Original article

Factors affecting maternal health care services utilization in rural Ethiopia: A study based on the 2011 EDHS data

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Abstract

Background: Many mothers suffer from complications of pregnancy and delivery in Ethiopia. Maternal mortality in Ethiopia is one of the highest in the world. In 2006 the maternal mortality rate for Ethiopia was 673 per 100,000 live births. Maternal healthcare service utilization in the country is far below the acceptable level, as a result of that maternal mortality is attributed to this shortcoming.
Objective: The main objective of this study was to identify factors affecting utilization of each one of the three maternal health care services (antenatal, delivery, and postnatal care) in rural Ethiopia.
Methods: The data for the study were taken from the 2011 Ethiopian Demographic and Health Survey which was a nationally representative survey of women in the age group15-49 years. Data about mothers who had at least one child in the five years before the survey were analyzed. To estimate the effect of the socio-economic and demographic variables on maternal health service utilization three outcome predictor variables were considered. These were use of antenatal care, delivery care and postnatal care services. The statistical method used to analyze the data and develop an appropriate model was multiple logistic regression.
Results: Mother's age at birth, mother's educational level, sex of head of household, household wealth status, employment/work status of mothers, region, religion, birth order and partner's/husband's level of educational were found to be predictors of utilization of delivery care and postnatal care services. Religion and sex of household head did not predict antenatal care use.
Conclusion: In order to increase utilization of mother health care services and improve maternal health care utilization services in rural Ethiopia critical interventions on the part of regional governments and the federal government would be necessary; efforts should be made to avail more resources to educate mothers. The same goes to creating job opportunities for mothers. Non-government bodies could contribute their share to alleviate the level of literacy and helping mothers to be economically self-reliant. The wider community and mass media should engage in creating awareness about the disadvantages of early marriage and high birth orders. [*Ethiop. J. Health Dev.* 2013;27(1):16-24]

Introduction

Maternal health refers to the health of women during pregnancy, childbirth and the postpartum period. In rich countries, where women have access to basic health care, giving birth is a positive and fulfilling experience. On the other hand, for many women in poor countries it is associated with suffering, ill health and even death (1).

An estimated 358,000 maternal deaths occurred worldwide in 2008 that was as a result of a 34% decline from the levels of 1990. Despite this decline, developing countries continued to account for 99% (355,000) of the deaths. Sub-Saharan Africa and South Asia accounted for 87% (313,000) of global maternal deaths. Eleven countries including Afghanistan, Bangladesh, the Democratic Republic of Congo, Ethiopia, India, Indonesia, Kenya, Nigeria, Pakistan, Sudan, and the United Republic of Tanzania, comprised 65% of all maternal deaths in 2008. Maternal Mortality Ratio (MMR) in 2008 was also highest in developing regions with 290 maternal deaths per 100,000 live births versus 14 maternal deaths per 100,000 live births in developed regions and countries of the Commonwealth of Independent States (40). Among the developing regions, sub-Saharan Africa had the highest MMR at 640 maternal deaths per 100,000 live births in 2008, followed by South Asia (280), Oceania (230), South-Eastern Asia (160), North Africa (92), Latin America and the Caribbean (85), Western Asia (68), and Eastern Asia (41). The progress of reducing MMR is notable, but the annual rate of decline is less than half of what is needed to achieve the fifth Millennium Development Goal (MDG5) target of reducing MMR between 1990 and 2015. The 34% decline of MMR for the period 1990-2008 translates into an average annual decline of just 2.3%. This is far from the annual decline of 5.5% required to achieve MDG5 (2).

United Nations data about maternal health care from developing countries are as follows: the number of pregnant women who received at least one antenatal care was approximately 74% in 2005 (3); 40% of deliveries took place in health facilities (4); and skilled health personnel assisted nearly 61% of births in 2006 (3). Obviously, the data indicate that commitment of governments to maternal health care have not reached the levels required to make strong impact on mortality rates.

The levels of maternal and infant mortality and morbidity in Ethiopia were among the highest in the world. MMR

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in 2006 was 673 per 100,000 live births, and infant mortality rate was 77 per 1,000 (5). One explanation for these poor health outcomes among women and children was the non-utilization of modern health care services by a sizable proportion of women in Ethiopia. According to the Ministry of Health of Ethiopia report in 2007, about 52% Ethiopian women received antenatal care (ANC), less than 17% received professionally assisted delivery care (DC) and 19% received postnatal care (PNC). Previous studies have also clearly demonstrated that the utilization of available maternal health services was very low in the country. About 25% of Ethiopian women received ANC and less than 10% received professionally assisted DC (6, 7).

Based on the 2011 EDHS, the Central Statistical Agency (CSA) reported that urban women were three time more likely to have received ANC from a health professional than rural women (76% vs. 26%); 51% of births to urban mothers were attended by health professionals and 50% delivered in health facilities. The percentages in rural areas were, respectively, 5% and 4% (8).

Despite the fact that using maternal health care services is essential for further improvement of maternal and child health, little is known about the current magnitude of use of and access to maternal care services. With the background given above this study aimed to fill the existing information gap about maternal health care by providing empirical evidence-based on the data of the 2011 EDHS by way of identifying factors/predictors that affect maternal health services in rural Ethiopia.

Methods

The source of data for this study, as pointed out above, was the 2011 EDHS obtained from CSA. It was the third survey conducted in Ethiopia as part of the worldwide Demographic and Health Surveys project. The survey was undertaken to provide current and reliable data on fertility and family planning behavior, child mortality, adult and maternal mortality, nutritional status of children, use of maternal and child health services, knowledge of HIV/AIDS, and prevalence of HIV/AIDS and anemia.

The 2007 Population and Housing Census conducted by the CSA provided the sampling frame from which the 2011 EDHS sample was drawn. The sample was selected using a stratified, two-stage cluster design; enumeration areas were the sampling units for the first stage. The sample included 624 enumeration areas, 187 in urban areas and 437 in rural areas; households comprised the second stage of sampling. A complete listing of households was carried out in each of the 624 selected enumeration areas from September 2010 through January 2011. A representative sample of 17,817 households was selected of which 17,018 were covered during data collection. Of these, 16,702 were successfully interviewed, yielding a household response rate of 98 %. All women aged 15-49 and all men aged 15-59 were eligible for the interview. In the interviewed households 17,385 eligible women were identified for individual interviews; complete interviews were conducted for 16,515 yielding a response rate of 95 %. A total of 15,908 eligible men were identified for interview; completed interviews were conducted for 14,110, yielding a response rate of 89%. In general, response rates were higher in rural areas than in urban areas, for both women and men.

In the 2011 EDHS, information and data on ANC, DC and PNC were collected from women who had at least one birth in the five years before the survey. A total of 6,251 rural women of age 15-49 years, who had at least one birth in the five years preceding the survey, were considered in this study.

Three response variables were created from questions included in the maternal health component of the 2011 EDHS questionnaire. The focus in the questionnaire were specific questions asked of women about their most recent pregnancy and live births in the five years preceding the survey. Women were asked (1) whether they were checked by a trained health professional (a doctor, nurse, or midwife) at least once during pregnancy, i.e., antenatal care; (2) whether they were attended by a trained health professional during their delivery, i.e., assisted delivery care; and (3) whether they received a medical checkup from a health professional within 42 days after delivery, i.e., postnatal care.

The predictor variables/factors were classified into two groups: socio-economic and demographic. The choice of the predictors was guided by the determinants of maternal health service utilization literature. The nine predictor variables considered were: mother's age, mother's educational level, educational level of husband/partner, work/employment status of mother, birth order, wealth index, region, sex of household head, and religion.

The regression analysis method adopted in the present study is a binary logistic regression; the method allows identification of the effect of each selected predictor variable on maternal healthcare utilization controlling for the effects of the other predictor variables included in the model. The study used the ENTER variables selection technique to arrive at the final logistic regression model. The 0.05 level of significance was adopted. The data analysis was accomplished using the Statistical Package for Social Sciences (SPSS) version 20.

Results

***General and Results of the Descriptive Analysis*:**

The distribution of mothers who had a live birth in the five years preceding the survey by utilization of ANC, DC and PNC for the most recent birth is given in Table 1.

Table 1: **Distribution of Socio-economic and demographic characteristics of maternal health care services utilization in rural Ethiopia (n=6,251)**

Predictor/explanatory Variable	DC			ANC		PBC	
	Yes (%)	df.	Chi-sq. (sig)	Yes (%)	Chi-sp. (sig)	Yes (%)	Chi-sp. (sig)
Mother' age at birth							
15-19	9		24.706 (.0000)	32	10.885 (0.004)	12.1	15.367 (0.000)
20-34	6.1	2		28.4		9.5	
35-49	3.5			25.1		6.7	
Educational level of mothers							
No education	3.7	1	162.58 (.000)	23.3	214.46 (0.000)	7.4	76.975 (0.000)
Primary and above education	12.5			42.6		14	
Educational level of husbands/partners							
No education	3.7	1	77.762 (.000)	22.9	116.77 (0.000)	7	95.889 (0.000)
Primary and above education	9			35.5		12.3	
Employment status of mothers							
Employed	8.5	1	28.998 (.000)	34.1	42.833 (0.000)	10.9	8.05 (0.000)
Non-employed	4.9			25.8		8.6	
Birth order							
1	14.2	2	153.13 (.000)	36.8	54.443 (0.000)	16.2	59.973 (0.000)
2-4	5.3			28.9		8.6	
5+	3.4			24.3		7.5	
Wealth index							
Poor	3.8	2	127.12 (.000)	21.4	230.45 (0.000)	6.8	102.327 (0.000)
Middle	4.7			30.5		8.4	
Rich	12			42.6		16.1	
Region							
Tigray	6.5			42.8		13.7	86.664 (0.000)
Affar	1.1			19.9		6.9	
Amhara	5.7			27.3		8.4	
Oromiya	5.7			25.8		7.6	
Somali	4.5		78.984 (.000)	15.8	169.8 (0.000)	4.5	
Benishangul-Gumuz	5.8	9		29.5		9.69	
SNNP	4.5			23.4		6.4	
Gabela	12.5			36.7		13.8	
Harari	9.2			36.5		19.3	
Dire Dawa	8.3			28.2		10.1	
Sex of household head							
Male	5.5	1	10.786 (.001)	27.7	3.067 (0.080)	8.6	12.242 (0.000)
Female	8.1			30.4		12.1	
Religion							
Ethiopian Orthodox	7.9			34.5		12.3	
Protestant	6.5			27.5		8.8	
Muslim	4.5	3	27.035 (.000)	24.7	61.288 (0.000)	7.8	35.597 (0.000)
Others	3.3			19.9		3.4	

With respect to ANC: Utilization of the service was found to be lower for older mothers (25.1%) than young mothers (28.4 %) and adolescent mothers (32%). The utilization by region was: Tigray (42.8%), Harari (36.5%), Gambela (36.7%), Benishangul-Gumuz (29.5%), Dire-Dawa (28.2%), Amhara (27.3%), Oromiya (25.8%), SNNP (23.4%), Affar (19.9%) and Somali (15.8%). The percentages of utilization of the service among Copts, Protestants, Muslims, followers of "other religions" were, respectively, 34.5%, 27.5 %, 24.7 %, 19.9%. Mothers with male household head and female households used the service 27.7% and 30.4%. Utilization rates by mothers from poor, middle level and wealthy households were 21.4%, 30.5% and 42.6%, respectively. About 42.6% of mothers with primary or higher education used ANC service; some 23.3% of mothers with no education used the service. Over 35% and about 23% of mothers whose husbands had primary

or higher educational status and those, whose husbands had no education, used ANC, respectively. Employed and unemployed mothers utilization of ANC was 34.1% and 25.8%, respectively.

With respect to DC: Utilization of the service was 3.5% for older mothers, 6.1% for younger mothers and 9% for adolescent mothers. For the first birth, birth order two to four and five and higher, respectively, were 14.2%, 5.3% and 3.4%. The percentage of by region was: Gambela (12.5%), Harari (9.2%), Dire-Dawa (8.3%), Tigray (6.5%), Benishangul-Gumuz (5.8%), Amhara (5.7%), Oromiya (5.7%), SNNP (4.5), Somali (4.5%), and Affar (1.1%). Copts, Protestants, Muslims, and followers of "other religions" used DC (7.9 %), (6.5 %), (4.5 %) and (3.3%), respectively. About 5.5% of mothers from households headed by males used the service whereas in households headed by females the utilization was 8.1%. The utilization among mothers with wealth indices poor, middle and high were 3.8%, 4.7% and 12%, respectively. About 12.5% of mothers with primary or higher level of education and 3.7% mothers with no education used the service. Some 9% mothers, whose husbands/partners had primary or higher education, and 3.7% of those mothers whose husbands/partners had no education used DC service. About 8.5% and 4.9% of employed mothers and un-employed mothers used the service.

With respect to PNC: About 12.1% of younger mothers, 9.5% of adult mothers and 6.7% of older mothers used the service. Some 11% and 8.6% of employed mothers and unemployed mothers, respectively, used the PNC service. Approximately 12.3% of mothers whose husbands/partners had primary or above education, and 7% of mothers whose husbands/partners had no education used this service. The utilization rates for mothers who had no education and mothers with primary or higher education were 7.4% and 14%, respectively. About 6.8%, 8.4% and 16.1% of mothers with the lowest, middle and highest wealth indices, respectively, utilized the service. The percentages of use of the service were 12.3%, 8.8%, 7.8% and 3.4%, respectively, among Copts, Protestants, Muslims and followers of "other religions". The utilization rate among mothers in households with female heads and male heads, respectively, were 12.1% and 8.6%. The percentages by region were: Harari (19.3%), Gambela (13.8%), Tigray (13.7%), Dire Dawa (10.1%), Benishangul-Gumuz (9.7%), Amhara (8.4%), Oromiya (7.6%), Afar (6.9%), SNNP (6.4%), and Somali (4.5%).

***Results of the multiple logistic regression analysis*:** In what follows interpretations of the empirical results for the significant predictors in the three models with ANC, DC, and PNC as response variables are given using estimated odds ratio (abbreviated $\widehat{OR}$) and the corresponding estimates of the 95% confidence intervals of the odds ratio. The results are displayed in Table 2. We would like to point out that all conclusions reached about the effect of a single predictor/explanatory variable on a response assume that the remaining explanatory variables in the model have been controlled/kept fixed. This convention saved us the trouble of repeating the phrase "controlling for all the other variables in the model", thereby avoiding unnecessary redundancy.

A. With ANC as a response variable the predictors sex of household head and religion were not significant indicators of use of ANC services.

Husband's/partner's education: Women whose husbands/partners had no education were 26.3% less likely to use ANC services compared to women whose husbands/partners had primary or above education ($\widehat{OR}$ = 0.737 (95% CI: 0.646-0.841)).

Birth order: In the cases of first birth and 2-4 births the respected estimated odds ratios were 1.466 (95% CI: 1.182-1.818) and 1.124 (95% CI: 0.969-1.302) compared to the reference group (fifth and higher birth orders).

Wealth: The estimated odds ratios for mothers whose household wealth indices were poor and middle level, compared to those mothers whose wealth index was rich (the reference category) were 0.441 (95% CI: 0.381-0.512) and 0.678 (95% CI: 0.572-0.803), respectively.

Education of mothers: For mothers with no education the $\widehat{OR}$ =0.551 (95% CI: 0.478-0.635) relative to those with primary or above education.

Age of mothers at birth: For the age groups 15-19 and 20-34 the estimated odds ratios were 0.752 (95% CI: 0.571-0.992) and 0.972 (95% CI: 0.815-1.159) compared with the reference category (35 to 49 years of age).

Employment status of mothers: For un-employed mothers the $\widehat{OR}$ = 0.721 (95% CI: 0.633-0.821) compared with those who were employed.

Region: The estimated odds ratios for mothers who lived in Tigray, Oromiya, Somali, and SNNP relative to mothers in Dire-Dawa (the reference category) were 1.691(95% CI: 1.515-2.484), 0.664 (95% CI: 0.474-0.932), 0.559 (95% CI: 0.374-0.836), and 0.628 (95% CI: 0.433-0.921), respectively. The remaining regions had more or less similar levels of ANC utilization as Dire-Dawa.

B. With DC as response variable all nine predictors affected utilization of delivery care services in rural Ethiopia.

Sex of household heads: In households headed by females the likelihood to get delivery care services from health professionals was 54.8% higher compared to that

for women living in households headed by men ($\widehat{OR}$ = 1.548 (95% CI: 1.178-2.034)).

Husbands'/partners' education: For mothers whose husbands/partners had primary or above education the $\widehat{OR}$ = 0.711 (95% CI: 0.549-0.921) compared to mothers whose husbands/partners had no education.

Birth order: For mothers with first birth and birth order 2-4, respectively, $\widehat{OR}$ = 3.970 (95% CI: 2.743-5.747) and $\widehat{OR}$ = 1.314 (95% CI: 0957-1.806) compared to the reference group (five and more births).

Religion: For Copts, Protestants and Muslims $\widehat{OR}$ = 2.729 (95% CI: 1.188-6.271), $\widehat{OR}$ = 1.474 (95% CI: 0.657-3.309) and $\widehat{OR}$ = 1.298 (95% CI: 0.554-3.041), respectively, compared to women of the reference group (followers of "other religions").

Wealth: For the poor and middle wealth index categories $\widehat{OR}$ = 0.438 (95% CI: 0.336-0.570) and $\widehat{OR}$ = 0.469 (95% CI: 0.338-0.652), respectively, compared to those mothers from wealthier households.

Education of mothers: For mothers with no education the $\widehat{OR}$ = 0.495 (95% CI: 0.384-0.638) compared to mothers with primary or above education.

Age of mothers at birth: For mothers in the age groups 15-19 and 20-34 $\widehat{OR}$ = 0.599 (95% CI: 0.355-1.011) and $\widehat{OR}$ = 1.022 (95% CI: 0.689-1.517), respectively, compared to those of the reference group of age 35-49.

Employment status of mothers: For not employed mothers $\widehat{OR}$ = 0.670 (95% CI: 0.530-0.847) compared to those who were employed.

Region: The respective estimated odds ratios for mothers who lived in Tigray, Affar, Amhara, Oromiya, Benishangul-Gumuz, and SNNP compared to mothers who lived in Dire-Dawa (the reference) were 0.226 (95% CI: 0.134-0.530), 0.148 (95% CI: 0.060-0.365), 0.317 (95% CI: 0.163-0.617), 0.330 (95% CI: 0.182-0.598), 0.339 (95% CI: 0.214-0.744), and 0.270(95% CI: 0.139-0.524). It is worthwhile pointing out that the remaining regions had similar levels of DC utilization as Dire-Dawa.

C. With PNC as a response variable all nine predictors included in the study were found to be significant indicators of utilization of this service.

Sex of household heads: For mothers living in households where the head was a female the $\widehat{OR}$ = 1.53 (95% CI: 1.220-1.919) compared to women living in households headed by a male.

Husband's/partner's education: For mothers whose husbands/partners had primary or above education the $\widehat{OR}$ = 0.756 (95% CI: 0.615-0.929) compared to those whose husbands/partners had no education.

Education of mother: For mothers with no education the $\widehat{OR}$ = 0.659 (95% CI: 0.531-0.817) compared to mothers with primary or above education.

Religion: The respective estimated odds of using the service for Copts, Protestants and Muslims were 3.606 (95% CI: 1.603-8.108), 2.263 (95% CI: 1.029-4.977) and 1.828 (95% CI: 0.808-4.137) compared to mothers in the reference category (followers of "other religions").

Wealth: The estimated odds ratios for mothers in the categories of wealth indices poor and middle compared to those mothers in the rich category were 0.486 (95% CI: 0.386-0.60) and 0.579 (95% CI: 0.444-0.754), respectively.

Birth order: For mothers who experienced first birth and 2-4 births the estimated odds ratios were 1.836 (95% CI: 1.345-2.505) and 0.921 (95% CI: 0.730-1.164) compared to the reference group (birth order five and more).

Age of mother at birth: For mothers in the age groups 15-19 and 20-34, respectively, $\widehat{OR}$ = 0.872 (95% CI: 0.568-1.337) and $\widehat{OR}$ = 1.240 (95% CI: 0.927-1.658) compared to those mothers of age 35-49 (the reference group).

Employment status of mothers: The estimated odds ratio for unemployed mothers compared to those employed was 0.852 (95% CI: 0.698-1.039).

Region: The respective estimated odds ratios for mothers who lived in Harari, Amhara, Oromiya, Somali, and SNNP compared with Dire-Dawa (the reference) were 1.439 (95% CI: 0.829-2.498) 0.446 (95% CI: 0.249-0.801), 0.438 (95% CI: 0.258-0.745), 0.434 (95% CI: 0.224-0.841), and 0.355 (95% CI: 0.197-0.642). The utilization levels in the remaining regions were found to be comparable to that in Dire-Dawa.

Table 2: **Multiple logistic regression results of maternal health care services utilization in rural Ethiopia (n=6,251)**

	ANC				DC				PNC			
	Sig.	Estimated Odds ratio	95% CI for odds ration		Sig.	Estimated Odds ratio	95% CI for odds ration		Sig.	Estimated Odds ratio	95% CI for odds ration	
			Lower	Upper			Lower	Upper			Lower	Upper
Female head	.057	1.163	.995	1.360	.002	1.548	1.178	2.034	.000	1.530	1.220	1.919
Husband/partner educ. (no)	.000	.737	.646	.841	.010	.711	.549	.921	.008	.756	.615	.929
1 birth	.000	1.466	1.182	1.81	.000	3.970	2.743	5.747	.000	1.836	1.345	2.505
2-4 births	.122	1.124	.969	1.302	.092	1.314	.957	1.806	.492	.921	.730	1.164
Poor	.000	.441	.381	.512	.000	.438	.336	.570	.000	.481	.386	.600
Middle	.000	.678	.572	.803	.000	.469	.338	.652	.000	.579	.444	.754
Coptic	.060	1.466	.983	2.187	.018	2.729	1.188	6.271	.002	3.606	1.603	8.108
Protestant	.336	1.202	.827	1.747	.346	1.474	.657	3.309	.004	2.263	1.029	4.977
Protestant	.120	1.366	.922	2.026	.548	1.298	.554	3.041	.147	1.828	.808	4.137
Muslim	.000	.551	.478	.635	.000	.495	.384	.638	.000	.659	.531	.817
Mother educ. (no)	.043	.752	.571	.992	.046	.599	.355	1.011	.039	.872	.568	1.337
15-19 yrs	.753	.972	.815	1.159	.913	1.022	.689	1.517	.147	1.240	.927	1.658
20-34 yrs	.000	.721	.633	.821	.001	.670	.530	.847	.006	.852	.698	1.039
Not-employ	.007	1.691	1.151	2.484	.000	.266	.134	.530	.105	.614	.341	1.106
Tigray	.632	.915	.638	1.314	.000	.148	.060	.365	.283	.737	.423	1.286
Amhara	.687	.926	.639	1.344	.001	.317	.163	.617	.007	.446	.249	.801
Oromiya	.018	.664	.474	.932	.000	.330	.182	.598	.002	.438	.258	.745
Somali	.005	.559	.374	.836	.146	.603	.305	1.193	.013	.434	.224	.841
Ben.-Gumuz	.673	.927	.653	1.317	.004	.399	.214	.744	.128	.657	.382	1.129
SNNP	.015	.628	.433	.912	.000	.270	.139	.524	.001	.355	.197	.642
Gambela	.327	1.221	.819	1.820	.318	.712	.366	1.386	.474	.801	.437	1.470
Harari	.825	.956	.644	1.419	.199	.651	.338	1.253	.003	1.439	.829	2.498

Discussion

The introduction section of this paper highlighted the extent and levels of maternal mortality and morbidity in the developing world. The first part of this section touches upon the situation with regard to the three maternal care services in developing countries. The second part provides a discussion about the findings of the current study by way of comparison with other similar research undertakings.

The strength of ANC lies in its role for early identification of complications and also for providing information on danger signs and how to handle them (9). Furthermore, other potential benefits of antenatal care are counseling on nutrition and healthy pregnancy/delivery behavior; getting immunization, getting malaria prophylaxis, iron and folic acid tablets and helping women to select a trained birth attendant or institution to deliver their babies in. Antenatal care also makes it possible to screen for sexually transmitted diseases such as HIV infection, which is known to have taken its toll in much of the developing world. Counseling and education of pregnant women about their own health and that of their children is also an opportunity that can be incorporated into ANC. WHO recommends a minimum of four ANC visits for every pregnant woman. However, the capability of ANC in improving maternal health outcomes is greatly reduced in the absence of a sensible health care and referral system where women can receive emergency obstetric care when needed.

Skilled attendance during delivery can only be provided in the presence of functioning health systems which include adequately trained and motivated workers, well equipped facilities, transportation and rapid referral systems. The presence of skilled birth attendants at all births is regarded, probably, as the single most critical intervention for reducing pregnancy-related deaths and disabilities (10). These are nonexistent in the health systems of developing countries, which are grossly under-funded. It is, therefore, no surprise that women in these countries have limited access to skilled birth attendants and even less access to emergency obstetric care (11).

The postnatal period is the time from immediately after birth up to 42 days. It is important for mothers to receive care at this time as it has been recorded that more than 60% of maternal deaths take place during this period (12, 13). The death of a mother further exposes her newborn child to high risks of morbidity and mortality. Thus, receiving PNC can make the difference between life and death for both mother and child. In developing countries, the most common causes of maternal deaths during the postpartum period are hemorrhage, infections and hypertensive disorders (13).

In this study the factors: mother age at birth, mother education, husband/partner education, birth order, religion, wealth index, region and mother's employment status came out as significant predictors associated with improved utilization of maternal healthcare services; sex of household head was found to be a non-significant factor.

A strong association between household wealth and the use of maternal health care services was observed. This finding was supported by a study in Nigeria (14) and another in Ethiopia (15). Even in areas where maternal healthcare services are provided for free, women still have to pay for transportation and other things. As a result, women, who could not afford to pay for these expenses found it difficult or even impossible to visit health facilities.

The results of this study showed that, to a great extent, women in the highest wealth index group used ANC, DC and PNC demonstrating Ethiopian society of population studies that household wealth was a very strong determinant of health services utilization. A similar study by the Ethiopian Society of Population Studies (15) reached the same conclusion. Another study in Bangladesh (16) about factors affecting utilization of skilled maternity care services came up with the same results as that in the current study.

We found that birth order(s) had significant associations with use of ANC, DC and PNC services. Use of maternal health services decreased with increasing birth order. This finding was consistent with the results in (15, 16).

In this study religion was found to be significantly related with the use of DC and PNC services but not with the use of ANC. It was observed that Ethiopian Orthodox women received delivery care services most. Another study in Ethiopia found that mothers who followed the Ethiopian Orthodox religion use ANC, DC, and PNC more than mothers belonging to other religions (17). By contrast, a result in the study by the Ethiopian Society of Population Studies (15) showed that mothers' religious affiliations did not influence utilization of ANC and PNC, but had a significant effect on the use of DC services. No significant difference was found in the use of ANC among the different religious groups in Nigeria (14).

The current study identified mothers' education to be an important predictive factor of utilization of ANC, DC and PNC services. The literature pointed out to the existence of strong relationships between mothers' education and utilization of maternal health care services. Mothers' education was found to be a strong determinant of maternal health services utilization with uneducated women less likely to use maternal healthcare services for delivery (15, 17-20).

We found that the age of mothers at birth was significantly related to all three maternal health care services. The result of this study showed that mothers giving birth while in the age category 35 to 49 years were more likely to use maternal healthcare services than adolescents and young mothers. Our finding was consistent with those in Chakraborty, et al and Addai. (18, 21). In contrast, the study by the Ethiopian Society in Population Studies (15) suggested that the effect of mothers' age at birth in maternal healthcare was not significant in the using health care services.

This study showed that the sex of household head had no influence on utilization of ANC services. It was also observed that the utilization of DC care and PNC services among mothers from male headed households was lower compared to female headed ones.

It was further found that employment status was associated with utilization of ANC, DC and PNC services; being employed showed a positive association with the use of an all three services. This was consistent with the results of other studies that found positive associations between ANC use and being employed (17, 22). On the other hand, this was contrary to the findings of the study by the Ethiopian Society of Population Studies (15) that found that mothers' employment status did not have any effect on making them use maternal health care services.

According to the result of the current study, mothers married to partners having primary or higher education used all three services more than those mothers who had partners/husbands with no education husbands/partners. According to Kamal (16) Elo (23), the higher the level of education of the husband/partner, the more pronounced the positive association with maternity care service utilization.

Our findings in the current study showed regional discrepancy with respect to maternal health care utilization. Compared to the reference region (Dire Dawa), utilization of the three services by mothers was lower in Oromiya, Somali and SNNP Regions. Mothers in Tigray used ANC services more than those in Dire Dawa. In addition, mothers who lived in Tigray, Afar and Benishangul-Gumuz Regions (for DC care only) and Amhara (for both DC and PNC services) used less of these services than mothers in Dire Dawa. Mothers in Harari Region used PNC services more than those in Dire

Dawa. A finding by the Ethiopian Society of Population Studies showed that women in Tigray, Benishangul-Gumuz, Gambela, SNNP, Addis Ababa and Dire Dawa used more ANC services compared to those in Oromiya Region (which was the reference region in that study).

Conclusion and Recommendations:

The major factors identified as determinants of maternal health were mothers' education, mothers' employment status, birth order, husbands'/partners' education and household economic status. The findings suggested that higher levels of husbands' and mothers' education had significant and positive effects on the utilization of maternal healthcare services. In addition, household wealth was found to have a very significant impact on the utilization of maternal health care services; mothers in wealthy households used the health services more than those in poor and middle income ones. Employed mothers used health services more effectively than mothers who were not employed. The current findings also show that mothers used the services more at first birth than in subsequent higher births.

In order to increase the utilization of maternal health care services in rural Ethiopia, some critical interventions on the part of the federal and regional governments would be necessary; efforts should be made to avail more resources to educate mothers. The same goes to creating job opportunities for mothers. Non-government organizations could contribute their share to alleviate the level of literacy and in helping mothers to be economically self supporting. It is also recommended that the wider community (e.g. religious leaders, and the like), and the mass media should be engaged in creating awareness about the disadvantages of early marriage and high birth orders.

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