
Factors associated with maternal health care services in Enderta District, Tigray, Northern Ethiopia: A cross sectional study

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Abstract: *Introduction:* Ethiopia is among the top six high burden countries in which half of global maternal deaths occur. To improve maternal health care service in Ethiopia, it is important to understand factors influencing maternal health care service utilization. This is study aimed at assessing the magnitude and factors associated with maternal health care service utilization. *Objective:* To determine the magnitude and factors associated with maternal health care service utilization in Enderta district, Tigray, Ethiopia. *Method:* Community based cross sectional study which contains both quantitative and qualitative methods of data collection was conducted among 574 married women in Enderta district from March 1-14, 2013. A multistage sampling technique was used to approach the study participants. Descriptive and multiple logistic regression analyses were performed using SPSS 20 for windows to estimate indicators and effect sizes of the predictors on maternal health care service. *Result:* The proportion of antenatal, delivery and postnatal care service utilization was 70%, 37.9% and 49.7%, respectively. Income status, knowledge on danger sign during pregnancy, husbands education and place of delivery were the determinant factors for ANC. Income status, family size, the women's time taken to health facility, husband attend ANC with spouse and who decides place of delivery were the determinant factors for delivery service utilization. And postnatal care was associated with place of delivery, knowledge on complicated related pregnancy, from where got information and knowledge on postnatal care. *Conclusion:* The proportion of ANC and Delivery service, and postnatal care in the study area was fair. Women's own monthly income, husbands' educational status, place of delivery and their knowledge on danger sign that could occur during pregnancy could influence ANC utilization. Women husband educational status might have on women decision to deliver at health institution. And accompany of women to ANC by their husband and their awareness on postnatal care services could influence postnatal care utilization.

Keywords: ANC, Delivery Care, Postnatal Care, Tigray, Ethiopia

1. Introduction

Globally over half a million women die as a result of childbirth or complication due to pregnancy. Almost all or 99% of these deaths occur in developing countries. Asia and Africa alone take 95% of the share of the world's maternal death. [1].

As reported in literatures maternal health care utilization is affected by multiple factors such as low male involvement, educational status, socio-economic status, and knowledge of mothers about the benefits of maternity services [2, 3, 4].

The major causes of maternal mortality are hemorrhage (24%), infection (15%), unsafe abortion (13%), prolonged labour (12%) and eclampsia (12%) whereas primary causes of maternal mortality in Africa are hemorrhage(34%), other direct causes (17%), infection (10%), hypertensive disorders (9%) and obstructed labour (4%), abortion (4%) and anaemia (4%) [1, 5].

Ethiopia is among the top six high burden countries (India, Nigeria, Pakistan, Afghanistan and the Democratic Republic of Congo) in which half of global maternal deaths occur, with an estimated maternal mortality ratio of 470 per 100, 000 live births [6, 7].

Skilled attendants during labour, delivery and in the early postpartum period can prevent up to 75% or more of maternal deaths [8, 9]. However, according to the most recent Ethiopian Demographic and Health Survey (EDHS, 2011), very few mothers (34%) make at least one antenatal visit and even less receive delivery care from skilled professionals. Twenty-eight percent of births were assisted by a traditional birth attendant (TBA) and 57 percent of births were assisted by a relative, or some other person [7].

According to the Ethiopian Demographic health survey, 2011, women who received antenatal care, institutional birth attendance and postnatal care in Tigray region were 50.1%, 11.6% and 2.8% respectively and those women who went for maternal health care services to health institutions were vary by age, socio-economic backgrounds, cultural-belief, partner support or educational levels [7].

So that, in order to improve maternal health care service in this community, it is important to understand these factors influencing maternal health care service like attitudes, education level, occupational status, monthly income and cultural norms [10]. Therefore this study is aimed at assessing these factors affecting male involvement either positively or negatively in maternal health care services in Enderta district.

2. Methods

2.1. Study Setting and Participants

A cross sectional study design which contains both quantitative and qualitative methods of data collection was employed. In the study, we included married women (15- 49 years old), at least have one birth and who were lived for at least six months in the study area.

A total of 574 individuals were determined using single population to proportion by considering 95% confidence interval, 5% marginal error, prevalence (65.4%) [5], design effect of 1.5 and 10% of non- response rate. For the qualitative part of the study four focus group discussions (FGD) of married men and women which contain 8 members in each group was selected based on purposive sampling based on residence and sex.

A multi-stage sampling technique was used to select the study participant. The town is divided into 68 districts comprises of 4697 households. Out of this 16 districts (consists 966 households) were selected using simple random sampling then proportion to size to districts was employed to share the sample size. Then picking a house on random for the initial house-hold from each sub-districts, the final households with married women were selected on systematic random sampling. For selecting the study participants' different sampling intervals were used for each sub-district. Finally, eligible married women (15-49 years) were interviewed from each selected households. When two or more married women were encountered in one household, only one woman used to be considered in the study on random to avoid intra-class correlation.

Focus group guide line was used to explore ideas of male partners and married women on utilizing maternal health care and for triangulation with the quantitative study. Two persons were assigned for note taking and tape recording while the principal investigator facilitated the discussion. Two FGD were conducted separately each for males and females, consisting of 8 participants each. Each FGD took an average time of 1 to 1 and a half hours. Some of the issues raised on FGDs were: the attitudes towards antenatal care (ANC) service utilization, reasons for not delivered at health facility (HF), when the women prefer to start postnatal care and its reasons. Finally, the recorded discussions and notes were transcribed into English manually.

2.2. Measurements

The quantitative data were collected using structured administered questionnaire while qualitative data was collected using focus group discussion guide line from March 1-14, 2013. For quantitative data the questionnaire was constitute information on socio demographic and economic variables, knowledge on maternal health services, cultural factors. The questionnaires were adapted by reviewing different literatures and considering the local situation of the study subject [11, 12, 13, 14]. Questionnaires were prepared first in English then translated to local language (Tigrigna) for data collection by language expert. The investigators were trained the data collectors and supervisors for two consecutive days on study guides, role plays (demonstration), informed consent, how to approach participants, ethical procedure and general information in maternal health care service and the objective of the study. Eight health extension workers (HEW) data collectors were used to collect the data and two diploma nurse supervisors were assigned to check for the daily activity, consistency and completeness of the questionnaire and to give appropriate support during the data collection process.

Before the actual data collection, the questionnaire was pre-tested on 29 participants (5%) in the nearby Hintalo wajirat district which have similar characteristics with the study participants to ensure clarity, wordings, logical sequence and skip patterns of the questions and the pre-tested sample was not included in the study and modification was done accordingly to the final data collection. Based on the pretest, the time needed for the complete interview and the number of data collectors in need was estimate.

Furthermore, a FGD guide was developed to ensure subject areas were covered systematically and note taking of the FGDs participants' expressions.

2.3. Data Analysis

The collected data were cleaned, edited and analyzed using STATA Version 11. Descriptive analyses were run to estimate the level of ANC, delivery service and postnatal care (PNC) utilization and descriptions of women characteristics. The predictors of ANC, delivery service and PNC utilization were assessed using multiple logistic

regression analysis. The effect size of predictors was estimated using adjusted Odds Ratio (OR) for the sample and 95% confidence interval (CI) of OR for the population effect sizes. A p-value of less than 0.05 was considered as statistically significant for all tests.

2.4. Ethical Consideration

The study was approved by Mekelle University College of health sciences ethical review board; an official permission letter was obtained from the district health office to conduct the study before conducting the study. Informed verbal consent was obtained from study participants after explaining the purpose of the study, potential risks and benefits of partaking in the study, and the right to withdraw from the study at any time.

3. Results

3.1. Socio-Demographic Characteristics

From the total of 574 married women (15-49 years), 543 were included in the analysis with a 94.6% response rate. Majority 413 (76.1%) of the respondents were residing in rural. The mean (\pm SD) age of the mothers were 31.1(\pm 7.4) years and large group 270 (49.7%) of the respondents were lie in the ages ranges of 25-34 years.

Regarding their education status and occupation of the women, 292 (53.8%) and 319 (58.8%) were illiterate and house wife's, respectively. Information about the distance between the health center and household was collected. Eight in ten of the women walk for 2 hours and above to reach the nearest health facility. [Table 1]

Moreover, the result of FGD also supports this finding. A focus group participant said "...The main barriers for maternity health service utilization are long distance, shortage of skilled birth attendants and lack of transport. And financial problem is one of the major factors which hinder women from going to health facilities and our husbands do not give us money even for transport and it has its own impact on service utilization of maternal health care....." [a 32 years old woman from Semi urban].

Information about the women husband characteristics indicates that four in ten and eight in ten of the husbands were illiterate and farmers in occupation, respectively. [Table 1]

Similarly, two third of the husbands choose home as place of delivery to their wives. This finding was also supported by the FGD result "... I was delivered at home and even I didn't attend ANC, this was due to lack of awareness and influence from my husband at that time (before three years). Similarly, even these days there are other men who didn't support ANC check up, delivery care and postnatal care or family planning...." [a 28 years old woman from semi urban].

Economically, 118 (21.7%) of the households had monthly income less than 25 USD. Out of the total participants 315 (58 %) and 74(7.9%) had radio and television respectively. Forty six percent of the household had a family size of less

than 5. [Table 1]

Table 1. Background characteristics and maternal health service utilization of women, in Enderta district, Tigray, Ethiopia (N=574), 2013.

Variables	Number(N)	Percent (%)
Age groups:		
15-24	97	17.9
25-34	270	49.7
35-44	139	25.6
\geq 45	37	6.8
Women's educational status:		
Illiterate	292	53.8
Read and write	84	15.5
Primary	112	20.6
secondary and above	55	10.1
Women's occupation :		
House wife	319	58.8
Farmer	184	33.9
Others	40	7.4
Do women's have monthly income?		
Yes	128	23.6
No	415	76.4
Place of residence:		
Semi-urban	130	23.9
Rural	413	76.1
Religion :		
Muslim	30	5.5
Orthodox	513	94.5
Have radio		
Yes	315	58
No	228	42
Have TV		
Yes	500	92.1
No	43	7.9
Husbands' education status :		
Illiterate	226	41.6
Read and write	200	36.8
Primary education	86	15.8
2ndary education and above	31	5.7
Husbands' occupation status:		
Farmer	438	80.7
Others	105	19.3
Average monthly Household income (USD):		
<25	118	21.7
25-50	167	30.8
51-100	134	24.8
>100	124	22.8
Marriage relationship:		
Monogamous	526	96.9
Polygamous	17	3.1
Estimated time taken to HF :		
<2hrs	445	82
\geq 2hrs	98	18
Total family members:		
<5	244	26.5
5 -7	253	46.6
>7	146	28.9
Husbands choice of delivery place:		
At health Institutional	181	33.3
At home	362	66.7

3.2. Obstetric Characteristics

The mean age at first birth was 18.6(SD \pm 1.8) years. Nearly two-third (62.6%) of the participants had history of pregnancy two to five times. Each women had average children of 2.4(SD \pm 1.2) and 46.1% of them had three or

more children. This study showed that below 50% of the husbands attend ANC with their spouses. Similarly, 270(49.7%) of the mothers were attended postnatal services in the study area. [Table 2]

Table 2. *Obstetrics and other characteristics of women in maternal health, in Enderta district, Tigray, Ethiopia (N=574).*

Variables	Number(N)	Percent (%)
Age of women at first birth:		
<20yrs	392	72.2
≥20yrs	151	27.8
Total number of pregnancy in life:		
1	39	7.2
2-5	340	62.6
>5	164	30.2
Ever had abortion:		
Yes	73	13.4
No	470	86.6
Husbands attended ANC with their spouses:		
Yes	255	47
No	288	53
Women who attended PNC:		
Yes	270	49.7
No	273	50.3
Child death in the last 12 months:		
Yes	26	4.8
No	517	95.2
Average time spent at HF:		
<2hrs	335	61.7
≥2hrs	208	38.3
Women who attended ANC :		
Yes	381	70.2
No	162	29.8

3.3. Maternal Health Care Service Utilization

The study has revealed that the level of ANC service utilization was 70.2%. This was supported by the FGD. One participants of the FGD report that “... *In the past three years everybody understood maternal health services, for example I was attended ANC with my wife when she was pregnant for the recent child and she was also started taking contraceptive within two months after she had delivered.....*” [35 year old man from Semi urban].

Moreover, 337(62.1%) of the mothers were delivered their last birth at home. This finding was supported by FGD. One participants of the FGD report that “..... *It is relatives and neighbors (including traditional birth attendants) who are the main decision makers in this community. And this is one of the reasons why laboring mothers stay at home during delivery but labour is unpredictable and usually arises suddenly without warning and most of them delivered at home....*” [40 years old women, Semi urban].

Out of the total mothers who delivered at home, 216(64.1%) were assisted by their mothers or family members and 121(35.9%) were assisted by TBA and neighbors. In this study, small number 107(19.7%) of the mothers decides on place of delivery by themselves and a very small number 98 (18.1%) of the partners gave care to

children during delivery. [Table 3]

Table 3. *Women who got support from their partners during ANC, delivery and postnatal care, in Enderta district, Tigray, Ethiopia (N=574), 2013.*

Variables	Number(N)	Percent (%)
Women who got support from their partners during delivery:		
Yes	464	67
No	179	33
Women provided financial support from their partners:		
Yes	298	54.9
No	245	45.1
Who decides on place of delivery?		
Just me	107	19.7
My husband	200	36.8
Both	236	43.5
Partners gave moral support to their wives during delivery:		
Yes	115	21.2
No	428	78.8
Home delivery assisted by:		
Mothers	216	64.5
TTBA	79	23.4
Neighbor	42	12.5
Women who had Immunized their children:		
Yes	441	81.2
No	102	18.8
Partners gave care to children during delivery:		
Yes	98	18.1
No	445	81.9
Place of delivery:		
Health institution	206	37.9
Home	337	62.1
Women who got information from:		
Others	51	15.4
HEW	148	44.7
Midwife/Nurse	132	39.9

3.4. Knowledge of Women on Complication Related Pregnancy and Maternal Health Services

Two third (66.3%) of the women had knowledge about danger sign that could occurs during pregnancy/labor. More than half (57.1%) of the respondents had severe anemia. Small number of women had headache (36.7%), hypertension (21.6%) and faced obstructed labor in the past (31.5%). Large number of women had knowledge about complication related pregnancy (76.9%) and PNC services (87.5%). [Table 4]

Table 4. *knowledge of women on danger sign, complication related pregnancy/labor and other maternal health services, in Enderta district, Tigray, Ethiopia (N=574), 2013.*

Variables	Number(N)	Percent (%)
Knowledge of danger sign that could occurs during pregnancy/labor:		
Yes	360	66.3
No	183	33.7
Those women who have severe anemia:		
Yes	310	57.1
No	233	42.9
Those women who have headache:		
Yes	199	36.7
No	344	63.3
Those women who have hypertension:		
Yes	177	21.6
No	426	78.4
Knowledge on complication related pregnancy/labor:		

Variables	Number(N)	Percent (%)
Yes	418	76.9
No	125	23.1
Those women who have hemorrhage during pregnancy/labor		
Yes	260	47.9
No	283	52.1
Women who faced obstructed labor in the past:		
Yes	171	31.5
No	372	68.5
Those women who have knowledge on persistent vomiting:		
Yes	234	43.1
No	309	56.9
Women's knowledge on PNC services:		
Yes	475	87.5
No	68	12.5

3.5. Factors Associated with Maternal Health Care Service Utilization in Enderta Woreda, Tigray, Ethiopia

3.5.1. Factors Associated with Antenatal Care Service Utilization

Table 3. Factors associated with ANC service utilization of women, in Enderta district Tigray, Ethiopia (N=574), 2013.

Variables	Antenatal care	
	COR 95% CI	AOR 95% CI
Do women have monthly income?		
Yes	2.16(1.33,3.52)	2.35(1.38,4.0)*
No	1	1
Women's education status:		
Illiterate	1	1
Read & write	1.18(0.69,2.03)	0.90(0.51,1.59)
Primary	0.72(0.45,1.13)	0.46(0.27,0.75)*
Secondary or above	3.64(1.50,8.80)	2.54(1.01,6.37)*
Women who had knowledge on danger sign that could occur during pregnancy/labor:		
Yes	2.35(1.61,3.44)	2.34(1.55,3.53)*
No	1	1
Women who had knowledge on persistent vomiting during pregnancy:		
Yes	1.72(1.76,2.53)	1.01(0.61,1.68)
No	1	1
Women who had severe anemia during pregnancy:		
Yes	1.68(1.16,2.43)	0.58(0.27,1.26)
No	1	1
Women who had headache during pregnancy:		
Yes	1.50(1.01,2.22)	0.74(0.44,1.22)
No	1	1
Women who had knowledge on complicated related:		
Yes	1.82(1.99,2.77)	1.00(0.59,1.68)
No	1	1
Women who had knowledge on hemorrhage:		
Yes	1.88(1.29,2.74)	1.46(0.98,2.19)
No	1	1
Women who were faced obstructed labor before:		
Yes	1.60(1.06,2.42)	1.33(0.86,2.07)
No	1	1
Who decide place of delivery:		
Both	1	1
Women	0.35(0.21,0.57)	0.35(0.21,0.60)*
Husbands	0.52(0.34,0.80)	0.55(0.34,0.87)*

Women who had monthly their own income were about 2.4 times more likely to utilize ANC service than those women who did not had their own monthly income [AOR=2.35, 95% CI (1.38, 4.00)]. [Table 5]

Women who had completed secondary school and above [AOR=2.54, 95% CI :(1.01, 6.37)] and completed primary school [AOR=0.46, 95% CI :(0.27, 0.75)] were attended ANC service than illiterate women. [Table 5]

Women who had knowledge on danger signs were 2.3 times more likely to attend ANC service than those women who had no knowledge on danger signs [AOR=2.34, 95% CI:(1.55, 3.53)].

In addition, a decision made by the women and husbands only on receiving ANC service were 65% and 45% less likely to attend ANC respectively than a decision made jointly[AOR=0.35, 95% CI (0.21,0.60)] and [AOR=0.55, 95% CI:(0.34, 0.87)]. [Table 5]

3.5.2. Factors Associated with Delivery Care Service Utilization

Women who had monthly their own income were 2 times more likely to utilize delivery care service than those women who have no monthly income [AOR=2.09, 95% CI (1.19, 3.67)]. Moreover, women who had greater than 7 family members were 52% less likely to utilize delivery care service than to women having less than 5 family members) [AOR=0.48, 95% CI (0.27, 0.83)]. [Table 6]

On the other hand, health facility which takes greater than 2 hours walking time to access was 65% less likely to utilize delivery care service than health facility takes less than 2 hours walking time to access [AOR=0.35, 95% CI (0.19, 0.65)]. [Table 6]

Those women whose husbands were attended ANC with them were 1.7 times more likely to choose health facility as place of delivery compared to those women whose husbands didn't attended ANC with them [AOR=1.73, 95% CI (1.15, 2.62)]. [Table 6]

Moreover, a decision made by women and husbands on place of delivery were 81% and 85% less likely to choice health facility as delivery care service respectively compared to the joint decision made [AOR=0.193, 95% CI (0.111, 0.336)] and [AOR=0.146, 95% CI (0.091,0.233)]. [Table 6]

3.5.3. Factors Associated with Postnatal Care Service Utilization

Women who were delivered at health institution were 3 times more likely to attend postnatal care services as compared to women who were delivered at home [AOR=3.04, 95% CI (1.05, 8.84)].

Similarly, those women who had knowledge on complication related pregnancy/labor were 5.4 times more likely to utilize postnatal care service as compared to those women who had no knowledge on complication related pregnancy /labor [AOR=5.43, 95% CI (2.32,12.76)]. [Table 7]

Moreover, those women who had got information about postnatal care services from health extension workers (HEW) and Midwife/Nurse were 24.87 and 37 times more likely to attend postnatal care service respectively compared to those women's who had got information from other sources [AOR=24.87, 95% CI (8.97, 68.98)]and [AOR=37.06, 95% CI (11.70,117.38)]. [Table 7]

In addition to, Women who had knowledge on postnatal care services were 4.6 times more likely to utilize postnatal care services compared to those women who had no knowledge on PNC services [AOR=4.55, 95% CI (1.81,11.44)]. [Table 7]

Table 4. Factors associated with delivery service utilization of women, in Enderta district Tigray, Ethiopia (N=574), 2013.

Variables	Delivery Service Utilization	
	COR 95% CI	AOR 95% CI
Education status of women:		
Illiterate	1	1
Read & write	1.95(1.19,3.19)	1.39(0.77,2.49)
Primary	2.50(1.60,3.90)	1.26(0.73,2.20)
Secondary & above	1.09(0.59,2.02)	0.55(0.26,1.60)
Occupation status of women:		
Housewife	0.47(0.24,0.92)	0.86(0.40,1.83)
Farmer	0.35(0.17,0.70)	0.96(0.43,2.17)
Others	1	1
Do women have monthly income?		
Yes	1.69(1.11,2.59)	2.09(1.19,3.67)*
No	1	1
Education status of husbands:		
Illiterate	1	1
Read & write	1.31(0.88,1.96)	1.15(0.72,1.82)
Primary	1.775(1.07,2.95)	0.83(0.45,1.53)
Secondary & above	3.39(1.56,7.35)	0.83(0.31,2.21)
Occupation status of husbands:		
Farmer	0.48(0.31,0.74)	0.99(0.59,1.66)
Others	1	1
Having radio:		
Yes	1.60(1.12,2.29)	1.39(0.91,2.12)
No	1	1
Total family members:		
<5	1	1
5-7	0.60(0.40,0.91)	0.70(0.43,1.12)
>7	0.42(0.26,0.67)	0.48(0.27,0.83)*
Estimated time taken for women to health facility:		
<2hrs	1	1
≥2hrs	0.50(0.31,0.82)	0.35(0.192,0.65)*
Husbands who attend ANC with spouse:		
Yes	2.63(1.84,3.75)	1.73(1.15,2.62)*
No	1	1
Were women attended ANC?		
Yes	1.55(1.05,2.30)	0.64(0.35,1.16)
No	1	1
Do women have support from partners?		
Yes	1.72(1.18,2.53)	0.71(0.40,1.32)
No	1	1
Do partners provide financial support?		
Yes	2.10(1.47,3.01)	1.452(0.964,2.188)
No	1	1
Do partners give care to other children?		
Yes	1.74(1.22,2.711)	1.03(0.62,1.71)
No	1	1
Do partners give moral support		
Yes	1.93(1.27,2.92)	1.53(0.94,2.50)
No	1	1
Who decides place of delivery?		
Just me (women)	0.18(0.11,0.30)	0.19 (0.111,0.34)*
My husband	0.14(0.09,0.21)	0.15(0.091,0.23)*
Both	1	1

Table 5. Factors associated with postnatal service utilization of women, in Enderta district, Tigray (N=574), 2013.

Variables	Postnatal Service Utilization	
	COR 95% CI	AOR 95% CI
Age of women at first birth:		
<20yrs	1	1
≥20yrs	1.50(1.03,2.18)	1.37(0.53,3.59)
Place of delivery:		
Health institution	1.48(1.05,2.10)	3.04(1.05,8.84)*
Home	1	1
Women who had immunized their babies:		
Yes	1.61(1.04,2.49)	3.05(0.88,10.50)
No	1	1
Those women who had knowledge on complication related pregnancy/labor:		
Yes	1.67(1.11,2.50)	5.44(2.32,12.76)*
No	1	1
Women who got information from:		
Others	1	1
HEW	28.82(12.46,66.67)	24.87(8.97,68.98)*
Midwife/Nurse	58.04(21.37,157.61)	37.06(11.70,117.38)*
Women's knowledge on PNC services:		
Yes	2.47(1.43,4.253)	4.55(1.81,11.442)*
No	1	1

4. Discussion

The proportion of antenatal, delivery and postnatal care service utilization was 70%, 37.9% and 49.7%, respectively. Women's who had their own monthly income and knowledge on danger sign that could occur during pregnancy were positively associated with ANC utilization. Moreover, mothers whose husbands had completed secondary school or above were more likely to deliver at health facility than those mothers whose husbands had never attended any formal schooling. Finally, women accompanied ANC by their husband and awareness on postnatal care services were positively associated with postnatal care utilization.

The study revealed that ANC service utilization was 70.2%. This finding was almost in line with the different study done ranges from 71%-75% [11, 15]. But it was higher than the Ethiopian demographic and health survey (EDHS) 2011 (34%) [7] and other studies done in Ethiopia [16, 17]. This is possibly because the sample was composed of semi-urban individuals who possibly have better access to health facilities where integrated maternal health care services are provided than the rural that make up the majority of the population.

This study revealed that four in ten women gave their last birth at health institution. This finding is almost similar with other studies [11, 13, 18]. But this finding was higher than the study done by Yared (10%) [3], studies done in North Gondar (13.5%) [19], Sekela District (12.1%) [20] and in Arsi zone (16%) [17]. This large difference could be due to the study area was surrounding areas of Mekelle city (urban), in which the negative influence of husbands and family members could be lower. However, it was lower than studies conducted in Enugu, Nigeria (47.1%), southern Tanzania (46.7%) and Zambia (42.8%) [13, 21, 22]. The difference could be explained by the fact that mothers in these countries

might have better educational status and better ANC service utilization. This implies that the government needs to work more on enhancing the utilization of women health institution for delivery by enhancing the access as well as quality.

One in two of the married women in this study use postnatal service. This result was higher compared to the study done in Sidama zone (37.2%) [18] and lower than reported in Kampala, Uganda (58%) [12]. This implies the government needs to work more on increasing the capacity building of health professional on providing appropriate counseling and adequate and relevant information to mothers.

The study revealed that the proportion of women who use ANC, delivery service and PNC. It indicates the number of women who use ANC service is higher than both delivery service and PNC. This implies that the government needs to work more on increasing the role of male involvement in maternal health care service as well as providing the service in high quality by improving the capacity building of health professional and equipping health care facilities with materials and improving the infrastructure (transportation, electricity, communication and water supply) of the country on providing appropriate counseling and adequate and relevant information to mothers.

Women who had monthly their own income were about 2.4 and 2 times more likely to utilize ANC service and deliver at health institution than those women who had no monthly income.

Moreover, women who had completed secondary school and above were 2.54 times more likely to attend ANC service than those illiterate mothers and women who had completed primary school were 54% less likely to attend ANC service than those mothers who had never attended any formal schooling. Education and having women their own income could influence women's overall empowerment,

access to information, and financial freedom to support themselves to take transport to quality services and (if applicable) to pay for services, as well as to easily absorb health messages through the media and from health professionals. These could collectively influence mothers' awareness to seek ANC service as well as other services including delivery and post natal care.

Moreover, women's overall attitudes towards danger health problem related to pregnancy and childbirth has significant association with service utilization, women who had knowledge on danger signs were 2.3 times more likely to attend ANC than those women who had no knowledge. This finding was in line with the study done in Arsi Zone, South-East Ethiopia [17]. The possible explanation could be that mothers who had history of danger sign have practical experience about the life treating conditions than those who did not. This experience could motivate the mother to attend ANC and give birth at health facility.

In addition, decision made on place of delivery by the women only on receiving ANC service were 65% less likely to attend ANC than a decision made jointly. And decision made on place of delivery by men only on receiving ANC service were 45% less likely to attend ANC than a decision made jointly.

On the other hand, health facility which takes greater than 2 hours walking time to access was 65% less likely to utilize delivery care service than health facility takes less than 2 hours walking time to access.

Antenatal care is a proximate predictor of women's decision about place of delivery. That is, women who have had no antenatal care in a health facility are more likely to give birth at home. Women whose husbands were attended ANC with them were 1.7 times more likely to accompany their wives to health facility during delivery compared to those women whose husbands didn't attend ANC with them. The result of this study was in line with the study done in Jinja district, Uganda [14].

Moreover, a decision made by women and husbands on place of delivery were 81% and 85% less likely to choose health facility as delivery care service, respectively compared to the joint decision made.

Those women who were delivered at health institution were 3 times more likely to attend postnatal care services compared to women who were delivered at home.

Similarly, those women who had knowledge on complication related pregnancy/labor were 5.4 times more likely to utilize postnatal care service compared to those women who had no knowledge on complication related pregnancy.

Moreover, those women who had got information about postnatal care services from HEW and Midwife/Nurse were 24.87 and 37 times more likely to attend postnatal care service respectively compared to those women's who had got information from other sources.

Knowledge of postnatal care is a prerequisite to obtaining access to and using a postnatal care service timely and effectively. In this study woman who had knowledge on postnatal care services were 4.6 times more likely to utilize

postnatal care services compared to those women who had no knowledge on postnatal services.

The study may have a limitation in that the partners' influence on the use of maternal health service was not addressed in this study. In addition, some of the data for the sensitive issues such as monthly income might not be valid. However, we are confident that this limitation wouldn't have a negative influence on the findings given that the study attempted to cover all other attributes that may be associated with maternal health service utilization.

5. Conclusion

The proportion of ANC and Delivery service and postnatal care in the study area was fair. Women's own monthly income and their knowledge on danger sign that could occur during pregnancy could influence ANC utilization. Women husband educational status might have on women decision to deliver at health institution. And accompany of women to ANC by their husband and their awareness on postnatal care services could influence postnatal utilization.

List of Abbreviations

ANC= Antenatal care, AOR= Adjusted Odds Ratio, COR = Crude Odds Ratio, EDHS= Ethiopian Demographic and Health Survey, FGD = Focus Group discussion, HEW = Health Extension Workers, OR = Odds Ratio, SD = Standard Deviation, TBA = Traditional Birth Attendant

Authors' Contributions

AR designed the study, performed the statistical analysis and participated in drafting the manuscript. MA participated in the study design, implementation of the study, and participated in drafting the manuscript. HA participated in the study design, implementation of the study, and drafted the manuscript. All authors contributed to the data analysis, read and approved the final manuscript.

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