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Community-based newborn care utilisation and associated factors in Geze Gofa rural district, South Ethiopia: a community-based cross-sectional study

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ABSTRACT

Objective The community-based newborn care (CBNC) is a newborn care package along the maternal and newborn health continuum of care that has been implemented at the community level in Ethiopia. The utilisation which might be affected by several factors has not been well assessed. Thus, this study aimed to examine the utilisation of CBNC and associated factors among women who delivered recently in Geze Gofa rural district, south Ethiopia.

Design Cross-sectional study.

Setting Community-based.

Participants Three-hundred seventy-one women who had their newborns recently were randomly selected. Then, they were interviewed at their places using an interviewer-administered structured questionnaire.

Methods A binary logistic regression analysis was done. In the multivariable logistic regression analysis, a p value of <0.05 and adjusted OR (AOR) with 95% CI were used to identify factors statistically associated with CBNC utilisation.

Outcomes CBNC utilisation.

Results The findings showed that the overall utilisation of CBNC by women who delivered recently with their newborns was 37.5% (95% CI: 32.6 to 42.6). Factors associated with the utilisation of CBNC included women who attended elementary school (AOR: 1.76, 95% CI: 1.01 to 3.07), college and above (AOR: 3.71, 95% CI: 1.12 to 12.24), farmer women (AOR: 0.35, 95% CI: 0.16 to 0.79), women in the lowest (AOR: 3.76, 95% CI: 1.65 to 8.54) and middle quantile of wealth status (AOR: 1.96, 95% CI: 1.01 to 3.76), and those whose preference was visiting hospital only when they faced any signs of danger (AOR: 0.29, 95% CI: 0.11 to 0.78).

Conclusion The use of the CBNC programme in the study area was surprisingly low. To increase utilisation and potentially improve the outcomes of these neonates, we need to increase awareness at community levels, make convenient arrangements and increase the availability of services at nearby health facilities that are essential to improve the uptake of CBNC in the rural district.

Strengths and limitations of this study

► The finding is expected to give insight to programme implementers and policymakers who aim to raise the accessibly and quality of community-based newborn care services in the area.

► Qualitative methods did not triangulate the study.

► The study might be subjected to social desirability bias because of the use of an interviewer-administered questionnaire which was, in fact, minimised through the use of experienced and trained data collectors from other district health facilities.

► Furthermore, women might experience recall bias, particularly regarding services they received during their previous obstetrics, such as antenatal care visits.

in which the risk for death is the highest and therefore needs more attention and care.[1 2]

Globally, 2.6 million newborns die in their first 28 days of life every year, and three-fourth of all newborn deaths occur in the first week of life.[3] The majority (98%) of the neonatal deaths are from preventable causes, occurring in middle-income and low-income countries, including Ethiopia.[1 4] Ethiopia was one of the highest contributors in Africa, with 187 000 neonatal mortality in 2015.[5] According to the Ethiopian Demographic and Health Survey (EDHS) 2016, the neonatal mortality rate in the country was 29 per 1000 live births.[6]

A community-based maternal and newborn care programme has been implemented in low-income countries, primarily for the improvement of maternal and newborn health status.[7–10] Two-third of neonatal deaths can be prevented if effective health measures are provided at birth and during the first week of life.[11] Similarly, community-based health interventions increase access to areas

INTRODUCTION

Neonatal period, from birth to the first 28 days of life, is the most critical phase of life

where facility of care is limited. Therefore, removing key barriers such as distance and transport costs for the poor and promoting the utilisation of facility-based services, and in some cases, providing treatment at community levels need to be considered.[12]

In Ethiopia, a community-based newborn care (CBNC) programme is an initiative that includes a newborn care package along the maternal and newborn health continuum of care.[13 14] It is carried out by health extension workers (HEWs) at community levels and aims at improving maternal and newborn health through the four Cs, prenatal and postnatal **c**ontact, **c**ase-identification of newborns with signs of bacterial infections, **c**are or treatment as early as possible and the **c**ompletion of a full 7-day course of appropriate antibiotics at the community level.[15]

Newborns in Ethiopia face multitude of barriers in accessing healthcare. Some of these are related to culture and fatalism and others to physical access due to distance and limited communication. Although nearly all the HEWs have been trained to treat severe newborn infections in the CBNC programme, relatively few sick newborns have been identified and treated in the country.[13 16]

The utilisation of available maternal and child health services is very low in Ethiopia.[17–20] A community-based child care household survey in 194 clusters in 46 woredas across four regions on newborn and child health service utilisation showed that only 4% of the newborns had a postnatal check within the recommended first 2 days of life.[21] For this low CBNC programme service utilisation, socioeconomic and demographic factors are the most important contributing variables.[13 19 21]

Despite the increasing availability of key maternal and newborn health services, low utilisation and lack of quality services continue to be a challenge in Ethiopia.[22–24] Of the total 72% of women who delivered at home without skilled assistance, 80% were from rural residents. Besides, only 13% of the newborns had a postnatal check within the critical first 2 days after birth, while 86% did not receive postpartum.[6] Lack of postnatal health checks can delay the identification of newborn complications and initiate appropriate care and treatment. Thus, early postpartum service is critical to ensure proper neonatal care, which includes exclusive breastfeeding, cord and thermal care, and the prevention of infections.[25]

Moreover, home care visits are not delivered on the standard days (1 and 3) of a newborn's life, and for the majority of mothers, a third visit does not occur before the end of the first week of life (day 7) in developing countries.[26]

In Ethiopia, implementing the CBNC programme has been taken as one of the core interventions to reduce child mortality and to attain the sustainable development goals of reducing under-five mortality to less than 25 per 1000 live births and neonatal mortality to 12 or fewer per 1000 live births by 2030.[27 28] However, studies that show the implementation status of these interventions are rare. Hence, this study aimed to inform policymakers,

programme managers and care providers about the utilisation level of the CBNC programme and the extent to which its key components were implemented as intended in the study area and in similar settings. Therefore, the objective of this study was to assess the CBNC utilisation and associated factors among women who delivered recently and their newborns in the Geze Gofa district, southern Ethiopia.

METHODS
Study design and settings
A community-based cross-sectional study was conducted in Geze Gofa district, Gamo Gofa zone, Southern Nation Nationalities and Peoples' Region, Ethiopia, from 1 May 2017 to 31 May 2017. Geze Gofa district is one of the 17 districts in Gamo Gofa zone located 535 km to the southwest of Addis Ababa, the capital of Ethiopia.

Administratively, the district is divided into one urban and 29 rural kebeles with 87 731 people. Of these, 43 690 (49.8%) were male and 44 041 (50.2%) female; 20 441 (23.3%) of the women were in the childbearing age group (15 to 49 years), and 3036 of the women were pregnant with 13 695 children under 5 years in the district; there also were 3036 and 2799 neonates and infants under 1 year, respectively.

All mothers in the childbearing age group and gave birth in between 2016 and 2017 were the source population, whereas all mothers who delivered from 1 September 2016 to 28 February 2017 were the study population.

Mothers who gave birth both at home and in health facilities in the district 6 months before the study and live young infants were included. Mothers who delivered in another district and came to the study area, lost their babies before 2 months of age, critically ill and unable to respond to interviews were excluded.

Sample size and sampling techniques
The sample size was determined using the single population proportion formula (n= $\frac{P(1-P)(Z_{\alpha/2})^2}{d^2}$) and assuming a 50% proportion (P) of service utilisation of women and newborns, 5% expected margin of error (d), 95% CI and 10% non-response that yielded a sample of 403.

Initially, nine health posts (30% of the total health posts) were selected using the lottery method.[29] Then, the sample was proportionally allocated to the nine health posts based on the estimated number of mothers who gave birth in the last 6 months. The final participants were selected using the simple random sampling technique (lottery method) from the delivery registries of the health posts. Then, home visits and interviews were conducted using household numbers.

Variables and measurements
The outcome variable of the study was the utilisation of CBNC programme. It was measured based on participant service uptake of such components of the programme as early identification pregnancy, receiving focussed

antenatal care (ANC), institutional delivery, postnatal care (PNC) for mother and child within 2 months of the postpartum period, and identification and management of sick newborns at community level up to the age of 2 months.[30–35] Accordingly, if the mothers received all the five components of the programme, we considered them as 'utilised' the CBNC programme; otherwise as 'not utilised'.

ANC service utilisation was measured according to WHO guidelines for healthy pregnancies the mother should make at least four visits during the pregnancy, the first of which must be within the first trimester.[36] If the pregnancy is unhealthy, the visit might be more than four times as per the healthcare provider's decision.

Institutional delivery service was measured when a woman gives birth at a health post, health centre, hospital or other private health facilities; otherwise, it is considered as home delivery

Similarly, PNC service was considered as received if the mother and her newborn received healthcare services and were visited by providers within 2 months of birth.

In this study, a woman who has delivered recently was used to denote a mother aged 15 to 49 years and delivered from 1 September 2016 to 28 February 2017.

A newborn in our study was taken as a child in its first 8 weeks after birth and taken as a target for CBNC services according to the Ethiopian CBNC programme implementation guidelines.[37] Birth weight was assessed by asking the mother and labelling as small (<2.5 kg), average (2.5 to 4.0 kg) and large (>4.0 kg).

The explanatory variables were the age of women (<24, 24 to 35 and >35 years), marital status (single, married, widowed or divorced), educational status (unable to read and write, able to read and write, elementary school, high school, college and above), religion (Protestant, Orthodox, Muslim or Catholic), ethnicity (Gofa, Gamo, Wolayita or others), occupational status (Government employee, merchant, daily labour, farmer or housewife), household wealth status (poorest, poorer, middle, richer or richest), parity (primipara or multipara), participation in the women health development team meetings (yes or no), visited by HEWs (yes or no), time it takes to the health post (<30, 30 to 60, 60 to 120 or >120 min), type of health facility visited for danger sign (hospital, health centre or health post) and information about CBNC (yes or no).

Wealth index was assessed using household assets through principal component analysis adapted from the EDHS[38] and ranked into five (poorest, poorer, middle, richer and richest) levels.

Data collection tools and procedures

An interviewer-administered standardised structured questionnaire was used after reviewing different studies and guidelines.[26 31 34 35 37 39–46] The tool was initially developed in English and translated into the local language (Amharic) and finally back to English to ensure consistency. Four trained BSc degree graduate nurses and two public health officers of the same qualification from the nearby Sawla district were recruited as data collectors and supervisors, respectively. The supervisors checked data accuracy, consistency and completeness daily.

Data quality control

Before data collection, a 1-day training was given to data collectors and supervisors on the objectives of the study, data collection instruments, techniques and producers. The data collectors were supervised daily, and the consistency and completeness of data were checked by the principal investigator every night. A pretest was conducted on 21 women (5% of the sample size) of Demba Gofa (one of the neighbouring districts with similar characteristics). Before the actual data collection, all findings from the pretest were incorporated into the final questionnaire and amendments were made.

Data processing and analysis

Data were cleaned and checked for completeness and consistency before they were coded and entered into EpiData V.3.1 software and exported to SPSS V.23 for analysis.

Descriptive statistics used were presented in narrations and tabular forms. Both bivariable and multivariable logistic regression analyses were computed to determine the associated factors. Variables with p values less than 0.2 in the bivariable logistic regression were candidates for the multivariable analysis after checking model fitness, χ^2 and multicollinearity assumptions. In the final multivariable logistic regression analysis model, a p value less than 0.05 and adjusted OR (AOR) with a 95% CI were used to identify statistically associated factors.

Patient and public involvement

No patients or the public were directly involved in the development of the research questions, outcomes, recruitment and the design of the study. However, the participants and administrative officials were informed about the research questions and objectives. The findings will be disseminated to the Geze Gofa District Health Office and Gamo Gofa Zonal Health Department. Besides, the results will be distributed to potential stakeholders who have been involved in programme implementation after being published in a peer-reviewed scientific journal.

Ethical considerations

Informed written consent was obtained from each respondent after a brief explanation of the risk and benefit of the study to ensure their voluntariness to participate before the actual data collection. Participants had the right to withdraw at any time or to skip for a single question or segment of questions they did not want to answer or refuse to participate at all with no negative repercussions, and the interview stayed averagely for 15 min.

Table 1 Sociodemographic and economic characteristics of study participants in Geze Gofa district, south Ethiopia, June 2017 (n=371)

Variables	Responses	Frequency (n)	Per cent
Age in years	<24	109	29.4
	24 to 35	246	66.3
	>35	16	4.3
Marital status	Single	23	6.2
	Married	276	74.4
	Widowed	32	8.6
	Divorced	40	10.8
Religion	Protestant	172	46.4
	Orthodox	131	35.3
	Muslim	28	7.5
	Catholic	40	10.8
Educational status	Unable to read and write	116	31.3
	Able to read and write	25	6.7
	Elementary school (Grade1 to 8)	157	42.3
	High school (Grade 9 to 12)	51	13.7
	College and above	22	5.9
Occupational status	Gov't employee	15	4.0
	Merchant	31	8.4
	Daily labour	21	5.7
	Farmer	35	9.4
	Housewife	269	72.5
Ethnicity	Gofa	249	67.1
	Gamo	69	18.6
	Wolayita	27	7.3
	Others*	26	7.0
Wealth quantiles	Poorest	65	17.5
	Poorer	63	17.0
	Middle	111	29.9
	Richer	54	14.6
	Richest	78	21.0

*Others: Amhara, Guraghe and Kembata.
Gov't employee, Government employee.

RESULTS

Sociodemographic and economic characteristics of participants

Table 1 shows the sociodemographic and economic characteristics of the study participants. A total of 371 women responded to the interviewer-administered questionnaire, with a response rate of 92.1%. The mean age of the women was 27.6 (SD±5) years; the majority (74.4%) were married and 6.2% single. Religious preference for 46.4% and 7.5% of the women were Protestant and Muslim, respectively; 42.3% went to elementary school, while 5.9% attended college or above; 72.5% were housewives and 4.0% government employees; and 67.1% were Gofa by ethnicity. Additionally, the mean parity was 3.5 (SD±1.9), and approximately 30% and 14.6% were in the middle and richer wealth status, respectively.

Health extension programme services and other related characteristics

All of the respondents knew the HEWs who worked in their respective kebeles. The majority (90.7%) of the women received advice from the HEWs during their recent pregnancies and postpartum period. Similarly, 88.4, 74.1, 73.9, 70.4 and 47.4% of the women received information about the health extension program (HEP) packages, advice on sexually transmitted infection, newborn and child diseases as well as supplies and vitamin A, respectively. A total of 340 (91.6%) women said that there was a Health Development team (in one to five networks) in their community. Of those, 323 women (95.0%) were members of the networks and 217 (67.1%) attended meetings during their recent pregnancies. Moreover, the nearest health post took less than 30, 30 to 60, 60 to 120 and more than 120 min of travel on foot for 21.3, 40.7, 29.4 and 8.6% of the participants, respectively.

Obstetric history and maternal health services

As shown in table 2, 98.1% of the women had ANC visits during their recent pregnancies, and the mean age of the pregnancies during the first ANC visit was 4.6 months (SD±1.3). Similarly, 80.2% and 4.4% of the women went to health posts and hospitals for their first ANC, respectively.

During their recent ANC visits, physical examinations and routine laboratory investigations were done for 95.6% and 56.6% of the women, respectively. Moreover, 90.7, 80.5 and 6.6% of the women received tetanus toxoid vaccination, iron folate supplementation and deworming during ANC follow-up, respectively. Of those who had ANC follow-up, 285 (78.3%) made ANC visits four times and above. Regarding knowledge of danger signs during pregnancies, 79.2, 75.5 and 49.6% stated that their danger signs were vaginal bleeding, blurred vision and convulsion, respectively. One-fifth of the women faced at least one danger sign, while 75.5% and 10% said that they went to health centres and hospitals when they have faced any of the danger signs, respectively. Of the total respondents, 233 (62.8%) delivered at health facilities.

Postpartum and immediate newborn care services

The postpartum and immediate newborn care services are presented in table 3. Of the total participants, 246 (66.3%) received PNC within 7 days after birth. Nearly 41% of them visited in the first 48 hours of delivery; 13 (9.4%) of those who delivered at home were made to use local material (buffer, dung and others) to apply on

Table 2 Obstetric characteristics and maternal health services in Geze Gofa district, south Ethiopia, June 2017 (n=371)

Variables	Responses	Frequency (n)	Per cent
Parity	Primipara	53	16.5
	Multipara	268	83.5
ANC follow-up	Yes	364	98.1
	No	7	1.9
Number of ANC visits (n=364)	One time	14	3.9
	Two times	26	7.1
	Three times	39	10.7
	Four and above	285	78.3
Timing of first ANC visit (n=364)	First trimester	58	15.9
	Second trimester	298	81.9
	Third trimester	8	2.2
Type of health facility for the first ANC visit	Hospital	16	4.4
	Health centre	56	15.4
	Health post	292	80.2
Knowing about danger sign during pregnancy	Swelling of hands and face	237	63.9
	Blurred vision	280	75.5
	Convulsion	184	49.6
	Severe headache	248	66.8
	Severe lower abdominal pain	206	55.5
	Vaginal bleeding	294	79.2
Place of visits, if they have faced danger signs	Hospital	37	10.0
	Health centre	280	75.5
	Health post	54	14.6
Faced danger sign	Yes	75	20.2
	No	289	77.8
Place of delivery	Health facility	233	62.8
	Home	138	37.2
Type of health facility attended during delivery (n=233)	Hospital	34	14.6
	Health centre	190	81.5
	Health post	9	3.9

ANC, antenatal care.

Table 3 Postpartum and immediate newborn care services in Geze Gofa district, south Ethiopia, June 2017 (n=371)

Variables	Responses	Frequency (n)	Per cent
Postnatal visit	Yes	246	66.3
	No	125	33.7
Postnatal care visiting time (n=246)	<48 hours	100	40.7
	Third day	38	15.4
	After third day	108	43.9
Timing of breastfeeding initiation	<1 hour	336	90.6
	≥1 hour	35	9.4
Exclusive breastfeeding	Yes	275	74.1
	No	96	25.9
Source of information about breastfeeding	HEWs	278	74.9
	Healthcare providers from health canter	49	13.2
	Mass media	24	6.5
	Relatives/friends	10	2.7
	Other*	10	2.7

*Others: health development army leader, community group and traditional birth attendant.
HEW, health extension workers.

health posts. During the first 2 months after delivery, 224 (60.4%) of the newborns received postnatal follow-up from HEWs at home. Of the newborns, 41 (18.3%) were checked once, and 87 (38.8%) three and above times. The majority of the newborns, 299 (80.6%), were weighed within 7 days, and 271 (90.6%) and 12 (4.0%) of them had average and high birth weight, respectively. Out of the total newborns, 56 (15.1%) faced health problems within 2 months of the postnatal period, and 34 (60.7%) consulted HEWs and visited health posts to receive medical services.

Community-based newborn care utilisation

A CBNC programme utilisation was measured when a woman and her newborn received all the components of the programme (ANC+institutional delivery+PNC+neonatal care up to 2 months of age) continually at home and/or health post level. Accordingly, 37.5% (95% CI: 32.6 to 42.6) of the women and their newborns utilised the full CBNC programme while the rest did not receive the entire programme.

Factors associated with community-based newborn care utilisation

In the bivariable logistic regression, age, educational level, occupational status, ethnicity, wealth status, time taken to reach the nearest health post, types of facility visited during danger signs and previous information about CBNC were candidate variables. In the multivariable logistic regression analysis, educational level,

cord. Of the total newborns, 336 (90.6%) started breastfeeding within an hour of delivery. Moreover, 74.1% of the newborns breastfed exclusively. Three-fourth of the women received information about breastfeeding for the first time from HEWs, while 24 (6.5%) obtained from the mass media.

Newborn care services during the first 2 months of age

Table 4 shows newborn care services during the first 2 months of age; 69.0% of the mothers had information about CBNC provided by HEWs at community level

Table 4 Newborn care services during the first 2 months of age in Geze Gofa district, south Ethiopia, June 2017 (n=371)

Variables	Responses	Frequency (n)	Per cent
Having information about the CBNC programme	Yes	256	69.0
	No	115	30.9
Newborn received PNC from HEWs at home within 2 months of age	Yes	224	60.4
	No	147	39.6
Frequency of follow-up received from HEWs (n=224)	One time	41	18.3
	Two times	96	42.9
	≥Three times	87	38.8
Baby's weight was measured within the first 7 days of birth	Yes	299	80.6
	No	72	19.4
Birth weight of the newborn (n=299)	Small	271	90.6
	Average	16	5.4
	Large	12	4.0
Newborn faced a health problem during the first 2 months of age	Yes	56	15.1
	No	315	84.9
Types of facility visited for medical services (n=56)	Health post	34	60.7
	Health centre	15	26.8
	Hospital	7	12.5

CBNC, community-based newborn care; HEW, health extension workers; PNC, postnatal care.

occupational status, wealth status and types of facility visited when they had danger signs were variables significantly associated, as presented in table 5.

Accordingly, women who attended elementary school, college and above were 1.76 (AOR: 1.76, 95% CI: 1.01 to 3.07) and 3.71 (AOR: 3.71, 95% CI: 1.12 to 12.24) times more likely to use the programme compared with those who were unable to read and write, respectively. Farmer women were 65% less likely to use the programme compared with housewives (AOR: 0.35, 95% CI: 0.16 to 0.79). Women who were in the poorest and middle wealth status were 3.76 (AOR: 3.76, 95% CI: 1.65 to 8.54) and 1.96 (AOR: 1.96, 95% CI: 1.03 to 3.76) times more likely to use the programme than rich women. Moreover, women who preferred visiting the hospital if they had any danger signs were 70.4% times less likely to use the services than those who chose to go to health posts (AOR: 0.29, 95% CI: 0.11 to 0.78).

DISCUSSION
Overall, 37.5% of the women who delivered recently and their newborns received the full components of the CBNC programme. This finding is higher than that of a study conducted at Xaybouathong district, Lao People's Democratic Republic. In this study, only 6.8% the women received all the modified composite coverage index components of maternal and child health services (ANC 4+, neonatal tetanus protection, facility-based delivery, PNC, immunisation and family planning).[30] A study in Ghana showed that from pregnancy to post-delivery, 7.9% of women and children received the continuum of care,[31] while another study in Ghana indicated that only 8.0% of the women completed the continuum of maternal and newborn care services.[35] Our finding is higher than that of a study conducted in Pakistan and showed that the continuum of maternal care was 27.4%.[33] The possible justification for the discrepancy could be the inclusion of the continuum of care as measured by ANC, institutional delivery, immediate PNC and newborn care services up to 2 months of age, whereas in others studies the continuum of care included child health services until the age of 1 year. The other possible explanation might be the use of a longer study period retrospectively to assess the utilisation that included 5 years before the survey, which might increase their recall bias about the services they received and the sociodemographic variations of study areas. Moreover, stronger and more resilient health systems which focus on community-based service provisions like the health extension programme in Ethiopia may explain some of the discordance in the findings of the current and other studies.[47–49] Results, however, were lower than that of a study done at Sohag Governorate, Egypt, and showed that 50.4% of the women achieved the continuum of care.[32] In addition, a study conducted in Cambodia showed that 60% of women had the full range of services for the continuum of maternal and newborn healthcare.[50] This discrepancy might be due to the use of only maternal continuum of care, which did not include newborn care that could give a higher result. A study conducted in Cambodia used a national survey that might have resulted in a higher findings, and the study area and sociocultural variations might be other possible reasons.

Our study showed that 98.1% of the women received ANC services once, 76.8% four times and above; 62.8% of women delivered at a health facility; and the health status of 60.3% of newborns was checked by HEWs until 2 months of age. Our finding is higher than that of a study conducted in Ratanakiri province, Cambodia, in which only 32.6% of the women made four and above visits in the continuum of maternal, newborn and child health services.[51] The possible explanation might be the difference in the target group, which included women who gave birth 2 years before the study that might have resulted in forgetting the services they took. The other possible reason might be the difference in the service delivery pace for ANC follow-up. Our study included services taken at the health post level, while their study measured ANC service follow-up at health centres and hospitals only. Our findings is lower than that of a study conducted in Sohag Governorate, Egypt, which showed that 90% of the women visited four and above ANC.[32] The reason for our low results may be the sociodemographic

Table 5 Bivariable and multivariable logistic regression analysis of factors associated with CBNC utilisation in Geze Gofa district, south Ethiopia, June 2017 (n=371)

Variables	CBNC utilised N (%)	CBNC not utilised N (%)	Cor (95% CI)	AOR (95% CI)
Age in years				
≤24	36 (33.0)	73 (67.0)	2.03 (0.70 to 5.84)	1.41 (0.42 to 4.76)
25 to 35	95 (38.6)	151 (61.4)	1.59 (0.58 to 4.38)	1.34 (0.44 to 4.10)
>35	8 (50.0)	8 (50.0)	1	1
Educational status				
Unable to read and write	49 (42.2)	67 (57.8)	1	1
Able to read and write	12 (48.0)	13 (52.0)	0.79 (0.33 to 1.88)	0.84 (0.32 to 2.17)
Elementary school	47 (29.9)	110 (70.1)	1.71 (1.04 to 2.83)	1.76 (1.01 to 3.07)*
High school	26 (51.0)	25 (49.0)	0.70 (0.36 to 1.36)	0.80 (0.36 to 1.78)
College and above	5 (22.7)	17 (77.3)	2.49 (0.86 to 7.20)	3.71 (1.12 to 12.24)*
Occupational status				
Government employee	8 (53.3)	7 (46.7)	0.43 (0.15 to 1.21)	0.41 (0.13 to 1.29)
Merchant	14 (45.2)	17 (54.8)	0.59 (0.28 to 1.25)	0.50 (0.22 to 1.15)
Daily labour	9 (42.9)	12 (57.1)	0.65 (0.26 to 1.60)	0.40 (0.15 to 1.08)
Farmer	20 (57.1)	15 (42.9)	0.37 (0.18 to 0.75)	0.35 (0.16 to 0.79)*
Housewife	88 (32.7)	181 (67.3)	1	1
Ethnicity				
Gofa	86 (34.5)	163 (65.5)	1	1
Gamo	30 (43.5)	39 (56.5)	0.69 (0.40 to 1.18)	0.76 (0.42 to 1.38)
Wolayita	13 (48.1)	14 (51.9)	0.57 (0.26 to 1.26)	0.47 (0.20 to 1.11)
Others*	10 (38.5)	16 (61.5)	0.84 (0.37 to 1.94)	1.27 (0.49 to 3.25)
Wealth status				
Poorest	13 (20.0)	52 (80.0)	4.21 (1.98 to 8.94)	3.76 (1.65 to 8.54)*
Poorer	22 (35.0)	41 (65.0)	1.96 (0.99 to 3.88)	1.92 (0.91 to 4.06)
Middle	39 (35.1)	72 (64.9)	1.943 (1.07 to 3.51)	1.96 (1.03 to 3.76)*
Richer	25 (46.3)	29 (53.7)	1.221 (0.61 to 2.45)	1.26 (0.57 to 2.80)
Richest	40 (51.3)	38 (48.7)	1	1
Time takes to reach the nearest health posts (in minutes)				
<30	28 (35.4)	51 (64.6)	0.51 (0.20 to 1.33)	1
30 to 60	59 (39.0)	92 (61.0)	0.44 (0.18 to 1.07)	0.83 (0.45 to 1.55)
60 to 120	45 (41.3)	64 (58.7)	0.39 (0.16 to 1.00)	0.70 (0.36 to 1.37)
>120	7 (21.9)	25 (78.1)		1.72 (0.61 to 4.85)
Place of visit (if they have faced danger signs)				
Hospital	20 (54.0)	17 (46.0)	0.29 (0.12 to 0.72)	0.29 (0.11 to 0.78)*
Health centre	105 (37.5)	175 (62.5)	0.58 (0.30 to 1.12)	0.58 (0.29 to 1.18)
Health post	14 (25.9)	40 (74.1)	1	1
Information about CBNC programme				
Yes	90 (35.2)	166 (64.8)	1	1
No	49 (42.6)	66 (57.4)	0.73 (0.47 to 1.15)	0.73 (0.43 to 1.21)

Others*: Amhara, Guraghe and Kembata.
*Statistically significant at p value <0.05.
AOR, adjusted OR; CBNC, community-based newborn care.

variability, as we have only assessed the utilisation for rural residents. Moreover, the presence of better maternal and child health services achievement in Egypt might be the possible explanation for this higher findings.[52]

Our study showed that women who attended elementary school, college and above had 1.7 and 3.7 times more chance of getting CBNC service utilisation compared with mothers who were unable to read and write, respectively. This finding was comparable with that of a study done in Nepal, South Asia and sub-Saharan countries in which women's education was positively associated with the maternal and newborn health service utilisation.[53 54] These findings might be explained by the fact that an education for a woman increases her knowledge and awareness about the importance of the services and the chance of getting information.

In this study, CBNC utilisation was lower by 65% among farmer women compared with housewives. This result is supported by a study done in the district of Xaybouathong, Lao People's Democratic Republic, showing that agriculture is detrimental to the use of maternal, newborn and child health services.[30] This result might be explained by the difficulty of serving women farmers because services are delivered at the community level.

Women who are in the poorest and middle wealth quantile were 3.76 and 1.96 times more likely to use the CBNC programme compared with those who were rich. This finding is different from those studies done in the a rural community of south eastern Nigeria and western regions of China showing women with higher economic status increased maternal and child service utilisation.[55 56] A study in Ghana showed that women and children in the richest households were more likely to utilise the continuum of care.[31] Another study in Africa showed that there was a three-fold disparity in the use of the continuum of care between the wealthiest 20% of African women compared with the poorest.[57] This disagreement might be explained by the fact that the programme in our study area aimed to serve the poorest households at health post and household levels to increase service access. The other possible explanation might be that wealthier families can afford the direct and indirect costs of services of health centres or hospitals and seek more quality care at higher facilities by well-trained providers. Additionally, the programme in our case is a free service that does not incur any cost on those who cannot seek other services at advanced or higher facilities.

In this study, women who preferred to visit hospitals when they faced danger signs had a 70.4% lower chance of utilisation of the CBNC services compared with those who preferred health posts. According to the Ethiopian health tier system, health posts are more accessible than hospitals; so, those who want to visit hospitals might not get the services as easily as they need.[58] This result is in line with that of a study in Pakistan and showed that the absence of difficulties for access to health facilities increases the use of maternal and newborn, and child healthcare continuum by 76.1% and 72.9%, respectively.[33] The other possible explanation might be that the effectiveness of community health workers in delivering preventive maternal and child health interventions in low-income and middle-income countries[59] increases community-based service acceptability in rural communities.

Limitations of the study

The finding was not triangulated by qualitative methods which are also subject to social desirability bias owing to our use of an interviewer-administered questionnaire. To minimise the impact, data collectors were recruited from other districts. Moreover, the women might have experienced recall bias, particularly regarding the services they received during their previous obstetrics, ANC visits, for instance. Compared with other studies, however, our work assessed later events that preceded the study by only 6 months. On top of that, the data collectors were highly experienced and well-trained on the tools to explain the questions and extend the time for respondents so they recall events later.

CONCLUSION

The study showed that CBNC utilisation in the study area was low compared with the current national recommendations. Elementary school, college and above education, as well as the poorest and middle wealth status affected the utilisation positively, whereas farming occupation and preference of hospitals in case of danger signs affected the utilisation negatively. Therefore, awareness creation at community levels for illiterate women, arranging convenient time for farmer women and providing full components of maternal and newborn services in nearby community level health facilities could improve the utilisation of CBNC programme in rural districts. Furthermore, subsequent studies must explore the barriers for low utilisation of CBNC services using qualitative methods and also better if studies assessed the effectiveness of the programme on maternal and child health outcomes.

in the manuscript. Data can be provided by the contact of the corresponding author on a reasonable request.

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