ADDIS ABABA UNIVERSITY

COLLEGE OF HEALTH SCIENCES

SCHOOL OF PUBLIC HEALTH

Association of Antenatal Depression with Anemia and Adherence to Iron-Folic AcidSupplement among Pregnant Women Attending Antenatal Care Services at Health Centers in Yeka Sub-City, Addis Ababa, Ethiopia, 2019

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A Thesis Submitted to Addis Ababa University College of Health Sciences, School of Public Health in Partial Fulfillment of the Requirements for the Degree of Master of Public Health

October, 2019

Addis Ababa, Ethiopia

APPROVED BY THE BOARD OF EXAMINATION

THIS THESIS, BY MIRAF MESFIN IS ACCEPTED IN ITS PRESENT FORM BY THE BOARD OF EXAMINERS AS FULFILLING FOR THE DEGREE OF MASTERS OF GENERAL PUBLIC HEALTH.

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ACKNOWLEDGEMENTS

My first and primary gratitude goes to almighty GOD. I am indebted lifelong for all the things that has been for me.

My heartfelt sincere acknowledgment also goes to my advisors Dr NegussieDeyessa and Mr. GebretsadikShibre for their invaluable guidance.

I would like to thank Addis Ababa University, School of Public Health for giving me this opportunity.

I would also like to acknowledge participants who volunteered to take part in this study, my data collectors and supervisors.

I am very thankful to my beloved family for their uninterrupted support.

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ACRONYMS

ANC	Antenatal care
AOR	Adjusted odds ratio
BDI	Beck's depression scale
BMI	Body mass index
CMD	Common mental disorders
HIV	Human Immuno-deficiency Virus
IDA	Iron deficiency anemia
IFAS	Iron-Folic Acid Supplement
IP	Intimate partner
IPV	Intimate partner violence
LAMIC	Low- and middle-income countries
LBW	Low birth weight
K-10	Kessler Psychological Distress Scale
MUAC	Mid upper arm circumference
PHQ	Patient health questionnaire
PTB	Pre-term birth
WHO	World Health Organization

ABSTARCT

Background: Depression affects a large proportion of the global population. It is reported to affect about a quarter of pregnant women in Ethiopia. Some studies indicate that anemia might bea risk factor for depression. This underscores the need for an iron-folic acid supplement (IFAS). IFAS adherence by pregnant women is however not satisfactory. Studies again implicate that depression might affect adherence to IFAS. Nevertheless, thispotential vicious cycleis not a well-explored area of research. The objective of this study is therefore to assess the association of antenatal depression with anemia and adherence to IFAS among pregnant women attending antenatal care (ANC) at selected health centers.

Methods: a facility-based cross-sectional study was conducted among pregnant women who attended ANC service in Yeka sub-city, Addis Ababa. A total of 406 pregnant women were recruited in the study. Patient health questionnaire (PHQ-9), a validated tool in Ethiopia, was used to assess antenatal depression. IFAS adherence was assessed using pill count method. Bivariableand subsequent multivariable logistic regression were employed for data analysis.

Results: it was found that anemic pregnant mothers had an increased odds of having antenatal depression [AOR=2.63; 95% CI (1.13, 6.14)] compared to non-anemic mothers. Having financial hardship, whether current pregnancy is planned and emotional abuse from an intimate partner also significantly associated with antenatal depression. Antenatal depression at cut-off (PHQ-9≥5) failed to show statistically significant association with IFAS adherence. Major depression (PHQ-9≥10) was however found to be significantly associated with adherence to IFAS [AOR=1.97; 95% CI (1.09, 3.56)] in pregnant women. Besides, factors significantly associated with IFAS adherence were parity, knowledge of the use of IFAS and current pregnancy complication.

Conclusion: the study revealed a significant association that exists between two important public health problems, anemia and antenatal depression; and the association between antenatal depression and IFAS adherence. Further investigation of these associations is a warranted area of future studies. In the meantime, putting these underlying determinants into consideration is beneficial as they might complicate diagnosis and have a negative impact on treatment outcomes.

1. INTRODUCTION

1.1. Background

Depression is a disabling mental health condition characterized by deviation in mood, thoughts, behavior and impairment of normal functioning including undemanding day to day activities(1). Globally it is estimated that more than 300 million of the world population suffers from depression, with the greater majority being women. Depression is ranked to be the largest contributor to non-fatal burden of disease where 80% of which occur in low and middle-income countries (LAMIC) (2).

Pregnancy is a period of increased susceptibility for a change in mental health state. Depression is one of the most common health adversities during pregnancy. There is growing consensus that implicates antenatal depression to be a significant public health problem. Micronutrient deficiencies including anemia are also evident in most pregnancies where dietary consumption of key micronutrients is often inadequate to meet substantial increase in physiological and nutritional demands during pregnancy. Anemia is reported to pose a significant burden to antenatal wellbeing and causes poor birth outcomes contributing to a significant share of morbidity and mortality (3-5).

Challenges of prenatal anemia seems to be well recognized in international and national contexts, as can be seen included in both World Health Organization (WHO) and Ethiopian guidelines of prenatal health interventions as a standard maternal care (6, 7). As it is highlighted that there is a need for daily IFAS at doses of 60 mg/day and 400 μg/day respectively, for at least 6 months during pregnancy and 3 months postpartum (7).

1.2. Statement of the Problem

Anemia affects a great share of pregnant women globally, predominantly developing countries. According to WHO report about 38.2% of pregnant women were found to be anemic with the highest proportion being in Africa (8). The national demographic health survey data of Ethiopia indicates the magnitude of anemia to be 29 % in pregnant women(9). Forgoing studies highlighted the magnitude of antenatal anemia in Ethiopia to range from 11.6 % - 63.8% (10, 11).

In addition to its considerable magnitude public health concern towards anemia stems from detrimental effects consequent to anemia during pregnancy. A systematic review and meta-analysis which synthesized results of 30 studies with a total sample size of 1,194,746 reported a significant relationship between anemia in the first trimester of pregnancy and low birth weight (LBW), pre-term birth (PTB) and small for gestational age (12).Similarly, another systematic review and meta-analysis revealed that in LAMIC, 12% of LBW, 19% of PTB, and 18% of perinatal mortality were attributable to maternal anemia (13). Undesirable perinatal outcomes observed to occur in anemic pregnant women also include intrauterine fetal deaths, perinatal mortality and low Apgar scores (14). Severe anemia in pregnancy is found to be correlated with an increased rate of maternal mortality (15). Impact of anemia during pregnancy is also indicated to extend after the child is born. Significant correlation has been shown to exist between maternal hemoglobin and, newborn and infant hemoglobin (16, 17). Prenatal hemoglobin level was again observed to have a significant negative relationship with infant motor and mental development (18).

Anemia, besides being an independent risk factor for maternal and newborn morbidity and mortality, another pathway that it might contribute in this adverse consequence is reported in studies. Scientific studies conducted in different populations implicate that anemia might also increase the risk of mental health problems including depression (19-23). This association is however not conclusive(24-27)and not adequately studied, and the role of anemia as a risk factor to (antenatal) depression is underappreciated.

In high-income countries antenatal depression is estimated to affect about one in ten pregnant women (28). Higher prevalence of up to about 39% was reported in Africa(29). In Ethiopia a systematic review reported a pooled prevalence of antenatal depression to be about 25 % (30).Untreated depression during pregnancy is on the other hand implicated to be a risk factor for poor maternal quality of life, morbidity, mortality and poor fetal outcomes. A meta-analysis reported that untreated depression during pregnancy was associated withsignificantly increased risks of PTB and LBW(31).It was also reported that women with antenatal depression had significantly more incidence of maternal obstetric complications during pregnancy including preeclampsia in pregnancy (32, 33). Antenatal depression is also one of the most significant predictors of postnatal depression which is also associated with poor maternal and child

wellbeing(34). Self-harm ideation during pregnancy and postpartum ranging from 5 to 14% has been reported (35). Studies reported up to 11 times increased adjusted odds of antenatal suicidal ideation in women with major depression during pregnancy (36).Infants of prenatally depressed mothers also showed significantly higher growth retardation like being underweight and stunting than controls, as well as more increased risk of diarrheal episodes(37, 38). Adult offspring exposed to maternal depression in pregnancy were more than three times more likely to have a depressive disorder compared with non-exposed offspring (39). Fetal exposure to maternal depression during pregnancy was also found to have effects on immune function of the offspring(40).

Besides risks on the mother and newborn, antenatal depression also has economic implications. Untreated perinatal depression is associated with costly complications to the mother(41), costs following adverse effects on the child, decreased productivity reflected in employment and income, as well as health care costs(42). In United Kingdom the overall cost associated with perinatal depression was estimated to approximate £6.6 billion in one year. The lifetime costs of one case of perinatal depression was found to be more than 70,000 pounds, where about one third is cost related to the mother while the other two-third is associated with cost related with the child (42, 43).

Taking thesedetrimentaleffects of depression in to account, adequate response to antenatal anemia thus might yield dual benefit in combating two significant antenatal health problems in Ethiopia, warranting the need to use of IFAS by pregnant women. However, despite efforts being made to avail the supplement, adherence by pregnant women to the recommended regimen of IFAS remains to be a problem. Studies conducted in different parts of Ethiopia reported low level of IFAS adherence ranging from 18% - 76% (44, 45). This contributes to unmanaged burden of modifiable risk factor for morbidity and mortality during pregnancy.Depression is reported to be associated with adherence to prescribed medical recommendations. This has been well demonstrated in different studies conducted to examine the role of depression on adherence to prescribed treatment regimens in other different disease conditions like Human Immuno-deficiency Virus(HIV)(46-49), Diabetes (50-53), Hypertension (54-56), etc. Whether level of adherence of pregnant women to IFAS is associated with depression is not well explored.

Different factors associated with IFAS adherence were repeatedly studied in different settings. However, the effect of mental state of the mother is usually left underexplored (57).

1.3. Rationale and significance of the study

Studies conducted elsewhere have attempted to shed a light on the link between anemia and depression. However, there is no study conducted in Ethiopia to the best of the investigator knowledge that assessed the association of depression with anemia. Similarly, there is also no study conducted in Ethiopia which explored the effect of depression on adherence to IFAS.

Exploring the association of anemia and depression in pregnant women will inform future research to explore unforeseen underlying comorbidity for better outcome of treatment. It might give a ground to assess comorbid depression in nutrition deficient settings. This is also specifically important in pregnant women where women are particularly prone to nutritional deficiency due to increased requirement and anemia is prevalent. It might also give an insight to treatment of patients with depression including antenatal depression to assess and monitor their hemoglobin level preceding initiation of pharmacological treatments or in cases of treatment resistant depression.

Exploring the association between antenatal depression and adherence to IFASwill similarly help to identify and scrutinize an inadequately studied risk factor which contributes a share to the proportion of non-adherence in pregnant mothers. This will be of a paramount importance to efforts being made to increase IFAS adherence among pregnant mothers. Lessons learned from this study can also inform other similar micronutrient supplementation efforts.

If the claimed associations hold to be true, anemia might be a risk factor for antenatal depression, which again affects anemia status of pregnant women via reducing adherence of the pregnant mothers to IFAS. Studying these factors together more importantly may identify a vicious cycle that might exist between anemia, antenatal depression and adherence to IFAS, which if left untreated, might contribute to further exacerbation of the problem.

2. LITERATURE REVIEW

2.1. Prevalence and Factors Associated with Anemia among Pregnant Women

Related to sensitive nature of the problem in the specific population of pregnant women, several studies have attempted to estimate the magnitude of anemia in different settings. Up to 90.5% prevalence of anemia in pregnant mothers was reported in Pakistan(58, 59). Two studies in India reported a prevalence status of 84.8% and 64% (60, 61). Similar magnitude was reported in studies undertaken in Africa. A study conducted at a hospital in Uganda reported a prevalence of 62.82% (62). In Libya (63)a study reported the prevalence to be 54.6%; while studies in South Africa (64) and Nigeria (65) reported that proportion of about 40% of pregnant women are affected. According to WHO, globally anemia was estimated to affect about 38.2% of pregnant women which translated to 32.4 million pregnant women(8).

In Ethiopia, the national estimate indicated that the prevalence of anemia during pregnancy is about 29%(9).Several studies were also conducted to estimate the magnitude of antenatal anemia in different parts of Ethiopia. A study conducted in Rural Part of JigJiga City reported that 63.8% of pregnant women are affected by anemia (10). The magnitude of anemia during pregnancy is reported to be in ranges of 14.9% - 36.6% in other studies conducted in different parts of Ethiopia (66-70). Comparably lesser prevalence of about 10.1% - 21.3% was reported in studies conducted athealth facilities in Addis Ababa(11, 71, 72). A systematic review published recently found a pooled prevalence of anemia to be 31.6% among pregnant women in Ethiopia (73).

Factors associated with anemia in pregnant mothers have been documented in different studies. A prospective study in Portugal conducted to identify the risk factors for iron depletion during the first half of pregnancy found that only maternal age was found to be significantly associated with serum ferritin level of the mothers where women older than thirty years of age had more risk (74). A similar longitudinal study in Switzerland also found that women older than 30 years had significantly decreased iron stores (ferritin <µg/l). In addition, women who had two or three children (parity) were also found to be at a significant higher risk(75).

According to a study published in 2017 from Nepal which recruited 1,675 pregnant women, factors associated with low serum hemoglobin were found to be maternal age, educational level,

trimester, mid upper arm circumference (MUAC), household water supply source, minimum dietary diversity and consumption of iron supplement after controlling ethnicity and geographic location (76). Intake of Iron by pregnant women was also found to be a mere significant determinant of anemia in another cross-sectional study conducted in Nepal(77).

The effect of nutritional factors were underscored to have a significant contribution in a prospective study conducted in Pakistan which enrolled 1,369 pregnant women at 20 to 26 weeks of gestation. Controlling for education, pregnancy history, iron supplementation, and height the study showed that consumption frequency of tea, consumption of eggs and consumption of clay or dirt are significantly associated with anemia while consumption frequency of red meat was marginally associated (58).

A secondary data analysis study in China which included a data of 26,255 pregnant women indicated that risk factors of anemia were maternal age of greater than 35 years, place of residence, family income and pre-pregnancy body mass index (BMI)(78). Anemia history of the pregnant women was the only factor found to be associated with anemia in a study conducted in 849 Moroccan pregnant women (79).A result of a study conducted in Tanzania which recruited 2,654 pregnant women concluded that factors that were independently associated with anemia were history of malaria, HIV status, clinic of enrollment and low socioeconomic status (80). On the other hand in its neighboring country Uganda a cross sectional study which included 743 pregnant women showed that being a housewife and place of residence are independent risk factors of anemia (81).

In Ethiopia studies also identified several factors associated with anemia during pregnancy. Among studies conducted in Addis Ababa, a cross-sectional study done in TikurAnbessa Specialized Hospital documented that risk factors associated with anemia were increased age, birth interval of less than two years, illiteracy, family size of greater than four, being in third trimester, history of blood loss, absence of ANC,multigravidity and multiparity (71). Similar types of risk factors were found to be significantly related with anemia in two studies conducted in Gondar, in Dembia(67) and Azezo(66).Different types of infections like intestinal parasites, worms as well as and rural residence were shown to be significantly associated with anemia. However, rural residence was found to be a risk factor in the study done in Dembia and

protective in the study in Azezo. Furthermore, increased age of women was in addition indicated to be significantly associated with anemia in the latter.

A facility based crosssectional study conducted in Arsi Zone identified multiparity, less frequent consumption of vegetables, intake of tea after meal and illness recurrence during pregnancies to be significant risk factors(69). A study atMizan-Tepi university teaching hospital revealed that previous chronic diseases, knowledge about anemia, excessive menstrual bleeding, history of malaria attack and history of abortion had significant association with anemia in the pregnant women (70). On the other hand, a study at Adama medical college hospital reported that pica during pregnancy was associated with about 33 times increased risk of anemia. Intake of iron supplementation during pregnancy also significantly decreased risk of anemia to about 80 percent (68).

A systematic review and meta-analysis published in 2017 which included twenty studies with a total of 10,281 pregnant women showed that factors which were found to increase risk of anemia almost twice were short pregnancy interval and malaria infection during pregnancy; whereas, primigravidity was observed to decrease anemia risk by about 40 percent. Similarly women's urban residence was found to reduce 30 percent of the risk of anemia (73).

2.2. Prevalence and Factors Associated with Antenatal Depression

Studies indicated antenatal depression to affect about up to one fourth of pregnant mothers on average although it differs in different settings. About 27.2%, 21.7% and 20% of antenatal depression was reported in studies conducted in Brazil, Slovenia and USA respectively (82-84). Other studies conducted in Turkey (10.9%), India (9.18%) and Sweden (8%) reported lower magnitudes of depression (85-87). A study conducted in Pakistan reported a very high prevalence of about 81% (88). Among studies conducted in Africa, magnitude of 13.4% was reported in Sudan (89) while in Nigeria (90) it was found to be 24.5%. Antenatal depression levels of 21.0% - 38.5% were found in three studies conducted in South Africa (29, 91).

In Ethiopia several studies were conducted to determine burden of depression in pregnant women which showed that antenatal depression affects significant proportion of pregnant women. Studies reported antenatal depression prevalence of 11.8%to 31% in different parts of

Ethiopia (92-97). In Addis Ababa, a cross sectional study conducted in health centers reported an antenatal depression prevalence of 24.9 % (98). A recent systematic review also confirmed that depression during pregnancy is very common maternal problem. The study reported a pooled prevalence of 23.6% - 25.3% antenatal depression depending on the type of screening tool used by the studies.

Risk factors that might predispose pregnant women to depression have been reported in different studies. Two studies conducted in USA demonstrated that socioeconomic and other associated factors to be predictive of antenatal depression. The study conducted at the University of Iowa medical clinic and maternal health centers recruiting 5,000 pregnant women highlighted that significant predictors of depression as measured by Beck's depression scale (BDI) were earlier weeks of pregnancy, recruitment site, lesser years of education, low income, being unmarried, unemployment, number of miscarriages and stillbirths (99). Another study conducted in Michigan recruited 3,472 pregnant women and,in addition to socioeconomic factors like being unmarried, unemployment, and lower educational attainment; past history of depression, poorer overall health, greater alcohol use and smoking problems were found to be associated with depression during pregnancy (83).

On the other hand, another cross-sectional study from Pacific Northwest, USA acknowledged psycho-social risk factors to be associated with antenatal depression. These were found to be brief and intermittent negative mood states primarily in the first trimester, a lack of marital satisfaction and social support. Gravida was also found to be a minor, but significant, contributor of depression (100). A cohort study where 1,662 participants were recruited in USA observed a significant difference in antenatal depression in terms of ethnicity and age; where black and hispanic women were shown to have a higher prevalence of depression compared with white mothers and younger maternal age was also found to be associated with greater risk of depression (101).Suffering or having suffered violence before pregnancy was found to be a risk factor for antenatal depression in addition to educational level, plan of pregnancy and gestational age risk factors in a longitudinal study conducted in Brazil (82). Pregnancy-related physical symptoms were also found to be associated with depression in addition to aforementioned risk factors according to a study from Turkey (86).

In south Africa, a birth cohort study which used BDI-II scale of depression in 726 pregnant women came up with risk factors of being unmarried, low socio-economic status, recent stressful life events, unplanned pregnancy, trauma in childhood, and intimate partner violence (IPV) in the past year to be significantly associated with antenatal depression (91). Another study conducted in a hospital in South Africa indicated that HIV seropositivity is also another factor that increases risks of antenatal depression among other aforementioned factors (29). On the other hand a cross-sectional survey from Nigeria identified additional risk factors like attending public health facility, large family size, coexisting medical conditions and history of complication like previous caesarian section (90).

Results of studies conducted in Ethiopia also points to more or less similar risk factors. A Community based cross-sectional study in Debretabor revealed a significant association between antenatal depression and being in debt, unplanned pregnancy, history of stillbirth and abortion, being in the third trimester, complication in the current pregnancy and previous history of depression (96). Another study conducted in Gondar reported that the risk of depression for women whose age ranges between 20 to 29 years was less compared to women whose age ranges between 14 to 19 years. In terms of occupational status, being a housewife were shown to have increased risk of more than twice whilemerchant and daily laborers had increased risk to more than three times; irregularity or absence of previous ANC follow up pattern was associated with very high increased risk of antenatal depression, Adjusted odds ratio (AOR) = 11.43,95% CI:3.68,35.49 and AOR = 11.98, 95%CI:4.73,30.33 respectively and history of previous pregnancy was found to increase the risk to more than four times (94). House wife mothers were also shown to have increased risk of about four times in another study conducted in Maichew similar to pregnant women who are unmarried and women with low level of income (93).

According to a hospital based cross sectional study conducted in Adama, factors which were found to be independently correlated with antenatal depression were history of abortion, fear of pregnancy complications, unwanted pregnancy and economic problem, while marital conflict showed very strong association(92). These was in line with a study undertaken in Dubti hospital, Afar where marital conflict increased risks of antenatal depression to about six times while planning of pregnancy and social support were found to be protective (95).

Similarly a cross-sectional study Addis Ababa carried out on 393 pregnant women attending ANC service in Addis Ababa public health centers supported the role of unplanned pregnancy and lack of child's father support as a risk factor. In addition it was also demonstrated that the odds of antenatal depression in pregnant women who had previous history of depression were more than two times higher compared to those who had no history of depression (98).

2.3. Prevalence and Factors Associated with IFAS Adherence

Regardless of its established use and efforts to make the supplement available free of charge to pregnant mothers, adherence of IFAS remains to be low, as has been reported by different studies. A cross sectional household survey conducted in Pakistan reported that only 38.3% of pregnant women reported taking IFAS during their last pregnancy (102). Studies undertaken in Cambodia, Nepal and India has shown IFAS adherence to be 47%, 55.7% and 64.7% respectively (103-105).

In similar studies in Africa, low level of adherence to IFASis reported. Two cross sectional studies conducted in Kenya determined adherence rates of the pregnant women to be 18.3% and 32.7% (106, 107). Another cross sectional study in Eygpt which assessed adherence status using both self-report and pill count method reported that proportion of pregnant women who complied to IFAS were 41.1% and 36.7% based on self-report and pill count respectively (108).

According to Ethiopian national health survey, only 42% of women reported that they took IFAS during pregnancy (9). Several studies conducted in different settings in Ethiopia reported unsatisfactory level of adherence of pregnant women to IFAS. Facility based studies conducted to explore the level of adherence among pregnant women reported adherence level in ranges of 22.9 % to 70.6%(45, 109). Community based cross-sectional studies conducted on pregnant women who attend ANC service in different settings reported even lesser IFAS adherencelevels,where 18% and 20.4% were reported in Afar(44) and western Amhara (110)respectively.

Studies explored socio-demographic and economic; obstetric and medical; health care service related and personal factors that are correlated with non-adherence of pregnant women to IFAS. A study was conducted in India in high focus states (lower socio demographic and economic

status) using national family health household survey where data of 11,085 recently delivered women were included. Whether or not the women consumed at least 90 IFAS tablets during their pregnancy was measured. Accordingly, factors that were found to be significantly associated with adherence were identified, where more educated women are four times more likely to adhere; while women with birth order below two, women whose husbands are present during ANC visits and women with high socioeconomic status are two times more likely to consume 90 days supplement. Also, women who had any mass media exposure had 34% increased adherence(111).

According to a cross sectional household survey where 6,266 women were interviewed in 14 districts across Pakistan; women who are aged 45 years and above, who has no education, whose husband had no education, who belong to the lowest household wealth index quartile, and who did not utilize ANC services (AOR: 13.39, $p < 0.001$) during their last pregnancy were significantly associated with the non-use of IFAS (102).In Cambodia, a research has been undertaken in two provinces to identify determinants and reasons for non-adherence as well. Inadequate number of tablets received, lower number of ANC visitsand poor access (distance) to ANC services were found to be statistically significant predictors of non-adherence. While the reasons identified for noncompliance were lack of information, difficulty of access to ANC and insufficient support from their families(112).

A result of a cross-sectional study conducted in Kenya which assessed adherence to IFAS taken in the previous 7 days reported that pregnant women with high knowledge about IFAS, who are primigravid and those who are counseled on management of IFAS side effects were found to adhere more (107).A cross-sectional study undertaken in Khartoum Hospital which recruited 856 pregnant women identified factors associated with adherence of IFAS and also folic acid supplement alone. Accordingly, elder age and use of ANC significantly increased IFAS adherence while primiparity, maternal employment and use of antenatal care associated with increased adherence of folic acid supplement (113).A study from a community- based cross- sectional survey of pregnant women in Niger found only husbands' advice about attending ANC to be significantly associated with adhere to IFAS(114).

A number of risk factors have been found to be associated with IFAS adherence in studies conducted in Ethiopia.In a cross sectional and qualitative study conducted in Mizan-Aman Town; factors that were found to be a risk factor for non-adherence were early registration to ANC, having any medical illness during pregnancy, experiencing side effect from taking IFAS and irregular intake of IFAS in the previous month. In contrast pregnant women who received strong advice on benefits of IFAS, who had satisfactory knowledge on anemia and who had better family encouragement adhered more. On the other side, the most prevailing reason for better adherence were clinician counseling, believing that IFAS increase their blood volume and fear of illness. While the reason for non-adherence were mostly side effect, forgetfulness and insufficient tablets prescribed by health professionals. The most cited side effects were gastritis, nausea, vomiting and heartburn (45).

Another facility based cross sectional study which sampled 450 pregnant women in Assaita Districts, Afar came up with similar findings where early registration, nutrition counseling and family support were significantly associated with better adherence; whereas rural residency was found to be a risk factor for non-adherence (109). Similar findings were reported in two community based cross-sectional studies conducted in Goba(44)and Misha district (115)where knowledge on anemia, knowledge on benefit of IFAS and receiving health education on IFAS were significantly associated with IFAS adherence and the first study found educational status of mother to be associated in addition. The latter, further explored reasons for non-adherence qualitatively and found that the most notable reasons were fear of side effects and forgetfulness.In line with these, a study conducted in Eritrean refugee camps, northern Ethiopia similarly found that lower knowledge about anemia and not obtaining information on the importance of IFAS were risk factors for IFAS adherence while attending four or more ANC visits was associated with increased adherence(116).

Socio-demographic and economic factors were also found to be associated with IFAS adherence. A study undertaken in Addis Ababa used hierarchical negative binomial Poisson regression to identify factors associated with the incidence of taking more number of IFAS. The incidence were higher in women who reached secondary education; who were private employees; who received health education and those who thought IFAS increases blood; while it was lower in women who reported any side effect, who had lower monthly income and who took the

supplement when they were sick (117).Another study in university of Gondar hospital found that women who reside in urban area, who are married, who have greater than four children, who started ANC early, who are facing anemia in current pregnancy and those who collected lesser number of tablets per visit adhered significantly more compared to their counterparts (118).

Studies from Mecha district and Hosanna town shown that knowledge of anemia and IFAS are among factors that increase adherence while the study in Macha additionally reported that lower age, illiteracy and history of anemia are also significantly associated with non-adherence (110)while in the later study, contrarily older age was found to be significantly linked to non-adherence along with lower income, current anemia and religion (119).

2.4. Association of Anemia and Depression

Some studies have attempted to explore the relationship between anemia and mental health state of patients including depression. A study which used 12 years data of national health insurance database of Taiwan to compare risk of psychiatric disorders in children and adolescents with diagnosis of iron deficiency anemia (IDA) and matched controls found that participants with IDA are at increased risk of depression and other psychiatric conditions (19). Another web based study in Japan which assessed association of anemia with psychological distress measured using Kessler scale using a data of 1,000 individuals, reported that self-reported life time history of IDA was found to be associated with self-reported history of depression (20).

In a cross sectional study conducted in Turkey, the frequency of anemia in treatment receiving psychiatric patients was found to be high in the majority of the psychiatric patients including depressive disorder patients (21). Another cross-sectional study conducted among women diagnosed with major depressive disorder reported that mean depression score was higher in patients with anemia however, between group difference of patients with and without anemia was not found to be statistically significant. Irrespective of this, the relationships between different levels of depression and levels of Hemoglobin showed a significant negative correlation (22).

A facility based cross-sectional study in Turkey compared the relationship between anemia and depressive mood in the last trimester of pregnancy. It was found that depression score was

significantly higher in women who are anemic. Hemoglobin level was found to be correlated with severity of depression and it was also shown that serum hemoglobin level was an independent risk factor for depression (23).

The association was also found to hold true in studies a conducted postpartum. A recent literature review summarized available studies that assessed the effect of anemia, iron-deficiency and iron supplementation on risk to postpartum depression. Anemic women were found to be at higher risk for postpartum depression in eight out of ten studies (r -0.19 to -0.43 and ORs 1.70–4.64). Lower level of ferritin in postpartum period was found to be linked to increased risk of postpartum depression. It was also found that, in four out of five studies iron supplementation in the postpartum period decreased the risk of postpartum depression (120).

A population based prospective study in rural Viet Nam didn't find a direct association related to the effect of IDA on mental health during pregnancy. Instead they observed that common mental disorder (CMD) affects IDA via reducing the likelihood that a woman will take the essential iron supplements needed (24).

2.5. Effects of depression on adherence to prescribed medications

Adherence to treatment recommendations in different disease conditions has been an interest of scientific studies. Medication adherence is becoming a concern especially in situations where patients without symptoms are required to take treatment regimens to prevent later complications. It was also seen that seriousness of the disease condition under treatment does not ensure medication adherence (121). Different studies have examined the association between adherences of treatment recommendations and depression.

A meta-analysis reviewed and synthesized 12 researches that studied the effect of anxiety and depression on adherence to medical treatment. The effect of depression was found to be significant and that depression was overall associated with three-fold increase with non-adherence (122).

Impact of depression on adherence to prescribed medications has been studied well in other disease conditions such as in HIV, Diabetes and Hypertension. A study which used cross-

sectional and longitudinal study design to examine depression and its severity in relation to adherence to HIV antiretroviral therapy found that depression was associated with lower adherence and longitudinal reduction of depression predicted increase in adherence (49). Results from another study also found that missed doses of antiretroviral therapy was associated with twice the odds of having a major depression (46).Another study similarly revealed about a threefold increase in non-adherence in those who have moderate to severe symptoms of depression (48). An article which reviewed available literature on impact of different mental health problems on adherence toantiretroviral therapy reported that among others depression is recognized to play an important role in influencing adherence. Severity of depression was also found to be inversely related to adherence (47).

Impact of depression was also explored in diabetes patients. A study which examined the effect of depression in diabetes primary care patients found that high severity scores of depression was significantly linked to high percentage of non-adherence to oral hypoglycemic agents (51). Another study which recruited 1,326 newly diagnosed patients with type 2 diabetes isolated depression as a significant independent predictor of adherence to oral hypoglycemic regimens (53). Depression was shown to be linked to a two to three fold increase in odds of missing medication doses in the previous week in another study (50). Relationship of depression with adherence to different medications was assessed in patients who are diabetic to find that depressed patients were significantly less adherent to oral hypoglycemic, antihypertensive and lipid-lowering medications differentially after adjusting for covariates (52).

Another studied area is in relation to hypertensive medication adherence. A longitudinal cohort study in patients on antihypertensive drug treatment followed participant's severity of symptoms of depression and anxiety with level of adherence to antihypertensive drug treatment and found that individuals with at least mild depression were 2.48 more likely to become non-adherent in the subsequent 3 months (123). A systematic review which assessed the association of depression with adherence to antihypertensive medications showed that among the studies reviewed, a study which comprised of 95% of all patients included in the review reported that depressed patients were significantly less adherent. The other studies included reported varying results within and across studies in terms of significant relationships (124).

Fisher et al., conducted two studies in Vietnam to assess the association of CMD with adherence to iron and iodized salt supplements in pregnant women. The first study which aimed to assess prevalence and correlates of CMD showed that compared to women who did not have CMD, lower percentage of women who had CMD had adherence to Iron and Iodine supplements though not found to be significant. However, in the later study adherence to Iodized salt supplement was found to be significantly lower in pregnant women who had CMD (125, 126).

A study in Zimbabwe recruited 1760 pregnant women in a trial and investigated the role of depression; perceived social support and perceived physical health on IFAS adherence. They found that antenatal depression and social support were significantly associated with adherence to IFAS (57).

A study which investigated depression as a risk factor for non-compliance with medical treatments put three possible reasons as to why depression might influence adherence to prescribed medications. It was postulated that a substantial degree of hopelessness encountered by depressed patients allows them hold little optimism that the action will be worthwhile, which makes adherence to medication difficult. Depression is also often characterized by social isolation which disconnects from family and social emotional support and assistance which otherwise would have been a positive input to better adherence according to researches. It is again suggested that depression is linked to reductions in the cognitive focus essential to remembering and following through treatment regimens (122).

2.6. Conceptual Framework

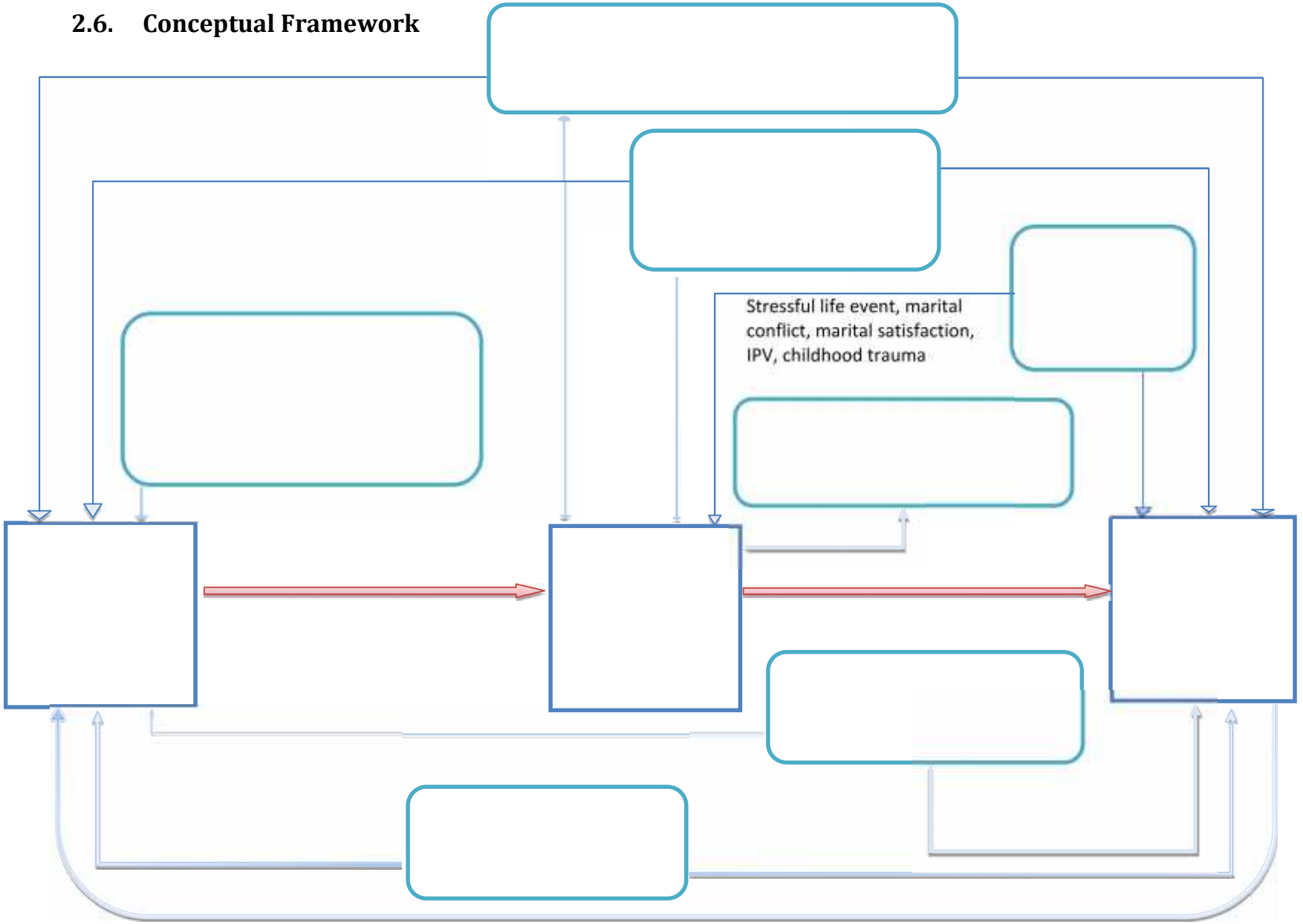

Figure 1: Conceptual frame work for the relationship between antenatal depression with anemia and its treatment (Developed from different literature)

3. OBJECTIVES

3.1. General Objective

To assess the association of antenatal depression with anemia and adherence to IFAS among pregnant women attending ANC at selected health centers in Yeka sub-city, Addis Ababa in 2019.

3.2. Specific objectives

- To examine the relationship between anemia and depression among pregnant women attending ANC at selected health centers in Yeka sub-city, Addis Ababa in 2019

- To investigate the association between antenatal depression and IFAS adherence among ANC attendee pregnant women at selected health centers in Yeka sub-city, Addis Ababa in 2019

4. METHODS

4.1. Study design

A facility-based cross-sectional study design was used to assess the association of depression with anemia status and IFAS adherence among ANC attendee pregnant women.

4.2. Study Setting

The study was undertaken in health centers located in Yeka sub-city, Addis Ababastarting from March 2019 up to May 2019. Addis Ababa has an estimated area of 530 square kilometers. There are 101 health centers in Addis Ababa distributed into the ten sub-cities. The total numbers of health centers in Yeka sub-city count to be 15. Among these, this study encompassed eight health centers.Yeka sub-city has an estimated total population of 454,850. Among these, women in reproductive age accounted for about 146,780 of the population in the study year. The total estimated pregnant women in the catchment area, expected to attend ANC service in the year of 2011EC,were about 12,730 women. Basic components of ANC services provided at public health facilities include antenatal assessments and checkups including hemoglobin level, hepatitis, HIV, blood pressure, nutritional assessments (like BMI and MUAC), and tetanus toxoid injections. IFAS isprovided for three months free of charge as part of the ANC package, which is also provided free of charge.

4.3. Population

4.3.1. Source Population

The source population of the study wasall pregnant women who come for ANC visit at health centers in Yeka sub-cityin Addis Ababa, Ethiopia.

4.3.2. Study Population

The study population were all pregnant women who attend ANC visit at selected health centers for their second visit of regular ANC tetanus injection follow up who met the eligibility criteria.

4.3.3. Eligibility Criteria

Pregnant women who were included in the study were those who were greater than 18 years of age; who stayed in ANC for one-monthduring data collection time point and who receivedIFAS. Pregnant women who took bottled supplementswere not included in the study.

4.4. Sample Size Determination

For the first and second objectives

The sample size was calculated using a formula of proportion for two populations considering 95% Confidence leveland 80% statistical power with the following further assumptions:

For the first objective: a 25% prevalence of antenatal depression(98) in the general (non-anemic) pregnant population; 15% difference in depression among anemic and non-anemic pregnant women and considering a 10% non-response rate yielded a sample size of 363 pregnant mothers.

For the second objective: the magnitude of IFAS adherence of 60%(117); 15% decrement in IFAS adherence among depressed pregnant women compared to non-depressed women and a 10% non-response rate. The required sample size was 410 pregnant mothers.

Accordingly, as the second objective yielded the greatest sample size, a total of 410 pregnant women were planned to be recruited in the study.

4.5. Sampling procedures

Eight health centers were selected randomly taking a list of all the health centers in Yeka sub-city as a sampling frame. Study participants were selected sequentially based on the schedule of appointments. Pregnant women who came a month later for tetanus imjectionafter their first visit of ANCduring the study period and volunteered for participation were included in the study.

4.6. Data collection tools and procedures

Data were collected from selected health centers in Yeka sub-city. Data related to socio-demographic and economic factors,obstetric and medical factors, ANC service utilization,

depressive symptoms, and psychosocial factors were collected usingan interviewer administered questionnaire prepared after an extensive review of studies. Data like hemoglobin (hematocrit) level of the pregnant women and other relevant recorded variables were collected from ANC record of the participants. Schedule of tetanus vaccination appointment which is a month after the first ANC visit was used for data collection time frame. Participants were called prior to the appointment date of their tetanus vaccination and were asked to bring their IFAS strip with the remaining supplement along with a reminder for their vaccination. IFAS Adherence was measured using the pill count method.

Patient Health Questionnaire (PHQ-9) was used to measure depression among pregnant women. PHQ-9 is an instrument designed to screen and measure the severity of depression which is based on criteria set by the Diagnostic and Statistical Manual of mental disorders IV (DSM IV), an international standard classification for mental disorders(127). It is a 9-item tool which in each item rates frequency of depression present in the previous two weeks ranging from 0 to 3. The total score spans from 0 to 27. The PHQ-9 was found to be a reliable and valid instrument to measure depressive disorder in different settings and in pregnant women as well, with a sensitivity and specificity of greater than 80% (128-130).

In Ethiopia, PHQ-9 was validated at antenatal care clinics of health centers in Butajira for detecting depression during pregnancy. Accordingly, in the primary care setting, PHQ-9 was found to have a sensitivity and specificity of 86.7% and 80.4% respectively. The instrument showed excellent performance (area under the receiver operating characteristic curve (ROC), 0.91) and good internal consistency (α ,0.74) as well(131). Similarly, another study conducted in a major referral hospitals among adults came up with a finding that PHQ-9 at a higher score, (cutoff, 10) showed optimal screening reliability and validity with respect to diagnosis of major depressive disorder(132). Accordingly, PHQ-9 value of 5 or more was taken to screen presence of antenatal depression, as has been validated in pregnant women in Ethiopia(131). AndPHQ-9 cut-off value of 10 or more was used for major depression which is also validated in Ethiopian population(132).

4.7. Study variables

For the first objective:

Dependent variable;

- ✓ Antenatal depression, measured using the PHQ-9 instrument.

Independent variable of interest;

- ✓ Anemia during pregnancy, measured using hemoglobin (hematocrit) level

For the second objective:

Dependent variable

- ✓ Non-Adherence to IFAS, measured using the pill count method

Independent variable of interest;

- ✓ Antenatal Depression

Potential confounding variables

In addition to the dependent and independent variables of interest, variables which might act as a confounder weremeasured. These included:

Socio-demographic and economic factors: among socio-demographic and economic factors literature indicate that educational status of the women and economic status acts as an independent determinant of the relationship between both anemia and antenatal depression; and antenatal depression and adherence to IFAS. Data on the formal educational level of the women was collected. The socioeconomic factor was measured as the income level of the women, family income, financial hardship to cover basic expenses and indebtedness at the time of interview. Data on age of the women (measured in years) and marital status were also be collected as it may also be a potential confounding variable.

Obstetric factors: gravidity and parity may also act as a confounder in the association between all the dependent and independent variable of interest. Accordingly, data werecollected on a number of previous pregnancies and the total number of children. In the potential association of anemia and antenatal depression, gestation age is a potential confounder. Litrature also indicate that, gestational age reflected as time of initiation of ANC visit affects IFAS adherence status,thus data on gestational age of the pregnant women was gathered.

Psychosocial factors: social support associates with both depression and IFAS adherence, thus data on the perceived presence of adequate support from husband intimate partner(IP)and family or friend/neighbor was collected.

4.8. Operational Definitions

Antenatal depression: pregnant women who score value of 5 or more on PHQ-9 scale were taken to have antenatal depression and those who scored 10 or more were taken as having major depression.

Adherence to IFAS: pregnant women were considered adherent to IFAS when she takes the supplement at least 20 days in a month (equivalent to at least five days supplement per week)(57).

Anemia: pregnant women with a hemoglobin level of less than 11 g/dl or a hematocrit level of less than 33% were considered anemic(133).

4.9. Data analysis procedures

Data were coded, entered and cleaned using Epi data (version 4.4.2.1). The data was then exported to Statistical Packages for Social Sciences (SPSS) (version 22) for statistical analysis. Descriptive summary was conducted for describing characteristics of study participants for relevant study variables.

Socio-demographic and economic factors were categorized and recoded according to the following. Educational status as ‘No formal education’ (Illiterate, literate but no formal education), ‘Primary school’ (grade 1-8), ‘Secondary school’ (grade 9-12) and ‘Higher

education' (some college or technical school, diploma, BSc/ BA, MSc/MA and above) categories. Encounter of financial hardship to cover basic expenses was categorized as 'Yes' (Rarely, sometimes, often) and 'No' (Never).

Pregnant mothers who have never heard of anemia, and those who answered 'I don't know' for the consequence of anemia, methods of prevention/treatment and uses of IFAS were categorized as 'No'- knowledge; while those who answered 'nutrition' or 'iron/vitamin intake' for the anemia prevention; 'effect on the fetus' or 'effect on the mother' for consequence of anemia; and 'to prevent/treat anemia' or 'for fetal development' for the uses of IFAS were categorized to have knowledge or 'Yes'. Pregnant mothers who mentioned 'Other' items were categorized manually based on their answer.

Marital/spousal conflict was categorized as 'Yes' for those who responded 'Sometimes', 'Often' and 'Almost always', where as those who responded 'Never' were categorized as 'No' – marital/spousal conflict. Similar method of classifications were employed for emotional, physical and sexual abuse on the pregnant mothers by partner/husband.

Bivariate logistic regression was used to examine the unadjusted association of antenatal depression with anemia status and IFAS adherence. Other possible predictor variables were also tested for significant association with the outcome variable. Whether significantly associated explanatory variables remained to be independent predictors was examined using multivariable logistic regression.

4.10. Data quality management

The questionnaire was prepared carefully to ensure that it will answer all the objectives of the study. The questionnaire which was originally prepared in English was translated into Amharic. The Amharic version was thenback-translated to English to ensure meaning consistency. The questionnaire was also pre-tested in the study population prior to the collection of actual data. A valid tool (for antenatal depression) and an objective measure (for IFAS adherence) was used to measure outcome variables. Data collectors were facility health care professionals (clinical nurse, midwives,and health officers). The data collectors and supervisors were trained on the techniques of the interview using the questionnaire prior to the start of data collection. Two data

supervisorsmonitoredthe quality of the filled questionnaires. Regular supervision and resolution of data queries wereongoing throughout the data collection period.

4.11. Ethical Considerations

Ethical approval was obtained from the research ethics committee of the School of Public Health and Institutional Review Board of the College of Health Science, Addis Ababa University. An approval and permission letter were obtained from Addis Ababa Health Bureau. Written informed consent was sought from all study participants. Confidentiality was maintained using codes instead of personal identifiers. Participants who were found to have moderately severe antenatal depression were counseled and those who have severe depression and suicidal ideation were linked to mental health care service at the facility.

4.12. Dissemination of Results

The result of the study will be presented to the School of Public Health, College of Health Sciences, Addis Ababa University, as partial fulfillment of Master's Degree in General Public Health. It will be communicated to Addis Ababa health bureau, Ministry of Health and other concerned organizations. An attempt will be made to share through publication in a peer-reviewed journal.

5. RESULTS

The result of the study is presented under three sub-sections; i) General characteristics of study participants ii) association between anemia and antenatal depression iii) association between antenatal depression and IFAS adherence.

5.1. Characteristics of study participants

5.1.1. Socio-demographic and economic characteristics

A total of 410 pregnant mothers were invited to participate in the study, out of which 406 were voluntary and met the eligibility criteria.The mean age (±SD) of the study participants was 25.92(± 4.43) years.More than half of the respondents 229 (56.7%) were in the agegroup of 25-34 years.The participants were predominantly 376 (92.8%)married. Nearly10%of respondents had no formal education, while40%and about one-third (33.5%) were at primary and secondary education level respectively. Those who attended higher education accounted for16.7% of the participants. More than half of the respondents 213 (52.5%) were housewives.

Related to the socio-economic status of the participants, about one-fifth (20.9%) of the participants had a monthly household income below 2000 birr. Financial hardship is encountered by 34.3% of the respondents while 4.7% were in debt at the time of interview.

Table 1- Sociodemographic and economic characteristics of pregnant mother participants attending ANC service at Yeka sub-city, Addis Ababa, 2019.

Characteristics	Number (N)	Percent (%)
Age		
15-24	154	38.1
25-34	229	56.7
35-49	21	5.2
Educational Status		
No formal education	40	9.9
Primary school	162	39.9
Secondary school	136	33.5
Higher education	68	16.7
Occupational status		
Housewife	213	52.5

Government/employee	37	9.1
Private employee	122	30.0
Unemployed	13	3.2
Other (Trade/merchant, daily laborer)	21	5.2
Marital status		
Never Married	29	7.2
Married / Living together	376	92.8
Family size		
Two	201	50.4
Three	96	24.1
Four	60	15.0
≥ Five	42	10.5
Monthly household income (birr)		
≤ 2000	83	20.9
2001- 4000	130	32.7
4001-6000	93	23.4
>6001	91	22.9
Financial hardship		
No	266	65.7
Yes	139	34.3
Debt		
No	386	95.3
Yes	19	4.7

5.1.2. Obstetric and medical characteristics

Gestational age of participants measured in weeks indicated that 279 coded, entered and 9.4%) are in their second trimester.Negative pregnancy outcomes (miscarriage/abortion/stillbirth) have been previously encountered by 88 (21.7%) of the respondents once or more times.For nearly half of the pregnant mothers (48.5%) the pregnancy was their first. Similarly, more than half 236 (58.1%) have no previous child.Among those who had previous pregnancies, 20 (11.8%) of the participants had a history of pregnancy complications. Pregnancy complications have been experienced by 32 (7.9%) during their current pregnancy.The pregnancy was not planned by 13.1% of the respondents.38 (9.4%) of the participants were found to be anemic, of whom 5.4% were mild and 4% were moderate.

Table 2-Obstetric and medical characteristics of pregnant mother participants attending ANC service at Yeka sub-city, Addis Ababa, 2019.

Characteristics	Number (N)	Percent (%)
Gestational age (week)		
1 - 12	95	23.6
13 - 28	279	69.4
29 - 40	28	7.0
Miscarriage/abortion/stillbirth		
None	318	78.3
Once	66	16.3
Twice or more	22	5.4
Gravidity		
First pregnancy	197	48.5
One	87	21.4
Two	70	17.2
Three or more	52	12.8
Parity		
Primiparous	236	58.1
One	92	22.7
Two	44	10.8
Three or more	34	8.4
History of pregnancy complication		
No	149	88.2
Yes	20	11.8
Current pregnancy complication		
No	373	92.1
Yes	32	7.9
Current pregnancy planned?		
No	53	13.1
Yes	353	86.9
Medical or chronic illnesses		
No	393	97.3
Yes	11	2.7
Anemia (severity)		
Non-anemic	365	90.6
Mild	22	5.4
Moderate	16	4.0
Severe	0	0

5.1.3. Psychosocial characteristics

Among study participants, 93 (22.9%) were found to have antenatal depressive symptoms. The severity of depression ranged from mild (6.4%), moderate (9.4%), moderately severe (4.9%) and severe (2.2%). In terms of social support perceived by the mothers, 24 (5.9%) perceived no support from their husband or IP. Social support from family or friends was perceived to be absent in 139 (34.5%) of the participants.4.7% of the respondents had a history of depression. None of the study participants were found to be smoking cigarette, however,3.9% drink alcohol and only two participants consume khat.34 (8.5%) of the participants reported their overall satisfaction of their marriage to be not good. Domestic violence in terms of emotional abuse was reported by 9.2% of the participants, whereas 3.0% and 3.2% of the respondents reported physical and sexual abuse respectively.

Table 3- Psychosocial and depressive symptom characteristicsof pregnant mother participants attending ANC service at Yeka sub-city, Addis Ababa, 2019.

Characteristics	Number (N)	Percent (%)
Depression		
None	313	77.1
Mild	26	6.4
Moderate	38	9.4
Moderately severe	20	4.9
Severe	9	2.2
Social support (husband/IP)		
No	24	5.9
Yes	382	94.1
Social support (Family/friends)		
No	139	34.5
Yes	264	65.5
Marital/Spousal conflict		
Yes	328	81.4
No	75	18.6
History of depression		
No	372	92.5
Yes	19	4.7
I don't know	11	2.7
Alcohol		
No	390	96.1

Yes	16	3.9
Khat		
No	404	99.5
Yes	2	0.5
Smoke		
No	405	100.0
Marital/Spousal satisfaction		
Not good	34	8.5
Neutral	30	7.5
Good	338	84.1
Past year stressful negative life events		
No	345	85.0
Yes	61	15.0
Emotional abuse		
No	367	90.8
Yes	37	9.2
Physical abuse		
No	393	97.0
Yes	12	3.0
Sexual abuse		
No	392	96.8
Yes	13	3.2

5.1.4. ANC service utilization characteristics

Almost one-third (32.1%)of participants started ANC after 16 weeks of their gestation. The magnitude of pregnant mothers, who were counseled about IFAS,was less than half 169 (42.1%). More than a quarter of pregnant mothers do not have knowledge of prevention of anemia (29.4%) and knowledge of IFAS use (28.3%) while 44.8% do not have knowledge of the effect of anemia.

Table 4- ANC service utilization characteristics of pregnant mother participants attending ANC service at Yeka sub-city, Addis Ababa, 2019.

ANC Service Utilization	Number (N)	Percent (%)
Time of ANC registration		
≤ 16 weeks	273	67.9
> 16 weeks	129	32.1

Nutritional counseling		
No	217	54.4
Yes	182	45.6
IFAS counseling		
No	169	42.1
Yes	232	57.9
Knowledge of effect of anemia		
No	182	44.8
Yes	224	55.2
Knowledge of prevention of anemia		
No	118	29.4
Yes	284	70.6
Knowledge of IFAS use		
No	115	28.3
Yes	291	71.7

5.2. Association between anemia and antenatal depression

5.2.1. Result of Bivariate Analysis

A bivariableanalysis which was undertaken to assess the association of anemia and other possible predicting variables with antenatal depression is presented in Table 5-7.Accordingly, among socio-demographic and economic factors, financial hardship and being in debt were significantly associated with antenatal depression (P<0.05). Pregnant mothers who face financial hardship to cover their basic expenses were more than two times [COR=2.18; 95% CI (1.24, 3.81)] more likely to have antenatal depression compared to others who don't have difficulty covering their expenses. Similarly, those who were in debt at the time of interview were at more than three times increased odds of being depressed [COR=3.24; 95% CI (1.27, 8.22)].

Obstetric factors that were found to be significantly associated with antenatal depression were presence of current pregnancy complication and whether the pregnancy was planned in which cases increased chance tomore than two times [COR=2.41; 95% CI (1.30, 4.45)] and

[COR=2.28; 95% CI (1.07, 4.84)], respectively. The bivariate analysis also revealed a significant association between anemia and antenatal depression. Pregnant mothers who were anemic were more than two times more likely to develop antenatal depression [COR=2.22; 95% CI (1.10, 4.49)].

Among psychosocial factors, perceived lack of support from husband or IP was significantly associated with antenatal depression [COR=3.10; 95% CI (1.34, 7.17)]. Pregnant mothers who had a history of depression havefour times [COR=4.06; 95% CI (1.59, 10.32)] higherlevel of depression during pregnancy compared to mothers who didn't report previous depression.Mothers who face emotional abuse from husband or IP were also more than four times more likely to have antenatal depression compared to mothers who don't face such violence [COR=4.25; 95% CI(2.12, 8.51)]. Marital/spousal conflict was significantly associated with nearly three times [COR=2.86; 95% CI (1.67, 4.90)] increased risk of antenatal depression.

5.2.2. Result of Multivariable Analysis

Analysis in the multi-variable regression model included all variables in the bivariate logistic regression with p< 0.2.Accordingly, a total of thirteen variables namely marital status, financial hardship, debt, gestational age, miscarriage/abortion/stillbirth, current complication, pregnancy plan, marital/spousal conflict, marital/spousal satisfaction, depression history, social support (husband/IP), emotional abuse and anemia status were analyzed in the final multivariable logistic regression. An adjusted odd of variables at P<0.05 is displayed in the table below (Table 5-7).

After controlling the effect of other predictor variables, the multivariable logistic regressionanalysis showed a statistically significant association between anemia and antenatal depression. The odds of being depressed during pregnancy was 2.6 times higher among pregnant mothers who were anemic compared to non-anemic pregnant mothers [AOR=2.63; 95% CI(1.13, 6.14)].

Variables, financial hardship, pregnancy plan, and emotional abuse also remained to be significant predictors. Pregnant mothers who reported having financial hardship to cover their basic expenses has 2.5 higher odds [AOR=2.50; 95% CI(1.42, 4.38)] of antenatal depression than pregnant mothers who have no such hardship. The odds of depression during pregnancy among

those who didn't plan their pregnancy was significantly higher than those who have planned pregnancy [AOR=2.28;95%CI (1.07, 4.84)]. Emotional abuse by a husband or IP increased the odds of depression [AOR=3.01; 95% CI (1.16, 7.82)].

Table 5- Association of socio-demographic and economic variables with antenatal depression among pregnant mother participants attending ANC service at Yeka sub-city, Addis Ababa, 2019.

Variables	Antenatal depression		COR (95% CI)	AOR (95% CI)
	No N (%)	Yes N (%)		
Age				
15-24	119 (77.3)	35 (22.7)	1.77 (0.49, 6.34)	
25-34	174 (76.0)	55 (24.0)	1.88 (0.54, 6.68)	
35-49	18(85.7)	3 (14.3)	1	
Educational Status				
No formal education	32 (80.0)	8 (20.0)	0.69 (0.27, 1.78)	
Primary school	124 (76.5)	38 (23.5)	0.85 (0.44, 1.63)	
Secondary school	107 (78.7)	29 (21.3)	0.75 (0.38, 1.48)	
Higher education	50 (73.5)	18 (26.5)	1	
Occupational status				
House wife	162 (76.1)	51 (23.9)	1	
Government/employee	26 (70.3)	11 (29.7)	1.34 (0.62, 2.91)	
Private employee	99 (81.1)	23 (18.9)	0.74 (0.43, 1.28)	
Unemployed	9 (69.2)	4 (30.8)	1.41 (0.42, 4.78)	
Other	17 (81.0)	4 (19.0)	0.75 (0.24, 2.32)	
Marital status				
Never Married	19(65.5)	10(34.5)	1.86 (0.83, 4.15)	1.65 (0.58, 4.72)
Married/Living together	293(77.9)	83(22.1)	1	1
Family size				
Two	156(77.6)	45(22.4)	1	
Three	72(75.0)	24(25.0)	1.16 (0.65, 2.04)	
Four	47(78.3)	13(21.7)	0.96 (0.48, 1.93)	
≥ Five	36(85.7)	6(14.3)	0.58 (0.23, 1.46)	
Monthly household income				
≤ 2000	63(75.9)	20(24.1)	0.94 (0.47, 1.87)	
2001- 4000	102(78.5)	28(21.5)	0.81 (0.43, 1.53)	
4001-6000	74(79.6)	19(20.4)	0.76 (0.38, 1.52)	
>6000	68(74.7)	23(25.3)	1	

Financial hardship				
No	222(84.1)	42(15.9)	1	1
Yes	91(64.5)	50(35.5)	2.66 (1.65, 4.29) *	2.18 (1.24, 3.81) *
Debt				
No	302(78.2)	84(21.8)	1	1
Yes	10(52.6)	9(47.4)	3.24 (1.27, 8.22) *	1.66 (0.49, 5.66)

Table 6- Association ofobstetric and medical variables with antenatal depression among pregnant mother participants attending ANC service at Yeka sub-city, Addis Ababa, 2019.

Variables	**Antenatal depression**		**COR (95% CI)**	**AOR (95% CI)**
	No N (%)	**Yes N (%)**		
Gestational age (week)				
1 - 12	67(70.5)	28(29.5)	1	1
13 - 28	221(79.2)	58(20.8)	0.63 (0.37, 1.06)	0.59 (0.32, 1.10)
29 - 40	23(82.1)	5(17.9)	0.52 (0.18, 1.51)	0.69 (0.21, 2.25)
Miscarriage/abortion/still birth				
None	252(79.2)	66(20.8)	1	1
Once	45(68.2)	21(31.8)	1.78 (0.99, 3.20)	1.64 (0.83, 3.25)
Twice or more	16(72.7)	6(27.3)	1.43 (0.54, 3.80)	0.92 (0.28, 2.97)
Gravidity				
First pregnancy	152(77.2)	45(22.8)	1	
One	68(78.2)	19(21.8)	0.94 (0.51, 1.73)	
Two	50(71.4)	20(28.6)	1.35 (0.73, 2.50)	
Three or more	43(82.7)	9(17.3)	0.71 (0.32, 1.56)	
History of pregnancy complication				
No	120(79.2)	39(20.8)	1	
Yes	15(70.0)	11(30.0)	1.63 (0.58, 4.59)	
Current pregnancy complication				
No	293(78.6)	80(21.4)	1	1
Yes	20(62.5)	12(37.5)	2.20 (1.03, 4.69)*	1.57 (0.60, 4.12)
Current pregnancy planned?				
No	32(61.5)	20(38.5)	2.41 (1.30, 4.45)*	2.28 (1.07, 4.84) *
Yes	281(79.4)	73(20.6)	1	1

Medical or chronic illnesses				
No	304(77.4)	89(22.6)	1	
Yes	8(72.7)	3(27.3)	1.28 (0.33, 4.93)	
HIV				
No	308(77.6)	89(22.4)	1	
Yes	4(57.1)	3(42.9)	2.69 (0.57, 11.81)	
Anemia				
Non-anemic	289 (79.2)	76 (20.8)	1	1
Anemic	24 (63.2)	14 (36.8)	2.22 (1.10, 4.49) *	2.63 (1.13, 6.14) *

Table 7- Associationbetween psychosocial variables and antenatal depression among pregnant mother participants attending ANC service at Yeka sub-city, Addis Ababa, 2019.

Variables	**Antenatal depression**		**COR (95% CI)**	**AOR (95% CI)**
	No N (%)	**Yes N (%)**		
Social support (husband/IP)				
No	13(54.2)	11(45.8)	3.10 (1.34, 7.17) *	2.40(0.85, 6.77)
Yes	300(78.5)	82(21.5)	1	1
Social support (Family/friends)				
No	111(79.9)	28(20.1)	0.81 (0.49, 1.33)	
Yes	201(76.1)	63(23.9)	1	
Spousal conflict				
No	266(81.1)	62(18.9)	1	1
Yes	45(60.0)	30(40.0)	2.86 (1.67, 4.90) *	1.57 (0.73, 3.37)
History of depression				
No	292(78.5)	80(21.5)	1	1
Yes	9(47.4)	10(52.6)	4.06 (1.59,10.32)*	2.59 (0.80, 8.40)
I don't know	9(81.8)	2(18.2)	0.81 (0.17, 3.83)	0.56 (0.06, 5.07)
Alcohol				
No	302(77.4)	88(22.6)	1	
Yes	11(68.8)	5(31.3)	1.56 (0.53, 4.61)	
Spousal satisfaction				
Not good	22(64.7)	12(35.3)	2.02 (0.95, 4.26)	1.29 (0.50, 3.28)
Neutral	23(76.7)	7(23.3)	1.13 (0.46, 2.73)	0.79 (0.28, 2.26)

Good	266(78.7)	72(21.3)	1	1
Past year stressful negative life events				
No	271(78.6)	74(21.4)	1	
Yes	42(68.9)	19(31.1)	1.66 (0.91, 3.02)	
Emotional abuse				
No	294(80.3)	72(19.7)	1	1
Yes	18(47.4)	20(52.6)	4.25 (2.12, 8.51) *	3.01 (1.16, 7.82)*
Physical abuse				
No	304(77.4)	89(22.6)	1	
Yes	9(75.0)	3(25.0)	1.14 (0.30, 4.30)	
Sexual abuse				
No	304(77.6)	88(22.4)	1	
Yes	9(69.2)	4(30.8)	1.54 (0.46, 5.11)	

5.3. Association between antenatal depression and IFAS adherence

5.3.1. Result of Bivariate Analysis

Socio-demographic and economic, medical and obstetric, psychosocial and health service utilization factors were tested for association with IFAS adherence. The factor that was found to be significantly associated among socio-demographic factors is marital status. The odds of non-adherence among pregnant women who were not married was 2.6 times higher than those who were married [COR=2.65; 95% CI (1.23, 5.72)].

As shownin Table 8-11, other significant factors that were found to be associated with adherence to IFAS at a P-value less than 0.05 comprised of parity, time of ANC initiation, counseling about IFAS, knowledge of IFAS and major antenatal depression (PHQ-9≥10). Pregnant women who had more than two children were at increased odds of non-adherence by 2.8 times compared to those who have no child [COR=2.77; 95% CI (1.34, 5.76)]. Pregnant mothers who initiate ANC after 16 weeks of their pregnancy were 1.56 times more likely not to adhere to IFAS [COR=1.56; 95% CI (1.01, 2.39)]compared to those who initiated ANC earlier. Not receiving counseling about IFAS [COR=1.73; 95% CI (1.15, 2.61)] and not having a knowledge of IFAS use [COR=1.86; 95% CI (1.19, 2.88)] significantly increased odds of non-adherence compared to their counterparts. Antenatal depression (PHQ-9≥5) was not found to be significantly associated

with non-adherence. Major depression however (PHQ-9≥10) was significantly associated with 1.9 times increased 0dds of non-adherence [COR=1.89; 95% CI (1.11, 3.21)].

5.3.2. Result of Multivariable Analysis

The result of the final adjusted model revealed that parity, knowledge of IFAS use and major antenatal depression (PHQ-9 ≥10) remained to be significant predictors of IFAS adherence. Also, even though experience of complications during current pregnancy didn't show a significant relationship in the bivariate analysis, it revealed a significant association in the multivariable analysis.

Accordingly, pregnant mothers who have children of more than two, were at increased odds of IFAS non-adherence more than two times compared to those who have no child [AOR=2.43; 95% CI (1.10, 5.35)].The odds of non-adherence increased by 1.8 times in pregnant mothers who have no knowledge of IFAS adherence [AOR=1.85; 95% CI (1.01, 3.37)].Experiencing complications in current pregnancy decreased odds of non-adherence by 63% compared to those who had no complication [AOR=0.37; 95% CI (0.14, 0.98)]. Pregnant mothers who had major depression were nearly two times more likely to be non-adherent to IFAS compared to mothers who were not depressed [AOR=1.97; 95% CI (1.09, 3.56)].

Table 8- Association between socio-demographic and economic variables and IFAS adherence among pregnant mother participants attending ANC service at Yeka sub-city, Addis Ababa, 2019.

Variables	**IFAS**		**COR (95% CI)**	**AOR (95% CI)**
	Adherent	**Non-adherent**		
	N (%)	**N (%)**		
Age				
15-24	97 (63.0)	57(37.0)	1	
25-34	146(63.8)	83(36.2)	0.97 (0.63, 1.48)	
35-49	14(66.7)	7(33.3)	0.85 (0.32, 2.23)	
Educational status				
No formal education	28(70.0)	12(30.0)	0.89(0.38, 2.08)	
Primary school	99(61.1)	63(38.9)	1.33 (0.73, 2.42)	
Secondary school	85(62.5)	51(37.5)	1.25 (0.67, 2.32)	

Higher education	46(67.6)	22(32.4)	1	
Occupational status				
House wife	131 (61.5)	82 (38.5)	1	
Government/employee	25 (67.6)	12 (32.4)	0.77 (0.37, 1.61)	
Private employee	82 (67.2)	40 (32.8)	0.78 (0.49, 1.24)	
Unemployed	6 (46.2)	7 (53.8)	1.86 (0.61, 5.74)	
Other	14 (66.7)	7 (33.3)	0.80 (0.31, 2.06)	
Marital status				
Never Married	12(41.4)	17(58.6)	2.65 (1.23, 5.72)*	1.97 (0.82,4.69)
Married / Living together	245(65.2)	131(34.8)	1	1
Husband's educational status				
No formal education	17(70.8)	7(29.2)	0.70 (0.26, 1.87)	
Primary school	78(66.1)	40(33.9)	0.88 (0.50, 1.54)	
Secondary school	89(64.5)	49(35.5)	0.94 (0.55, 1.62)	
Higher education	62(63.3)	36(36.7)	1	
Monthly household income				
≤ 2000	53(63.9)	30(36.1)	0.99 (0.53, 1.84)	
2001- 4000	82(63.1)	48(36.9)	1.02 (0.59, 1.79)	
4001-6000	57(61.3)	36(38.7)	1.11 (0.61, 2.01)	
> 6000	58(63.7)	33(36.3)	1	
Financial hardship				
No	172(64.7)	94(35.3)	1	
Yes	86(61.9)	53(38.1)	1.12 (0.73, 1.72)	
Debt				
No	247(64.0)	139(36.0)	1	
Yes	10(52.6)	9(47.4)	1.59 (0.63, 4.03)	

Table 9- Association between obstetric and medical and IFAS adherence among pregnant mother participants attending ANC service at Yeka sub-city, Addis Ababa, 2019.

Variables	**IFAS**		**COR (95% CI)**	**AOR (95% CI)**
	Adherent	**Non-adherent**		
	N (%)	**N (%)**		
Parity				
Primiparous	162(68.6)	74(31.4)	1	1
One	56(60.9)	36(39.1)	1.40 (0.85, 2.32)	1.52 (0.87, 2.64)
Two	25(56.8)	19(43.2)	1.66 (0.86, 3.20)	1.72 (0.84, 3.49)
Three or more	15(44.1)	19(55.9)	2.77 (1.33, 5.75) *	2.43 (1.10, 5.35) *

Current pregnancy complication				
No	233(62.5)	140(37.5)	1	1
Yes	25(78.1)	7(21.9)	0.46 (0.19, 1.10)	0.36 (0.13, 0.97) *
Medical or chronic illnesses				
No	251(63.9)	142(36.1)	1	
Yes	6(54.5)	5(45.5)	1.47 (0.44, 4.91)	

Table 10- Association between ANC service utilization variables and IFAS adherence among pregnant mother participants attending ANC service at Yeka sub-city, Addis Ababa, 2019.

Variables	**IFAS**		**COR (95% CI)**	**AOR (95% CI)**
	Adherent N (%)	**Non-adherent N (%)**		
History of anemia				
No	175(66.3)	89(33.7)	1	
Yes	30(62.5)	18(37.5)	1.18 (0.62, 2.23)	
I don't know	5(71.4)	2(28.6)	0.78 (0.15, 4.13)	
Current anemia (Knowledge)				
No	190(66.2)	97(33.8)	1	
Yes	16(59.3)	11(40.7)	1.34 (0.60, 3.01)	
I don't know	4(80.0)	1(20.0)	0.49 (0.05, 4.44)	
Time of ANC initiation				
≤ 16 weeks	183(67.3)	89(32.7)	1	1
> 16 weeks	74(56.9)	56(43.1)	1.55 (1.01, 2.39) *	1.33 (0.83, 2.12)
Nutritional counseling				
No	131(60.4)	86(39.6)	1.33 (0.88, 2.01)	0.97 (0.58, 1.63)
Yes	122(67.0)	60(33.0)	1	1
IFAS counseling				
No	95(56.2)	74(43.8)	1.73 (1.14, 2.61) *	1.32 (0.78, 2.23)
Yes	160(69.0)	72(31.0)	1	1
Knowledge of the effect of anemia				
No	109(59.9)	73(40.1)	1.33 (0.88, 1.99)	0.95 (0.56, 1.61)
Yes	149(66.5)	75(33.5)	1	1
Knowledge of prevention of anemia				
No	68(57.6)	50(42.4)	1.44 (0.92, 2.23)	1.16 (0.63, 2.11)
Yes	188(66.2)	96(33.8)	1	1

Knowledge of use of IFAS				
No	61(53.0)	54(47.0)	1.85 (1.19, 2.88) *	1.84 (1.01, 3.36) *
Yes	197(67.7)	94(32.3)	1	1

Table 11- Association ofpsychosocial variables and antenatal depressionwith IFAS adherence among pregnant mother participants attending ANC service at Yeka sub-city, Addis Ababa, 2019.

Variables	**IFAS**		**COR (95% CI)**	**AOR (95% CI)**
	Adherent N (%)	**Non-adherent N (%)**		
Social support (husband/IP)				
No	12(50.0)	12(50.0)	1.80 (0.79, 4.13)	1.45 (0.56, 3.70)
Yes	246(64.4)	136(35.6)	1	1
Social support (Family/friends)				
No	87(62.6)	52(37.4)	1.04 (0.68, 1.60)	
Yes	168(63.6)	96(36.4)	1	
Depression (PHQ-9≥5)				
No	202(64.5)	111(35.5)	1	
Yes	56(60.2)	37(39.8)	1.20 (0.74, 1.93)	
Major Depression (PHQ-9≥10)				
No	224(66.1)	115(33.9)	1	1
Yes	34(50.7)	33(49.3)	1.89(1.11, 3.20) *	1.97 (1.09, 3.56) *

6. DISCUSSION

This study has examined the association between anemia and antenatal depression as well as antenatal depression and adherence to IFAS with the aim of exploring a possibly overlooked vicious cycle that might exist between anemia, depression, and adherence to treatment of anemia during pregnancy.

The result of our study revealed that anemia is negatively associated with antenatal depression. Anemia hasmore than two times higher odds of depression during pregnancy. This is grossly consistent with studies conducted elsewhere(23, 134). A cross-sectional study conducted in Turkey found that total depression score was significantly higher in anemic pregnant mothers compared to non-anemic mothers.The study also tested adjusted association between the two variables to find that the presence of anemia independently predicts depression scorein the pregnant mothers(23). Likewise, another retrospective study in Canada which compared depression scores and odds of developing antenatal depression between iron deficient and non-deficient anemic pregnant mothers found that the anemic group scored significantly higher depression score and odds of developing antenatal depression in was higher in those who were anemic (134).

On the other hand, a hospital-based study done in India reported in their finding that among physiologic factors tested, presence of anemia showed a stronger association with antenatal depression although the association was not found to be statistically significant, at 95% significant level(25). On the contrary, a cross-sectional study from India came up with a finding that showed the prevalence ratio of antenatal depression was higher in non-anemic pregnant women(26).This disparity might be due to the instrument used to measure depression by the study, that Kessler Psychological Distress Scale (K-10) was used to screen depression.The K-10is widely used to screen non-specific psychological distress and has comparatively low specificity for screening depression. Another factor which contributed to the observed variation could be sample size. Both studies assessed baseline data of a cohort and a clinical trial respectively, whether sample size was computed for this specific objective was not indicated.

Studies also reported a significant association between anemia and postpartum depression (120, 135, 136). There are studies nevertheless, which didn’t find a significant

association(27).However, a systematic review and meta-analysis conducted recently found that postpartum anemia is significantly associated with postpartum depression(137). The effect of anemia during pregnancy on postpartum depression also showed a significant association in the review.As was aforementioned, studies conducted to explore anemia on antenatal depression are limited in number. However, some other studies reported similar findings in other population subgroups. Studies conducted in reproductive age group women (22, 138, 139), children and adolescents(19, 20), general population(20, 92, 140, 141), psychiatric patients(92), geriatric population(142)showed a significant association between anemia and depression.

In view of the observed association of anemia and antenatal depression, it has been hypothesized that the mechanism that anemia contributes to depression could be due to its impact on mental changes. Attributably, micronutrients like iron are essential for the synthesis of neurotransmitters and their modulationmaythereforebe involved in regulations and alterations of mood, cognition, and neurologic behaviors. Iron being the most abundant metal in the brain plays numerous central rolesin this function.Pregnancy is placed at the center of these link as it creates extra demand and leaves the pregnant women susceptible to deficiency(143-146). Therefore, this study appears to confirm the association between anemia and antenatal depression.

In our study, antenatal depression was independently associated with an unplanned pregnancy, IPV and economic factors. Several systematic review and meta-analysis have synthesized risk factors associated with antenatal depression and identified one or more of these factors as significant contributors in their finding(30, 147-149). A systematic review and meta-analysis conducted in Ethiopia found that unplanned pregnancy, household violence, and economic factors are among factors that contribute to antenatal depression significantly. The effect of unplanned pregnancy on antenatal depression was pooled to be 1.93 (1.81, 2.06) in the study.It also showed that pregnant mothers who have economic problems are at increased odds of developing antenatal depression. However, they also recommended further studies related to the effect of socio-economic factors owing to some inconclusive findings obtained from their review(30). Our study could provide evidence to the independent association between antenatal depression and unplanned pregnancy, IPV and economic factors.

Most studies reported a significant combined (Physical, emotional, sexual) effect of IPV on depression, however, a study conducted using the distinct classification of IPV reported that physical abuse failed to show significant association with depression(150). In our finding, sexual violence also failed to show statistical significance.

When it comes to the association of antenatal depression and IFAS adherence, it is a topic not well explored by previous studies. Findings from the present study showed that antenatal depression at the cut off PHQ-9 ≥ 5 didn't reveal a significant association with non-adherence to IFAS. A significant association was observed between depression, PHQ-9 ≥ 10 and adherence to IFAS indicating that major depression is associated with IFAS adherence.Information based on symptom severity of depressionassociated with non-adherence, is not reported in studies which assessed the relationship between antenatal depression and IFAS adherence, and thus no comparison could be made.

In our study, antenatal depression was associated with nearly two times increment in the odds of non-adherence to IFAS. A published abstract of a study which analyzed a data of 1461 pregnant women recruited in a clinical trial Zimbabwe found that depressive symptoms are significantly associated with reduced adherence to IFAS(57). In contrast to our study, the study also found that perceived social support acted as a mediator and was also significantly associated with IFAS adherence. The variation in results obtained could also be owing to the difference in the number of factors controlled, where it was indicated that only education, economic status, HIV status, and parity were controlled.

Similarly, apopulation-based prospective study which used Edinburgh Postnatal Depression Scale (EPDS) to measure common mental disorders (CMD) found that CMD affected the extent of iron supplementation intake in the duration of time that the supplement has been taken(24).Another cross-sectional survey in Viet Nam found that women who took iron supplements during pregnancy were fewer in women who have CMD compared to those without CMD but the significance of the difference was found at borderline (P=0.05). This could be due to the difference in the type of measurement method, where the study measured whether or not iron supplement was used during pregnancy which might not be a sensitive enough measure of non-adherence(125).

It has been postulated that antenatal depression is associated with increased non-adherence to IFAS due to its impact in impairing healthy behaviors causing cognitive distortions that negatively affect the decision-making capacities for self-care, reducing motivation to attend to preventive health care and expectations from treatment(122, 151).Therefore, our study could provide strong evidence that depression status, mainly major depression, during pregnancy could be related to lower adherence to IFAS.

Our result indicated that knowledge of the use of IFAS is positively associated with IFAS adherence. Pregnant women who had knowledge about IFAS use had increased odds of nearly two times in adhering to IFAS compared to women who do not have. Several studies conducted in Ethiopia supports this where knowledge of IFAS was found to be significantly associated with IFAS adherence in their finding(44, 110, 115).

Another factor that was found to be significantly associated with adherence was parity in our study, where pregnant women who had children of more than three had odds of more than two times for non-adherence compared to those who have no children. Studies reported inconsistent results regarding the association of parity with adherence. A study conducted in Sudan reported that primiparous pregnant mothers were likely to adhere to IFAS(113).Other studies, however, found that multiparity is associated with significantly higherodds of non-adherence(152, 153). The possible reason could be pregnant women might have a relaxed attitude towards the supplement, more so if she had good previous pregnancy outcomes.

A significant association between the current complication by the pregnant women and IFAS adherence was found in our study.IFAS non-adherence decreased by 63% in pregnant women who had experienced a complication during their pregnancy compared to those who never had a complication. This finding can indirectly be supported by a study which found that the incidence rate ratio of IFAS adherence was significantly higher in women who took the supplement when they feel ill (117). Another study conducted in Mizan-Aman town which studied reasons forpregnant women non-adherence to IFAS found that women’s fear of illness is among the factors that increase women’s adherence(45).

7. STRENGTHS AND LIMITATIONS

7.1. Strength of the study

This study has tried to explore the potetialentire cycle of unforeseeable underlying determinants of important public health issues during pregnancy.

The major outcome variables of the study had been assessed using a validated tool in Ethiopian context in case of antenatal depression and pill count in case of IFAS adherence, which is comparatively objective measure than self-report.

The data had been collected by professional health care providers of the pregnant mothers, which might have helped the pregnant mothers to feel at ease while collecting data ofsensitive and private nature.

7.2. Limitations of the study

Results of this study need to be interpreted in consideration of the following limitations;

Even though, there is a plausible biological explanation for anemia to induce depression, it is also acknowledged that the effect might also play in the opposite direction. Also, it might also hold to be true that antenatal depression and IFAS adherence might also associate in the reverse direction. Related to the cross-sectional nature of the study design, the direction of the association could not be ascertained.

The findings of this study might not represent the general population, and should thus be interpreted in the context of populations with similar sociodemographic and economic status with that of this study.

8. CONCLUSION AND RECOMMENDATIONS

8.1. Conclusion

This study revealed that there is a significant association between anemia and antenatal depression. Pregnant mothers who were anemicwere more than two timesmore likely to be affected by antenatal depression than pregnant mothers who are non-anemic.Other important factors identified to be significantly associated with antenatal depression were financial hardship, unplanned pregnancy, and IPV in terms of emotional abuse. This study also noted that there is a statistically significant association between major antenatal depression and adherence to IFAS in pregnant mothers.The odds of non-adherence to IFAS is nearly two times higher among pregnant mothers with major depression than those without antenatal depression. Determinants like parity, knowledge of the benefit of IFAS and complications during pregnancy were also found to be significant factors for non-adherence.

8.2. Recommendations

Clinical recommendations:

Other health care professionals will benefit from testing for anemia status when treating patients with depression, especially in treatment-refractory cases. This will also be beneficial in treating pregnant mothers with depression before initiation of pharmacologic treatments.

In addition to the mere provision of IFAS, health care providers need to assess and ensure whether pregnant mothers are taking the recommended IFAS.And along with this, the mental state status of pregnant mothers must be put into consideration and needs to be targeted for treatment of depression to improve IFAS adherence behavior.

Policy recommendations:

Antenatal depression needs to be integrated into the routine screening in the ANC service owing to the prevalence during pregnancy and its possible association with anemia and also IFAS adherence.

The routine screening of anemia currently being implemented at ANC services need to be kept, on account of its probable association with antenatal depression and possible indirect implication on its treatment.

In efforts being made on interventions related to nutritional deficiencies like anemia, it is worth assessing and screening for depression as well.

Research recommendation:

Further prospective or retrospective studies which can reveal the direction of the association of anemia, depression and IFAS adherence are warranted

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ANNEXES

I. Participant Information Sheet and Informed Consent Form (English)

Institution: Addis Ababa University, College of Health Sciences, School of Public Health

Name of the Principal Investigator: MirafMesfin

Participant Identification Number: _____

Participants Information Sheet

Hello, my name is _____. I am collecting a data for a research entitled 'Association of antenatal depression with anemia and adherence to IFAS adherence among pregnant women attending antenatal care services at health centers in Yeka sub-city, Addis Ababa'.

We would like to invite you to participate in this study. Your participation in this study will only be based on your willingness. Your decision not to participate in the study will not affect any of the health services you get from the facility. Before making a decision please take a little time to understand the following information. Thank you for your time.

Study objective: The objective of the study is to assess the relationship between anemia, depression and adherence to Iron Folic Acid supplement in pregnant women.

Procedures: You are invited to participate in this study because you are attending your pregnancy follow up in one of the health centers in Yeka sub-city selected for this study. If you are willing to participate in the study after you have understood all the information, you will sign on the informed consent form as a confirmation of your agreement. You will then be requested to provide your response for the questions you will be asked from a questionnaire. These will be mainly questions regarding your background information, information related to presence/absence of depressive symptoms during your pregnancy, regarding your intake of Iron Folic Acid supplement. Information like your hemoglobin status and other recorded parameters which are important to the study will be collected from your ANC record.

Benefits of participation: Your participation will be useful to give insight in support of efforts being made to improve maternal health care services based on evidence base. Besides this, you will have access to professional counseling and/or treatment if you happen to be affected by antenatal depression.

Risks/discomfort of participation: Participation in this study does not cause any notable harm. The questionnaire will take about 30 minutes of your time. Some questions might be personal in nature.We hope that you will answer all the questions in the questionnaire since your responses are very important to us. However, you can still refrain from answering any question you don't want to respond.

Confidentiality: the information you provide will be kept strictly confidential and will not be shared with anyone. We will be using code numbers on the questionnaire instead of your name. The filled questionnaires will be locked and access will be restricted only to the study team members.

Contact: If you have any question, you can contact the principal investigator using the following address:

MirafMesfin, Tel.:- +251-912-91-48-62

Email address: mripta@gmail.com

Informed Consent Form

I have understood the detail of information provided above. My decision to take part in the study is;

Yes ☐ No ☐

Signature: _____

Date: _____

Name of data collector: _____

Signature: _____

Thank you for your time.

II. Participant Information Sheet and Informed Consent Form (Amharic)

የጥናቱ ተሳታፊዎች የመረጃ እና የፈቃደኝነት ማረጋገጫ ቅፅ

ተቋም፡ አዲስ አበባ ዩኒቨርሲቲ፣ ጤና ሳይንስ ኮሌጅ፣ የህብረተሰብ ጤና ት/ቤት

የዋና አጥኚው ስም፡ ምሕረፍ መስፍን

የተሳታፊው መለያ ቁጥር፡ ____________________

የጥናቱ ተሳታፊዎች የመረጃ ቅፅ

ጤና ይስጥልኝ፣ የእኔ ስም ______________________________ ይባላል።

‹‹በእርግዝና ወቅት የሚከሰት የደም ግፊት እና ከአይረን ፎሊክ አሲድ አወሳሰድ ጋር ያለው ተዛምዶ በአዲስ አበባ የካ ክፍለ ከተማ ባሉ ጤና ጣቢያዎች ውስጥ የቅድመ ወሊድ ክትትል በሚያደርጉ እናቶች ላይ›› ለተሰኘ ጥናት መረጃ እየሰበሰብኩ ነው።

እዚህ ጥናት ውስጥ ተሳታፊ እንዲሆኑልን ጋብዘዎት እንወዳለን።
በጥናቱ ላይ መሳተፍ በእርስዎ ሙሉ ፈቃደኝነት ላይ ብቻ የተመሰረተ ይሆናል።
በጥናቱ ላይ ላለመሳተፍ መወሰኑ በዚህ ተቋም የሚያገኙት የጤና አገልግሎት ላይ ምንም አይነት ተፅዕኖ አይፈጥርም።
ውሳኔ ከማድረግዎ በፊት ትንሽ ጊዜ ወስደው የሚከተለውን መግለጫ እንዲያዳምጡ ይጠየቃሉ።
ለሚሰጡን ጊዜ እናመሰግናለን።

የጥናቱ አላማ

የዚህ ጥናት አላማ የደም ግፊት እና የአይረን ፎሊክ አሲድ እንክብል አወሳሰድ ያለውን ግንኙነት በነፍሰጡር እናቶች ላይ ለማጥናት ነው።

የአካሄድ ቅደም ተከተል፡

እርስዎ በዚህ ጥናት ለመሳተፍ የተጋበዙት በየካ ክፍለ ከተማ ውስጥ ባሉ ለጥናቱ በተመረጡ ጤና ጣቢያዎች ውስጥ የቅድመ ወሊድ ክትትል ስለሚያደርጉ ነው።
መግለጫውን በሚገባ ተረድተው በጥናቱ ለመሳተፍ ፈቃደኛ ከሆኑ ፈቃደኝነትዎን ለማረጋገጥ የፈቃደኝነት ማረጋገጫ ቅጹ ላይ ይፈርማሉ። ከዚያም በመጠይቁ ላይ ለሚገኙ ጥያቄዎች መልሶችዎን ይሰጣሉ።

ይህምበዋናነ ትየ ሚሆነ ዉሳለእርስዎስለሚ ልጸ መስረ ታዊሚ ጃዎች፣

በዚህእርግዝና ወቅትየ ደባቴስሜ ችመኖ ራቸዉ ወይምአለመኖራቸዉ ስለሚያ መላከቱ ሚ ጃዎችእናስለአይረንጠለክአሲድአወ ሳሰደዎትይሆናል፡ ፡

የ ደምዎ ስዉጤቶምንእንዲህምእዚህጥናትአስፈላጊየ ሆኑለሎችሚ ጃዎችንከቅደመዉሲደከትትልመህደርዎላይእንመዘግባለን ፡ ፡

በጥናቱ መሳተፍየ ሚኖረዉጥቅም፡

የ እርስዎተሳትፎየ እናቶችጤናከብከበእ ገ ልግሎትንበሚ ጃላይየ ተመሰረተ ማሻሻያለሚደረግእየ ተደረጉላሉጥረቶች ጠቃሚ ግንዛ ቤይሰጣል፡ ፡

ከዚህበተጨማሪእርስዎበእርግዝና ወቅትየ ሚ ከሰትደባቴተጠቂሆነ ዉከተገ ኙየ ባለሙ የ ምክርአገ ልግሎትወይምእና ህክምናየ ሚ ገ ኙትህቤ ታይመቻችልዎታል፡ ፡

በጥናቱ መሳተፍየ ሚኖረዉጉዳት፡ በጥናቱ መሳተፍይሄነ ዉየ ሚ ጎልችግርአይኖረዉም፡ ፡ መጠይቁዉደ 30 ደቂቃ ደሚ ዉስዳል፡ ፡ አንዳንድጥያቄዎችበባህሪያቸዉየ ግልጉዳይንየ ሚ ነ ሱስለሆኑ ይችላሉ፡ ፡ በመጠይቁላይያሉትንሁሉንምጥያቄዎችይመልሱልናልብለንተስፋእናደርጋለን፡ ፡ ሆኖምግንእርስዎለመመለስያልወደዱትንየ ትኛዉንምጥያቄአለመመለስይችላሉ፡ ፡

ሚ ስጥራዊነ ት፡ እርስዎየ ሚ ሰጡመረጃ ሚ ስጥራዊነ ቱበጥብቅየ ተያዘይሆናል ፤ ለማንምስዉአሳልፈንየ ምንሰጠዉአይሆንም፡ ፡ በመጠይቁላይስምዎትንሳይሆንየ መለያቁጥርየ ምንጠቀምይሆናል፡ ፡ የ ተሞሉትመጠይቆችምቁቆለፍባቸዋል፤ ከጥናትበደኑአባላትዉጪማንምንንማ ገ ኘትአይችልም፡ ፡

መገ ኛአድራሻ፡ ማንኛዉምአይነ ትጥያቄካለዎትዋናአጥኒዉበሚ ከተለዉአድራሻማገ ነ ትይችላሉ፡ ፡

ምሕሪፍመስፍን፣ ስልክቁጥር፡ +251-912-91-48-62

የ ኢሜልአድራሻ፡ mripta@gmail.com

የፈቃደኝነት መጠየቂያ ቅፅ

ከላይ የተገለጹትን ዝርዝር መግለጫዎች ተረድቻቸዋለሁ፡፡ በዚህ ጥናት ለመሳተፍ፣

ፈቃደኛ ነኝ □ ፈቃደኛ አይደለሁም □

ፊርማ ____________

ቀን፡ ____________

የመረጃ ሰብሳቢው ስም፡ ______________________

ፊርማ ____________

ስለሰጡኝ ጊዜ እናመሰግናለን፡፡

III. Questionnaire (English)

Questionnaire prepared to assess the association of antenatal depression with anemia and adherence to IFAS

Participant ID:_____ Health center:_____

Date: _____

I. Eligibility Check			
No.	Questions	Response	Remark
101	Age (in complete years)	_____	
102	During this pregnancy, were you given or did you buy any IFAS?	1. No 2. Yes	
Note: if the potential participant: 1) is less than 18 years **or** 2) didn't take/buy any IFAS in the past month ——>Thank theinterviewee and stop the interview here.			

II. Participant Identifying Information			
No	Questions	Response	Remark
201	Medical Record Number (MRN)	_____	
202	Address of current residence	Sub city: _____ Woreda:_____ Kebele:_____ Tel. no: 1. _____ 2. _____	

III. Socio-demographic and Economic Factors			
No	Questions	Response	Remark
301	Educational Status	1. Illiterate (can't read and write)	

		2. Literate but no formal education 3. Primary school (grade 1-8) 4. Secondary school (grade 9-12) 5. Some college or technical school 6. Diploma 7. BSc/ BA 8. MSc/MA and above	
302	Occupation	1. House wife 2. Daily Laborer 3. Trade/Merchant 4. Governmental Employee 5. Private Employee 6. Unemployed 7. Other (specify _____)	
303	Marital status	1. Never Married 2. Married / Living together 3. Divorced /Separated 4. Widowed	If response is '1, 3, 4' skip to item 306.
304	Husband's educational status	1. Illiterate (can't read and write) 2. Literate but no formal education 3. Primary school (grade 1-8) 4. Secondary school (grade 9-12) 5. Some college or technical school 6. Diploma 7. BSc/ BA 8. MSc/MA and above	
305	Husband's occupation	1. Daily Laborer 2. Trade/Merchant 3. Governmental Employee 4. Private Employee 5. Unemployed	

		6. Other (specify _____)	
306	Religion	1. Orthodox 2. Muslim 3. Protestant 4. Other (specify _____)	
307	Family Size (how many persons live in your house)?	_____	
308	Total number of children	_____	
309	Monthly income/salary (Birr)	_____	
310	Monthly household income (Birr)	_____	
311	Do you usually encounter financial hardship to cover your basic expenses?	1. Never 2. Rarely 3. Sometimes 4. Often	
312	Are you currently in debt? (You/yourhusband as a family)	1. No 2. Yes	

IV. Obstetric and medical history			
No	Questions	Response	Remark
401	Date of first ANC visit?	___ /___ /_____E.C(DD/MM/YYYY)	
402	Gestational age	_____months _____weeks (If gestational age is unknown, record expected date of delivery)	
403	Number of antenatal visits attended during current pregnancy?	1. Once 2. Two times 3. Three times and above	
404	Have you ever encountered	1. None	

	miscarriages/abortion or stillbirth?	2. Once 3. Twice or more	
405	Number of previous pregnancies	1. First pregnancy 2. One 3. Two 4. Three or more	If response is '1' skip to item 408.
406	Date of Birth of your last child	___ /___ /_____E.C(DD/MM/YYYY)	
407	History of any complication during last pregnancy? (E.g., Vaginal bleeding/gush of fluid, severe swelling of face/hand/feet severe headache, blurred vision, fever, severe abdominal pain, convulsion, other)	1. No 2. Yes If yes, specify _____	
408	Did you experience any of the above complications during current pregnancy?	1. No 2. Yes If Yes which one, _____ (Specify)	
409	Is the current pregnancy planned?	1. No 2. Yes	
410	Do you currently have any medical or chronic illnesses (like hypertension, diabetics, cardiac disease, etc.)?	1. No 2. Yes If yes, _____(Specify)	
411	Do you take any other regular medication for other medical illness?	1. No 2. Yes If yes _____ (Specify)	
412	HIV status	1. Negative 2. Positive	
413	Level of Hemoglobin/Hematicrit	_____	

V. ANC Service Utilization			
No	Questions	Response	Remark
501	For how many days per week in average did you take the IFAS in the past month?	_____ days per week	
502	Have you ever received nutritional counseling?	1. No 2. Yes	
503	Have you ever heard of Anemia?	1. No 2. Yes	If response is '1' Skip to item 508
504	Did you have a history of anemia?	1. No 2. Yes 3. I don't know	
505	Do you have anemia in the current pregnancy?	1. No 2. Yes 3. I don't know	
506	What do you know about consequence of anemia?	1. I don't know 2. Effect on the fetus 3. Effect on the mother 4. Other_____(Specify)	
507	What do you know about methods of prevention/treatment of anemia?	1. I don't know 2. Nutrition 3. Iron/vitamin intake 4. Other_____(Specify)	
508	Have you ever received counseling about IFAS?	1. No 2. Yes	
509	What do you know about uses of IFAS?	1. I don't know 2. To prevent/treat anemia 3. For fetus development 4. Other_____(Specify)	
510	What is your opinion on ANC service you have received?	1. Not satisfied (Has many things to improve) 2. Not that much satisfied (Has	

		some things to improve) 3. Neutral 3. Satisfied	

511	Number of IFAS prescribed	Quantity _____ Daily dose _____	
512	Number of remaining IFAS (Pill count)	_____	

VI. Depressive symptoms (PHQ-9) Over the last 2 weeks, how often have you been bothered by any of the following problems?						
601	Little interest or pleasure in doing things	0. Not at all	1. Several days (2-6 days)	2. More than half the days (7-11 days)	3. Nearly everyday (11-14 days)	Remark
602	Feeling down, depressed, or hopeless					
603	Trouble falling or staying asleep, or sleeping too much					
604	Feeling tired or having little energy					
605	Poor appetite or overeating					
606	Feeling bad about yourself - or that you are a failure or have let yourself or your family down					
607	Trouble concentrating on things, such as reading the newspaper or watching television					
608	Moving or speaking so					

	slowly that other people could have noticed? or the opposite - being so fidgety or restless that you have been moving around a lot more than usual					
609	Thoughts that you would be better off dead or of hurting yourself in some way					
610	If you checked off any problem on this questionnaire so far, how difficult have these problems made it for you to do your work, take care of things at home, or get along with other people?	1. Not difficult at all 2. Somewhat difficult 3. Very difficult 4. Extremely difficult				
611	Total Score	_____				

VII. Psychosocial Factors			
No	Questions	Response	Remark
701	Do you get adequate support you need from your husband/intimate partner/baby's father? (like practical help with routine activities, information and advice, emotional support and assurance, resource and material goods, prayer, nutritional support, accompaniment)	1. No 2. Yes	

702	Do you get adequate support you need from your family/friends/neighbors (like practical help with routine activities, information and advice, emotional support and assurance, resource and material goods, prayer, nutritional support, accompaniment)?	1. No 2. Yes If yes _____ (Specify source of support)	
703	How often do you often get in a conflict with your intimate partner/husband?	1. Never 2. Sometimes 3. Often 4. Almost always	
704	History of mental illness	1. No 2. Yes 3. I don't know	
705	History of depression	1. No 2. Yes 3. I don't know	
706	Family history of mental illness	1. No 2. Yes 3. I don't know	
707	Do you drink alcohol drinks?	1.No 2.Yes If yes, how often _____ (Specify)	
708	Do you consume khat?	1.No 2.Yes If yes, how often _____ (Specify)	
709	Do you smoke?	1.No 2.Yes If yes, how many per day _____ (Specify)	
710	How do you describe your overall relationship with your	1. Not good 2.Neutral 2. Good	

	husband/IP(your marital/spousal satisfaction)?		
711	Have you encountered stressful negative life events in the past 12 months? (like death of spouse/child/close relative, difficult spousal separation, financial crisis, serious illness/injury/assault to self/close relative, loss of job, other adverse event)	1. No 2. Yes If yes, _____ (Specify)	
712	Does your partner/husband abuse you emotionally (like insult, talk down to, threaten to harm, scream, curse you, make you feel bad about yourself)?	1. Never 2. Sometimes 3. Often 4. Almost always	
713	Does your partner/husband abuse you physically (like hit, slapped, kicked, push you)?	1. Never 2. Sometimes 3. Often 4. Almost always	
714	Does your partner/husband abuse you sexually (forced to have sexual activity)?	1. Never 2. Sometimes 3. Often 4. Almost always	

Name of data collector: _____Name of data supervisor: _____

Signature: _____ Signature: _____

IV. Questionnaire (Amharic)

የአማርኛ መጠይቅ

በእርግዝና ወቅት የሚስተዋል የደም ማነስ እና ከአይረን ፎሊክ አሲድ አወሳሰድ ጋር ያለው ተዛምዶ በተመለከተ መረጃ ለመሰብሰብ የተዘጋጀ መጠይቅ

የተሳታፊው መለያ ቁጥር፡ ________________ ጤና ጣቢያ፡ ____________________

ቀን፡ ___________________

ሀ. በጥናቱ ለመሳተፍ የሚያበቁ ቅድመ ሁኔታዎችን ማረጋገጫ		
ተ.ቁ	**ጥያቄ**	**ምላሽ**
101	እድሜ (በተጠናቀቁ አመታት)	______________
102	በአሁኑ እርግዝና ወቅት የአይረን ፎሊክ አሲድ ንጥረ ነገር ወስደው ወይስ ገዝተው ተጠቅመዋል?	1. አልወሰድኩም 2. ወስጃለሁ
ማስታወሻ፡ የጥናቱ ተሳታፊ 1) እድሜያቸው ከ 18 ዓመት በታች ከሆነ ወይም 2) ላለፈው ወር የአይረን ፎሊክ አሲድ ንጥረ ነገር ተቀብለው/ገዝተው ካልወሰዱ ——> ተሳታፊውን አመስግነው ቃለ መጠይቁን እዚህ ላይ ያቁሙ፡፡		

ለ. የተሳታፊ መለያ መረጃ		
ተ.ቁ	**ጥያቄ**	**ምላሽ**
201	የህክምና ካርድ ቁጥር	________________
202	አሁን የሚኖሩበት አድራሻ	ክ/ከተማ __________ ወረዳ፡ ________ ቀበሌ፡ __________ ስ.ቁጥር 1. ____________________ 2. ____________________

ሐ የማህበራዊእናየኢኮኖሚያዊመረጃ		
ተ.ቁ	ጥያቄ	ምላሽ
301	የትምህርትደረጃ	1. ምንምአልተማርኩም(ማንበብናመጻፍአልችልም) 2. ማንበብናመፃ ፍእችላለሁግንመደበኛትምህርትየለኝም 3. አንደኛደረጃ (1ኛ-8ኛ ክፍል) 4. ሁለተኛደረጃ (9ኛ-12ኛ ክፍል) 5. ጥቂትየኮሌጅወይምቴክኒክናሞያትምህርት 6.ዲፕሎማ 7. የመጀመሪያዲግሪ 8. ሁለተኛዲግሪእናከዛበላይ
302	ስራ	1. የቤትእመቤት 2. የጉልበት (የቀን) ሰራተኛ 3. ነጋዴ 4. የመንግስትሰራተኛ 5. የግልስራ 6. ስራየሌለው 7. ሌላ (ይገለጽ _____)
303	የትዳርሁኔታ	1. ያላገባች 2. በትዳርላይያለች / ያለህጋዊጋብቻእብረየምትኖር 3. በፍቺ/ ያለህጋዊፍቺየተለየያች 4. በሞትየተለያየች
የ ‘303’ ምላሽ 1፣ 3፣ 4’ ከሆነ ወደተራቁጥር 306 ይቀጥሉ		
304	የባለቤትዎየትምህርትደረጃ	1. ምንምያልተማረ (ማንበብናመጻፍየማይችል) 2. ማንበብናመፃ ፍይችላልግንመደበኛትምህርትየለወም 3. አንደኛደረጃ (1ኛ-8ኛ ክፍል) 4. ሁለተኛደረጃ (9ኛ-12ኛ ክፍል) 5. ጥቂትየኮሌጅወይምቴክኒክናሞያትምህርት 6. ዲፕሎማ 7. የመጀመሪያዲግሪ 8. ሁለተኛዲግሪእናከዛበላይ
305	የባለቤትዎየስራሁኔታ	1. የጉልበት (የቀን) ሰራተኛ

		2. ነጋዴ 3. የማግስትሰራተኛ 4. የግልስራ 5. ስራአጥ 6. ሌላ (ይገለጽ ____________________)
306	ሀይማኖትዎ?	1. ኦርቶዶክስ 2. ሙስሊም 3. ፕሮቴስታንት 4. ሌላ (ይገለጽ ______________________)
307	ጠቅላላየቤተሰብብዛት (ምንያህልሰዎችበቤትዎዉስጥይኖራሉ)?	____________
308	ጠቅላላየልጆችብዛት	____________
309	የወርገቢ/ደሞዝ (በብር)	____________
310	የቤተሰብዎየወርገቢ (በብር)	____________
311	መሰረታዊወጪዎንለመሸፈንብዙግዜይቸገራሉ?	1. በፍጹም 2. ያንያህልአንቸገርም 3. አንዳንድጊዜ 4. አብዛኛዉንጊዜ
312	በአሁንሰዓትመክፈልያልቻሉትዕዳአለብዎት(እርሶ/እንደቤተሰብበለቤትዎ)?	1. የለብኝም 2. አለብኝ

መ. የወሊድእናየጤናሁኔታዎች		
ተ.ቁ.	ጥያቄ	ምላሽ
401	ለመጀመሪያወየቅድመወሊድክትትልየመጡበትቀን	_____ /_____ / ________
402	የጽንሱእድሜ	____________ (የጽንሱእድሜካልታወቀየመጨረሻየወሊደቀንይጻፍ)
403	በአሁኑእርግዝናምንያህልጊዜየእርግዝናክትትልአድርገዋል (ከዛሬወጭጪ)?	1. አንድጊዜ 2. ሁለትጊዜ 3. ሶስትጊዜእናከዛበላይ

404	ከዚህቀደምሞ ጾንስመቼቼገ ፍ፤ የ ጾንስማቋረጥወይምከወሊድጊዜየ ጾንስሳትአጋጥሞትያ ወቃል?	1. ምንምሞ ለም2. አንድጊዜ 3. ሀለትእናከዚያበላይ
405	ከዚህቀደምእምያህልጊዜነ ፍሰጠፎሆነ ወየ ወቃሉ?	1. ይሄየ መጀመሪያእርግዝናነ ው 2. አንድግዜ 3. ሀለትግዜ 4. ሶስትግዜእናከዚያበላይ
የ ‘405’ ምላሽ ‘1’ ከሆነ ወደተራቁጥር 408 ይቀጥሉ		
406	የ መጪፈሻልጅዎየ ተወለደበትቀን?	_____ /_____ /_____
407	በቀደሞእርግዝናጊዜየ ተፈጠረየ እርግዝናወቅትየ ጠፍእክልነ በር?(ለምሳሌ፡ ከማህጸንደያማመፈሳሽመፍሰስ፣ ከበድያለየ ፊት፣ የእጅ/የእግርእብጠት፣ ከፍተኛየ ሪስምቃት፣ ብዥየለእይታከሳት፣ ከፍያለየ ሆድህማም እንደሚከልበሽታመጣዘፍዘፍ)	1. አላጋጠመኝም 2. አጋጥሞኛል ካጋጠመኝትየ ትኛቹ_____(ይገ ለጽ)
408	በአሀኑእርግዝናከላይእንደተገ ለጸትአይነ ትችግሮችአጋጥሞታል?	1. አላጋጠመኝም 2. አጋጥሞኛል ካጋጠመኝትየ ትኛቹ_____(ይገ ለጽ)
409	የ አሀኑእርግዝናዎየ ታቀደእርግዝናነ ወ?	1. አይደለም 2. አዎነ ው
410	ከባደየ ሆነ ህመማመጀምኡብሮምትየ ቆየ በሽታአለብዎት?(ለምሳሌ፡ እንደደምገፊት፣ ስኳር ፣ የልበበሽታመጀምሳለ)	1. የለብኝም2. አለብኝ ካለብዎት _____(ይግለጹ)
411	ለሌለህመማመጀበኛየ ህክምና መጀህኒትይወስዳሉ?	1. አልወስድም2. እወስዳለሁ ከወሰዳየ መድሃኒቱንአይነ ትይግለጹ_____
412	የ ኤች.አይ.ቪሁኔታ?	1. ኔጌቲቭ 2. ፖዘቲቭ
413	የ ደምግ ስ (የ ሄሞግለብን/ሄማቶክሪትመጠን)	_____

\

ሠ. ቅደመወሊደክትትልአገ ልግለትአጠቃቀም		
ተ.ቁ	**ጥያቄ**	**ምላሽ**
501	ባለፈመጀርበሳምንትብአማካይለምንያህልቀናትለሚሆንግዜየ አደረ ንፎሊክአሲድንጥረነ ገ ርይወስዳ በር ?	በሳምንት _____ ቀናት
502	ስለአመጋገ ብዎየ ህክምና ምክርአግኝተወያ ወቃሉ?	1. አላወቅም 2. አወቃለሁ
503	ስለደምግ ስበሽታሰምተወያ ወቃሉ?	1. አላገ ኝህም2. አግኝቻለሁ
የ ‘503’ ምላሽ 1 ከሆነ ወደተራቁጥር 508 ይቀጥሉ		

504	የደም ግፊት ህመም ከዚህ ቀደም አለብዎት?	1. የለብኝም 2. አለብኝ 3. አላውቅም
505	በአሁኑ እርግዝና የደም ግፊት ችግር አለብዎት?	1. የለብኝም 2. አለብኝ 3. አላውቅም
506	ስለ ደም ግፊት ጉዳት የምታውቂው?	1. አላውቅም 2. ጽንስ እድገት ላይ 3. በእናት እርግዝና ጤንነት ሌላ ____________________ (ይገለጽ)
507	ስለ ደም ግፊት መከላከያ/ማከሚያ መንገዶች የምታውቂው?	1.አላውቅም 2. አመጋገብ 3. አይረን/ቫይታሚን መውሰድ ሌላ ____________________ (ይገለጽ)
508	ስለ አይረን ፎሊክ ንጥረ ነገር የህክምና ምክር አግኝተው ያውቃሉ?	1. አላገኘሁም 2. አግኝቻለሁ
509	የሚያውቋቸው አይረን ፎሊክ ንጥረ ነገር ጥቅሞች ምንድናቸው?	1. አላውቅም 2. የደም ግፊትን ለመከላከል/ለማከም 3. ለጽንሱ እድገት ሌላ ______________(ይገለጽ)
510	በአጠቃላይ በቅድመ ወሊድ ክትትል አገልግሎቱ ላይ ስሜትዎ ምንድነው?	1. ፈጽሞ አልረካሁም (ብዙ የሚስተካከሉ ነገሮች አሉት) 2. እምብዛም አልረካሁም (አንዳንድ የሚስተካከሉ ነገሮች አሉት) 3. መካከለኛ ስሜት 4. እረክቻለሁ

511	የወሰዱት/የገዙት የአይረን ፎሊክ ንጥረ ነገር ብዛት?	ብዛት ________ (ፍሬ) በቀን የሚወስዱት መጠን __________
512	የቀራቸው/የመለሱት የአይረን ፎሊክ ንጥረ ነገር ሲቆጠር ምን ያህል ነው?	________

ረ. የመደበትስሜት (ፒ-ኤች-ኪዩ-9)					
ባለፉትሁለትሳምንታትጊዜውስጥየሚከተሉትችግሮችበየስንትጊዜደርሰውብዎት (በየትኛውቱችግረው) ነበር?					
		0. አጋጥሞኝአያውቅም	1.አልፎአልፎብቻ(2-6 ቀናት)	2.በዛላለጊዜ(7-11 ቀናት)	3.ከሞላ ጎደልበየቀኑ (12-14 ቀናት)
601	የእለትተእለትተግባርዎንለማከናወን (ለመስራት) ያለዎትተነሳሽነትምንያህልቀንቀንሶነበር?				
602	የመከፋት፣ የመደበትወይምተስፋየመቁረጥስሜትለምንያህልቀንይሰማዎነበር ?				
603	ለምንያህልቀንእንቅልፍአልወስድዎብለዎትወይምበደንብየማይተኛትአቅተዎትወይምደግሞእንቅልፍእየበዛብዎትይቸገሩነበር ?				
604	ለምንያህልቀንየድካምወይምየአቅምማጣት ስሜትይሰማዎትነበር ?				
605	ለምንያህልቀንየምግብፍላጎትዎቀንሶብዎትወይምከተለመደውበላይይመገቡነበር ?				
606	ለምንያህልቀንራስዎንየመጥላትወይምየጋየለኝምየማለትወይምራሴንምሆነ ቤተሰቤንአሳዝኛለሁየሚልስ ሜትተሰምቶዎትነበር?				
607	ለምንያህልቀንበሚሰሩትስራላይሃሳብዎንመሰብሰብ/ትኩረትያለመስጠትችግር (ለምሳሌ፡ - ከሰዎችጋርሲጨዋወቱትኩረትሰጥቶማዳመጥ) አስቸግሮዎትነበር?				
608	ለምንያህልቀንለሌሎችሰዎችእስከሚታወቅድረስበእንቅስቃሴዎወይምበንግግርዎበጣምቀስብለውወይም ተቃራኒውየሚጋጋትአቅተዎት፣ አንድቦታአርፎመቀመጥወይምመቆምእስከሚያቅትዎሆነው ነበር ?				
609	ከምሞትብሞትይሻላልብለውአስበውወይምራስዎንበሆነ መንገድ ለመጉዳትአስበው ነበር?				
610	ከላይበተጠቀሱትችግሮችምክንያትስራዎንለመስራት፣ የቤትሓላፊነትዎንለመወጣትወይምከሰዎችጋርተስማምተውለመኖርምንያህልአስቸጋሪሆኖብዎትነበር?	1. በጭራሽአልተቸገርኩም 2. በመጠኑተቸግሬነበር 3. በጣምተቸግሬነበር 4. እጅግበጣምተቸግሬነበር			
611	**ጠቅላላውጤት**	_______________			

ሰ. ስነ ልቦናዊና ማህበረሰባዊ ጉዳዮች		
ተ.ቁ.	ጥያቄ	ምላሽ
701	ከባለቤትዎ /ከፍቅር ጓደኛዎ/ከልጅዎ አባት በቂ ድጋፍ ያገኛሉ? (ለምሳሌ፡ ተግባራዊ እርዳታ የዕለት ተዕለት ስራ ላይ፤ ሚጃና ምክር በማቅረብ፤ የስነ ልቦና እገዛ፤ የአስፈላጊ ቁሳቁሶች እርዳታ፤ በጸሎት በማገዝ፤ አንዳንድ ቦታ አብረዎት መሄድ)	1. አላገኝም 2. አዎ አገኛለሁ
702	ከላይ የተገለጹትን አይነት ድጋፍ ከወላጆችዎ፣ ከጓደኞችዎ ወይም ከጎረቤትዎ በቂ ድጋፍ ያገኛሉ ?	1. አላገኝም 2. አዎ አገኛለሁ መልስ አዎ ከሆነ ከማን ያገኛሉ ________________
703	በየ ስንት ግዜ ያትዎት ከባቤትዎ/ከፍቅር ጓደኛዎት ጋር ግጭት ውስጥ ይገባሉ?	1. በፍጹም 3. ብዙ ጊዜ 2. አንዳንድ ጊዜ 4. ሁልጊዜ ማለት ይቻላል
704	ከዚህ በፊት የአእምሮ ህመም አጋጥሞት ያውቃል?	1. አጋጥሞኝ አያውቅም 2. አጋጥሞኝ ያውቃል 3. አላውቅም
705	ከዚህ በፊት የድባቴ ህመም አጋጥሞት ያውቃል?	1. አጋጥሞኝ አያውቅም 2. አጋጥሞኝ ያውቃል 3. አላውቅም
706	ከዚህ በፊት በቤተሰብዎ የአእምሮ ህመም የገጠመው ሰው አለ?	1. የለም 2. አለ 3. አላውቅም
707	የአልኮል መጠጥ ይወስዳሉ?	1.አልወስድም 2.እወስዳለሁ፡ በምን ያህል ግዜ ___________
708	ጫት ይጠቀማሉ ?	1.አልጠቀምም 2.እጠቀማለሁ በምን ያህል ግዜ ___________
709	ሲጋራ ያጨሳሉ ?	1.አላጨስም 2. አጨሳለሁ፡ በቀን ምን ያህል __________
710	ከባለቤትዎ/ከፍቅር ጓደኛዎ ጋር ያለዎት ትንግንኙነት እንዴት ይገልጹታ ?	1.ጥሩ የሚባል አይደለም 2. መካከለኛ 3. ጥሩ የሚባል ነው
711	ባለፉት 12 ወራት አስጨናቂ የሆነ የህይወት አጋጣሚ አጋጥሞትነ በር ? (ለምሳሌ የባለቤት/ የልጅ/ የቅርብ ዘመድ ሞት ፤ ከባድ ፍቺ፤ ከባድ በሽታ/ አደጋ/ የራስ ወይም የቅርብ ዘመድን ጥቃት፤ ከስራ መቀነስ በትእና ሌላ ከበድ ያለ ችግር አጋጥሞት ያውቃል)	1. አላጋጠመኝም 2. አጋጥሞኛል አጋጥሞዎት ከሆነ አይነቱ ይገለጽ ____________________
712	ባለቤትዎ ወይም የፍቅር ጓደኛዎ ስሜትዎን የሚጎዱ ነገሮችን ያደርጋል ? (ለምሳሌ ስድብ፤ ማጣጣል፤ ለማሳደት ማስፈራራት፤ መጮህ፤ መናገም፤ ለራስ ሽመተፎ ስሜት እንዲሰማዎ ማድረግ)	1. በፍጹም 3. ብዙ ጊዜ 2. አንዳንድ ጊዜ 4. ሁልጊዜ ለማለት ይቻላል
713	ባለቤትዎ ወይም የፍቅር ጓደኛዎ አካላዊ ጥቃት አድርሶቦት ያውቃል? (ለምሳሌ፤ በጥፊ መምታት፣ በካልቾ መምታት፣ መገፍተር)	1. በፍጹም 3. ብዙ ጊዜ 2. አንዳንድ ጊዜ 4. ሁልጊዜ ለማለት ይቻላል
714	ባለቤትዎ ወይም የፍቅር ጓደኛዎ ጾታዊ ጥቃት ፈጽሞቦት ያውቃል ?(አስገድዶ ጾታዊ ግንኙነት ማድረግ)	1. በፍጹም 3. ብዙ ጊዜ 2. አንዳንድ ጊዜ 4. ሁልጊዜ ለማለት ይቻላል

የመረጃ ሰብሳቢው ስም ______________________ የሱፐርቫይዘር ስም ____________________

ፊርማ ___________ ፊርማ ___________

DECLARATION

I, the undersigned, declare that this is my original work and has not been presented in this or any other university for a degree and all source of materials used for this thesis have been fully acknowledged.

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This thesis work has been submitted for examination with my approval as university advisor.

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