Health Extension Workers Involvement in the Utilization of Focused Antenatal Care Service in Rural Sidama Zone, Southern Ethiopia: A Cross-Sectional Study

Achamyelesh Gebretsadik1, Million Teshome2, Mekdes Mekonnen3, Akalewold Alemayehu1, and Yusuf Haji1

Abstract

Background: Health extension workers (HEWs) are primarily been assigned in rural areas of Ethiopia to provide maternal and child health services. Few studies have been done to investigate HEWs’ contributions towards maternal health services. This study describes HEWs involvement in the utilization of focused antenatal care (FANC).

Methods: A population-based cross-sectional survey was conducted between January 21 and February 4, 2017. Mothers (2300) who gave birth in the last 6 months (0-6 months) in randomly selected 30 kebeles in the rural Sidama zone, participated in the study. A face-to-face interview was done using a structured questionnaire adapted from the Saving Newborn Lives Program. The main outcome variable was FANC utilization. Descriptive statistics and multivariate logistic regression analysis were used using SPSS statistical software.

Results: The FANC was used by 525 (24.36%; 95% confidence interval [CI]: 22.5%-26.2%) women. Health extension workers accounted for 244 (46.47%; 95% CI: 43.5-47.7%) of mothers. The FANC utilization was less likely among those who were illiterate (adjusted odds ratio [AOR]: .32; 95% CI: .18-.57) and those who attended first cycle (AOR: .41; 95% CI: .23-.74), those who attended secondary cycle (AOR: .47; 95% CI: .27-.82), primipara (AOR: 0.53; 95% CI: .35-.83), and those who gave birth at home (AOR: .66; 95% CI: .51-.84). Mothers who had knowledge of pregnancy danger signs (AOR: 1.42; 95% CI: 1.2-1.7) and exposure to mass media (AOR: 1.35; 95% CI: 1.1-1.66) were more likely to utilize FANC.

Conclusions: FANC utilization in this study was low compared to other studies. The HEWs had a major contribution to the services. However, it is low when compared to the plan set by the state ministry of health. The existing health extension program could be strengthened by increasing the number of HEWs. Empowering rural mothers through continuous education program to enhance the utilization of maternal health services.

Keywords
focused antenatal care, utilization, health extension workers involvement, rural sidama Ethiopia

Background

Focused antenatal care (FANC) is a goal-oriented antenatal care (ANC) approach that was recommended by researchers in 2001 and adopted by the World Health Organization (WHO) in 2002.1 Increased ANC coverage and repeated visits of the woman to the health services provide opportunities for delivering evidence-based interventions to positive impact on maternal, fetal, and neonatal health and survival.2 In Ethiopia, 85% of the population live in the rural part of the country.3 To expand primary health-care service for the rural population, the government of Ethiopia has undertaken a number of

1 College of Medicine and Health Science, School of Public Health, Hawassa University, Hawassa, Ethiopia
2 School of Medicine, College of Medicine and Health Science, Hawassa University Comprehensive Specialized Hospital, Hawassa University, Awasa, Ethiopia
3 School of Nursing, College of Medicine and Health Science, Hawassa University, Hawassa, Ethiopia

Submitted February 07, 2019. Accepted February 08, 2019.

Corresponding Author: Achamyelesh Gebretsadik, School of Public Health, College of Medicine and Health Science, Hawassa University, Hawassa, Ethiopia, P.O. Box: 1560, Hawassa, Ethiopia.
Email: agtsadik@gmail.com
Health Services Research and Managerial Epidemiology

important public health initiatives aimed at improving the health outcomes of women and children. One of these initiatives is the launching of the Health Services Extension Program (HEP) in 2003; an innovative way of scaling up the delivery of essential health interventions targeting the household and community. The objectives of HEP were to reach the poor and deliver preventive and basic curative high-impact interventions to all of the Ethiopian population. The program was started by recruiting HEWs from the communities, in which they will work according to specific criteria, that is, all are females at least 18 years old, have at least a 10th-grade education, and speak the local language. Upon completion of training, pairs of HEWs are assigned as salaried government employees to health post (smallest health-care delivery point) in one kebele (the smallest administrative unit). They work directly with individual households. Each kebele has a health post that serves 5000 people and functions as an operational center for HEWs. Five health posts and a health center work in collaboration and for the Primary Health Care Unit (PHCU) that serves 25 000 people. Federal ministry of health report showed that the employment of the HEWs utilization of maternal and child health service showed improvement. The HEWs were provided ANC for 83% of pregnant mothers, 59% clean deliveries, and 47% postnatal care. A household survey conducted by the Last Ten Kilometers Project in the 4 largest regions showed that HEWs were provided ANC services for about 54% of pregnant women and 20% FANC (4 or more visits). The objectives of HEP were to reach the poor and deliver preventive and basic curative high-impact interventions to all of the Ethiopian population. The program was started by recruiting HEWs from the communities in which they will work according to specific criteria, that is, all are females at least 18 years old, have at least a 10th-grade education, and speak the local language. Upon completion of training, pairs of HEWs are assigned as salaried government employees to health post (smallest health-care delivery point) in one kebele (the smallest administrative unit). They work directly with individual households. Each kebele has a health post that serves 5000 people and functions as an operational center for HEWs. Five health posts and a health center work in collaboration and for the PHCU that serves 25 000 people. According to the 2016 Ethiopian demographic and health survey (EDHS) report, 62% of women who gave birth in the 5 years preceding the survey received ANC from a skilled health-care provider at least once for their last pregnancy and only 32% had 4 or more ANC visits for their most recent live birth. In Ethiopia, very limited studies have been done to measure the role of HEWs in the utilization of FANC. Hence, the aims of this study were to assess HEWs involvement for the utilization of FANC among pregnant women in the rural Sidama zone in southern Ethiopia in 2017.

Methods

This study is part of Maternal and Newborn Health Research and Training of Saving Newborn Lives Program (SNL-III Project) aimed at assessing the role of HEWs in utilization of maternal and newborn health services in the rural Sidama Zone. A community-based cross-sectional survey was conducted among mothers who had given birth in the past 6 months in rural Sidama zone, Ethiopia. A total of 2300 mothers with children aged 0 to 6 months were interviewed within the selected clusters. The authors adopted a previously published standard questionnaire developed by the Saving Newborn Lives Program for this survey. The main outcome variables was utilization of FANC. Socioeconomic, obstetrics, and gynecological characteristics are some of the predictor variables. Five districts were selected randomly from Sidama Zone in southern part of Ethiopia. The selected districts have 148 kebeles (the smallest unit of administration) of which 30 kebeles were selected using random generated numbers of OpenEpi Version 2.2 software and accounts for 20% of the total. All mothers with 0 to 6 months of age children residing in the selected kebeles were included in the study. Totally, 2300 eligible mothers participated in the study.

Descriptive statistics and logistic regression analysis were conducted to determine the effect of various factors on the outcome variable of FANC utilization. The degree of association between independent and dependent variables was assessed using odds ratios with 95% confidence intervals. The details of the methods section has already been published.

Variable Definitions

Antenatal care (ANC): whether the woman attended a health facility for ANC at least once in her recent pregnancy.

Utilization of focused antenatal care (FANC): whether the woman attended 4 visits of ANC for the youngest pregnancy as per WHO recommendations.

Health facility delivery: whether the woman gave birth in a health facility for her youngest child.

Knowledge of pregnancy danger signs: mothers correctly answered for danger signs during pregnancy questions and classified as having good knowledge if the mothers correctly answered half or more of the questions.

Health extension workers involvement: if the HEWs gave ANC for the pregnant women, if she initiated the pregnant women to seek ANC, or if the pregnant women referred by the health extension to the nearest health facility to seek advanced care. Then classified as involved at least 1 of these 3 activities were done by the HEWs.

Ethics Approval and Consent to Participate

The proposal was reviewed and approved by the research and ethics committee of the College of Medical and Health Sciences at Hawassa University, the Institutional Review Board (IRB). The reference number is IRB/041/09, issued on the date of September 20, 2017. Permission to undertake this study was obtained from every relevant authority of all the
selected district Health offices. Informed verbal consent was taken from all study participants. In case of adolescent mothers (<18 years of age), consent was obtained from parents. An information sheet that contain statements of potential risk, benefits, and confidentiality was attached to each questionnaire. The consent form was prepared in line with the ethical principle of “autonomy” by including statements that give participants the right to decline participation in the study at any time.

### Results

**Socio Demographic Characteristics of the Study**

Data were collected from 2279 mothers making the response rate 99%. Data were not collected from 21 eligible mothers because they were not present in their home during the time of survey repeatedly. The majority (1435 [62.9%]) of the mothers were in the age-group of 20 to 29 years. Two-thirds (1517 [66.6%]) of the mothers have attended school of which 1224 (53.6%) were married or living together, and most (1940 [85.1%]) of the mothers were housewives (Table 1).

| Variables                          | Frequency | %    |
|------------------------------------|-----------|------|
| Woreda/districts of the study      |           |      |
| Boricha                            | 622       | 27.3 |
| Dalle                              | 606       | 26.6 |
| Shebedino                          | 624       | 27.4 |
| Loka Abaya                         | 208       | 9.1  |
| Wonsho                             | 219       | 9.6  |
| Maternal age in year               |           |      |
| 15-19                              | 233       | 10.2 |
| 20-24                              | 769       | 33.7 |
| 25-29                              | 666       | 29.2 |
| 30-34                              | 393       | 17.2 |
| 35+                                | 218       | 9.6  |
| Mothers educational status         |           |      |
| Illiterate                         | 762       | 33.4 |
| Grade 1-4                          | 599       | 26.3 |
| Grade 5-8                          | 680       | 29.8 |
| Grade 9-10                         | 170       | 7.5  |
| Higher than grade 10               | 68        | 3    |
| Maternal occupation                |           |      |
| Housewife                          | 1940      | 85.1 |
| Farmers/merchants/traders          | 170       | 7.5  |
| Family size                        |           |      |
| <5 persons                         | 1327      | 58.2 |
| ≥5 persons                         | 952       | 41.8 |
| Spouse’s occupation                |           |      |
| Farmer                             | 1342      | 58.9 |
| Merchant/trader                    | 644       | 28.3 |
| Day laborer/other                  | 185       | 8.1  |
| Employed                           | 108       | 4.7  |
| Family size                        |           |      |
| <5 persons                         | 1327      | 58.2 |
| ≥5 persons                         | 952       | 41.8 |
| Spouse’s Education                 |           |      |
| Never married                      | 24        | 1.1  |
| Divorced                           | 3         | 0.3  |
| Family size                        |           |      |
| <5 persons                         | 1327      | 58.2 |
| ≥5 persons                         | 952       | 41.8 |
| Distance of health post from home  |           |      |
| < 1 hour                           | 2126      | 93.3 |
| ≥1 hour                            | 152       | 6.7  |
| Distance of health center from home|           |      |
| < 1 hour                           | 1663      | 73.0 |
| ≥1 hour                            | 616       | 27.0 |
| Exposure to mass media             |           |      |
| Yes                                | 601       | 26.4 |
| No                                 | 1678      | 73.6 |

**Obstetric and Child Characteristics of the Study Population**

Altogether, 729 (34.9%) mothers were primigravidas, while 574 (25.2%) were gravida 4 and above. In terms of numbers of live births, 834 (36.6%) have had 1 birth and 544 (23.9%) mothers have had 4 live births. Sixty-two (2.7%) of mothers had a history of a stillbirth. The birth interval from the most recent previous birth was the ≥5 years in 1516 (66.5%) of mothers. There was history of infant death under 1 month of age in 123 (5.4%) of mothers (Table 2).

| Variables                          | Frequency | %    |
|------------------------------------|-----------|------|
| Maternal age in year               |           |      |
| 15-19                              | 233       | 10.2 |
| 20-24                              | 769       | 33.7 |
| 25-29                              | 666       | 29.2 |
| 30-34                              | 393       | 17.2 |
| Maternal occupation                |           |      |
| Housewife                          | 1940      | 85.1 |
| Farmers/merchants/traders          | 170       | 7.5  |
| Family size                        |           |      |
| <5 persons                         | 1327      | 58.2 |
| ≥5 persons                         | 952       | 41.8 |
| Spouse’s occupation                |           |      |
| Farmer                             | 1342      | 58.9 |
| Merchant/trader                    | 644       | 28.3 |
| Day laborer/other                  | 185       | 8.1  |
| Employed                           | 108       | 4.7  |
| Family size                        |           |      |
| <5 persons                         | 1327      | 58.2 |
| ≥5 persons                         | 952       | 41.8 |
| Spouse’s Education                 |           |      |
| Never married                      | 24        | 1.1  |
| Divorced                           | 3         | 0.3  |
| Family size                        |           |      |
| <5 persons                         | 1327      | 58.2 |
| ≥5 persons                         | 952       | 41.8 |
| Distance of health post from home  |           |      |
| < 1 hour                           | 2126      | 93.3 |
| ≥1 hour                            | 152       | 6.7  |
| Distance of health center from home|           |      |
| < 1 hour                           | 1663      | 73.0 |
| ≥1 hour                            | 616       | 27.0 |
| Exposure to mass media             |           |      |
| Yes                                | 601       | 26.4 |
| No                                 | 1678      | 73.6 |

### Focused Antenatal Care Utilization and HEWs Involvement

The study found that 2155 (94.6%) pregnant women had a history of at least 1 ANC visit for recent pregnancy. Of these, 983 (45.6%) of pregnant women were encouraged by HEWs to seek care. Nearly all mothers (2077 [96.4%]) received ANC service at health facilities, and the rest 83 (3.6%) received care in their own homes. Five hundred twenty-five (24.3%) of mothers reported 4 or more visit; therefore, by definition, the use of FANC was found to be 525 (24.36%; 95% CI: 22.5-26.2). Of these, HEWs have played a role among 244 (46.47%; 95% CI: 43.5-47.7) mothers who utilized FANC. Altogether, 576 (26.73%) mothers received their first ANC service at 16 or fewer weeks of gestation (Table 3).

| Variables                          | Frequency | %    |
|------------------------------------|-----------|------|
| Maternal age in year               |           |      |
| 15-19                              | 233       | 10.2 |
| 20-24                              | 769       | 33.7 |
| 25-29                              | 666       | 29.2 |
| 30-34                              | 393       | 17.2 |
| Maternal occupation                |           |      |
| Housewife                          | 1940      | 85.1 |
| Farmers/merchants/traders          | 170       | 7.5  |
| Family size                        |           |      |
| <5 persons                         | 1327      | 58.2 |
| ≥5 persons                         | 952       | 41.8 |
| Spouse’s occupation                |           |      |
| Farmer                             | 1342      | 58.9 |
| Merchant/trader                    | 644       | 28.3 |
| Day laborer/other                  | 185       | 8.1  |
| Employed                           | 108       | 4.7  |
| Family size                        |           |      |
| <5 persons                         | 1327      | 58.2 |
| ≥5 persons                         | 952       | 41.8 |
| Spouse’s Education                 |           |      |
| Never married                      | 24        | 1.1  |
| Divorced                           | 3         | 0.3  |
| Family size                        |           |      |
| <5 persons                         | 1327      | 58.2 |
| ≥5 persons                         | 952       | 41.8 |
| Distance of health post from home  |           |      |
| < 1 hour                           | 2126      | 93.3 |
| ≥1 hour                            | 152       | 6.7  |
| Distance of health center from home|           |      |
| < 1 hour                           | 1663      | 73.0 |
| ≥1 hour                            | 616       | 27.0 |
| Exposure to mass media             |           |      |
| Yes                                | 601       | 26.4 |
| No                                 | 1678      | 73.6 |

### Knowledge of Study Population

**About the Importance of ANC**

The ANC service was thought necessary by 1346 (59.1%) mothers. Three hundred fifty-two (15.4%) reported the necessity of ANC for first-time pregnant mother and 202 (8.9%) for mothers who gave many births (Figure 1).

### Factors Associated With FANC Service Utilization

Logistic regression analysis was done to assess factors associated with FANC utilization. Those who are earning monthly below 1000 ETB (AOR: 0.74; 95% CI: 0.52-0.97) are less likely to utilize FANC service compared to those who earn
more than 2000 ETB. Compared to mothers who attended grade 10 or more, those who are illiterate (AOR: 0.32; 95% CI: 0.18-0.57), who attended completed (1-4) grade (AOR: 0.41; 95% CI: 0.23-0.74), and attended (5-8) grade (AOR: 0.47; 95% CI: 0.27-0.82) are less likely to utilize FANC.

Similarly, compared to mothers whose parity was 5 or more, mothers whose primi para are (AOR: 0.53; 95% CI: 0.35-0.83) less likely to utilize FANC service. When compared to mothers who delivered the youngest birth in a health facility, those who gave birth at home are (AOR: 0.66; 95% CI: 0.51-0.84) less likely to utilize FANC. Those mothers who had knowledge of pregnancy danger sign were more likely to utilize FANC than their counterpart (AOR: 1.42; 95% CI: 1.2-1.7). In addition, compared to mothers who did not have exposure to mass media, those had exposure (AOR: . 1.35; 95% CI:. 1.1-1.66) are more likely to utilize FANC. Variables such as distance to health facilities, maternal age, and spouse’s occupation were not significant in this study (Table 5).
Discussion

This study has attempted to determine HEWs involvement in the utilization of FANC and its associated factors. The results have shown the prevalence of FANC service utilization, 525 (24.36%), and HEWs have played their role among 244 (46.47%) mothers who utilized FANC.

The HEWs are important to aid rural women accessing maternal and child health services. They also play a major role in reducing maternal and child morbidity and mortality. This study found that HEWs were used by nearly half of the mothers who utilized FANC. The finding is similar to studies done in the Tigray region and Southern Ethiopia, where the HEWs were important in improving the ANC services.17,18 The ministry of health of Ethiopia designed the HEP to address the primary health-care service package for every rural woman. However, our study showed that more than half of the mothers did not receive care from the HEWs. We do not know why close to half mothers did not use the HEWs. Further study is important to investigate the reasons.

The prevalence of FANC service utilization in this study (24.36%) was lower compared to the findings of EDHS, and another study was conducted in southern part of Ethiopia, where FANC utilization was about 32% and 46%, respectively.13,19 This difference might be because our study was done exclusively in rural areas. However, it is also consistent with another similar study conducted in 2009 in Yem special Woreda, southwestern Ethiopia, where 28.5% of women had FANC services during their last pregnancy, while, higher than the studies done in Northeast, Northwest, and southern Ethiopia.20-22 This variation may be due to differences in time of study and settings.

Initiation of ANC in the first trimester of pregnancy is helpful for early detection and management of pregnancy-related health risks. This study showed a similar percentage of pregnant women initiated care in the first trimester compared to studies done in southern Ethiopia and Kenya,22,23 and lower compared to a study done in Sindh, Pakistan.24

Income was one of the factors associated with FANC service utilization, where those who earn below 1000 ETB were less likely to utilize ANC service compared to those who earn more than 2000 ETB. This finding is consistent with a finding based on demographic and health surveys in Ethiopia and Kenya, which showed women’s of lower socioeconomic status were less likely to complete prenatal care.13,25 Another study done in Kham District showed that the cost of transportation is one of the major barriers for the utilization of ANC services.26 Those with low income have a problem paying for transportation and use their low income to fulfill their basic needs.

The study found that maternal basic education has a major role in the utilization of FANC. Compared to mothers who attended grade 10 or more, mothers who were illiterate and attended primary level education are less likely to utilize FANC. Similarly, a study conducted in Ibadan, Nigeria, Kham district, and in rural West Sumatra, Indonesia, and Kenya, showed respondents who had an education of secondary school and above utilized FANC more compared to women who had an education of primary school and below.25-29 This can be explained as education is likely to enhance mothers understanding about the importance of FANC utilization, seek care, and also increase decision-making ability.
The finding of this study also showed an association with place of delivery; compared to women who gave birth at a health facility, mothers who gave birth at home were less likely to utilize FANC. This might be mothers coming to ANC are more likely to have adequate counseling to plan their place of delivery at health facilities and create awareness on the pregnancy-related danger signs and other related information from the health-care providers. Thus, this enables the mother to seek 4 and more times for ANC as well as to give their birth at health facilities. This finding is similar to studies done in rural India, Nigeria, and Sudan.

Compared to women who had 5 or more babies, primiparas were less likely to utilize FANC. This finding is similar to studies done in Northwest Ethiopia and rural India. It is different from studies done in Kenya and Sudan. The difference might be unlike our study participants were selected from a health facility. This might be those who don’t have experience may not have a good perception to seek care and utilize. On the contrary, those who had 5 or more births may have experience and previous exposure to the service that encourages them to utilize more.

This study also revealed that mothers who had knowledge of pregnancy danger sign were more likely to utilize FANC compared to their counterpart. This might be because this knowledge helps the pregnant women to seek appropriate, regular, and timely health-care service including FANC. Studies were done in Eritrea and rural Bangladesh also reported a lack of knowledge of pregnancy danger sign delay health-care seeking.

Women who had exposure to mass media were more likely to utilize FANC compared to their counterparts. This might be the exposure to different mass media have a positive influence. The finding of this study is similar to studies done in Tigray region, Ethiopia, and rural Bangladesh.

Limitations of this study include the self-reported nature of the data. However, to minimize the recall bias, all women had given in the past 6 months participated.

### Conclusion

The prevalence of FANC service utilization is low in this study compared to other similar studies. The HEWs have a major role in the utilization of FANC. However, the expectation is to

### Table 5. Multivariate Logistic Regression Analysis Result of Factors Associated With Utilization of Focused Antenatal Service Study Population in Rural Sidama Zone, Southern Ethiopia, 2017.

| Study Variables                  | Focused ANC Utilization |   |   |   |   |
|----------------------------------|-------------------------|---|---|---|---|
|                                  | Yes                     | No | COR (95%CI) | AOR (95%CI) |
| Maternal age in year             |                         |   |   |   |
| 15-19                            | 50 (21.5)                | 183 (78.5) | 1.1 (0.7-1.7) | 1.3 (0.74-2.2) |
| 20-24                            | 186 (24.2)               | 583 (75.8) | 1.3 (0.89-1.8) | 1.3 (0.8-2) |
| 25-29                            | 156 (23.4)               | 510 (76.7) | 1.2 (0.85-1.8) | 1.3 (0.83-1.9) |
| 30-34                            | 90 (22.9)                | 303 (77.1) | 1.2 (0.80-1.8) | 1.16 (0.76-1.77) |
| 35+                              | 43 (19.7)                | 175 (80.3) | 1 | 1 |
| Monthly income (Ethiopian Birr)  |                         |   |   |   |
| <499                             | 137 (21.4)               | 503 (78.6) | 0.68 (0.50-0.92) | 0.74 (0.53-1) |
| 500-999                          | 161 (20)                 | 643 (80) | 0.63 (0.47-0.84) | 0.71 (0.52-0.97) |
| 1000-1499                        | 85 (24.9)                | 256 (75.1) | 0.83 (0.59-1.17) | 0.91 (0.64-1.3) |
| 1500-1999                        | 47 (29.4)                | 113 (70.6) | 1.04 (0.69-1.58) | 1.07 (0.70-1.6) |
| ≥2000                            | 95 (28.4)                | 239 (71.6) | 1 | 1 |
| Spouse’s occupation              |                         |   |   |   |
| Farmer                           | 306 (22.8)               | 1036 (77.2) | 0.88 (0.56-1.4) | 1.6 (0.96-2.7) |
| Merchant/trader                  | 150 (23.3)               | 494 (76.7) | 0.91 (0.56-1.5) | 1.4 (0.82-2.3) |
| Dairy laborer                    | 42 (22.7)                | 143 (77.3) | 0.88 (0.5-1.5) | 1.4 (0.77-2.5) |
| Employed                         | 27 (25.0)                | 81 (75) | 1 | 1 |
| Mother’s highest education       |                         |   |   |   |
| Grade 1-4                        | 135 (22.5)               | 466 (77.5) | 0.44 (0.26-0.74) | 0.41 (0.23-0.74) |
| Grade 5-8                        | 171 (25.1)               | 509 (74.9) | 0.51 (0.31-0.85) | 0.47 (0.27-0.82) |
| Grade 9-10                       | 49 (28.8)                | 121 (71.2) | 0.61 (0.34-1.1) | 0.59 (0.32-1.1) |
| >Grade 10                        | 27 (37.9)                | 41 (60.3) | 1 | 1 |
| Never attended                   | 143 (18.8)               | 619 (81.2) | 0.35 (0.21-0.59) | 0.32 (0.18-0.57) |
| Parity                           |                         |   |   |   |
| 1                                | 183 (21.9)               | 651 (78.1) | 0.90 (0.65-1.25) | 0.53 (0.35-0.83) |
| 2-4                              | 276 (23.7)               | 890 (76.3) | 1.03 (0.73-1.36) | 0.75 (0.53-1.08) |
| 5+                               | 66 (23.7)                | 213 (76.3) | 1 | 1 |
| Place of Delivery                |                         |   |   |   |
| Home                             | 115 (18.0)               | 525 (82.0) | 0.66 (0.52-0.82) | 0.66 (0.51-0.84) |
| Health facility                  | 410 (25.0)               | 1229 (75.0) | 1 | 1 |
| Knowledge of pregnancy danger signs |                     |   |   |   |
| Yes                              | 286 (24.4)               | 885 (75.6) | 1.42 (1.2-1.68) | 1.42 (1.2-1.7)  |
| No                               | 239 (21.6)               | 869 (78.4) | 1 | 1 |
| Distance from health post to home|                         |   |   |   |
| <1 hour                          | 514 (22.9)               | 1728 (77.1) | 0.9 (0.46-1.77) | 0.86 (0.43-1.74) |
| ≥1 hour                          | 11 (29.7)                | 26 (70.3) | 1 | 1 |
| Exposure to mass media            |                         |   |   |   |
| Yes                              | 167 (27.8)               | 434 (72.2) | 1.31 (1.1-1.6) | 1.35 (1.1-1.66) |
| No                               | 358 (21.3)               | 1320 (78.7) | 1 | 1 |

Abbreviations: AOR, adjusted odds ratio; CI, confidence interval; COR, crude odds ratio.
reach every mother in rural areas. Low income, low educational level, home delivery, low parity, and low exposure to mass media were associated with low utilization of FANC. Therefore, figuring out how HEWs can reach more rural expectant women is important. Empowering rural mothers to receive maternal health care by improving education and income may enhance the utilization of maternal health services.

Authors’ Note
The A.G. and Y.H. were involved in the conception and design of the study, the data collection, data supervision, data processing, cleaning, analysis and interpretation of the results, and developing the manuscript. A.A., M.T., and M.M. were involved in the conception and design of the study, data collection, and data supervision. All authors have read and approved the manuscript. The data sets generated and/or analyzed during the current study available from the corresponding author on reasonable request.

Acknowledgments
First of all, we would like to thank Save the Children and the CHIRIT project for providing a material support for this study. We also extend our thanks to the Hawassa University, College of Medicine and Health Science for the opportunity and overall material support. Our special thanks also go to the Sidama Zone Health Bureau and the 5 Woreda Health Offices for their support in approving the study. Lastly, we wish to thank the data collectors and the study participants, without whom this study could not have been achieved.

Declaration of Conflicting Interests
The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding
The author(s) received no financial support for the research, authorship, and/or publication of this article.

ORCID iD
Achamyelesh Gebretsadik https://orcid.org/0000-0002-0060-2103

References
1. World health organization. dept. of reproductive health and research, Villar J, Bergsjo P. WHO Map Best Reproductive Health Practices & UNDP/UNFPA/WHO/World Bank Special Program of Research, Development and Research Training in Human Reproduction. WHO Antenatal Care Randomized Trial: Manual for the Implementation of the New Model. Geneva, Switzerland: World Health Organization; 2002.
2. Lincetto O. Antenatal Care: opportunities for Africa’s Newborns. WHO: 2006. https://www.who.int/pmnch/media/publications/aonsectionIII_2.pdf.
3. Sabina A, Mihika C, Adriana C, Suman S, Ana V. Poverty in Rural and Urban Areas Direct Comparisons using the Global MPI 2014. Oxford, England: Oxford Poverty & Human Development Initiative (OPHI); 2014.
4. FMOH (Federal Ministry of Health). Annual Performance Report of HSHP. Addis Ababa, Ethiopia: FMOH (Federal Ministry of Health); 2010.
5. FMOH (Federal Ministry of Health). Third National Health Account Report. Addis Ababa, Ethiopia: FMOH (Federal Ministry of Health); 2005.
6. Federal Ministry of Health. Ethiopian Health Sector Development Program (HSDP III). Addis Ababa, Ethiopia: Federal Ministry of Health; 2008.
7. Bilal NK, Herbst CH, Zhao F, Soucat A, Lemiere C. Health Extension Workers in Ethiopia: Improved Access and Coverage for the Rural Poor. In: Chunan-Pole P, Angwao M, eds. Yes Africa Can: Success Stories from a Dynamic Continent. The Washington D.C: World Bank; 2011:433-443.
8. Yayehyirad K, Yemane Y, Amir S, Haiay D, Awash T. Assessment of the training of the first intake of health extension workers. Ethiop J Health Dev. 2007;21(3):232-239.
9. Federal democratic republic of Ethiopia. Ministry of Health Health Sector Development Program IV 2010/11 – 2014/15. Federal democratic republic of Ethiopia: Ministry of Health; 2010.
10. Center for National Health Development in Ethiopia. Ethiopia Health Extension Program Evaluation Study, 2005–2007, Vol. I. Household Health Survey. Addis Ababa, Ethiopia: Center for National Health Development in Ethiopia; 2008.
11. Federal Ministry of Health (Ethiopia). The Health Service Before and After 1991: a Summary of Achievements from 1991 to 2010. Addis Ababa, Ethiopia: Federal Ministry of Health (Ethiopia); 2010.
12. Last Ten Kilometers Project. Baseline Household Health Survey. Amhara, Oromiya: SNNPR; 2009.
13. Central Statistical Agency (CSA) [Ethiopia] and ICF. Ethiopia Demographic and Health Survey 2016: Key Indicators Report. Addis Ababa, Ethiopia and Rockville, MD: Central Statistical Agency (CSA) [Ethiopia] and ICF; 2016.
14. Valley research group. A baseline survey on community based newborn care package in two districts in Rural Nepal. 2009: 97-128.
15. Yusuf H, Million T, Akalewold A, Mekdes M, Fisum W, Achamyelsh G. The levels of neonatal care practices at health facilities and home deliveries in rural sidama zone, southern ethiopia. J Prim Care Community Health. 2018;9:1-10.
16. Carroli G, Villar J, Piaggio G, et al. WHO antenatal care trial research group. WHO systematic review of randomized controlled trials of routine antenatal care. Lancet. 2001;357(9268):1565-1570.
17. Araya M, Mark S, Yohannes K, et al. The role of health extension workers in improving utilization of maternal health services in rural areas in Ethiopia: a cross sectional study. BMC Health Serv Res. 2012;12:352.
18. Negussie A, Girma G. Is the role of Health Extension Workers in the delivery of maternal and child health care services a significant attribute? The case of Dale district, southern Ethiopia. BMC Health Serv Res. 2017;17(1):641.
19. Abera B, Wolde F, Alemu L. Focused antenatal care service utilization and associated factors in damot soro district, southern ethiopia, community based cross sectional study. Am J Health Res. 2017;5(6):167-172.
20. Getachew T, Abajobir A, Aychiluhim M. Focused antenatal care service utilization and associated factors in dejen and aneded districts, Northwest Ethiopia. Prim Health Care. 2014;4:170.
21. Mulat G, Kassaw T, Aychiluhim M. Antenatal care service utilization and its associated factors among mothers who gave live birth in the past one year in womberma woreda, North West Ethiopia. Epidemiology (Sunnyvale) S. 2015; 2(003).
22. Bahilu T, Abebe G, Yohannes D. Factors affecting antenatal care utilization in the Yem special woreda, southwestern Ethiopia. Ethiopia J Health Sci. 2009;19(1):45-51.
23. Chorongo D, Okinda FM, Kariuki EJ, et al. Factors influencing the utilization of focused antenatal care services in Malindi and Magarini sub-counties of Kilifi county, Kenya. Pan Afr Med J. 2016;25(suppl 2):14.
24. Agha S, Tappis H. The timing of antenatal care initiation and the content of care in Sindh, Pakistan. BMC Pregnancy Childbirth. 2016;16(1):190.
25. Gitonga E. Determinants of focused antenatal care uptake among women in tharaka Nithi County, Kenya. Adv Public Health. 2017; 2017:4.
26. Ye Y, Yoshida Y, Harun-Or-Rashid M, Sakamoto J. Factors affecting the utilization of antenatal care services among women in Kham District, Xiengkhouang province, Lao PDR. Nagoya J Med Sci. 2010;72(1-2):23-33.
27. Yenita A, Shigeko H. Factors influencing the use of antenatal care in rural West Sumatra, Indonesia. BMC Pregnancy and Childbirth. 2012;12:9.
28. Dairo MD, Owoyokun KE. Factors affecting the utilization of antenatal care services in Ibadan, Nigeria. Benin Journal of Postgraduate Medicine. 2010;12(1).
29. Nzioki M, Rosebella OO, James HO. Socio-demographic factors influencing maternal and child health service utilization in mwingi; a rural semi-arid district in Kenya. Am J Public Health Res. 2015;3(1):21-30.
30. Kakati R, Barua K, Borah M. Factors associated with the utilization of antenatal care services in rural areas of Assam, India. Int J Comm Med Public Health. 2016;3(10):7.
31. Dahiru T, Oche OM. Determinants of antenatal care, institutional delivery and postnatal care services utilization in Nigeria. Pan Afr Med J. 2015;21:321.
32. Muna HM, Mukhta AM. Factors associated with antenatal and delivery care in Sudan: analysis of the 2010 Sudan household survey. BMC Health Serv Res. 2015;15:452.
33. Chandhiok N, Dhillon BS, Kambo I, Saxena NC. Determinants of antenatal care utilization in rural areas of India: a cross-sectional study from 28 districts. J Obstet Gynecol India. 2006;56(1):47-52.
34. Ghebrehiwet M, Morrow RM. Delay in seeking and receiving emergency obstetric care in Eritrea. J Eritrea Med Assoc. 2007; 2(1):8-13.
35. Killewo J, Anwar I, Bashir I, Yunus M, Chakraborty J. Perceived delay in health care seeking for episodes of serious illness and its implications for safe motherhood interventions in rural Bangladesh. J Health Popul Nutr. 2006;24(4):403-412.
36. Shahjahan MD, Hasina AC, Jesmin A, Afsana A, Mizanur R, Hafez MA. Factors associated with the use of antenatal care services in a rural area of Bangladesh. South East Asia J Public Health. 2013;2(2):61-66.

Author Biographies

Achamyelesh Gebretsadik, PhD in Public Health. She has been working in Hawassa University as assistant professor and researcher for the past 13 years.

Million Teshome, MD, is a senior gynecologist at Hawassa University, working as assistant professor for the past 14 years.

Mekdes Mekonnen, MSc in Nursing. She has been here in Hawassa university for the last 12 years, working as a clinician and lecturer.

Akalewold Alemayehu, MPH in Epidemiology. He is working as lecturer, researcher and head of school of Public Health at Hawassa University.

Yusuf Haji, is an assistance professor of epidemiology .Has 13 years experience as clinician and currently working at Hawassa University since 2015.