Prevalence of Depression and Associated Factors among Pregnant Women Attending Antenatal Care in Public Health Institutions of Awabale Woreda, East Gojjam Zone, Northwestern Ethiopia: a cross-sectional study

Abstract:
Background: Antenatal depression is a serious health problem and has negative consequences for the mother, fetus, and the entire family. However, it is a neglected component of care for women in pregnancy. The purpose of this study was to assess the prevalence of depression and associated factors among pregnant women attending antenatal clinics in public health institutions, in the Awabale Woreda Method: An institutional-based cross-sectional study was conducted in 2018 and a stratified sampling technique was used to select the study health institutions. A structured questionnaire was used to collect data. Edinburgh Postnatal Depression Scale was used to declare the presence of antenatal depression with a cut point score of 13 and above.

Result: This study showed that 63(17.8%) pregnant mothers had antenatal depression. Women who were running their business were 85% reduced to develop antenatal depression than housewives [AOR=0.15(0.001-0.25)]. Pregnant women had high school and above educational level 18 times higher odds of developing antenatal depression than women who had no formal education [AOR=18.15 (2.73-120.76)]. Women who had poor husband feeling on the current pregnancy were 4.94 more likely to develop antenatal depression than women who had good partner feeling on the current pregnancy [AOR=4.94(95%CI: 1.78-13.72)]. Women who had a history of depression were 8.2 times to develop antenatal depression than women who had no history of depression [AOR=8.22 (95%CI: 2.87-23.57)].

Conclusion: This study revealed that one-fifth of pregnant women developed antenatal depression. Women's occupational status, educational status, previous history of depression, and poor husband feeling on the current pregnancy were the significant factors of antenatal depression.

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Prevalence of Depression and Associated Factors among Pregnant Women Attending Antenatal Care in Public Health Institutions of Awabale Woreda, East Gojjam Zone, Northwestern Ethiopia: a cross-sectional study

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Abstract

Background: Antenatal depression is a serious health problem and has negative consequences for the mother, fetus, and the entire family. However, it is a neglected component of care for women in pregnancy. The purpose of this study was to assess the prevalence of depression and associated factors among pregnant women attending antenatal clinics in public health institutions, in the Awabale Woreda

Method: An institutional-based cross-sectional study was conducted in 2018 and a stratified sampling technique was used to select the study health institutions. A structured questionnaire was used to collect data. Edinburgh Postnatal Depression Scale was used to declare the presence of antenatal depression with a cut point score of 13 and above.

Result: This study showed that 63(17.8%) pregnant mothers had antenatal depression. Women who were running their business were 85% reduced to develop antenatal depression than housewives [AOR=0.15(0.001-0.25)]. Pregnant women had high school and above educational level 18 times higher odds of developing antenatal depression than women who had no formal education [AOR18.15 (2.73-120.76)].
Women who had poor husband feeling on the current pregnancy were 4.94 more likely to develop antenatal depression than women who had good partner feeling on the current pregnancy [AOR=4.94(95%CI: 1.78-13.72)]. Women who had a history of depression were 8.2 times to develop antenatal depression than women who had no history of depression [AOR=8.22 (95%CI: 2.87-23.57)].

**Conclusion:** This study revealed that one-fifth of pregnant women developed antenatal depression. Women’s occupational status, educational status, previous history of depression, and poor husband feeling on the current pregnancy were the significant factors of antenatal depression.

**Keywords:** Depression; Antenatal depression; Antenatal care; Awabel Woreda

**Introduction**

Pregnancy is the period from the fertilization of the egg by sperm to the delivery of the fetus and usually lasts 40 weeks. Starting from the last normal menstrual period, it is divided into three trimesters, each lasting three months[1]. It is a distinctive social and biological event in a woman's life [2, 3].

A depressive disorder is an illness that involves the body, mood, and thoughts in which the person has unrelenting sentiments of unhappiness and irrelevance and a lack of aspiration to engage in previously enjoyable activities that last more than two weeks. When these sentiments last for a short period, it may be a case of feeling sadness[4]. It is the most frequent expressive disorder in women and the general population, and one in every five people has depression with more than the twofold increased incidence in women than men [2]. Psychiatric history, stressful life events, lack of social support, teenage pregnancy, low educational level, low income, and violence against women are the factors that make depression prevalent in pregnant women [3, 5, 6].

Antenatal depression means depression that starts from conception to delivery[7]. Pregnant women experience symptoms similar to general depression and may interfere with their normal day-to-day activities. It may occur at any stage of pregnancy and can be a reaction to the pregnancy itself, due to health issues, major life stresses, genetic
and biochemical basis, or due to a continuation or relapse of a pre-pregnancy condition[8]. Antenatal depression ends with poor fetal, infant development, and maternal outcomes like small for gestational age, prematurity, intrauterine growth problem; postnatal depression preeclampsia, anemia; educational problem, malnutrition, respiratory disorders, and mental retardation [9-13].

Most of the researches was undertake on postnatal depression. The majority of studies on the prevalence of antenatal depression and associated factors have been conducted in developed countries [14]. However, there is a paucity of studies, which examined the prevalence and associated factors of antenatal depression in low-income countries like Ethiopia. There are studies undertaken on antenatal depression. Yet, they focus on adolescent pregnant women and women’s that have antenatal care service in hospital settings[3]. Those studies have a limitation on addressing pregnant women in all age groups. In addition, they are likely to have a bias because most women with hindrance in their pregnancies are likely to seek antenatal care services in hospitals. There are studies, which were excluded illiterate women from the study[15]. This may lead to selection bias because educational status has a significant association with antenatal depression as described in the literature.

The Federal Democratic Republic of Ethiopia National Mental Health Strategy promotes a decentralized approach in which mental health services are to be offered from local health institutions up to tertiary hospitals to ensure access to treatment near to their living area and with a less restraining setting [16]. This study aimed to assess the prevalence of depression and associated factors among pregnant women attending antenatal clinics in public health institutions, in Awabale Woreda.

**Methods**

**Study area and period**

The study was conducted in 2018 in Awabale woreda which is found in the Amhara region, North West Ethiopia, which is located 300 km from Addis Ababa, the capital city of Ethiopia, and located 265 km from Bihar Dar, the capital city of the Amhara region. The population of the Woreda is 146260, of which 37413 are females aged 15-49
years[17]. There are seven public health institutions (one primary hospital and six health centers) eligible for this study in Awabale Woreda. Maternal health services are free of charge in Ethiopia at public health institutions including public health institutions included in this study. Antenatal care is provided in all public health institutions of Awabale. The Woreda has an annual ANC plan of 5590 (1309 in Lumame health center, 648 in Shebela health center, 641 in Wejele health center, 665 in Lega health center, 901 in Yesenbet health center, 765 in Tsid-Maryam health center and 661 in Lumame primary hospital)[17]. This study was conducted in public health institutions of Awabale Woreda, in 2018.

**Study design**

An institutional-based cross-sectional study design was employed.

**Study participants**

All pregnant women attending antenatal care in Awabale Woreda public health institutions were the source population. All pregnant women attending antenatal care in selected public health institutions during the study period were the study population. Pregnant women at any age of gestation who come to the selected health institutions for antenatal care visits during the study period were included in the study and we excluded those who were critically ill during the data collection period.

**Sample size**

The required sample size was calculated using a single population proportion formula with the assumption of 31.2% of depression during pregnancy from a study conducted in Adama, Ethiopia[18] and 5% marginal error (w), a standard Z score of 1.96 corresponding to a 95% confidence interval ($Z_{\alpha/2}$), and 10% non-response rate.

$$n = \frac{(Z_{\alpha/2})^2 p (1-p)}{W^2}$$

$$n = \frac{(1.96)^2 (0.312) (0.688)}{(0.05)^2} = 329.8$$
By considering 10% non response rate=32.98. Then the required sample size was 363.

**Sampling techniques**

Stratified sampling was undertaken to select the study of health institutions. All seven public health institutions in Awabale District were included and the sample size was proportionally allocated based on the number of target mothers. All eligible and consenting women attending for antenatal care during the study period were taken into the study consecutively until the sample size was reached.

**Study variables**

- **Dependent variable**: depression during pregnancy (present/absent)
- **Independent variables**
  - **Socio-demographic factors**: maternal age, educational status, marital status, occupation of the mother and family, monthly income
  - **Obstetric factors**: Gravidity, gestational age, history of abortion, unplanned pregnancy
  - **Psycho-social factors**: social support, relationship with a partner, husband support, violence
  - **Clinical factors**: a self history of depression, family history of depression, history of chronic illness

**Operational definitions**

- **Antenatal depression**: it is an illness in which pregnant women have an Edinburgh Postnatal Depression Scale (EPDS) score of 13 and above[19, 20]
- **Social support**: Is support from the community ranges from a score of 3 to 14 according to the OSLO social support scale. A score of 3-8 is poor support, 9-11 is moderate support, and 12-14 is strong support.

**Data collection procedure and data quality control**

To assure the data quality, data were collected with face-to-face interviews by attained BSc Midwife in each institution after one-day data collection training was given to them together with two MSc holder supervisors. The questionnaire was structured and pre-
tested which was first prepared in English and translated to local (Amharic) language and then again translated back to English. A pretest was conducted on 18 pregnant women of the sample size other than the study area and the necessary correction on the tool was employed accordingly.

**Data collection and measurement tool**

EPDS was administered to detect symptoms of depression and their socio-demographic data along with obstetric and psychosocial factors. EPDS is a 10 item questionnaire scored from zero up to three (higher score indicating more depressive symptoms), that has been validated for detecting depression in antepartum and postpartum samples in many countries. The instrument was validated in public health centers in Addis Ababa for postpartum use and showed a sensitivity of 84.6 % and specificity of 77.0 % at the cutoff score of 7/8[20]. Those pregnant women who score 13 and above were categorized as depressed women while pregnant women who scored below 13 were considered as non-depressed women.

The OSLO-3 item social support scale was used to measure social support for pregnant women. Partners feeling on the current pregnancy can be defined as the sensation of pregnant women about the feeling of their partners concerning the current pregnancy. It was measured by asking whether her partner feeling on the current pregnancy was good or poor. Similarly, husband/partner support was assessed by asking women emotions about their partner's support to the health of the fetus and continuation of pregnancy. A structured Amharic version questioner containing socio-demographic characteristics, obstetric history, and psychosocial history, history of clinical factors, history of violence, and history of substance abuse was administered.

**Data analysis technique**

EpiData version 3.1 software was used for data entry and SPSS version 20 was used for analysis. Bivariate logistic regression was employed to identify an association between independent and dependent variables. Variables having a P-value of less than 0.2 in the bivariate logistic regression analysis were fitted into the multivariable logistic regression model to manage confounders. The 95% confidence interval of odds ratio
was computed and a variable having P-value less than 0.05 in the multivariable logistic regression analysis was considered as statistically significant. The result was presented by tables and text.

**Ethical consideration**

The study was approved by the Institutional Health Research Ethics Review Committee of Debre Markos University, College of health science. An official letter was written from Debre Markos University to the selected health institutions. The participants enrolled in the study were informed about the study objectives, expected outcomes, benefits, and the risks associated with it. Written consent was taken from the participants before the interview.

**Result**

**Socio-demographic factors**

Three hundred fifty-four study participants gave the response to the questionnaire, giving a response rate of 97.5%. The majorities of the respondents were Amhara 351 (99.2%) and orthodox by religion were 293 (82.8%). Three hundred thirty-five (94.6%) of the women were married and 150 (44.8%) were farmers in their occupation (Table 1).

**Obstetric and clinical characteristics**

Two hundred nine (59%) of the respondents had a history of pregnancy. Around 58 (16.4%) and 9 (2.5%) of the respondents had a previous history of depression and a family history of depression respectively and 38 (10.7%) had a history of chronic illness (Table 2).

**Psychosocial, History of violence and substance use**

more than Three-fourths (77.4%) of the respondents reported their husbands are happy with the occurrence of current pregnancy and a half (50.8%) of women explored good
baby father support to the health of the fetus and continuation of pregnancy. Most 33(47.1%) and 249(70.3%) of the participants complained health-related problems were the most frequent emotionally disturbing factor in their lifetime and during the current pregnancy respectively. According to the OSLO social support scale, 112(31.6%) women have poor, 160(45.2%) moderate, and 82(23.2%) strong social support. Seventy-three (20.6%) of women's had a history of violence in their lifetime (Table 3).

**Prevalence of antenatal depression**
About 63 (17.8%) of respondents had antenatal depression (EPDS score ≥13). More than half (57%) of the respondents were able to laugh and see the funny side of things. On the other hand, (58.5%) of pregnant women felt sad or miserable most of the time (Table4)

**Factors associated with antenatal depression**
Age, marital status, educational status of the respondent, occupation of respondents and partners, history of abortion and stillbirth, trimester, unplanned pregnancy week at first ANC, poor husband support and feelings, social support, emotionally disturbing factors, history of depression, history of violence and substance use were significant factors in the bivariate regression analysis.

In the multivariable regression analysis; occupational status of the respondent [AOR=0.15(95%CI 0.001-0.25)], women educational status of high school and above[AOR=16.23(95%CI 2.46-107.27)], poor husband feeling on the current pregnancy[AOR=4.86(95%CI: 1.74-13.58)] and the previous history of depression [AOR=7.26(95%CI: 2.52-20.93)] were significant factors for antenatal depression (Table- 5).

**Discussion**
This study aimed to assess the prevalence of depression and associated factors among pregnant women attending antenatal care in public health institutions of Awabale Woreda, East Gojam zone, Amhara National Regional State, Northwestern Ethiopia, during March-April 2018. The study finding of antenatal depression (17.8%) in the
current study was in line with similar reports in Bangladesh (18%) and Ethiopia (19.9%) [21, 22]. The finding of this research was lower than the studies done in China (28.5%) [7], 29.9% and 31.2% in Ethiopia [19, 23], 33.8 in Tanzania [15], 38.5% and 47% in South Africa [15, 24]. This difference might be due to the difference in their population demographic characteristics, study design, period, and the difference in their investigatory or diagnostic tools.

Prevalence of antenatal depression was associated with the occupation of the women, educational status, history of depression, and poor husband feeling in the current pregnancy. Women who were running their business were 85% reduced to develop antenatal depression than housewives [AOR=0.15(0.001-0.25)]. This might be due to that, those who have their own business may have social relationships and putting women economically independent [25]. Also, those housewife women are expending most of their time at home and alone. This loneliness may put them in depression [26]. Women with high school and above educational levels were 18 times more likely to develop antenatal depression than women who had no formal education [16.23(95%CI 2.46-107.27)]. This might be due to their difficulty in managing interpersonal relationship strains related to academic performance pressure and inability to translate their additional education into better mental health outcomes [27]. On the other hand, different studies in different countries report the association of lower educational status with an increased prevalence of antenatal depression [21, 25, 28]. Those women who had a history of depression had 7.26 times the odds of developing antenatal depression than women who had no history of depression [AOR=7.26(95%CI: 2.52- 20.93)]. The comparable association was also reported from studies conducted in developing and developed countries [19]. This might be due to physical and hormonal changes occurring during pregnancy and the recurrence of depressive symptoms [25]. Conversely, the personal history of previous psychiatric illness was not found to be a significant risk factor for antenatal depression in a study conducted in Lahore, Pakistan [29].

Pregnant women who had poor husband feeling on the current pregnancy were 4.86 times more likely to develop antenatal depression as compared with good husband feeling towards current pregnancy [AOR=4.86(95%CI: 1.74-13.58)]. This is possible
because those partners who had good feelings about the pregnancy authorize the women on their home responsibilities and help women to have cared for their health and the health of the fetus. It might be also due to the effect of a poor husband’s feeling on diminishing partner support[19].

The finding of this study shows no significant association between partner occupational status, trimester, unplanned pregnancy, social support, history of violence, and substance use in the multivariable model. This result seems consistent with other findings[19, 30]. On the other hand, contrary to this finding, those women who had a history of substance use had a higher risk of developing antenatal depression[15].

**Limitations of the study**

We cannot be certain that individuals with an EPDS score ≥ of 13 had depressive illness without confirmation. Moreover, the EPDS cut-off score varies in different kinds of literature and this could be the reason for the different prevalence of antenatal depression in different kinds of literature. Concluding about partner feeling on the current pregnancy by asking pregnant women was an indirect conclusion and may have a biased result. Social desirability bias due to face-to-face interviews and using cross-sectional studies which do not show causality is also the limitation of this study.

**Strength of the study**

The main strength of this study was the data source. It used a primary data source during data collection.

**Conclusion**

This study showed that 17.8% of pregnant women develop antenatal depression. These notify a higher prevalence of antenatal depression in women attending antenatal care services at public health institutions. Women's occupational statuses, educational status, previous history of depression, and poor husband feeling on the current pregnancy were significant factors for antenatal depression.

**Recommendation**
This higher prevalence of antenatal depression should alert health care professionals for conscious screening of housewife pregnant women and pregnant women with the educational status of high school and above for all depressive symptoms by focusing on the previous history of depression as an overall health assessment. Encouraging male's involvement in maternal health service and identifying those partners who have poor feelings about the current pregnancy and providing appropriate counseling should be in the mind of all stakeholders. Enhancing employment opportunities and empowering housewife women's involvement in income-earning activities should be a matter of both governmental and non-governmental stakeholders. Formulating strategies for better mental health outcomes and improving women's capability in translating their educational status into better mental health outcomes should be in the mind of both the Federal Ministry of health (FMO) and the Regional health bureau in collaboration with the Ministry of education. Expansion of mental health services far to the extreme rural areas and providing appropriate counseling, treatment, referral, and linkage of women with antenatal depression to the appropriate health institution should be considered by all stakeholders. Strengthening admission of pregnant women on early gestation to the nearby health center by focusing on those housewife women and women with a previous history of depression are the recommended interventions.

**Abbreviations**

AOR: Adjusted Odds Ratio; CI: Confidence Interval; COR: Crude Odds Ratio; EPDS Edinburgh Postnatal Dépression Scale

**Availability of data and materials**

The data that support the findings of this study are available, but some restrictions may apply to the availability of these data as there are some sensitive issues. However, data are available from the corresponding authors upon reasonable request.

**Competing interests**

The authors declare that they have no competing interests.
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Authors’ contributions
All authors involved equally, read and approved the final manuscript.

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Reference

1. *Pregnancy* | definition of pregnancy by Medical dictionary
   https://medical-dictionarythefreedictionarycom/pregnancy.

2. Mirsanjari MO, Muda WAM, Ahmad A, Othman MS, Mirsanjari MM: *Depression symptoms in the second and third trimester of gestation*. 2012.

3. Pereira PK, Lovisi GM, Pilowsky DL, Lima LA, Legay LF: *Depression during pregnancy: prevalence and risk factors among women attending a public health clinic in Rio de Janeiro, Brazil*. *Cadernos de Saúde Pública* 2009, 25(12):2725-2736.

4. *Depressive Disorders* | Psychology Today
   https://www.psychologytoday.com/conditions/depressive-disorders

5. Getinet W, Amare T, Boru B, Shumet S, Worku W, Azale T: *Prevalence and Risk Factors for Antenatal Depression in Ethiopia: Systematic Review*. *Depression Research and Treatment* 2018, 2018:3649269.

6. Zegeye A, Alebel A, Gebrie A, Tesfaye B, Belay YA, Adane F, Abie W: *Prevalence and determinants of antenatal depression among pregnant women in Ethiopia: a systematic review and meta-analysis*. *BMC Pregnancy and Childbirth* 2018, 18(1):462.
7. Zeng Y, Cui Y, Li J: Prevalence and predictors of antenatal depressive symptoms among Chinese women in their third trimester: a cross-sectional survey. *BMC psychiatry* 2015, 15(1):66.

8. Antenatal depression. *Black Dog Institute* http://www.blackdoginstitute.org.au/public/depression/inpregnancypostnatal/antenataldepressioncfm.

9. Alder J, Fink N, Bitzer J, Hösl I, Holzgreve W: Depression and anxiety during pregnancy: a risk factor for obstetric, fetal and neonatal outcome? A critical review of the literature. *The journal of maternal-fetal & neonatal medicine : the official journal of the European Association of Perinatal Medicine, the Federation of Asia and Oceania Perinatal Societies, the International Society of Perinatal Obst* 2007, 20(3):189-209.

10. Husain N, Munshi T, Jafri F, Husain M, Parveen A, Saeed Q, Tomenson B, Naeem F, Chaudhry N: Antenatal Depression is Not Associated with Low-Birth Weight: A Study from Urban Pakistan. *Frontiers in psychiatry* 2014, 5:175.

11. Grote NK, Bridge JA, Gavin AR, Melville JL, Iyengar S, Katon WJ: A meta-analysis of depression during pregnancy and the risk of preterm birth, low birth weight, and intrauterine growth restriction. *Archives of general psychiatry* 2010, 67(10):1012-1024.

12. Bonari L, Pinto N, Ahn E, Einarson A, Steiner M, Koren G: Perinatal risks of untreated depression during pregnancy. *Canadian journal of psychiatry Revue canadienne de psychiatrie* 2004, 49(11):726-735.

13. Dunkel Schetter C, Tanner L: Anxiety, depression and stress in pregnancy: implications for mothers, children, research, and practice. *Curr Opin Psychiatry* 2012, 25(2):141-148.

14. Pereira PK, Lovisi GM, Lima LA, Legay LF, de Cintra Santos JF, Santos SA, Thiengo DL, Valencia E: Depression during pregnancy: review of epidemiological and clinical aspects in developed and developing countries. In: *Psychiatric Disorders-Trends and Developments*. edn.: InTech; 2011.

15. Manikkam L, Burns JK: Antenatal depression and its risk factors: an urban prevalence study in KwaZulu-Natal. *SAMJ: South African Medical Journal* 2012, 102(12):940-944.

16. Federal Democratic Republic of Ethiopia Ministry of Health.National Mental Health Strategy 2012/13 - 2015/16. 2012/13-2015/16.

17. Annual report of Awabale District health office 2010 E.C.
18. Assessment on Prevalence of Antenatal Depressive Disorders and Associated Factors among Adama Hospital Antenatal Clinic Attendants, Adama, Ethiopia, 2011. Unpublished study. Ethiopian Public Health Association 2011.

19. Biratu A, Haile D: Prevalence of antenatal depression and associated factors among pregnant women in Addis Ababa, Ethiopia: a cross-sectional study. Reproductive health 2015, 12(1):99.

20. Tesfaye M, Hanlon C, Wondimagegn D, Alem A: Detecting postnatal common mental disorders in Addis Ababa, Ethiopia: validation of the Edinburgh postnatal depression scale and Kessler scales. Journal of affective disorders 2010, 122(1):102-108.

21. Nasreen HE, Edhborg M, Forsell Y, Kabir ZN: Prevalence and associated factors of depressive and anxiety symptoms during pregnancy: a population based study in rural Bangladesh. BMC women's health 2011, 11(1):22.

22. Dibaba Y, Fantahun M, Hindin MJ: The association of unwanted pregnancy and social support with depressive symptoms in pregnancy: evidence from rural Southwestern Ethiopia. BMC pregnancy and childbirth 2013, 13(1):135.

23. Martha Assefa Sahile1 MTS, Tadese Awoke3 and Dessalegn Bekele4: Prevalence and predictors of antenatal depressive symptoms among women attending Adama Hospital Antenatal Clinic, Adama, Ethiopia. International Journal of Nursing and Midwifery.

24. Rochat TJ, Tomlinson M, Bärnighausen T, Newell M-L, Stein A: The prevalence and clinical presentation of antenatal depression in rural South Africa. Journal of Affective Disorders 2011, 135(1):362-373.

25. Yanikkerem E, Ay S, Mutlu S, Goker A: Antenatal depression: prevalence and risk factors in a hospital based Turkish sample. J Pak Med Assoc 2013, 63(4):472-477.

26. Singh A, Misra N: Loneliness, depression and sociability in old age. Industrial psychiatry journal 2009, 18(1):51.

27. Sarah K. Dixon SERK: Depression and College Stress Among University Undergraduates: Do Mattering and Self-Esteem Make a Difference?

28. Marcus SM, Flynn HA, Blow FC, Barry KL: Depressive symptoms among pregnant women screened in obstetrics settings. Journal of Women's Health 2003, 12(4):373-380.

29. Humayun A, Haider I, Imran N, Iqbal H, Humayun N: Antenatal depression and its predictors in Lahore, Pakistan/Depression prénatale et facteurs
predictifs a Lahore (Pakistan). Eastern Mediterranean Health Journal 2013, 19(4):327.

30. Hartley M, Tomlinson M, Greco E, Comulada WS, Stewart J, Le Roux I, Mbewu N, Rotheram-Borus MJ: Depressed mood in pregnancy: prevalence and correlates in two Cape Town peri-urban settlements. Reproductive health 2011, 8(1):9.

Table 1: Socio-demographic characteristics of pregnant women attending ANC in Awabale district, East Gojjam zone, Northwest Ethiopia 2018(n=354)

| Variables               | Frequency | Percentage |
|-------------------------|-----------|------------|
| Maternal Age            |           |            |
| ≤ 19                    | 17        | 4.8        |
| 20-34                   | 262       | 74.0       |
| ≥35                     | 75        | 21.2       |
| Orthodox Christian      | 293       | 82.8       |
| Muslim                  | 61        | 17.2       |
| Religion                |           |            |
| Amhara                  | 351       | 99.2       |
| Oromo                   | 3         | 0.8        |
| Ethnicity               |           |            |
| Marital status          |           |            |
| Not married             | 19        | 5.4        |
| Married                 | 335       | 94.6       |
| Illiterate(Unable to read and write) | 170 | 48.0 |
| Variables                          | Frequency | Percentage |
|-----------------------------------|-----------|------------|
| History of previous pregnancy     | No        | 145        | 41.0       |
|                                   | Yes       | 209        | 59.0       |
| Number of pregnancies             | Primigravidas | 145    | 41.0       |
|                                   | Multigravida | 209    | 59.0       |
| Previous history of abortion      | No        | 167        | 79.9       |
|                                   | Yes       | 42         | 20.1       |
| Type of abortion                  | Spontaneous | 37     | 88.1       |
|                                   | Induced   | 5          | 11.9       |
| History of stillbirth             | No        | 186        | 89.0       |
|                                   | Yes       | 23         | 11.0       |
| Is the current pregnancy planned  | No        | 48         | 13.6       |
| Variables                                                       | Frequency | Percentage% |
|----------------------------------------------------------------|-----------|-------------|
| Husband feeling on the current pregnancy                       |           |             |
| Happy(Good)                                                    | 274       | 77.4        |
| Not happy(Poor)                                                | 80        | 22.6        |
| Husband support to the health of the fetus and continuation of pregnancy |           |             |
| Very good                                                      | 148       | 41.8        |
| Good                                                           | 180       | 50.8        |
| Not good                                                       | 26        | 7.3         |
| Social support(Based on OSLO social support scale)             |           |             |
| Poor                                                           | 112       | 31.6        |
| Moderate                                                       | 160       | 45.2        |
| Strong                                                         | 80        | 23.2        |
| The emotionally disturbing factor for the last twelve month    |           |             |
| No                                                             | 284       | 80.2        |
| Yes                                                            | 70        | 19.8        |

Table 3: Psychosocial, history of violence and substance use of pregnant women attending ANC in Awabale district, East Gojjam zone, Northwest Ethiopia 2018(n=354)
| Variables                                                                 | Frequency | Percentage |
|--------------------------------------------------------------------------|-----------|------------|
| I have been able to laugh and see the funny side of things:              |           |            |
| As much as I always could                                               | 203       | 57.3       |
| Not quite as much now                                                   | 110       | 31.1       |
| Not so much now                                                         | 24        | 6.8        |
| Not at all                                                              | 17        | 4.8        |
| I have look forward with enjoyment to things:                            |           |            |
| As much as I ever did                                                   | 204       | 57.6       |
| Rather less than I used to                                              | 99        | 28.0       |
| Less than I used to                                                     | 28        | 7.9        |
| Hardly at all                                                           | 23        | 6.5        |
| I have blamed myself unnecessarily when things went wrong:              |           |            |
| Yes, most of the time                                                   | 111       | 31.4       |
| Yes, some of the time                                                   | 103       | 29.1       |
| Not very often                                                          | 128       | 36.2       |

Table 4: EPDS measurement of antenatal depression among pregnant women attending ANC in Awabale district, East Gojjam zone, Northwest Ethiopia 2018 (n=354)
|                                  | Depression | COR(95%CI) | AOR(95%CI) |
|----------------------------------|------------|------------|------------|
|                                  | No         | Yes        |            |
| Occupational status of the       |            |            |            |
| respondent                       |            |            |            |
| Employed                         | 63         | 6          | 0.37 (0.15, 0.91) | 0.16(0.001, 0.25) |
| Running personal business         | 49         | 11         | 0.87(0.42, 1.81) | 0.48(0.07, 3.21) |
| Housewife                        | 179        | 46         | 1          | 1 |
| Illiterate                       | 147        | 23         | 1          | 1 |
| Educational status of the        |            |            |            |
| respondent                       |            |            |            |
| Elementary school                | 64         | 27         | 1.68(0.82, 3.45) | 1.08(0.18, 6.4) |
| High school and above            | 80         | 13         | 1.04(0.5, 2.16) | 16.23(2.46, 107.27) |
| Occupational status of the husband | Employed | 66 | 11 | 0.57(0.27, 1.2) | 1.47(0.21, 10.04) | Running personal business | 102 | 6 | 0.20(0.81, 0.5) | 0.22(0.044, 1.09) |
|----------------------------------|---------|----|----|----------------|------------------|--------------------------|------|---|----------------|------------------|
| Trimester                        |         |    |    |                |                  |                          |      |   |                |                  |
| First                            | 88      | 10 | 2.4(1.30, 4.42) | 1.90(0.47, 7.74) |                  |                          |      |   |                |                  |
| Second                           | 154     | 41 | 1  | 1              |                  |                          |      |   |                |                  |
| Third                            | 69      | 12 | 0.65(0.32, 1.32) | 0.87(0.28, 3.69) |                  |                          |      |   |                |                  |
| Planned pregnancy                |         |    |    |                |                  |                          |      |   |                |                  |
| No                               | 24      | 24 | 6.85(3.55,13.22) | 3.06(0.73, 12.87) |                  |                          |      |   |                |                  |
| Yes                              | 267     | 39 | 1  | 1              |                  |                          |      |   |                |                  |
| Social support                   |         |    |    |                |                  |                          |      |   |                |                  |
| Poor                             | 81      | 31 | 2.40(1.30, 4.42) | 1.14(0.28, 4.61) |                  |                          |      |   |                |                  |
| Moderate                         | 138     | 22 | 1  | 1              |                  |                          |      |   |                |                  |
| Strong                           | 72      | 10 | 0.87(0.39, 1.94) | 0.92(0.24, 3.61) |                  |                          |      |   |                |                  |
| Husband feeling on the current pregnancy |   |    |    |                |                  |                          |      |   |                |                  |
| Good                             | 248     | 26 | 1  | 1              |                  |                          |      |   |                |                  |
| Poor                             | 43      | 37 | 8.21(4.52, 4.91) | 4.86(1.74, 13.58) |                  |                          |      |   |                |                  |
| Previous history of depression   |         |    |    |                |                  |                          |      |   |                |                  |
| No                               | 256     | 40 | 1  | 1              |                  |                          |      |   |                |                  |
| Yes                              | 35      | 23 | 4.21(2.26, 7.84) | 7.26(2.52, 20.93) |                  |                          |      |   |                |                  |
| History of violence              |         |    |    |                |                  |                          |      |   |                |                  |
| No                               | 247     | 34 | 1  | 1              |                  |                          |      |   |                |                  |
| Yes                              | 44      | 29 | 4.79(2.65, 8.64) | 1.27(0.34, 4.79) |                  |                          |      |   |                |                  |
| Lifetime history of substance use |         |    |    |                |                  |                          |      |   |                |                  |
| No                               | 116     | 42 | 1  | 1              |                  |                          |      |   |                |                  |
| Yes                              | 175     | 21 | 3.02(1.70, 5.36) | 1.88(0.73, 4.84) |                  |                          |      |   |                |                  |
| History of substance use in the current pregnancy |   |    |    |                |                  |                          |      |   |                |                  |
| No                               | 114     | 40 | 1  | 1              |                  |                          |      |   |                |                  |
| Yes                              | 177     | 23 | 2.70(1.54, 4.75) | 0.09(0.004, 1.82) |                  |                          |      |   |                |                  |
Prevalence of Depression and Associated Factors among Pregnant Women Attending Antenatal Care in Public Health Institutions of Awabale Woreda, East Gojjam Zone, Northwestern Ethiopia: a cross-sectional study

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Abstract

Background: Antenatal depression is a serious health problem and has negative consequences for the mother, fetus, and the entire family. However, it is a neglected component of care for women in pregnancy. The purpose of this study was to assess the prevalence of depression and associated factors among pregnant women attending antenatal clinics in public health institutions, in the Awabale Woreda

Method: An institutional-based cross-sectional study was conducted in 2018 and a stratified sampling technique was used to select the study health institutions. A structured questionnaire was used to collect data. Edinburgh Postnatal Depression Scale was used to declare the presence of antenatal depression with a cut point score of 13 and above.

Result: This study showed that 63(17.8%) pregnant mothers had antenatal depression. Women who were running their business were 85% reduced to develop antenatal depression than housewives [AOR=0.15(0.001-0.25)]. Pregnant women had high school and above educational level 18 times higher odds of developing antenatal depression than women who had no formal education [AOR18.15 (2.73-120.76)].
Women who had poor husband feeling on the current pregnancy were 4.94 more likely to develop antenatal depression than women who had good partner feeling on the current pregnancy \[\text{AOR}=4.94(95\%\text{CI}: 1.78-13.72)]\. Women who had a history of depression were 8.2 times to develop antenatal depression than women who had no history of depression \[\text{AOR}=8.22 (95\%\text{CI}: 2.87-23.57)]\. 

**Conclusion:** This study revealed that one-fifth of pregnant women developed antenatal depression. Women’s occupational status, educational status, previous history of depression, and poor husband feeling on the current pregnancy were the significant factors of antenatal depression.

**Keywords:** Depression; Antenatal depression; Antenatal care; Awabel Woreda

**Introduction**

Pregnancy is the period from the fertilization of the egg by sperm to the delivery of the fetus and usually lasts 40 weeks. Starting from the last normal menstrual period, it is divided into three trimesters, each lasting three months[1]. It is a distinctive social and biological event in a woman’s life [2, 3].

A depressive disorder is an illness that involves the body, mood, and thoughts in which the person has unrelenting sentiments of unhappiness and irrelevance and a lack of aspiration to engage in previously enjoyable activities that last more than two weeks. When these sentiments last for a short period, it may be a case of feeling sadness[4]. It is the most frequent expressive disorder in women and the general population, and one in every five people has depression with more than the twofold increased incidence in women than men [2]. Psychiatric history, stressful life events, lack of social support, teenage pregnancy, low educational level, low income, and violence against women are the factors that make depression prevalent in pregnant women [3, 5, 6].

Antenatal depression means depression that starts from conception to delivery[7]. Pregnant women experience symptoms similar to general depression and may interfere with their normal day-to-day activities. It may occur at any stage of pregnancy and can be a reaction to the pregnancy itself, due to health issues, major life stresses, genetic
and biochemical basis, or due to a continuation or relapse of a pre-pregnancy condition[8]. Antenatal depression ends with poor fetal, infant development, and maternal outcomes like small for gestational age, prematurity, intrauterine growth problem; postnatal depression preeclampsia, anemia; educational problem, malnutrition, respiratory disorders, and mental retardation [9-13].

Most of the researches was undertake on postnatal depression. The majority of studies on the prevalence of antenatal depression and associated factors have been conducted in developed countries [14]. However, there is a paucity of studies, which examined the prevalence and associated factors of antenatal depression in low-income countries like Ethiopia. There are studies undertaken on antenatal depression. Yet, they focus on adolescent pregnant women and women's that have antenatal care service in hospital settings[3]. Those studies have a limitation on addressing pregnant women in all age groups. In addition, they are likely to have a bias because most women with hindrance in their pregnancies are likely to seek antenatal care services in hospitals. There are studies, which were excluded illiterate women from the study[15]. This may lead to selection bias because educational status has a significant association with antenatal depression as described in the literature.

The Federal Democratic Republic of Ethiopia National Mental Health Strategy promotes a decentralized approach in which mental health services are to be offered from local health institutions up to tertiary hospitals to ensure access to treatment near to their living area and with a less restraining setting [16]. This study aimed to assess the prevalence of depression and associated factors among pregnant women attending antenatal clinics in public health institutions, in Awabale Woreda.

Methods

Study area and period

The study was conducted in 2018 in Awabale woreda which is found in the Amhara region, North West Ethiopia, which is located 300 km from Addis Ababa, the capital city of Ethiopia, and located 265 km from Bihar Dar, the capital city of the Amhara region. The population of the Woreda is 146260, of which 37413 are females aged 15-49
years[17]. There are seven public health institutions (one primary hospital and six health centers) eligible for this study in Awabale Woreda. Maternal health services are free of charge in Ethiopia at public health institutions including public health institutions included in this study. Antenatal care is provided in all public health institutions of Awabale. The Woreda has an annual ANC plan of 5590(1309 in Lumame health center, 648 in Shebela health center, 641 in Wejele health center, 665 in Lega health center, 901 in Yesenbet health center, 765 in Tsid-Maryam health center and 661 in Lumame primary hospital)[17]. This study was conducted in public health institutions of Awabale Woreda, in 2018.

**Study design**

An institutional-based cross-sectional study design was employed.

**Study participants**

All pregnant women attending antenatal care in Awabale Woreda public health institutions were the source population. And all pregnant women attending antenatal care in selected public health institutions during the study period were the study population. Pregnant women at any age of gestation who come to the selected health institutions for antenatal care visits during the study period were included in the study and we excluded those who were critically ill during the data collection period.

**Sample size**

The required sample size was calculated using a single population proportion formula with the assumption of 31.2 % of depression during pregnancy from a study conducted in Adama, Ethiopia[18] and 5% marginal error (w), a standard Z score of 1.96 corresponding to a 95% confidence interval (Za/2),and 10% non-response rate.

\[
\begin{align*}
n &= \left( \frac{Za}{2} \right)^2 p \ (1-p) \\
&= \left( \frac{1.96}{2} \right)^2 (0.312) (0.688) = 329.8 \\
&= \left( 0.05 \right)^2 
\end{align*}
\]
By considering 10% non response rate=32.98. Then the required sample size was 363.

**Sampling techniques**

Stratified sampling was undertaken to select the study of health institutions. All seven public health institutions in Awabale District were included and the sample size was proportionally allocated based on the number of target mothers (Lumame Health Center =85, Shebila Health Center=42, Wejele Health Center =42, Lega Health Center =43, Yesenbet Health Center =58, Tsid-Maryam Health Center =50, Lumame Primary Pospital=43). All eligible and consenting women attending for antenatal care during the study period were taken into the study consecutively until the sample size was reached.

**Study variables**

**Dependent variable:** depression during pregnancy (present/absent)

**Independent variables**

**Socio-demographic factors:** maternal age, educational status, marital status, occupation of the mother and family, monthly income

**Obstetric factors:** Gravidity, gestational age, history of abortion, unplanned pregnancy

**Psycho-social factors:** social support, relationship with a partner, husband support, violence

**Clinical factors:** a self history of depression, family history of depression, history of chronic illness

**Operational definitions**

**Antenatal depression:** it is an illness in which pregnant women have an Edinburgh Postnatal Depression Scale (EPDS) score of 13 and above[19, 20]

**Social support:** Is support from the community ranges from a score of 3 to 14 according to the OSLO social support scale. A score of 3-8 is poor support, 9-11 is moderate support, and 12-14 is strong support.

**Data collection procedure and data quality control**
To assure the data quality, data were collected with face-to-face interviews by attained BSc Midwife in each institution after one-day data collection training was given to them together with two MSc holder supervisors. The questionnaire was structured and pre-tested which was first prepared in English and translated to local (Amharic) language and then again translated back to English. A pretest was conducted on 18 pregnant women of the sample size other than the study area and the necessary correction on the tool was employed accordingly.

**Data collection and measurement tool**

*Edinburgh Postnatal Depression Scale (EPDS)* was administered to detect symptoms of depression and their socio-demographic data along with obstetric and psychosocial factors. *Edinburgh Postnatal Depression Scale (EPDS)* is a 10 item questionnaire scored from zero up to three (higher score indicating more depressive symptoms), that has been validated for detecting depression in antepartum and postpartum samples in many countries. The instrument was validated in public health centers in Addis Ababa for postpartum use and showed a sensitivity of 84.6 % and specificity of 77.0 % at the cutoff score of 7/8[20]. Those pregnant women who score 13 and above were categorized as depressed women while pregnant women who scored below 13 were considered as non-depressed women.

The OSLO-3 item social support scale was used to measure social support for pregnant women. The score ranges from 3 to 14. A score of 3-8 poor support, 9-11 moderate support, and 12-14 were strong. Partners feeling on the current pregnancy can be defined as the sensation of pregnant women about the feeling of their partners concerning the current pregnancy. It was measured by asking whether her partner feeling on the current pregnancy was good or poor. Similarly, husband/partner support was assessed by asking women emotions about their partner's support to the health of the fetus and continuation of pregnancy. A structured Amharic version questioner containing socio-demographic characteristics, obstetric history, psychosocial history, history of clinical factors, history of violence, and history of substance abuse was administered.
Data analysis technique

EpiData version 3.1 software was used for data entry and SPSS version 20 was used for analysis. Bivariate logistic regression was employed to identify an association between independent and dependent variables. Variables having a P-value of less than 0.2 in the bivariate logistic regression analysis were fitted into the multivariable logistic regression model to manage confounders. The 95% confidence interval of odds ratio was computed and a variable having P-value less than 0.05 in the multivariable logistic regression analysis was considered as statistically significant. The result was presented by tables and text.

Ethical consideration

The study was approved by the Institutional Health Research Ethics Review Committee of Debre Markos University, College of health science. An official letter was written from Debre Markos University to the selected health institutions. The participants enrolled in the study were informed about the study objectives, expected outcomes, benefits, and the risks associated with it. Written consent was taken from the participants before the interview.

Result

Socio-demographic factors

Three hundred fifty-four study participants gave the response to the questionnaire, giving a response rate of 97.5%. The majorities of the respondents were Amhara 351 (99.2%) and orthodox by religion were 293 (82.8%). Three hundred thirty-five (94.6%) of the women were married and 150(44.8%) were farmers in their occupation (Table 1).

Obstetric and clinical characteristics

Two hundred nine (59%) of the respondents had a history of pregnancy. Around 58(16.4%) and 9 (2.5%) of the respondents had a previous history of depression and a
family history of depression respectively and 38(10.7%) had a history of chronic illness (Table 2).

**Psychosocial, History of violence and substance use**

more than Three-fourths (77.4%) of the respondents reported their husbands are happy with the occurrence of current pregnancy and a half (50.8%) of women explored good baby father support to the health of the fetus and continuation of pregnancy. Most 33(47.1%) and 249(70.3%) of the participants complained health-related problems were the most frequent emotionally disturbing factor in their lifetime and during the current pregnancy respectively. According to the OSLO social support scale, 112(31.6%) women have poor, 160(45.2%) moderate, and 82(23.2%) strong social support. Seventy-three (20.6%) of women's had a history of violence in their lifetime (Table 3).

**Prevalence of antenatal depression**

About 63 (17.8%) of respondents had antenatal depression (EPDS score ≥13). More than half (57%) of the respondents were able to laugh and see the funny side of things. On the other hand, (58.5%) of pregnant women felt sad or miserable most of the time (Table4)

**Factors associated with antenatal depression**

Age, marital status, educational status of the respondent, occupation of respondents and partners, history of abortion and stillbirth, trimester, unplanned pregnancy week at first ANC, poor husband support and feelings, social support, emotionally disturbing factors, history of depression, history of violence and substance use were significant factors in the bivariate regression analysis.

In the multivariable regression analysis; occupational status of the respondent [AOR=0.15(95%CI 0.001-0.25)], women educational status of high school and above[AOR=16.23(95%CI 2.46-107.27)], poor husband feeling on the current pregnancy[AOR=4.86(95%CI: 1.74-13.58)] and the previous history of depression
[AOR=7.26(95%CI: 2.52-20.93)] were significant factors for antenatal depression (Table- 5).

**Discussion**

This study aimed to assess the prevalence of depression and associated factors among pregnant women attending antenatal care in public health institutions of Awabale Woreda, East Gojam zone, Amhara National Regional State, Northwestern Ethiopia, during March-April 2018. The study finding of antenatal depression (17.8%) in the current study was in line with similar reports in Bangladesh (18%) and Ethiopia (19.9%) [21, 22]. The finding of this research was lower than the studies done in China (28.5%) [7], 29.9% and 31.2% in Ethiopia [19, 23], 33.8 in Tanzania[15], 38.5% and 47% in South Africa[15, 24]. This difference might be due to the difference in their population demographic characteristics, study design, period, and the difference in their investigatory or diagnostic tools.

Prevalence of antenatal depression was associated with the occupation of the women, educational status, history of depression, and poor husband feeling in the current pregnancy. Women who were running their business were 85% reduced to develop antenatal depression than housewives [AOR=0.15(0.001-0.25)]. This might be due to that, those who have their own business may have social relationships and putting women economically independent [25]. Also, those housewife women are expending most of their time at home and alone. This loneliness may put them in depression [26]. Women with high school and above educational levels were 18 times more likely to develop antenatal depression than women who had no formal education [16.23(95%CI 2.46-107.27)]. This might be due to their difficulty in managing interpersonal relationship strains related to academic performance pressure and inability to translate their additional education into better mental health outcomes[27].On the other hand, different studies in different countries report the association of lower educational status with an increased prevalence of antenatal depression[21, 25, 28]. Those women who had a history of depression had 7.26 times the odds of developing antenatal depression than women who had no history of depression [AOR=7.26(95%CI: 2.52- 20.93)]. The comparable association was also reported from studies conducted in
developing and developed countries [19]. This might be due to physical and hormonal changes occurring during pregnancy and the recurrence of depressive symptoms [25]. Conversely, the personal history of previous psychiatric illness was not found to be a significant risk factor for antenatal depression in a study conducted in Lahore, Pakistan [29].

Pregnant women who had poor husband feeling on the current pregnancy were 4.86 times more likely to develop antenatal depression as compared with good husband feeling towards current pregnancy [AOR=4.86(95%CI: 1.74-13.58)]. This is possible because those partners who had good feelings about the pregnancy authorize the women on their home responsibilities and help women to have cared for their health and the health of the fetus. It might be also due to the effect of a poor husband's feeling on diminishing partner support [19].

The finding of this study shows no significant association between partner occupational status, trimester, unplanned pregnancy, social support, history of violence, and substance use in the multivariable model. This result seems consistent with other findings [19, 30]. On the other hand, contrary to this finding, those women who had a history of substance use had a higher risk of developing antenatal depression [15].

**Limitations of the study**

We cannot be certain that individuals with an EPDS score ≥ of 13 had depressive illness without confirmation. Moreover, the EPDS cut-off score varies in different kinds of literature and this could be the reason for the different prevalence of antenatal depression in different kinds of literature. Concluding about partner feeling on the current pregnancy by asking pregnant women was an indirect conclusion and may have a biased result. Social desirability bias due to face-to-face interviews and using cross-sectional studies which do not show causality is also the limitation of this study.

**Strength of the study**

The main strength of this study was the data source. It used a primary data source during data collection.

**Conclusion**
This study showed that 17.8% of pregnant women develop antenatal depression. These notify a higher prevalence of antenatal depression in women attending antenatal care services at public health institutions. Women's occupational statuses, educational status, previous history of depression, and poor husband feeling on the current pregnancy were significant factors for antenatal depression.

**Recommendation**

This higher prevalence of antenatal depression should alert health care professionals for conscious screening of housewife pregnant women and pregnant women with the educational status of high school and above for all depressive symptoms by focusing on the previous history of depression as an overall health assessment. Encouraging male's involvement in maternal health service and identifying those partners who have poor feelings about the current pregnancy and providing appropriate counseling should be in the mind of all stakeholders. Enhancing employment opportunities and empowering housewife women's involvement in income-earning activities should be a matter of both governmental and non-governmental stakeholders.

Formulating strategies for better mental health outcomes and improving women's capability in translating their educational status into better mental health outcomes should be in the mind of both the Federal Ministry of health (FMO) and the Regional health bureau in collaboration with the Ministry of education. Expansion of mental health services far to the extreme rural areas and providing appropriate counseling, treatment, referral, and linkage of women with antenatal depression to the appropriate health institution should be considered by all stakeholders. Strengthening admission of pregnant women on early gestation to the nearby health center by focusing on those housewife women and women with a previous history of depression are the recommended interventions.

**Abbreviations**

AOR: Adjusted Odds Ratio; CI: Confidence Interval; COR: Crude Odds Ratio; EPDS Edinburgh Postnatal Dépression Scale

**Availability of data and materials**
The data that support the findings of this study are available, but some restrictions may apply to the availability of these data as there are some sensitive issues. However, data are available from the corresponding authors upon reasonable request.

**Competing interests**

The authors declare that they have no competing interests.

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Debre Markos University

**Authors’ contributions**

All authors involved equally, read and approved the final manuscript.

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**Reference**

1. **Pregnancy | definition of pregnancy by Medical dictionary**
   
   https://medical-dictionarythefreedictionarycom/pregnancy.

2. Mirsanjari MO, Muda WAM, Ahmad A, Othman MS, Mirsanjari MM: Depression symptoms in the second and third trimester of gestation. 2012.

3. Pereira PK, Lovisi GM, Pilowsky DL, Lima LA, Legay LF: Depression during pregnancy: prevalence and risk factors among women attending a public health clinic in Rio de Janeiro, Brazil. Cadernos de Saúde Pública 2009, 25(12):2725-2736.

4. **Depressive Disorders | Psychology Today**
   
   https://wwwpsychologytodaycom/conditions/depressive-disorders
5. Getinet W, Amare T, Boru B, Shumet S, Worku W, Azale T: Prevalence and Risk Factors for Antenatal Depression in Ethiopia: Systematic Review. Depression Research and Treatment 2018, 2018:3649269.

6. Zegeye A, Alebel A, Gebrie A, Tesfaye B, Belay YA, Adane F, Abie W: Prevalence and determinants of antenatal depression among pregnant women in Ethiopia: a systematic review and meta-analysis. BMC Pregnancy and Childbirth 2018, 18(1):462.

7. Zeng Y, Cui Y, Li J: Prevalence and predictors of antenatal depressive symptoms among Chinese women in their third trimester: a cross-sectional survey. BMC psychiatry 2015, 15(1):66.

8. Antenatal depression. Black Dog Institute http://wwwblackdoginstituteorgau/public/depression/inpregnancypostnatal/antenataldepressioncfm.

9. Alder J, Fink N, Bitzer J, Hösli I, Holzgreve W: Depression and anxiety during pregnancy: a risk factor for obstetric, fetal and neonatal outcome? A critical review of the literature. The journal of maternal-fetal & neonatal medicine : the official journal of the European Association of Perinatal Medicine, the Federation of Asia and Oceania Perinatal Societies, the International Society of Perinatal Obstet 2007, 20(3):189-209.

10. Husain N, Munshi T, Jafri F, Husain M, Parveen A, Saeed Q, Tomenson B, Naeem F, Chaudhry N: Antenatal Depression is Not Associated with Low-Birth Weight: A Study from Urban Pakistan. Frontiers in psychiatry 2014, 5:175.

11. Grote NK, Bridge JA, Gavin AR, Melville JL, Iyengar S, Katon WJ: A meta-analysis of depression during pregnancy and the risk of preterm birth, low birth weight, and intrauterine growth restriction. Archives of general psychiatry 2010, 67(10):1012-1024.

12. Bonari L, Pinto N, Ahn E, Einarson A, Steiner M, Koren G: Perinatal risks of untreated depression during pregnancy. Canadian journal of psychiatry Revue canadienne de psychiatrie 2004, 49(11):726-735.

13. Dunkel Schetter C, Tanner L: Anxiety, depression and stress in pregnancy: implications for mothers, children, research, and practice. Curr Opin Psychiatry 2012, 25(2):141-148.

14. Pereira PK, Lovisi GM, Lima LA, Legay LF, de Cintra Santos JF, Santos SA, Thiengo DL, Valencia E: Depression during pregnancy: review of epidemiological and clinical aspects in developed and developing
countr
countries. In: Psychiatric Disorders-Trends and Developments. edn.: InTech; 2011.

15. Manikkam L, Burns JK: Antenatal depression and its risk factors: an urban prevalence study in KwaZulu-Natal. SAMJ: South African Medical Journal 2012, 102(12):940-944.

16. Federal Democratic Republic of Ethiopia Ministry of Health. National Mental Health Strategy 2012/13 - 2015/16. 2012/13-2015/16.

17. Annual report of Awabale District health office 2010 E.C.

18. Assessment on Prevalence of Antenatal Depressive Disorders and Associated Factors among Adama Hospital Antenatal Clinic Attendants, Adama, Ethiopia, 2011. Unpublished study. Ethiopian Public Health Association 2011.

19. Biratu A, Haile D: Prevalence of antenatal depression and associated factors among pregnant women in Addis Ababa, Ethiopia: a cross-sectional study. Reproductive health 2015, 12(1):99.

20. Tesfaye M, Hanlon C, Wondimagegn D, Alem A: Detecting postnatal common mental disorders in Addis Ababa, Ethiopia: validation of the Edinburgh postnatal depression scale and Kessler scales. Journal of affective disorders 2010, 122(1):102-108.

21. Nasreen HE, Edhborg M, Forsell Y, Kabir ZN: Prevalence and associated factors of depressive and anxiety symptoms during pregnancy: a population based study in rural Bangladesh. BMC women’s health 2011, 11(1):22.

22. Dibaba Y, Fantahun M, Hindin MJ: The association of unwanted pregnancy and social support with depressive symptoms in pregnancy: evidence from rural Southwestern Ethiopia. BMC pregnancy and childbirth 2013, 13(1):135.

23. Martha Assefa Sahile1 MTS, Tadese Awoke3 and Dessalegn Bekele4: Prevalence and predictors of antenatal depressive symptoms among women attending Adama Hospital Antenatal Clinic, Adama, Ethiopia. International Journal of Nursing and Midwifery.

24. Rochat TJ, Tomlinson M, Bärnighausen T, Newell M-L, Stein A: The prevalence and clinical presentation of antenatal depression in rural South Africa. Journal of Affective Disorders 2011, 135(1):362-373.

25. Yanikkerem E, Ay S, Mutlu S, Goker A: Antenatal depression: prevalence and risk factors in a hospital based Turkish sample. J Pak Med Assoc 2013, 63(4):472-477.
26. Singh A, Misra N: *Loneliness, depression and sociability in old age*. *Industrial psychiatry journal* 2009, **18**(1):51.

27. Sarah K. Dixon SERK: *Depression and College Stress Among University Undergraduates: Do Mattering and Self-Esteem Make a Difference?*

28. Marcus SM, Flynn HA, Blow FC, Barry KL: *Depressive symptoms among pregnant women screened in obstetrics settings*. *Journal of Women's Health* 2003, **12**(4):373-380.

29. Humayun A, Haider I, Imran N, Iqbal H, Humayun N: *Antenatal depression and its predictors in Lahore, Pakistan/Depression prenatale et facteurs predictifs a Lahore (Pakistan)*. *Eastern Mediterranean Health Journal* 2013, **19**(4):327.

30. Hartley M, Tomlinson M, Greco E, Comulada WS, Stewart J, Le Roux I, Mbewu N, Rotheram-Borus MJ: *Depressed mood in pregnancy: prevalence and correlates in two Cape Town peri-urban settlements*. *Reproductive health* 2011, **8**(1):9.

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**Table 1**: Socio-demographic characteristics of pregnant women attending ANC in Awabale district, East Gojjam zone, Northwest Ethiopia 2018(n=354)

| Variables         | Frequency | Percentage |
|-------------------|-----------|------------|
| Maternal Age ≤ 19 | 17        | 4.8        |
| Variables                              | Frequency | Percentage |
|----------------------------------------|-----------|------------|
| Age                                    |           |            |
| 20-34                                  | 262       | 74.0       |
| ≥35                                    | 75        | 21.2       |
| Orthodox Christian                     | 293       | 82.8       |
| Muslim                                 | 61        | 17.2       |
| Religion                               |           |            |
| Amhara                                 | 351       | 99.2       |
| Oromo                                  | 3         | 0.8        |
| Ethnicity                              |           |            |
| Marital status                         |           |            |
| Not married                            | 19        | 5.4        |
| Married                                | 335       | 94.6       |
| Educational status of the respondent   |           |            |
| Illiterate (Unable to read and write)  | 170       | 48.0       |
| Elementary school (grade 1-8)          | 91        | 25.7       |
| High school and above                  | 93        | 26.3       |
| Occupation of the respondent           |           |            |
| Employed                               | 69        | 19.5       |
| Running personal business              | 60        | 16.9       |
| Housewife                              | 225       | 63.6       |
| Educational status of the husband      |           |            |
| Illiterate (Unable to read and write)  | 187       | 55.8       |
| Elementary school (grade 1-8)          | 57        | 17.0       |
| High school and above                  | 91        | 27.2       |
| Employed                               | 77        | 23.0       |
| Occupation of the husband              |           |            |
| Running personal business              | 108       | 32.2       |
| Farmer                                 | 150       | 44.8       |
| Residence                              |           |            |
| Rural                                  | 189       | 53.4       |
| Urban                                  | 165       | 46.6       |
| Monthly income                         |           |            |
| ≤ 500                                  | 45        | 12.7       |
| >500                                   | 309       | 87.3       |

Table 2: Obstetrics and clinical characteristics of pregnant women attending ANC in Awabale district, East Gojjam zone, Northwest Ethiopia 2018(n=354)
| Table 3: Psychosocial, history of violence and substance use of pregnant women attending ANC in Awabale district, East Gojjam zone, Northwest Ethiopia 2018(n=354) |
| Variables                                                                 | Frequency | Percentage |
|--------------------------------------------------------------------------|-----------|------------|
| Husband feeling on the current pregnancy                                |           |            |
| Happy(Good)                                                              | 274       | 77.4       |
| Not happy(Poor)                                                          | 80        | 22.6       |
| Husband support to the health of the fetus and continuation of pregnancy |           |            |
| Very good                                                                | 148       | 41.8       |
| Good                                                                     | 180       | 50.8       |
| Not good                                                                 | 26        | 7.3        |
| Social support(Based on OSLO social support scale)                       |           |            |
| Poor                                                                     | 112       | 31.6       |
| Moderate                                                                 | 160       | 45.2       |
| Strong                                                                    | 80        | 23.2       |
| The emotionally disturbing factor for the last twelve month              |           |            |
| No                                                                       | 284       | 80.2       |
| Yes                                                                      | 70        | 19.8       |
| Psychosocial problems addressed at the antenatal clinic                  |           |            |
| No                                                                       | 29        | 8.2        |
| Yes                                                                      | 325       | 91.8       |
| Enough information about the pregnancy and expected labor at ANC         |           |            |
| No                                                                       | 23        | 6.5        |
| Yes                                                                      | 331       | 93.5       |
| History of violence                                                      |           |            |
| No                                                                       | 281       | 79.4       |
| Yes                                                                      | 73        | 20.6       |
| Lifetime history of substance use                                        |           |            |
| No                                                                       | 196       | 55.4       |
| Yes                                                                      | 158       | 44.6       |
| History of substance use during the current pregnancy                    |           |            |
| No                                                                       | 200       | 56.5       |
| Yes                                                                      | 154       | 43.5       |

Table 4: EPDS measurement of antenatal depression among pregnant women attending ANC in Awabale district, East Gojjam zone, Northwest Ethiopia 2018(n=354)
I have been able to laugh and see the funny side of things:

|                      | As much as I always could | Not quite as much now | Not so much now | Not at all |
|----------------------|----------------------------|-----------------------|-----------------|------------|
|                      | 203                        | 110                   | 24              | 17         |
|                      | 57.3                       | 31.1                  | 6.8             | 4.8        |

I have look forward with enjoyment to things:

|                      | As much as I ever did       | Rather less than I used to | Less than I used to | Hardly at all |
|----------------------|----------------------------|-----------------------------|---------------------|---------------|
|                      | 204                        | 99                          | 28                  | 23            |
|                      | 57.6                       | 28.0                        | 7.9                 | 6.5           |

I have blamed myself unnecessarily when things went wrong:

|                      | Yes, most of the time       | Yes, some of the time       | Not very often      |
|----------------------|-----------------------------|-----------------------------|---------------------|
|                      | 111                         | 103                         | 128                 |
|                      | 31.4                        | 29.1                        | 36.2                |

I have been anxious or worried for no good reason:

|                      | No, not at all              | Hardly ever                 | Yes, sometimes      |
|----------------------|-----------------------------|-----------------------------|---------------------|
|                      | 133                         | 82                          | 125                 |
|                      | 37.6                        | 23.2                        | 35.3                |

I have felt scared or panicky for no very good reason:

|                      | Yes, very often             | Yes, quite a lot            | Yes, sometimes     |
|----------------------|-----------------------------|-----------------------------|--------------------|
|                      | 14                          | 88                          | 112                |
|                      | 4.0                         | 24.9                        | 31.6               |

Things have been getting on top of me:

|                      | Yes, most of the time I haven’t been able to cope at all | Yes, sometimes I haven’t been coping as well as usual | No, most of the time I have coped quite well | No, I have been coping |
|----------------------|----------------------------------------------------------|-----------------------------------------------------|---------------------------------------------|-----------------------|
|                      | 105                                                       | 135                                                  | 108                                          | 6                     |
|                      | 29.7                                                      | 38.1                                                 | 30.5                                         | 1.7                   |

I have been so unhappy that I have had difficulty sleeping:

|                      | Yes, most of the time                                     | Yes, sometimes                                      | Not very often                                | No, not at all         |
|----------------------|----------------------------------------------------------|-----------------------------------------------------|-----------------------------------------------|------------------------|
|                      | 139                                                       | 118                                                  | 68                                            | 29                     |
|                      | 39.3                                                      | 33.3                                                 | 19.2                                          | 8.2                    |

I have felt sad or miserable:

|                      | Yes, most of the time                                     | Yes, quite often                                    | Not very often                                | No, not at all         |
|----------------------|----------------------------------------------------------|-----------------------------------------------------|-----------------------------------------------|------------------------|
|                      | 207                                                       | 103                                                  | 31                                            | 13                     |
|                      | 58.5                                                      | 29.1                                                 | 8.8                                           | 3.7                    |

I have so unhappy that I have been crying

|                      | Yes, most of the time                                     | Yes quite often                                      | Only occasionally                             | No, never              |
|----------------------|----------------------------------------------------------|-----------------------------------------------------|-----------------------------------------------|------------------------|
|                      | 282                                                       | 53                                                   | 18                                            | 1                      |
|                      | 79.7                                                      | 15                                                   | 5.1                                           | 0.3                    |

The thought of harming myself has occurred to me:

|                      | Yes, quite often                                          | Sometimes                                            | Hardly ever                                   | Never                  |
|----------------------|----------------------------------------------------------|-----------------------------------------------------|-----------------------------------------------|------------------------|
|                      | 0                                                         | 340                                                  | 12                                            | 2                      |
|                      | 0                                                         | 96.0                                                 | 3.4                                           | 0.6                    |

Table 5: Factors associated with antenatal depression among pregnant women attending ANC in Awabale district, East Gojjam zone, Northwest Ethiopia 2018(n=354)

| variables                                     | Depression | COR(95%CI) | AOR(95%CI) |
|-----------------------------------------------|------------|------------|------------|
| I have been able to laugh and see the funny   | As much    | 203        | 57.3       |
| side of things:                               | as I       | 110        | 31.1       |
|                                               | always      | 24         | 6.8        |
|                                               | could       | 17         | 4.8        |
| I have look forward with enjoyment to things: | As much     | 204        | 57.6       |
|                                               | as I       | 99         | 28.0       |
|                                               | ever did    | 28         | 7.9        |
|                                               | Rather    | 23         | 6.5        |
|                                               | less than  | 111        | 31.4       |
|                                               | I used to  | 103        | 29.1       |
|                                               | Less than  | 128        | 36.2       |
|                                               | I used to  | 12          | 3.4        |
| I have blamed myself unnecessarily when things | Yes, most   | 133        | 37.6       |
| went wrong:                                   | of the     | 82         | 23.2       |
|                                               | time       | 125        | 35.3       |
|                                               | Yes,       | 14         | 4.0        |
|                                               | sometimes  | 88         | 24.9       |
|                                               | No, not    | 112        | 31.6       |
|                                               | much       | 118        | 33.3       |
|                                               | No, not    | 36         | 10.2       |
|                                               | at all     | 118        | 33.3       |
|                                               | I haven’t | 105        | 29.7       |
|                                               | been able | 135        | 38.1       |
|                                               | to cope at| 108        | 30.5       |
|                                               | all       | 6          | 1.7        |
| I have been anxious or worried for no good    | Yes,       | 139        | 39.3       |
| reason:                                       | most of   | 118        | 33.3       |
|                                               | the time  | 68         | 19.2       |
|                                               | Not very  | 29         | 8.2        |
|                                               | often     | 13         | 3.7        |
| I have felt scared or panicky for no very     | Yes, most  | 207        | 58.5       |
| good reason:                                  | of the     | 103        | 29.1       |
|                                               | time       | 31         | 8.8        |
|                                               | Not very   | 13         | 3.7        |
| I have been so unhappy that I have had        | Yes, most  | 282        | 79.7       |
| difficulty sleeping:                          | of the     | 53         | 15         |
|                                               | time       | 18         | 5.1        |
|                                               | Not very   | 1          | 0.3        |
| I have felt sad or miserable:                 | Yes, most  | 0          | 0          |
|                                               | of the     | 340        | 96.0       |
|                                               | time       | 12         | 3.4        |
| I have so unhappy that I have been crying:    | Yes, most  | 2          | 0.6        |
|                                      | No     | Yes     | 1.000 (1.000, 1.000) | 1.000 (1.000, 1.000) |
|--------------------------------------|--------|---------|---------------------|---------------------|
| **Occupational status of the respondent** |        |         |                     |                     |
| Employed                             | 63     | 6       | 0.37 (0.15, 0.91)   | 0.16 (0.001, 0.25)  |
| Running personal business            | 49     | 11      | 0.87 (0.42, 1.81)   | 0.48 (0.07, 3.21)   |
| Housewife                            | 179    | 46      | 1                   | 1                   |
| Illiterate                           | 147    | 23      | 1.68 (0.82, 3.45)   | 1.08 (0.18, 6.4)    |
| Elementary school                    | 64     | 27      | 1.04 (0.5, 2.16)    | 16.23 (2.46, 107.27)|
| High school and above                | 80     | 13      | 1.04 (0.5, 2.16)    | 16.23 (2.46, 107.27)|
| **Educational status of the respondent** |        |         |                     |                     |
| Illiterate                           | 147    | 23      | 1.68 (0.82, 3.45)   | 1.08 (0.18, 6.4)    |
| Elementary school                    | 64     | 27      | 1.04 (0.5, 2.16)    | 16.23 (2.46, 107.27)|
| High school and above                | 80     | 13      | 1.04 (0.5, 2.16)    | 16.23 (2.46, 107.27)|
| **Occupational status of the husband** |        |         |                     |                     |
| Employed                             | 66     | 11      | 0.57 (0.27, 1.2)    | 1.47 (0.21, 10.04)  |
| Running personal business            | 102    | 6       | 0.20 (0.81, 0.5)    | 0.22 (0.044, 1.09)  |
| Farmer                               | 116    | 34      | 1                   | 1                   |
| First                                | 88     | 10      | 2.4 (1.30, 4.42)    | 1.90 (0.47, 7.74)   |
| Second                               | 154    | 41      | 1                   | 1                   |
| Third                                | 69     | 12      | 0.65 (0.32, 1.32)   | 0.87 (0.28, 3.69)   |
| No                                   | 24     | 24      | 6.85 (3.55, 13.22)  | 3.06 (0.73, 12.87)  |
| Yes                                  | 267    | 39      | 1                   | 1                   |
| Poor                                 | 81     | 31      | 2.40 (1.30, 4.42)   | 1.14 (0.28, 4.61)   |
| Moderate                             | 138    | 22      | 1                   | 1                   |
| Strong                               | 72     | 10      | 0.87 (0.39, 1.94)   | 0.92 (0.24, 3.61)   |
| Good                                 | 248    | 26      | 1                   | 1                   |
| Poor                                 | 43     | 37      | 0.87 (0.39, 1.94)   | 0.92 (0.24, 3.61)   |
| **Trimester**                        |        |         |                     |                     |
| First                                | 88     | 10      | 2.4 (1.30, 4.42)    | 1.90 (0.47, 7.74)   |
| Second                               | 154    | 41      | 1                   | 1                   |
| Third                                | 69     | 12      | 0.65 (0.32, 1.32)   | 0.87 (0.28, 3.69)   |
| **Planned pregnancy**                |        |         |                     |                     |
| No                                   | 24     | 24      | 6.85 (3.55, 13.22)  | 3.06 (0.73, 12.87)  |
| Yes                                  | 267    | 39      | 1                   | 1                   |
| **Social support**                   |        |         |                     |                     |
| Poor                                 | 81     | 31      | 2.40 (1.30, 4.42)   | 1.14 (0.28, 4.61)   |
| Moderate                             | 138    | 22      | 1                   | 1                   |
| Strong                               | 72     | 10      | 0.87 (0.39, 1.94)   | 0.92 (0.24, 3.61)   |
| Good                                 | 248    | 26      | 1                   | 1                   |
| Poor                                 | 43     | 37      | 0.87 (0.39, 1.94)   | 0.92 (0.24, 3.61)   |
| **History of depression**            |        |         |                     |                     |
| No                                   | 256    | 40      | 1                   | 1                   |
| Yes                                  | 35     | 23      | 4.21 (2.26, 7.84)   | 7.26 (2.52, 20.93)  |
| **History of violence**              |        |         |                     |                     |
| No                                   | 247    | 34      | 1                   | 1                   |
| Yes                                  | 44     | 29      | 4.79 (2.65, 8.64)   | 1.27 (0.34, 4.79)   |
| **Previous history of depression**   |        |         |                     |                     |
| No                                   | 256    | 40      | 1                   | 1                   |
| Yes                                  | 35     | 23      | 4.21 (2.26, 7.84)   | 7.26 (2.52, 20.93)  |
| **History of substance use**         |        |         |                     |                     |
| No                                   | 116    | 42      | 1                   | 1                   |
| Yes                                  | 175    | 21      | 3.02 (1.70, 5.36)   | 1.88 (0.73, 4.84)   |
| **History of substance use in the current pregnancy** | | | | |
Responses for reviewers

Thank you all for your constructive suggestions and comments.

Reviewer #1:

1. The main reasons that we did this study were:
   - Most of the researches was undertaking on postnatal depression.
   - The majority of studies have been conducted in developed countries.
   - There are studies undertaken on antenatal depression. Yet, they focus on adolescent pregnant women and women's that have antenatal care service in hospital settings that couldn’t include in all public health settings.
   - Those studies have a limitation on addressing pregnant women in all age groups.
   - In addition, they are likely to have a bias because most women with hindrance in their pregnancies are likely to seek antenatal care services in hospitals.
   - There are studies, which were excluded illiterate women from the study.
   - Federal Democratic Republic of Ethiopia National Mental Health Strategy promotes a decentralized approach in which mental health services are to be offered from local health institutions up to tertiary hospitals to ensure access to treatment near to their living area and with a less restraining setting
     - So, the result of this this study will be important for concerned bodies the see the effectiveness of the strategy and to develop new strategy if needed.

2. The methods
   - We have revised this section based on the given comment.
Reviewer #2

Even though there is studies done in this area

- They focus on adolescent pregnant women and women’s that have antenatal care service in hospital settings.
- Those studies have a limitation on addressing pregnant women in all age groups.
- In addition, they are likely to have a bias because most women with hindrance in their pregnancies are likely to seek antenatal care services in hospitals.
- There are studies, which were excluded illiterate women from the study.
Reviewer #3

Dear reviewer #3, as my view I addressed all of your comments, but some comments were accepted and corrections were done on the manuscript.

- The main reasons that we did this study were:
  - Most of the researches was undertaking on postnatal depression.
  - The majority of studies have been conducted in developed countries.
  - There are studies undertaken on antenatal depression. Yet, they focus on adolescent pregnant women and women's that have antenatal care service in hospital settings.
  - Those studies have a limitation on addressing pregnant women in all age groups.
  - In addition, they are likely to have a bias because most women with hindrance in their pregnancies are likely to seek antenatal care services in hospitals.
  - There are studies, which were excluded illiterate women from the study.
  - Federal Democratic Republic of Ethiopia National Mental Health Strategy promotes a decentralized approach in which mental health services are to be offered from local health institutions up to tertiary hospitals to ensure access to treatment near to their living area and with a less restraining setting
    - So, the result of this this study will be important for concerned bodies the see the effectiveness of the strategy and to develop new strategy if needed.
  - In a study conducted on the prevalence of antenatal depression and associated factors in Addis Ababa, Ethiopia comorbid illnesses and gender violence were not assessed. This may hinder the result of the finding and the possible association of factors with antenatal depression. The prevalence of antenatal depression also varies in different places. These variations indicate that a study to assess the prevalence and associated factors with antenatal depression in the local context should be undertaken.
Even though we have used a stratified sampling method to select public health institutions, we selected the samples consecutively because they had no sampling frame and were difficult to do it with every kth interval (it was in the outpatient setting).

Adama and Awabel may not have different health care services because they are led by similar health care delivery systems (health care providers, health institutions, and other related services) guided by a similar agency like the ministry of health. The population may have socio-cultural and/or economical differences, but we can use it since there is no other study near to Awabel other than Adama.

Since there is no validated tool for antenatal depression and the study populations were mothers, it would be better to use a validated tool than a simple tool.

The fitness model was assessed by chi-square test and the strength of the association was measured by adjusted odds ratio.

Our base to classify rural-urban was based on residence.

Income was categorized based on a previous study.

Is there any family history of depressive episodes? Was the question for family history of the depressive episode? They know if the family member has ever experienced sadness or loss of interest in normal activities almost daily for two weeks or more.

History of chronic illness was asked, Do you have any chronic illness? And they know if they have any history of

- Diabetes mellitus
- Hypertension
- HIV/AIDS
- Others