42 | 0.29 [0.82–0.99] | 0.07 [0.01–0.36] | 0.12 |
| Residence | Urban | 82 | 133 | 1.794 [1.108–2.9] | 1.299 [0.62–2.73] | 0.49 |
| | Rural | 33 | 96 | 1 | 1 | |
| Marital status | Married | 18 | 39 | 1.1 [0.49–1.6] | 0.97 [0.4–2.5] | 0.95 |
| | Never married | 97 | 190 | 1 | 1 | |
| Educational status | Can't read and write | 35 | 43 | 1 | 1 | |
| | Read and write | 30 | 28 | 1.3 [0.6–2.6] | 1.53 [0.5–4.0] | 0.38 |
| | Primary School | 29 | 39 | 0.9 [0.47–1.76] | 1.14 [0.4–2.8] | 0.76 |
| | High school | 13 | 35 | 0.45 [0.21–0.99] | 0.26 [0.8, 0.84] | 0.24 |
| | Diploma and above | 8 | 84 | 0.11 [0.05–0.16] | 0.13 [0.43,0.49] | 0.11 |
| Occupation of the mother | Employed | 87 | 110 | 3.36 [2.04–5.53] | 5.3 [2.4–11.5] | 0.00* |
| | Unemployed | 28 | 119 | 1 | 1 | |
| Gestational age | First trimester | 14 | 9 | 0.47 [0.1, 1.9] | 0.07 [0.01–0.4] | 0.5 |
| | Second trimester | 88 | 216 | 0.12 [0.4–0.9] | 0.046 [0.01–0.2] | 0.2 |
| | Third trimester | 13 | 4 | 1 | 1 | |
| Stop taking IFA because of side effect | Yes | 66 | 84 | 2.37 [1.5–3.7] | 0.34 [0.17–0.67] | 0.6 |
| | No | 48 | 145 | 1 | 1 | |
| Mothers' knowledge about IFA | Good | 74 | 120 | 1.64 [1.03–2.6] | 3.33 [1.66–6.69] | 0.001* |
| | Poor | 41 | 109 | 1 | 1 | |
| History of anemia | Yes | 54 | 34 | 5.077 [3.03–8.5] | 5.9 [2.52–13.6] | 0.00* |
| | No | 61 | 195 | 1 | 1 | |
| Received counseling during ANC visit | Yes | 65 | 80 | 2.42 [1.532–3.8] | 2.48 [1.3–4.7] | 0.006* |
| | No | 50 | 149 | 1 | 1 | |
| Gravidity | Primigravida | 16 | 55 | 0.33 [0.2–0.66] | 0.146 [0.43– 0.49] | 0.7 |
| | Multigravida | 58 | 128 | 0.508 [0.3–0.86] | 0.49 [0.22–1.096] | 0.8 |
| | Grand multipara | 41 | 46 | 1 | 1 | |

Hospital and Mettu Health Center, South West Ethiopia, in 2021. The findings of this study demonstrated that maternal knowledge of IFA, counseling about iron folate supplementation, history of anaemia, and occupation of the pregnant women were independent determinants of compliance with iron folate supplementation.

It was observed in this study that women who had good knowledge about the importance of IFA supplementation during pregnancy were three times more likely to comply with iron supplementation than those with poor knowledge. This finding was consistent with studies conducted in different parts of Ethiopia, Tanzania, and Nigeria.[6,26–28]

The reason could be that knowledge helps women have a good understanding of the importance of prevention and treatment of anaemia during pregnancy by taking iron-folate supplements. This implies that a high knowledge level results in behavioral change and promotes healthy behaviors.

A previous history of anaemia has also shown a significant association with the participants' compliance with iron folate; women who reported a previous history of anaemia during pregnancy were six times more likely to be compliant compared to those who did not have a history of anaemia. This finding is consistent with study reports from several studies in Ethiopia.[29–31]

This could be because these pregnant women who suffered from previous anaemia have learned from their experience (through a negative feedback mechanism).

This study also found that pregnant women who received counseling from health workers were two times more likely to adhere

to IFA than who didn't receive counseling. This finding is in line with studies conducted in many parts of Ethiopia and Kiambu County, Kenya, and is also consistent with evidence that health education on IFAS accompanied by clear instructions on its intake improved compliance.[4,19,30,32]

This could be because these pregnant women who suffered from previous anaemia have learned from their experience (through a negative feedback mechanism).

This study also found that pregnant women who received counseling from health workers were two times more likely to adhere to IFAS than their counterparts. This finding is in line with studies conducted in many parts of Ethiopia and Kiambu County, Kenya, and is also consistent with evidence that health education on IFAS accompanied by clear instructions on its intake improved compliance.[6,32] The possible justification for this discrepancy could be the variation in socio-demographic characteristics among individuals who participated in our study and theirs. That is, as we tried to see their data, the proportion of employed pregnant women who participated in their study was far fewer than those who participated in ours.

In general, the study's findings have broad practical implications. In general, the study's findings have broad practical implications. It indicates that quality counseling services aimed at improving maternal knowledge about IFAS and its consequences during the ANC follow-up, with special emphasis on unemployed women with no formal education residing in remote areas, can increase adherence to IFAS among pregnant women. This, in turn, can improve birth outcomes and contribute to reducing maternal and perinatal morbidity and mortality. Beyond reducing morbidity and mortality, better birth outcomes also contribute to stabilizing the health financing system by reducing the potential high financial and human resource expenditures to be expended in treating adverse birth outcomes.

Despite civil war, a devastating drought that has killed thousands, and COVID-19 pandemics, Ethiopia is working to meet the Sustainable Development Goals and targets, particularly Goal 3 Target 1, which states, "By 2030, reduce the global maternal mortality ratio to less than 70 per 100,000 live births."[4,33]

The current national reproductive health strategy of Ethiopia aims at reducing anaemia among pregnant women from 29% to 21% at the end of 2025 by increasing the proportion of pregnant women who receive iron and folic acid supplements at least 90+ from 11% to 60% and by other feasible interventions. Along with working to increase the iron-folic acid supplement, identifying conditions that enhance and impede compliance with it is very helpful for policymakers and health managers to achieve these goals.

### 4.1 | The strength of the study

This study used Primary data to determine the determinants of IFAS.

### 4.2 | The limitation of study

Information on the compliance (adherence) level of the pregnant women came from their self-reported IFA intake. Therefore, there is a possibility of social desirability bias. Further, the respondents were expected to recall how they were taking the tablets. This might result in recall bias.

## 5 | CONCLUSION

Maternal knowledge about IFAS, counseling about IFAS, occupation, and history of anaemia were found to be significantly associated factors with compliance with iron folate supplementation during pregnancy. This implies that adherence to IFAS can be improved through improving maternal knowledge about the importance of IFAS, providing quality counseling services, and strengthening overall ANC follow-up services.

## 6 | RECOMMENDATIONS

Based on the findings, the following recommendations are forwarded:

❖ Health facilities:

- Health facilities (hospitals and health centers) should encourage, support, and supervise health workers within their institutions to increase their efforts to diagnose anaemia early among pregnant women, provide proper counseling services, provide health education to their clients, and strengthen overall ANC services.

❖ Health workers

- Should keep up or increase their commitment to screening, counseling, and providing health education to pregnant women on the importance of taking IFAS.
- Special attention should be given to unemployed and pregnant women, as they have fewer tendencies to take the supplement as per the WHO recommendation. Probably, unemployed women could be less educated. So prompt health education with a special emphasis may help change the situation among these segments of the community.

❖ Future researchers:

- Future researchers are advised to approach this by employing a stronger study design, like an interventional study, considering the limitations mentioned in this study and including other important variables.

## AUTHOR CONTRIBUTIONS

**Lensa Shumi**: Conceptualization; data curation; formal analysis; funding acquisition; investigation; methodology; project administration; resources; software; supervision; validation; visualization; writing—original draft; writing—review and editing. **Abdi Geda Gedefa**: Conceptualization; data curation; formal analysis; investigation; methodology; project administration; resources; software; supervision; validation; visualization; writing—original draft; writing—review and editing. **Kebebe Bidira**: Conceptualization; formal analysis; investigation; methodology; project administration; resources; software; supervision; validation; visualization; writing—original draft.

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## CONFLICT OF INTEREST STATEMENT

The authors declare no conflict of interest.

## DATA AVAILABILITY STATEMENT

All data generated or analyzed during this study are included in this article. All authors have read and approved the final version of the manuscript [CORRESPONDING AUTHOR or MANUSCRIPT GUARANTOR] had full access to all of the data in this study and take complete responsibility for the integrity of the data and the accuracy of the data analysis.

## ETHICS STATEMENT

This study adhered to the Declaration of Helsinki. The Mettu University Health Science College's Research Ethical Committee approved this study with reference number RPG/09/2013. A formal letter of cooperation was acquired from the health department of the Iluu Abbaa Boor Zone. Before the collection of data, all study participants provided written informed consent. Data collectors were taught on how to maintain confidentiality and privacy by completing consent papers connected to each questionnaire. The names of study participants were kept anonymous to safeguard their confidentiality. The study participants were clearly informed about the study's goal, protocol, length, potential hazards, and benefits. Participants in the study were advised that they could skip any questions they did not wish to answer and leave the interview at any moment.

## TRANSPARENCY STATEMENT

The lead author Abdi Geda Gedefa affirms that this manuscript is an honest, accurate, and transparent account of the study being reported; that no important aspects of the study have been omitted; and that any discrepancies from the study as planned (and, if relevant, registered) have been explained.

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