

# Magnitude and Factors Associated with Ambulance Service Utilization Among Women Who Gave Birth at Public Health Institutions in Central Ethiopia

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**Background:** Effective and well-organized ambulance services system forms the link between household and health facility for providing basic or comprehensive emergency obstetric care. Therefore, the establishment of a strong ambulance services network across the country based on evidences from local study is necessary for the improvement of ambulance service utilization among mothers who gave birth. This study aimed to assess magnitude and factors associated with ambulance service utilization among women who gave birth at public health institutions in central Ethiopia.

**Methods:** A community-based cross-sectional study supplemented by a qualitative method was employed. Data were collected via face-to-face interview. A simple random sampling and purposive sampling techniques were used to select study participants. Bivariate and multivariable logistic regression analyses were done to identify factors associated with ambulance services utilization, and variables with a p-value <0.25 were entered in the multivariable logistic regression analysis. Adjusted odds ratio (AOR) with 95% CI and a P-value <0.05 were used to declare statistically significant associations.

**Results:** Among study participants, only 214 (46%) utilized ambulance service. Mother who had no formal education (AOR=0.03, 95% CI [0.01, 0.07]), husband who completed primary school and above (AOR=7.03, 95% CI [1.83, 27.16]), rural residence (AOR=2.27, 95% CI [1.11, 4.65]), decision maker to get ambulance service (AOR=0.03, 95% CI [0.01, 0.07]), multigravida (AOR=4.8, 95% CI [2.48, 9.34]), having ambulance phone number (AOR=0.36, 95% CI [0.19, 0.68]), antenatal care attendance (AOR=0.07, 95% CI [0.04, 0.16]), and having discussion with health extension worker (AOR=0.14, 95% CI [0.084, 0.24]) were significantly associated with ambulance service utilization.

**Conclusion:** The magnitude of ambulance service utilization was low. Hence, health sector should improve the awareness of pregnant mothers on benefit of ambulance utilization through provision of information. Health care providers should provide antenatal services for pregnant mothers as early as possible.

**Keywords:** ambulance, health facility, deliveries, utilization, women

## Background

Maternal health is a central concern both globally and nationally.<sup>1</sup> Though there is a plan to decrease the global maternal mortality ratio to less than 70 per 100,000 live births by 2030, a significant challenge continued to be seen in sub-Saharan Africa in this regard. Another target is that no country should have maternal mortality ratio (MMR) of greater than 140/100,000 live births (a number twice the global target) by 2030.<sup>1,2</sup>

Ambulance is a vehicle for transportation of obstetric emergency, sick or injured people to, from or between places of treatment for an illness or injury where there is immediate risk to the health and life of the people requiring immediate

medical concern.<sup>3</sup> All pregnant women are encouraged and supported to utilize ambulance service and give birth in health facilities with skilled birth attendants. According to Ministry of Health guidelines, ambulances should link health posts in rural kebeles with health centres at the District level, and health centres with hospitals at the zonal and regional levels through a referral system so that women can be transferred if they need emergency maternal obstetric and newborn care (EmONC).<sup>4</sup>

According to World Bank report, an estimated 75% of maternal mortality could be prevented through timely access to child birth-related care that is facilitated by ambulance transport.<sup>5</sup> The majority of maternal health complications and deaths occurred in low- and middle-income countries (LMIC) and about one-third of all maternal mortality can be directly attributed to lack of ambulance service.<sup>6</sup> In rural area of Burundi, the integration of ambulance network in EmONC referral systems was estimated to reduce maternal mortality by 74%.<sup>7</sup> However, the majority of maternal deaths in sub-Saharan Africa are linked with birth complications related to lack of timely health care due to low ambulance service utilization.<sup>6,8</sup>

Although the benefits of ambulance service utilization are clearly indicated in literature, very few studies have been conducted in Ethiopia in this regard. Therefore, this study aimed to assess magnitude and factors associated with ambulance service utilization among women who gave birth at public health institutions in the last 12 months in Chelia district, West Shoa, Oromia, central Ethiopia. The finding of this study will be used as baseline information for those who are interested in carrying out further research and the results of this study will provide relevant information for policy makers and non-governmental organizations for future planning and interventions of appropriate strategies to control ambulance service and its service provision. It also contributes to the formulation and implementation of ambulance care services in the health care system and increases service delivery for the community.

## Methods

### Study Design, Period, and Setting

A community-based cross-sectional study design, supplemented by qualitative approach was conducted from March to April 2021 in Chelia district, Oromia regional state, central Ethiopia. Chelia district is located at 179 km away from Addis Ababa, the capital city of Ethiopia. The district has 18 rural and 2 urban kebeles. A total population of the district is 107,429 of which 23,774 were women of childbearing age and 3728 were women who gave were in the last 12 months prior to the study. The district has one general hospital, 4 health centres, 18 health posts, 1 NGO and 9 private clinics.<sup>9</sup> There were has three ambulances in the district during the study period providing services for the district population.

### Source Population

The source population was all women who gave birth in last 12 months and were residing in Chelia district.

### Inclusion and Exclusion Criteria

Women of reproductive age who gave birth in last 12 months in a public health facility irrespective of the status of birth outcome (live birth or stillbirth) and residence in the area for at least 6 months were included in the study. Women who were severely ill, who could not talk, hear and were mentally ill were excluded from the study.

### Sample Size Determination and Sampling Procedure

The required sample size was determined using a single population proportion formula. The following assumptions were considered while calculating the sample size. Ninety-five percent confidence level (95% CI), 5% margin of error,  $p=24.9\%$  from a study conducted in rural Districts of Tigray Region, Ethiopia.<sup>12</sup> After considering a design effect of 1.5 and 10% non-response rate, the final sample size became 473.

Multi-stage sampling technique was used in this study. Six kebeles (one urban and five rural), which account 30% of the total kebeles, were selected from the district using simple random sampling technique and study subjects were selected from each selected kebele based on proportional size of households who had women who gave birth in last 1 year using simple random sampling technique. The first household was selected using lottery method.

Lists of all women who gave birth within the last 12 months from each selected kebele were obtained from a health management information system registration log-book at Health post. Computer-generated simple random sampling techniques were used to select study participants.

For the qualitative study, since mothers were expected to be homogenous in many ways. For qualitative data, purposive sampling technique was employed to select mothers for focus group discussion (FGD). Four FGDs comprising a total of 41<sup>10-26</sup> individuals were conducted until idea saturation was reached.

## Data Collection Tool

Pretested structured questionnaires were used to collect the quantitative data. The questionnaire included socio-demographic variables and variables of ambulance service utilization-related factors that were prepared based on objective of the study after reviewing different literatures.<sup>6,12,13</sup>

## Data Collection Method

Data were collected by six trained data collectors via face-to-face interviews, and two supervisors supervised the data collection process. To have an in-depth insight on the factors related to ambulance service utilization, qualitative data were collected using four focus group discussions. Three FGDs consisted of mothers while the other one consisted husband. Each session took a time span of one to 1.5 hours. The groups were prepared homogeneously in terms of sex and social classes. The two recruited supervisors conducted the FGD taking the role of facilitator and note taking while the principal investigator had the role to oversee the discussion process.

## Study Variables

### Dependent Variable

Ambulance service utilization status.

### Independent Variable

Socio-demographic variables (age, marital status, educational status of mother and husband, place of residence, religion, occupation of mother, and monthly income), Source of information of availability of ambulance services, Awareness on obstetric emergency, Decision making power to get services, Prior knowledge of the ambulance telephone number and Health system-related factors (Cost of ambulance services, need for training of ambulance professionals, need for more ambulances, Qualification of care givers, Organizational communication, waiting time).

## Operational Definitions

### Ambulance Service Utilization

A women considered utilized ambulance services if she had ambulance service to give childbirth in a health facility in the previous 12 months.

The quality of the data was controlled through training of the data collectors and supervisors. Data collection tools were pretested in communities with similar setting to the study communities. Supervisors also checked questionnaires for completeness and consistency during the data collection process.

## Data Processing and Analysis

The data were cleaned, coded, entered and analysed using statistical package SPSS Windows version 22. Frequency distributions were carried out, and further cleaning and missing values and errors were checked. Bivariate analysis was done to identify the association between each independent variable and the outcome variable, and factors associated with ambulance services utilization with p-value <0.25 were entered into multivariable logistic regression model to control the effect of potential confounders. Finally, adjusted odds ratio with 95% CI and P-value <0.05 were used to determine independent predictors of the ambulance services utilization.

Recorded data of FGDs conducted in Afan Oromo language were first transcribed and translated into English language that was further analysed thematically. The result of the qualitative data was then presented in narration form and used to triangulate the findings with the quantitative findings.

## Data Quality Control

To ensure the quality of the data, questionnaire was structured and data collectors were trained for 1 day on the aim of the study, the tool and concerning the quality of the data. A pretest was done prior to the survey in the district on 24 participants (5%) of similar populations outside the selected kebeles. The supervisors have strictly supervised the data collection process and checked questionnaires for completeness and consistency.

## Ethical Consideration

This study was carried out in accordance with the Helsinki Declaration. Ambo University College of Medicine and Health Sciences' Ethical Review Committee approved the Ethical clearance of oral informed consent. To conduct the study, a support letter was obtained from the West Shoa zone and Chelia district health offices, and oral informed consent was obtained from all study participants after explaining the objective and goal of the study. The study participants' privacy and confidentiality were also properly followed. The privacy and confidentiality of study participants were strictly maintained.

## Result

### Socio-Demographic Characteristics of Participants

Four hundred and sixty-nine women participated in the study yielded a response rate of 99%. Half of respondents (50.1%) were in the age group of 24–30 with mean age of  $28.2 \pm (5.3)$  years. Regarding the religion of respondents, 57.6%, 31.6% and 9% of them were protestant, orthodox and catholic religion followers, respectively. Three hundred and sixty-five (77.8%) were rural dwellers and 95.9% of them were Oromo in ethnicity (Table 1).

### Obstetric Characteristics of the Respondents

The majority of study participants (71%) were multiparous, and 92% of them utilized ANC services at least once for their last pregnancy (Table 2).

### Accessibility of Health Facility

Out of the respondents who utilized health facilities for delivery, 46%, 26%, 21%, 3% and 4% arrived by modern ambulances, traditional ambulance, on foot, private car and others respectively to get delivery services. For nearly two-third (69%) of the respondents, the time it took for the ambulance to come to the respondents was 16–60 minutes per trip with a mean time of  $51.6 \pm 39$  minutes (Figure 1).

### Source of Information

Regarding sources of information on ambulance services, majority 415 (88%) of them heard about ambulance services. Among those who heard about ambulance services, their main sources of information were health workers including HEWs which accounts for 54% (Figure 2).

The majority of the participants in the four FGDs were aware of the existence of the ambulances as was stated by a 38 years old mother who said,

Yes, I have heard about ambulance service utilization. I know that it is a very useful mode of transportation in our village. One of my relative utilized it when she went to the health facility for delivery.

The findings from the focus group discussion indicated that many of them had awareness about ambulance services and its benefits. However, some of them mentioned it took a long time for ambulance to reach them which in turn in delay to reach health facilities as described by discussants as follows.

**Table 1** Socio-Demographic Characteristics of the Study Participants, Chelia District, West Shoa, Oromia, Ethiopia, 2021 (n=469)

Variables	Categories	Frequency	Percent
Age of respondent n=469	17–23 years	96	20.5
	24–30 years	235	50.1
	31–37 years	114	24.3
	>37 years	24	5.1
Religion (n=469)	Orthodox	148	31.6
	Muslim	9	1.9
	Catholic	42	9.0
	Protestant	270	57.5
Residence n=469	Urban	104	22.2
	Rural	365	77.8
Ethnicity n=469	Oromo	450	95.9
	Gurage	6	1.3
	Amhara	13	2.8
Educational status (n=469)	No formal education	202	43.1
	Primary	152	32.4
	Secondary	60	12.8
	Diploma and above	55	11.7
Marital status (n=469)	Married	448	95.5
	Widowed	4	0.9
	Divorced	9	1.9
	Single	8	1.7
Educational status of husband (n=448)	Had no formal education	166	37.1
	Completed primary school	128	28.6
	Completed secondary school	80	17.8
	Diploma and above	74	16.5
Occupation of husband (n=448)	Government or NGO employed	69	15.4
	Own business or Merchant	52	11.6
	Daily labor	33	7.4
	Private employee	25	5.6
	Farmer	258	57.6
	Others*	11	2.5

(Continued)

**Table 1** (Continued).

Variables	Categories	Frequency	Percent
Occupation of respondent n=469	Government or NGO employed	51	10.9
	Own business or Merchant	39	8.3
	Housewife	128	27.3
	Daily labor	24	5.1
	Private employee	15	3.2
	Farmer	212	45.2
Monthly income (ETB)	<600	92	19.6
	600–1500	134	28.6
	≥1500	243	51.8
Family size	<5	218	46.5
	≥5	251	53.5

**Abbreviation:** NGO, Non-government organization. \*Carpenter, student, had no work.

A 35-year-old woman who had 6 children and cannot read and write said that

Most of the time I got information regarding ambulance from health extension workers, kebele leaders, community volunteers and women affairs.

Another discussant, 27 years old women who had 2 children and completed primary education stated the following idea:

Now days health information is commonly disseminated through public media. So, I got the information through television and radio programs. Additionally, Health Extension workers have given us health information regarding how to use ambulance services and gave us ambulance phone number.

## Ambulance Service Utilization

Among the study participants, only 214 (46%) utilized ambulance services to reach the health facility for their last delivery. More than half of the respondents, 117 (54%) who utilized ambulance had got obstetric emergency service in the ambulance (Figure 3).

## Reasons for Not Utilizing Ambulance Services

Among the study participants who gave birth at public health institutions and did not utilize the ambulance raised different reasons for their non-utilization of ambulances: Some of the respondents (justified not knowing ambulance phone number (32 [6.8%]) and lack of ambulance service to go back home (28 [6%]) (Table 3).

Similarly, a significant number of FGD discussants indicated that they have not utilized ambulance. The common reasons they reported were road inaccessibility, lack of awareness, shortage of ambulance, fuel inadequacy, non-functionality of call taker phone, short labor and precipitated labor for which they justified as no need of ambulance services utilization. Others mentioned financial and accessibility-related constraints for not using the ambulance services.

One of FGD participant who was 33-year-old women said,

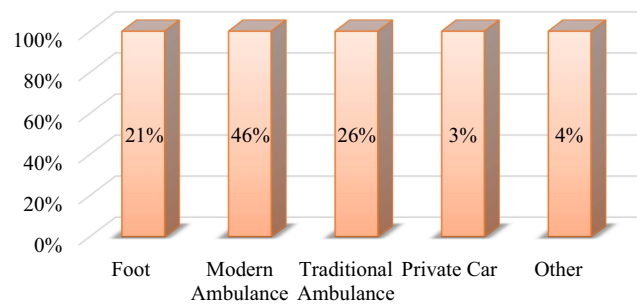
For persons like me who live away from the road and in the hills far up, it does not help me very much because there is no road for the ambulance. We carry our laboring mother on the back until we reach the roadside from where the ambulance can take the mother.

**Table 2** Obstetric Characteristics of the Study Participants, in Chelia District, West Shoa, Oromia Ethiopia January 2021 (n=469)

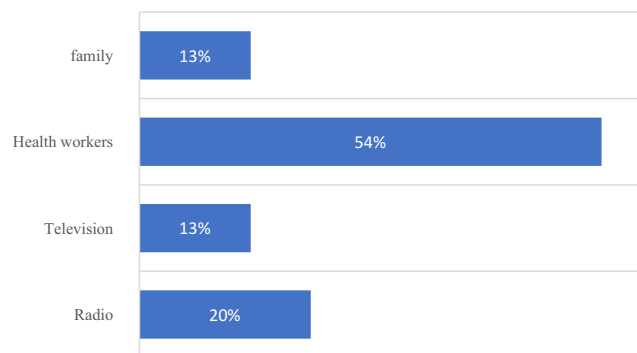
Characteristics	Category	Frequency	Percent
Primigravida	No	334	71.2
	Yes	135	28.8
Utilized antenatal care	No	38	8.1
	Yes	431	91.9
Health facility visited for antenatal care	Hospital	62	14.4
	Health centre	305	70.8
	Health post	55	12.8
	Private health institution	9	2.1
Antenatal care service provider	Doctor	8	1.9
	Clinical officer	4	0.9
	Nurse	97	22.5
	Midwife	268	62.2
	Health extension worker	54	12.5
Frequency of antenatal care received	1	18	4.2
	2	81	18.8
	3	113	26.2
	4	219	50.8
Got obstetric emergency services in the ambulance	No	97	45.3
	Yes	117	54.7
Gravidity	1	135	28.8
	2–5	253	53.9
	>5	81	17.3
Parity	1	145	30.9
	2–5	258	55.0
	>5	66	14.1

Another male discussant raised that

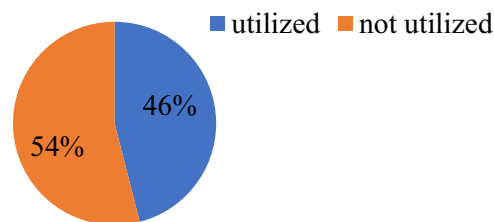
I know the ambulance is a good thing but there are some problems we face. You see Chelia district is a very big district and the available ambulance is not enough. Another thing is that sometimes the laboring mother needs the ambulance but they can't get



**Figure 1** Mothers' mode of arrival to health facility among those who gave birth in the last 1 year in Chelia district, West Shoa, Oromia, Western Ethiopia January 2021 (n=469).



**Figure 2** Sources of information on ambulance services for the respondents in Chelia district, West Shoa, Oromia, Ethiopia (n=469).



**Figure 3** Magnitude of ambulance service utilization among mothers who gave birth in the last 1 year in Chelia district, West Shoa, Oromia, Ethiopia January 2021 (n=469).

the services for different reasons that include shortage of fuel, maintenance problem, unavailability of drivers' due social problems.

Another FGD participant added that

I had a plan to give birth in the health institution by using ambulance, but my labor was very short and I delivered at home as soon as labor started within half hour. (A 37-year-old mother of 5 children)

A 27-year-old mother of two children stated that

There are women who do not know a current condition of health facilities; they look as every service need fees and afraid to go to health facilities. Mothers who lack information and awareness on health facilities and existing services miss ambulance service utilization.

### Factors Associated with Ambulance Service Utilization

According to multivariable logistic regression analysis result, women who live in rural had 2.27-fold higher odds of utilizing ambulance services compared to those who live in urban (AOR=2.27, 95 CI [1.11, 4.65]). Mothers without

**Table 3** Reasons for Not Utilizing Ambulance Service, in Chelia District, West Shoa, Oromia, Ethiopia January, 2021 (n=255)

Reasons for Not Utilizing the Ambulance Services	Frequency	Percent
Ambulance was busy	16	3.4
Ambulance delayed	25	5.3
Ambulance driver declined	26	5.5
Ambulance phone was not functional	8	1.7
Ambulance was not functional	8	1.7
Asked payment for the service	2	0.4
<b>Lack of ambulance service to go back home</b>	<b>28</b>	<b>6.0</b>
Fuel problem	4	0.9
Husband declined	11	2.3
I utilized personal car	10	2.1
Labor was urgent	6	1.3
Near to health facility	24	5.1
Network problem not to call ambulance	23	4.9
Unable to get ambulance phone number	32	6.8
Lack of information	5	1.1
Some women used horse transportation	18	3.8

formal education were 97% times less likely to use ambulance services than those mothers with diploma and above educational status (AOR=0.03, 95% CI [0.01, 0.07]). Mothers whose husband completed primary school and above had 7 folds higher odds of using ambulance services compared those whose husband that had no formal education [AOR=7.03, 95 CI (1.83, 27.16)]. Multigravida mothers had 4.8 folds higher odds of using ambulance services as compared to Primigravida mothers [AOR=4.8, 95 CI (2.48, 9.34)]. Mothers who did not attend any ANC during their last pregnancy were 93% times less likely to use ambulance services than those who attended ANC service [AOR= 0.07, 95% CI (0.04, 0.16)]. Mothers who did not know the ambulance phone number were 64% times less likely to use ambulance services when compared to those who knew ambulance phone number [AOR=0.36, 95 CI (0.19, 0.68)]. Mothers who did not call to ambulance call taker in their last pregnancy were 98% times less likely to use ambulance services compared to mothers who call to ambulance call taker [AOR=0.02, 95 CI (0.01, 0.06)]. Mothers whose ambulance services utilization decision is determined by their husbands were 30% time less likely to use the ambulance services as compared to mothers who decide jointly with their husbands [AOR=0.70; 95 CI (0.35, 1.42)]. Mothers who did not talk about ambulance services with health extension workers (HEWs) were 86% times less likely to use ambulance service than those who discussed with HEWs [AOR=0.14; 95 CI (0.084, 0.241)] [Table 4].

The results of FGD revealed that ambulances to transport labor women to health facilities were highly recognized and appreciated by most members of the community. Participants in all FDGs generally appreciate the government for providing the ambulances for the community and indicated as follows:

For me I can talk only good things ... in September my wife started to feel pain for giving birth at 6 am. I called the driver and he came to help us. My wife came to hospital and delivered a very beautiful baby boy. If it was not like that,

**Table 4** Factors Associated with Ambulance Service Utilization Among Mothers Who Gave Birth in the Last One Year in Chelia District, 2021 (n=469)

Variables	Category	Ambulance Service		COR (95% CI)	AOR (95% CI)
		Utilized	Not Utilized		
Residence	Urban	41	63	1	1
	Rural	173	192	1.38 (0.88,2.16)	2.27 (1.11,4.65)
Educational level of respondents	No formal education	40	129	0.09 (0.05,0.15)	0.03 (0.01,0.07)
	Primary	53	69	0.22 (0.12,0.37)	0.07 (0.03,0.19)
	Secondary	21	29	0.20 (0.10,0.41)	0.10 (0.04,0.30)
	Diploma and above	100	28	1	1
Husband educational level	No formal education	61	105	0.61 (0.35,1.06)	0.75 (0.19,2.543)
	Primary	75	53	1.49 (0.84,2.65)	7.03 (1.82,27.16)
	Secondary	41	39	1.11 (0.59,2.10)	5.23 (1.48,18.53)
	Diploma and above	36	38	1	1
Occupation of husband	NGO employee	37	32	1	1
	Own business	25	27	0.8 (0.39,1.64)	0.65 (0.18,2.43)
	Daily labor	12	21	0.49 (0.21,1.16)	0.76 (0.18,3.19)
	Private employed	6	19	0.27 (0.098,0.77)	0.10 (0.02,0.40)
	Farmer	127	131	0.84 (0.49,1.4)	0.99 (0.29,3.40)
	Others <sup>a</sup>	6	5	1.03 (2.9,3.7)	0.99 (0.18,5.50)
Occupation of respondent	NGO employed	26	25	1	1
	Own business	22	17	1.24 (0.53,2.9)	4.92 (0.99,24.53)
	Housewife	50	78	0.61 (0.32,1.18)	1.34 (0.41,4.40)
	Daily labor	8	16	0.48 (0.17,1.3)	3.14 (0.50,19.54)
	Private employed	7	8	0.84 (0.26,2.66)	0.91 (0.15,5.52)
	Farmer	101	111	0.87 (0.47,1.6)	1.84 (0.51,6.69)
Primigravida	No	148	124	2.27 (1.52,3.38)	4.8 (2.48, 9.34)
	Yes	66	131	1	1
Received antenatal care	No	11	126	0.055 (0.03,0.11)	0.07 (0.04,0.16)
	Yes	203	129	1	1
Did you know the availability of ambulance service utilization (ASU)?	No	12	34	0.38 (0.19,0.760)	2.86 (0.71,11.48)
	Yes	202	221	1	1
Know the ambulance phone number	No	131	224	0.22 (0.14,0.35)	0.36 (0.19,0.68)
	Yes	83	31	1	1
Call to ambulance call taker	No	7	146	0.025 (0.01,0.05)	0.02 (0.01,0.06)
	Yes	207	109	1	1

(Continued)

**Table 4** (Continued).

Variables	Category	Ambulance Service		COR (95% CI)	AOR (95% CI)
		Utilized	Not Utilized		
ASU is advantageous to laboring mother?	No	3	14	0.24 (0.069,0.86)	0.20 (0.04,1.11)
	Yes	211	241	1	1
Decision maker to get ambulance services	Self	9	17	0.5 (0.21,1.18)	0.20 (0.07,0.63)
	Husband	56	47	1.12 (0.69,1.8)	0.70 (0.35,1.42)
	Neighbours	15	27	0.52 (0.26,1.05)	0.45 (0.16,1.29)
	Family	40	58	0.65 (0.39,1.07)	0.45 (0.22,0.92)
	Relatives	4	21	0.18 (0.059,0.5)	0.17 (0.04,0.77)
	Wife and husband	90	85	1	1
Ambulances driver gender preference	Male	143	141	1	1
	Female	71	114	0.61 (0.42,0.89)	0.63 (0.36,1.10)
Discussion with the health extension workers	No	36	158	0.12 (0.08,0.19)	0.14 (0.084,0.24)
	Yes	178	97	1	1
Health facility's distance	<10 km	177	198	1.3 (0.87,2.1)	1.75 (0.92,3.34)
	≥10 km	37	57	1	1
Parity	1	79	66	1.62 (0.9,2.9)	1.62 (0.73,3.61)
	2-5	107	151	0.96 (0.56,1.7)	0.80 (0.39,1.65)
	>5	28	38	1	1

**Abbreviations:** NGO, non-government organization; COR, crude odds ratio; AOR, adjusted odds ratio; ASU, ambulance service utilization. <sup>a</sup>Carpenter, student, had no work.

I would have used a lot of money to reach the health facility or my wife would have delivered at home. Who would have helped her?

The main facilitators generally rotated around drivers being good to the pregnant women, the ambulance service being provided free of charge, and availability of the ambulance as can be seen from the quotations below:

You see our driver is a very good man, he comes when you need him. He operates in many health centers. Can you imagine it means to call an ambulance that will take you to the health facility free of charge ... ?

The driver is good and he does not ask any charge. The driver talks politely even when he is very tired.

Another male discussant said,

On the issue of barriers to use ambulance service, participants' views generally reflected financial, driver not tolerated, ambulance were utilized for another purposes, accessibility-related constraints.

The quotations below show what participants reported in as far as these barriers are concerned:

For a person like me who lives away from the road and in the hills far up, it does not help me very much because there is no road for it to reach where we are. We carry our patients on the backs until we reach the road where the ambulance can take the patient.

A 25-year-old discussant said:

Education of the mothers and husband affects ambulance service utilization. Why because educated family discusses their health condition with each other on time which may increase ANC utilization, mother's confidence, decrease fears and minimize risk and complication during labor and delivery.

## Discussion

This study assessed magnitude and factors associated with ambulance service utilization among women who gave birth at public health institutions in central Ethiopia. The study showed that the magnitude of mothers who gave birth in the past 12 months who utilized ambulance service was 46%. This is similar to the findings of studies conducted in eastern Uganda (48.3%), eastern Ghana (43.3%) and England Ambulance Service Trust in Norfolk (40%).<sup>15–17</sup>

On the other hand, it is higher than the findings from studies conducted in Gura Dhamole District, Bale zone, southeast Ethiopia (11.9%), Gamo Zone, Southern Ethiopia (15.1%), northern part of Ethiopia (24.9%), Addis Ababa (8.8%) and rural Nepal (37%),<sup>12,18–20</sup> but it is lower than findings of study conducted in Digelu and Tijo district of the Arsi Zone 68.8%.<sup>21</sup> The difference could be due to differences in the study period and area in which health facility coverage and the existence of free ambulance services could vary. Differences in ambulance accessibility and readiness, number of ambulances ready for the service, and level of awareness may create a chance for pregnant mothers to reach health institutions without transport expense.

Rural residence was significantly associated with ambulance services utilization in this study. This finding is different from EDHS 2016 where only 17.4% utilized the service,<sup>22</sup> obstetric referral in rural Sierra Leone, 26.35%<sup>8</sup> and rural Burkina Faso, West-Africa.<sup>23</sup> This difference may be due the contribution of health extension workers for each household. This is due to the fact that rural community has no other modern transportation accessibility unless they use ambulances.

The study also reveals that mothers who lack formal education were independent predictor of ambulance services utilization. This finding is consistent with studies conducted in India, Brazil and South Africa.<sup>24,25</sup> This can be explained as education makes individuals more informed about their health through discussion with educated peers, reading different websites, literatures, books and brochures which can improve their chance of ambulance service utilization. Education is likely to harmonize female autonomy so that educated mothers can develop greater confidence and capabilities to make decisions regarding their own health. But it would continue to challenge the health care systems of countries like Ethiopia, where nearly half of the women (49%) had no formal education.<sup>22</sup>

Women whose husbands completed primary school and above were positively associated with ambulance services utilization in the current study. This study is consistent with the other study conducted at Ethiopia<sup>26</sup> and the study conducted at Enderta District, Tigray, Northern Ethiopia.<sup>27</sup> This is due to the fact that educated husbands facilitate resource, encourage women to deliver at facilities, and encourage the use of ambulance to reach the health facilities.

Multigravida was positively associated with ambulance services utilization. This can be explained as mothers who had small parity were not experienced more to what things are importantly needed and those with experience could be skilled enough with ambulance service utilization from the more child birth they faced throughout their life.

Similarly, respondents who did not attend any ANC during their last pregnancy were 93% times less likely to use ambulance services than those who attended ANC. This study is consistent with the findings of studies conducted in Rural eastern Uganda, 81%,<sup>15</sup> Enderta District of Tigray, Northern Ethiopia, 70%.<sup>27</sup> This could be due to the fact that, during ANC utilization health professionals may provide counselling, advice regarding birth preparedness and give health information that may facilitate ambulance service utilization.

In this study, participants who did not know the ambulance phone number were 64% times less likely to use ambulance services when compared to those who knew ambulance phone number. This finding is similar to studies conducted in Addis Ababa, west Africa, South Asia and sub-Saharan Africa.<sup>10,20,28</sup> The explanations for this could be explained by the fact that not having a phone number of the ambulance could cause challenges to get ambulance service provider.

Having the phone number of the ambulance can be considered as one of the birth preparedness and complication readiness strategies of the mothers for the utilization of the ambulance services. This might be due to weak announcement of ambulance phone numbers in different media and no toll-free line in the region and district.

Mothers who did not call ambulance call taker in their last labor were 98% times less likely to use ambulance services compared to mothers who call ambulance call taker. This study is consistent with studies conducted at Mekelle town and western Africa NAS.<sup>10,14</sup> The possible explanation for this could be ambulance service providers can be contacted and asked for it in order to get the service.

Mothers who decided to utilize ambulance services by only herself alone were 80% times less likely to use the ambulance services when compared to the mothers who decided jointly with husbands. This could be due to the fact that, male involvement in the decision of birth preparedness plan can assist the execution of the planned issues since the husband own household budget in most cases. This finding is consistent with study conducted in Rural eastern Uganda 74.1%.<sup>17</sup> However, this finding is different from study conducted in Mekelle town, 46.2%.<sup>14</sup> This may be due to difference in socio-demographic characteristics, study design, and study period.

Mothers who did not talk about ambulance services with HEW were 86% times less likely to use ambulance services than those who discussed. This finding is in line with studies conducted at Adwa District, Tigray Region, north south-central Ethiopia.<sup>29,30</sup> This could be due the reality that, HEWs are responsible for ambulance information dissemination, calling for ambulances to transport women either before their EDD or during the onset of labour at home as they are very familiar with women where they can discuss with the HEWs about their problems in a good way and confidential manner.

## Strength of the Study

The study was a quantitative study supplemented by qualitative method.

## Limitation of the Study

Since the study is cross-sectional, it is not possible to demonstrate direct cause and effect relationship between the dependent and independent variables. Recall and interviewer bias were the potential limitations of this study. However, several scientific procedures have been employed to minimize these possible effects. To reduce recall bias, for instance, only women who gave birth in the last 1 year were interviewed. The study was also supplemented by qualitative data. In addition, procedures such as pretesting of data collection tool, appropriate training of data collectors and supervision during data collection as well as software-based data entry were undertaken.

## Conclusion

The magnitude of ambulance service utilization in the study area was low which needs intensive intervention. Educational status of the mothers, educational status of husband, residence, spouse decision-making skill, level of gravidity, knowledge of ambulance phone number, making call to ambulance call taker, ANC attendance, and discussion with HEW were factors associated with ambulance service utilization among the study participants.

Health workers should teach the community to improve awareness on the ambulance transportation and early transportation to a hospital so as to decrease morbidity and mortality during labour and delivery. Health Extension workers in collaboration with catchment area supervisors from health centres should provide ambulance-related information, conduct pregnant women conferences with all pregnant women since participation enhances ambulance service utilization.

## Abbreviations

ASU, ambulance service utilization; ANC, ante natal care; CI, confidence interval; FGD, focus group discussion; HEW, health extension worker; SPSS, Statistical Package for Social Science; WHO, World Health Organization.

## Data Sharing Statement

The tools used for data collection, data and materials used in the study for this manuscript are available at the hand of the author and can be accessed on reasonable request.

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## Author Contributions

All authors made substantial contributions to the conception, design, acquisition of data or analysis, and interpretation of the data. They have participated in drafting the article or critically reviewing it for important intellectual content; decided to submit it to the current journal. They gave final approval of the version to be published; and decided to be accountable for all aspects of the work.

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The authors report no conflicts of interest in this work.

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