Determinants of Utilization of Maternal Healthcare Services in Ethiopia

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Abstract: Utilizing maternal healthcare services, such as antenatal care, professionals' assistance during delivery and postnatal care contributes significant role in reduction of maternal and child mortality. However, there are many factors both at individual and community level that affect utilization of these required services. To determine the levels of effects of socio-economic and demographic factors on uses of Maternal Healthcare services 7764 women who had given birth at least one times have taken from the 2011 Ethiopian DHS. The results showed that the rate of safe motherhood practices among reproductive age group of women in Ethiopia were too low. About 51 percent of them did not use any health care services during pregnancy, childbirth, and post-delivery periods. As WHO recommend only 6.9 percent of women were attending ANC at least four times, assisted by health professional during delivery and received PNC. The result of logistic regression showed that antenatal care, skilled delivery and postnatal care utilizations were commonly influenced by place of residence, wealth status, women's and husband's education and parity. Whereas, mother's working status and husband's education were found to be uniquely influence the uses of ANC and PNC services, respectively. In addition, both religious affiliation and age of women were also prominent predictors on utilization of ANC and uses of skilled assistance during delivery. Based on these significant factors, it is important to design and promote uses of maternal healthcare services in order to minimize the risk of maternal and child mortality.

Keywords: Antenatal care, skilled delivery, postnatal care, logistic regression, Ethiopia.

1. INTRODUCTION

1.2. Background

Complications allied to pregnancy and child-birth is one of the leading causes of morbidity and mortality for reproductive age group of women in many developing countries. According to WHO report poor maternal conditions account for the fourth leading cause of death for those reproductive age group of women's next to HIV/ADIS, malaria and tuberculosis in the world [1]. Empirically every day approximately 800 women die globally from reasons related to pregnancy and childbirth. In which about 99% of all maternal deaths occur in developing countries. Among these regions, Sub-Saharan Africa countries had the highest maternal mortality ratio (MMR), which is 500 per 100,000 live births [2].

Mostly, the observed maternal mortality in different country is highly influenced by a huge diversity of country's context and causes of maternal health. In developing countries, the most leading factors for high maternal death are lack of health facilities, lack of transport, cost of services, motivations of staffs, inadequate skilled attendants, lack of care during ANC, delivery and PNC, lack of health equipment's, and weak referral systems [3]. Another issues associated with high maternal mortality are also poor physical condition of women, such as food deficiencies (poor diet and nutrition), domestic sexual violence and weak prevention of infectious and sexually transmitted diseases [4].

In addition to these in developing countries, for instance in Ethiopia, one explanation for poor health outcome is due to non-use of available modern healthcare services by a large proportion of women in the country [5]. These all suggests utilization of healthcare services is not a simple behavioural phenomenon. It is directly and indirectly influenced by several reasons. Therefore, identifying the barriers for non-utilizing of maternal healthcare services is a crucial issue for intensive contribution of saving mothers when they strives to realize their potential as mothers, family members and also as citizen of a large community.

1.2. The Ethiopia Context

Ethiopia, officially known as the Federal Democratic Republic of Ethiopia, is a country located in the Horn of Africa. Recently, the population size is about 93 million, which account the second most populated nation in African next to Nigeria [6]. Furthermore, maternal

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morbidity and mortality in Ethiopia are among the highest in Sub-Saharan countries. According to World Bank estimates the maternal mortality ratio in Ethiopia was 350 per 100,000 live births in 2013. Besides, Ethiopia has huge diversity in culture and hence this average MMR is highly diverted by socio-economic and demographic differences. These imply the proportion of women who use ANC, skilled assistance delivery and postnatal services within different regions and also different groups of people are not similar [7].

The 2012 EDHS report showed that the coverage of antenatal care was 34%. This varied from 76% for women residing in urban areas to 26% of women in rural areas. Even among those who used ANC, lower proportions of women were received care according to WHO recommendations (beginning ANC in the first trimester, and making four antenatal care visits during time of pregnancy). Again, a large majority of the births (90%) in Ethiopia occur at home, and only 10% of births received assistance of trained health professionals' during delivery [5]

1.3. Statement of the Problem

Identifying the main factors influencing utilization of maternal healthcare services is one of important research problem in developing countries, especially in Ethiopia. Even if there are many factors contributing for high maternal death in these regions, utilizing MHC service is one of significant protective measure for maternal and child deaths. For instance, using ANC service is necessary to detect early any complications during pregnancy and then it encourages assisting by health professionals during delivery. Attending health professionals' assistance during child delivery also helps to minimize the risk of difficulties for mother and child(ren) by diagnosing and treating conceivable problems. Again, using postnatal care benefits both mother and child through handling any possible complications after child-birth. However, the current prevalence of using MHC such as, ANC, skilled delivery as well as PNC services in Ethiopia is much lower than required average [8]. The study, therefore, identifies the effect of socio-economic and demographic factors on utilizations of antenatal care, health professionals' assistance during delivery and postnatal care services in Ethiopia, which could give better understanding for policy makers in order to make further intervention and more improvement on uses of these maternal healthcare services in the country.

2. RESEARCH METHODOLOGY

2.1. Study Design

A quantitative analysis was done based on cross-sectional secondary data obtained from Ethiopian 2011 DHS. These analyses includes both descriptive and inferential measures in such a way that possible descriptions and also detail investigation on recent status of utilization of MHC services was made allied with socio-economic and demographic factors. Under discussion, scientific explanations had given about statistical outputs through relating these results with recent scientific literatures.

2.2. Methods of Analyses

In order to assess the effects of socio-economic and demographic factors on utilization of maternal healthcare services three dependent variables were constructed. These are: the number of visiting health centre during pregnancy (use of ANC), the use of skilled assistances during delivery and the utilization of postnatal care from trained health professionals. In order to facilitate comparisons between women based on their background factors, number of ANC visit had grouped into four categories (0, 1-2, 3, 4+ times). Where, 0-represents when women did not receive any health services, 1-2 when women used health service one or two time during pregnancy, and the same for the rest. For the others dependent variables, we built a binary categories to indicate whether or not a woman used health care services from health-professionals.

A descriptive measure is computed to assess the response and missing rates among categories of predictor variable. The chi-square test was done to examine the association between each predictor variables with utilization of MHC services. Through these, the chi-square values could indicate the predictor variables that will be included in multivariate logistic regression.

2.2.1. Binary Logistic Regression

Binary logistic regression is used to examine the effect of socio-economic and demographic variables on the utilization of MHC services. In this statistical model, the response variable can take the value 1 with a probability of success p, or the value 0 with probability of failure 1- p, when a woman use MHC service and when a woman did not used any service, respectively. While, the explanatory or predictor variables can be either continues or categorical variable. Besides, in

binary logistic regression the relationship between the explanatory and the response variables has not a linear function. Hence, logit transformation is important in order to make linear relationship between the log-odds of the response variable and predictor variables [9]. The binary logistic regression model based on k explanatory variables i.e. $X' = (X_1, X_2, \ldots, X_k)$ with the conditional probability of success denoted by P is defined as:

$$Ln(p/(1-p)) = logit(p) = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \cdots + \beta_k X_k$$

where, β_0 is the constant of the equation and, β_i is the coefficient of the ith predictor variable.

After the model is fitted the next step is checking the adequacy of the model in order to assess how close the observed values are predicted by the fitted model. Hence, the Hosmer-lemeshow and Wald tests are used to check the adequacy of the fitted model and significance of the regression coefficients, respectively. Relative comparison is made using odds of utilization of MHC services among different groups of women (that are categorized based on their background factors). In such a way that, the effects of each socio-economic and demographic variables on health seeking behaviour of women was assessed.

2.2.2. Multinomial Logistic Regression

Multinomial logistic regression is an extension of binomial logistic regression. It has used when the dependent variable has more than two unordered categories. In multinomial logistic regression, the dependent variable that has m-categories further dummy coded into (m-1) several 1/0 value variables. Then, there will be m-1 separate binary logistic regression model, where, each model tells the effect of the predictors on the probability of success in that category, in comparison to the reference group [9].

Therefore, the multinomial logistic regression model that has m-categories and k explanatory variables i.e. $X' = (X_1, X_2, \ldots, X_k)$ with the conditional probabilities of success $(p_1, p_2, \ldots, p_{m-1})$ is defined as:

$$Ln(p_i/p_j) = \beta_{0i} + \beta_{1i} X_1 + \beta_{2i} X_2 + \cdots + \beta_{ki} X_k$$

where, β_{0i} is the constant of the equation and, β_{zi} is the coefficient of the zth predictor analogous to i[th] category of response variable ,and i ≠ j can contain 1, 2, …, m-1.

Specifically, in this study multinomial logistic regression is applied in order to see the joint effects of

socio-economic and demographic variables on utilization of ANC services. To facilitate comparisons, we grouped the outcome variable into four response, that is, whether woman had used ANC service for '0' or '1-2' or '3' or '4+' times during her pregnancy. Finally, the levels of effects of each and/or joint predictors on respective categories of response variable will be assessed by using suitable measures (it could be odds ratio, Wald-test, or p-values).

2.3. Reliability and Limitation of the Data

The main strength of our study is the nature of the study population, which is derived from the national representative population; and the data collection was done face-to-face by trained interviewers [5]. Ethically the validity and acceptability of data is officially approved by both Ministry of Health Ethics committee (Addis Ababa, Ethiopia) and Opinion Research Corporation Macro International Incorporated (ORC Macro Inc., USA). Hence, the data found in Ethiopian DHS is reliable to assess the effects of studied variables on uses of maternal healthcare services at national level. However, the limitation of this study is the cross-sectional design using 2011 Ethiopian DHS. So that any inference concerning the level of significance and direction of association between utilization of maternal healthcare services and studied factors in recent time is speculated.

3. BASIC FINDINGS

3.1. Descriptive Information of the Respondents

The analysis of this study is based on 7764 women respondents who had given at least one birth within five years preceding the survey. The descriptive information showed that the median age of women to have first birth was 20 years.

Information found in Figure **1** shows among the total sample, 54.9% of mothers were not visited by any health professionals (midwifes, nurse or doctor) at least one times during their pregnancy. Whereas, 11.2% and 11.6% of women were visited "1-2" and "3" times to get prenatal services, respectively. Small proportions (22.3%) of women were following antenatal care four or more times. Parallel to this, large proportion (82.6%) of mother had not received health professionals' assistance during delivery (Figure **1**).

Again, Figure **1** shows in the country half of the proportion (51%) of women had not received any health care during pregnancy, at time of delivery and
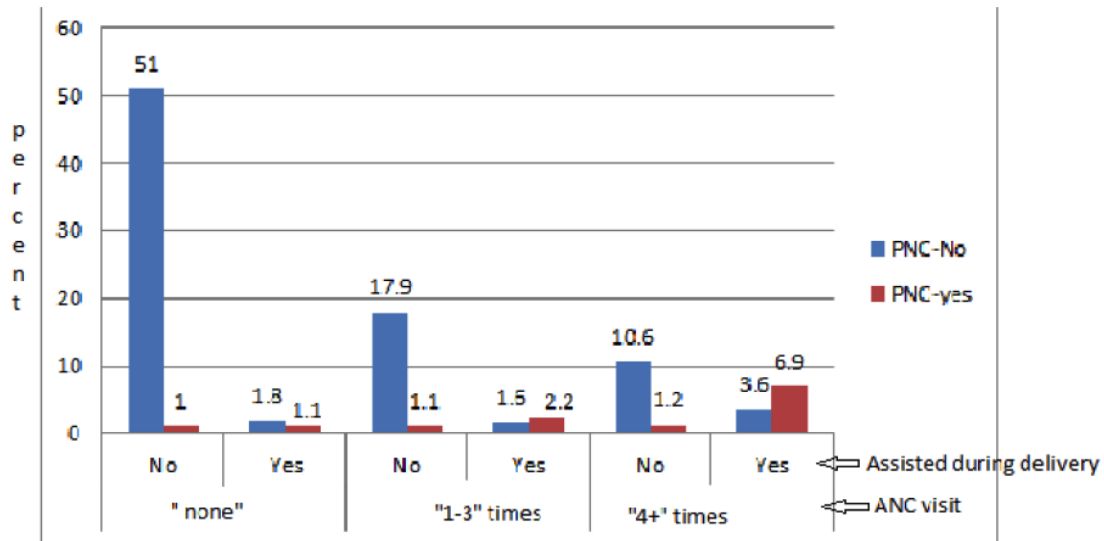
Figure 1: Bar graph for percentage distribution of mothers who were received the three indictors of MHC services.

after delivery. Too small proportion (6.9%) of women used three required maternal healthcare services, such as antenatal care at least four times during pregnancy, professionals' assistance during childbirth and heath check-up within six weeks of birth.

3.2. Cross-Tabulation and Bivariate Measures Based on Socio-Economic and Demographic Factors

Among total female participants, a significant percentage (66.8 %) of women had no formal education, whereas 27% were at primary level and lower proportion (6.2%) of sampled women had both secondary and higher education (Table **1**). A significant proportion (80.5%) of women was residing in rural areas. While, only 19.5% of women participated from urban residence. The percentage distribution of women analogous to wealth status also showed different proportions. Twenty nine percent of women were from lowest wealth quintile, 17.4% from poor families, 21.4% from richest and remaining 31.9% were from middle and rich family groups (Table **1**).

The bivariate measure from Table **1** displayed that only 13.3% of sampled women with no-education attained prenatal services at least four times; and 32.7, 70 and 79.8 percent of women from primary, secondary and higher education groups used the ANC service four or more times during pregnancy, respectively. These indicated, through holding other covariates' effect constant, women with higher education were six (79.8% /13.3%) times more likely to have four or more times the antenatal care than women with no formal education. As expected, the chi-square value shows

presence of significant association between utilization of MHC services and education of women (Table **1**).

Again, from bivariate analysis we found that religion was significantly associated with utilization of maternal healthcare services. Women from orthodox religion were more likely to use prenatal care, assistance during delivery and postnatal services from health professionals than other religion groups (Table **1**).

Regardless of effects of women's education, husband's education also found to be a significant background factor on utilization of maternal healthcare services. A higher proportion of women along with better education of husband were utilized ANC, assisted during birth and postnatal care. Women who possibly had taken decision for self and their family choice were more likely to attain four or more times for antenatal care, use professionals' assistance during delivery and also receiving postnatal care.

Lower proportion (14%) of women who were residing in rural area had received ANC at least four times from health professionals. Wealth status also found to be prominent factor that influences the utilization of maternal health services in Ethiopia. As example, women in richest family were 7.1 (55.9% ÷7.8%) times more likely to attend antenatal care at least four times compared to poorest women. The chi-square output also shows the women's working status was an important predictor for utilization of maternal health care services. Relatively, high proportion of women who had been working was more likely to use ANC, assistance during delivery, and postnatal care than women who were not working. ANC, skilled

Table 1: **Percentage and Chi-Square Measures of Women who Used ANC, Skilled Delivery and PNC Services Based on Socio-Economic and Demographic Characteristics**

Characteristics	Number of women		Women who used ANC at least 4 times		Women who were assisted during delivery		Women who used PNC	
	N	*%*	*%*	*X²*	*%*	*X²*	*%*	*X²*
education level								
No-education	5184	66.8	13.3		8.1		6.9	
Primary	2095	27.0	32.7	*P< .001*	25.8	*P< .001*	18.8	*P< .001*
Secondary	312	4.0	70.8		75.6		57.9	
Higher	173	2.2	79.8		86.7		68.0	
Religion								
Orthodox	2694	34.7	31.7		24.8		19.4	
Catholic	79	1.0	21.5		16.9		9.7	
Protestant	1479	19.0	17.7	*P< .001*	12.7	*P< .001*	10.6	*P< .001*
Muslim	3359	43.3	17.5		13.8		10.8	
Others	60	0.8	5.0		8.3		1.3	
Missing	93	1.2						
Husband's education level								
No-education	3932	50.6	11.4		6.0		5.9	
Primary	2790	35.9	26.3		18.8		13.2	
Secondary	594	7.7	48.3	*P< .001*	53.0	*P< .001*	40.4	*P< .001*
Higher	372	4.8	60.3		62.5		49.4	
Missing	76	1.0						
Sex of household head								
Male	6202	79.9	21.6	*P< .001*	15.6	*P< .001*	11.8	*P< .001*
Female	1562	20.1	25.3		24.2		20.3	
Residence								
Urban	1513	19.5	56.5	*P< .001*	62.7	*P< .001*	43.7	*P< .001*
Rural	6251	80.5	14.0		6.4		6.2	
Wealth index								
Poorest	2279	29.4	7.8		5.8		4.7	
Poor	1354	17.4	11.7		5.1		5.1	
Middle	1241	16.0	15.5	*P< .001*	8.8	*P< .001*	5.1	*P< .001*
Rich	1229	15.9	22.5		11.6		10.5	
Richest	1661	21.4	55.9		58.4		41.1	
Respondents working								
No	5309	68.4	18.8		14.5		12.0	
Yes	2445	31.5	29.9	*P<.001*	23.7	*P<.001*	17.6	P<.001
Missing	10	0.1						
Age group								
<=19	805	10.4	20.0		18.9		14.4	
20-24	1911	24.6	26.5		22.9		16.2	
25-29	2061	26.5	22.5		17.7		14.6	
30-34	1353	17.4	22.8	*P<.001*	16.0	*P<.001*	12.5	*P<.001*
35-39	898	11.6	19.0		10.1		9.6	
40$^+$	387	5.0	13.4		5.7		7.5	
Parity								
0	1477	19.0	34.8		36.6		26.4	
1	1336	17.2	30.2		25		17.3	
2	1083	13.9	19.7	*P<.001*	15.2	*P<.001*	12.5	*P<.001*
3	973	12.5	18.0		10.6		10.3	
4	805	10.4	17.9		10		8.5	
5+	2090	26.9	13.5		6		6.9	
Any child had died before								
None has died	5493	70.7	25.4	*P<.001*	21.1	*P<.001*	16.1	*P<.001*
One or more	2271	29.3	14.9		8.3		8.0	
All respondent	7764	100	22.3%		17.3%		13.5%	

Note that: In the above table, in order to reduce redundancies in bivariate analysis, we only focused on uses of ANC services at least four times during their pregnancy.

assistance delivery and postnatal coverage are also associated with mother's age, number of children they have had and with survival status of previous child(ren). Parity was negatively associated with utilization of all maternal health components. Specifically, 36.6% of mothers with no-child before and 6% of mothers who had 5 or more children received assistance from health professionals during delivery, respectively (Table **1**).

To summarize, in the bivariate analysis an attempt is made to see the marginal effects of each independent variables on utilization of maternity care. As expected the bivariate analysis showed all socio-economic and demographic predictors displayed a significant association with utilization of maternal healthcare services. Hence, all variables that are measured in bivariate analysis will be considered in multivariate logistic regression in order to assess the joint effects of all predictors.

3.3. Multinomial Logistic regression

3.3.1. Antenatal Care

In this section, multinomial logistic regression is applied to see the combined effects of studying factors on uses of prenatal care. Alike bivariate measures, the regression output in Table **2** showed that including all characteristics in one logistic-regression did not alter the existence of significant association between many predictor variables and number of ANC visits. However, the degrees of association between utilization of ANC and few variables, such as survival status of previous child (SIPC) and sex of household head did not show any significance. Particularly, women with no formal education were 70% less likely to receive ANC service for three times compared with higher educated women (OR = 0.3; 95% CI (0.12, 0.73)). However, there were no significant differences between primary, secondary and higher educated women to utilize prenatal care for "3" times. Parallel to this, the odds of utilizing ANC for at least four times were 0.33 and 0.16 times for women with primary and no-educated compared to those higher educated women's (Table **2**). That means, women at higher education were about 203 and 525% more likely to use antenatal care for at least four times than women from primary and no-education, respectively.

Similar to other predictors, religious affiliation had not shown significant impact on uses of ANC for one or two times. Whereas, the proportion of women who

were received antenatal care for three and more times displayed marked difference between Orthodox and "Other" religion followers. As compared to followers of "Other" religion, Orthodox women showed 163% and 231% more tendency to visit health professionals for "three" and four or more times during pregnancy, respectively. On the other hand, antenatal coverage between Muslim, Catholic, Protestant and Other religion followers were not significantly different (Table **2**).

Through controlling all other variables in the model, the odds of using of antenatal care among women whose husband's had no formal education showed about 54% lower compared to women whose husbands' had higher education. Whereas, other groups of women clustered by their husband's level of education did not show any significant difference on uses of maternity care during pregnancy. Residence and wealth quintile of women were also other important predictors that influence utilization of ANC services from health professionals. In particular, women residing in urban area were about 49 and 119% more likely to receive ANC services for "three" and "four or more" times than women who were lived in rural places, respectively. Consistent with cross-tabulation and bivariate analysis, the logistic output also shows existence of significant positive association between women's economic condition and utilization of prenatal care (Table **2**).

Women that were age under 20 exhibited less likelihood on uses of ANC service for "3" and "four or more" times compared with other higher age groups. From logistic regression in Table **2**, other than reference category, the overlaps of the 95% confidence interval of odds ratio suggests the existence of non-significant disparities on utilization of ANC among all other age groups of women. Mothers who were not working in any private or governmental organization had less possibility by 19% and 36% to receive ANC for "3" and "4+" times, respectively (Table **2**). The number of children a mother have had before found also an important predictor that clearly affects the level of utilization of antenatal care. Women with no-child or with lower number of children relatively had high probability to use MHC services during pregnancy. For example, the estimated odds of receiving prenatal check-up for "3" and "4 or more" times by women at parity zero were 1.70 and 2.85 times higher than women at parity 5 or more.

Table 2:   Unadjusted Odds Ratio and its 95% CI from Multinomial Logistic Regression to Identify the Effects of Background Factors on Utilization of Prenatal Care

Variable	Used ANC "1-2" times		Used ANC "3" times		used ANC "4+" times	
	OR [95% CI OR]		OR [95% CI OR]		OR [95% CI OR]	
Education						
No-education	0.64	[0.18, 2.26]	0.30	[0.12, 0.73]	0.16	[0.07, 0.35]
Primary	0.90	[0.26, 3.17]	0.50	[0.21, 1.21]	0.33	[0.15, 0.72]
secondary	1.70	[0.43, 6.76]	1.39	[0.52, 3.76]	1.15	[0.47, 2.78]
higher (ref)	1	----------	1	--------	1	-------
Religion						
Orthodox	1.67	[0.95, 2.92]	2.63	[1.26, 5.53]	3.31	[1.65, 6.63]
Catholic	1.21	[0.48, 3.01]	1.88	[0.66, 5.34]	1.71	[0.65, 4.50]
Protestant	1.12	[0.63, 1.99]	1.64	[0.77, 3.47]	1.58	[0.78, 3.20]
Muslim	1.08	[0.62, 1.90]	1.85	[0.88, 3.87]	1.82	[0.91, 3.64]
Others(ref)	1	---------	1	--------	1	-------
Husband's education						
No-education	0.70	[0.35, 1.42]	0.94	[0.43, 2.06]	0.46	[0.25, 0.83]
Primary	1.03	[0.51, 2.10]	1.21	[0.55, 2.65]	0.78	[0.43, 1.41]
Secondary	1.09	[0.50, 2.36]	1.26	[0.55, 2.90]	0.89	[0.47, 1.69]
Higher(ref)	1	------	1	------	1	-------
Residence						
Rural (ref)	1	------	1	------	1	-------
Urban	1.36	[0.96, 1.92]	1.49	[1.11, 2.02]	2.19	[1.71, 2.82]
Wealth index						
Poorest	0.72	[0.50, 1.03]	0.25	[0.18, 0.35]	0.18	[0.13, 0.23]
Poor	0.91	[0.62, 1.32]	0.45	[0.32, 0.62]	0.26	[0.20, 0.36]
Middle	1.08	[0.74, 1.57]	0.47	[0.34, 0.66]	0.37	[0.28, 0.49]
Rich	0.95	[0.66, 1.37]	0.57	[0.41, 0.77]	0.47	[0.36, 0.62]
Richest (ref)	1	-------	1	-------	1	-------
Age group						
<19(ref)	1	------	1	-------	1	-------
20-24	1.04	[0.78, 1.38]	1.46	[1.08, 1.97]	1.85	[1.42, 2.42]
25-29	0.90	[0.65, 1.24]	1.26	[0.89, 1.77]	2.03	[1.50, 2.74]
30-34	0.90	[0.61, 1.31]	1.82	[1.24, 2.68]	3.07	[2.18, 4.32]
35-39	0.89	[0.58, 1.37]	1.86	[1.21, 2.86]	3.38	[2.31, 4.95]
40[+]	1.14	[0.70, 1.87]	1.92	[1.15, 3.22]	3.24	[2.02, 5.19]
Sex of household head						
Male	0.97	[0.80, 1.19]	0.91	[0.75, 1.11]	1.11	[0.93, 1.33]
Female (ref)	1	---------	1	--------	1	--------
Is a mother working						
No	1.07	[0.90, 1.28]	0.81	[0.69, 0.96]	0.74	[0.64, 0.86]
Yes (ref)	1	--------	1	--------	1	-------
No. of child(ren) died before						
none	0.97	[0.80, 1.17]	1.01	[0.82, 1.23]	0.93	[0.78, 1.12]
one or more (ref)	1	----------	1	---------	1	-------
Parity						
0	1.28	[0.87, 1.89]	1.70	[1.15, 2.49]	2.85	[2.03, 4.01]
1	1.20	[0.85, 1.71]	1.47	[1.04, 2.07]	2.34	[1.72, 3.17]
2	1.18	[0.86, 1.63]	1.32	[0.95, 1.82]	1.38	[1.03, 1.86]
3	1.16	[0.85, 1.57]	1.41	[1.04, 1.91]	1.51	[1.14, 1.99]
4	1.28	[0.95, 1.72]	1.42	[1.06, 1.92]	1.62	[1.23, 2.12]
5+(ref)	1	---------	1	--------	1	------

Note: In order to facilitate comparisons among groups of women on utilization of ANC service, those who did not used the service for at least one times are taken as reference.

Table 3: Unadjusted Odds Ratio and its 95% CI to Assess the Effects of Background Factors on Uses of Skilled Assistance Delivery and Postnatal Care

Variable	Category	Assisted during delivery			Postnatal care		
		Exp(β)	95% CI of exp(β)		Exp(β) 95% CI of exp(β)		
education level	No-education (ref)	1			1		
	Primary	0.88	[0.72	1.07]	1.25	[1.02	1.53]
	secondary	1.87	[1.27	2.76]	2.03	[1.46	2.83]
	higher	3.06	[1.69	5.56]	2.45	[1.56	3.85]
Religion	Orthodox(ref)	1			1		
	Catholic	0.64	[0.27	1.52]	0.61	[0.25	1.52]
	Protestant	0.54	[0.42	0.68]	0.94	[0.74	1.20]
	Muslim	0.49	[0.41	0.57]	0.91	[0.76	1.09]
	Others	0.64	[0.33	1.22]	0.25	[0.06	1.03]
Husband's education	No-education(ref)	1			1		
	Primary	1.01	[0.83	1.23]	1.09	[0.88	1.35]
	Secondary	1.73	[1.28	2.33]	1.99	[1.50	2.65]
	Higher	1.21	[0.82	1.79]	1.79	[1.26	2.55]
Residence	Rural (ref)						
	Urban	5.66	[4.36	7.35]	2.51	[1.93	3.26]
Wealth index	Poorest (ref)						
	Poor	0.93	[0.74	1.12]	1.01	[0.72	1.40]
	Middle	0.84	[0.69	1.01]	0.89	[0.63	1.25]
	Rich	1.27	[1.13	1.42]	1.46	[1.09	1.96]
	Richest	1.43	[1.12	1.74]	1.95	[1.40	2.72]
Age group	<19 (ref)						
	20-24	1.16	[0.83	1.51]	0.96	[0.72	1.29]
	25-29	0.52	[0.39	0.69]	1.15	[0.83	1.60]
	30-34	0.63	[0.44	0.89]	1.03	[0.70	1.51]
	35-39	0.55	[0.37	0.84]	1.12	[0.72	1.74]
	40^{+}	0.52	[0.29	0.95]	1.31	[0.75	2.31]
-Sex of household head	Male (ref)						
	Female	0.83	[0.68	1.01]	1.42	[1.18	1.72]
-Is a mother working	No (ref)						
	Yes	0.94	[0.79	1.12]	0.96	[0.81	1.14]
-No. of child(ren) died before	none (ref)						
	one or more	1.0	[0.80	1.30]	1.01	[0.80	1.28]
Use of ANC	None (ref)						
	1-2	0.95	[0.71	1.25]	2.04	[1.51	2.75]
	3	1.35	[1.05	1.75]	3.11	[2.40	4.03]
	4+	2.78	[2.25	3.43]	4.65	[3.71	5.83]
Parity	0(ref)						
	1	0.33	[0.26	0.42]	0.68	[0.53	0.87]
	2	0.26	[0.19	0.35]	0.69	[0.51	0.94]
	3	0.20	[0.14	0.28]	0.75	[0.53	1.06]
	4	0.20	[0.13	0.29]	0.64	[0.43	0.95]
	5+	0.15	[0.10	0.22]	0.67	[0.45	0.99]

3.3.2. Utilization of Skilled Assistance during Delivery and Postnatal Care

In this section, binary logistic regression is computed to assess the effects of socio-economic and demographic variables on utilization of skilled delivery and postnatal care. Alike bivariate results, the logistic regression output in Table **3** reinforces women's and husband's education, place of residence, wealth status, parity and number of ANC visit as the most relevant determinants to utilize both skilled delivery and postnatal care. Women's age and disparities on religion

also were important determinant factors on using skilled assistance delivery; but not were for postnatal care utilization. On other hand, women who had better position on decision of their and family's choice were more likely (around 42%) to receive postnatal care, but not showed significant difference on uses of antenatal care or assistance delivery.

Education background of women was significant predictor both for utilizations of skilled delivery and PNC services. In particular, women from higher education were three times more likely and those women with secondary education were about 1.9 times more likely in order to use professionals' assistance during childbirth compared with women from no-education (Table **3**). However, there was no significance difference between those had no formal education and primary educated women's on uses of assistance during delivery. On other hand, women from primary, secondary and higher education were 25%, 103% and 145% more tends to have health check-up after childbirth compared with non-educated women, respectively. Women from Orthodox religion were with high chance to attend assisted delivery compared with Protestant and Muslim religion followers. That means, Orthodox religion women were in advance by 46% and 51% to use maternity care during delivery than protestant and Muslim women, respectively (Table **3**). A significant difference was not observed between Orthodox and Catholic, and again between Orthodox and Other religion factions.

According to logistic regression result in Table **3**, one of important characteristic that showed huge difference in the proportion of uses of assistance during delivery as well as on uses of postnatal care was husband's education. Through controlling the effects of other variables in the model, women whose partners had secondary education were 73 percent more likely to receive skilled assistance during delivery compared to women where whose spouse had no formal education. On another hand, the proportions of women along whose husbands' educations were higher, primary and no-education comparatively did not show significant difference on utilization of skilled delivery. The odds of receiving assistance during delivery and postnatal care for women's who were residing in urban area, respectively, were 5.66 and 2.51 times higher than those living in rural places (Table **3**).

Another important factor found to be significant on the uses of maternal healthcare is wealth status of household a woman belongs to. The binary logistic

regression reveals that the odds of receiving assistance during delivery was 1.43 times higher if the woman was from richest wealth quintile as compared to those poorest woman (OR =1.43; 95% CI OR 1.12, 1.74); and about 1.3 times higher the odd if the woman was from rich compared to poorest women (OR 1.27; 95% CI (1.13, 1.42)). For other groups of women, such as middle and poor wealth quintiles, the odds of using both skilled assistance delivery and postnatal care were found to be statistically non-significant compared to poorest ones. However, the survival status of previous child(ren) and mother's working status were not significant predictors for uses of skilled delivery and postnatal care. Besides, age of women was negatively associated with uses of professionals' assistance during birth, but not was with uses of postnatal care (Table **3**).

Using antenatal care during pregnancy was positively influenced the level of utilization of skilled assistance delivery and uses of postnatal care. For instance, women who had received antenatal care for "three" and "four or more" times, respectively, were more likely to admit assistance delivery by 35 and 178 percent (Table **3**). While, using ANC for "1-2"times during pregnancy did not show a significant impact on utilization of skilled assistance during delivery compared with women who did not attained ANC. On other hand, the odds of receiving postnatal care was 2.04 times higher if the women attained ANC for one or two times; about 3.11 times was more if the woman attained ANC for three times, and about 3.56 times greater the odds if the woman visited ANC "four or more" times compared with those women who had not received any prenatal care (Table **3**).

Similar to the result obtained from uses of ANC, professionals' assistance during delivery and utilization of health care after child-birth are substantially influenced by birth-orders (parity). The results of the multivariate logistic regression shows women at lower birth order have high probability of receiving skilled assistance delivery and postnatal care. For example, the estimated odd of using skilled delivery by mother at her second birth compared to the reference case (first birth) was 0.33. This means, controlling other variables effect in the model, at first birth mothers nearly three-fold more likely to use health professionals' assistance during delivery compared to mothers at their second birth (Table **3**).

In general, from both binary and multinomial logistic regression we identified the common and unique socio-

Table 4:   Common and Unique Factors Influencing Uses of ANC, Skilled Assistance Delivery and PNC

Common background factors that affect uses of three components of MHC services	Socio-demographic and economic factors that affect uniquely utilization of the following maternity cares		
	ANC	**Skilled delivery**	**PNC**
- Education of mother - husband's education - Residence - Wealth status - Parity	Working status Religion Age of mother	Religion Age of mother Number of ANC visit	Sex of household head Number of ANC visit

demographic and economic factors that influence utilization of ANC, skilled delivery and PNC. Regardless of the degree of association, Table **4** displays the common and unique factors influencing utilization of antenatal, skilled delivery and postnatal care. Besides, survival status of previous child found to be non-significant factor on utilizations of all three components of maternity cares.

4. DISCUSSIONS

In this study a total of 7764 women who had at least one birth preceding the survey were taken in the analysis to investigate the factors that influencing the uses of maternal health care services in Ethiopia. It was seen that around 45% of women were received antenatal care at least one time; about 17.3% of women assisted during their child birth and 13% received health care within six weeks of delivery (see Table **1**). However, only 22.3 % of women were received health care at least four times during pregnancy as WHO recommendation. This status indicates the use of maternity care services in Ethiopia is among the lower most from sub- Saharan countries listed on Global Health Observatory report [8]. Hence, consistent with related studies conducted in Ethiopia and other developing countries, relatively high proportion of women were used ANC service compared with utilization of skilled assistance delivery and postnatal care [7, 10]. This possibly explained may be due to unpredictability of onset of labor and other constraints, such as poor infrastructure (road, transportation, ambulance, etc.), high cost of delivery services and also cultural influence for preference of healthcare during child-birth [3, 11].

From logistic regression results, different socio-economic and demographic predictors were found to be strongly associated with the uses of antenatal, skilled delivery and postnatal healthcare services. Among these, significant variables that affect utilization of ANC are mother's and husband's education, religion,

residence, wealth status, age, parity and working status of mother. Survival index of previous child(ren) and sex of household head were not found as prominent factor influences the number of antenatal visits in the country (see Table **2**). On the other hand, sex of household head, working status and previous number of children died belongs to a woman did not contribute measurable impact on uses of professionals' assistance during delivery. It has also seen that women's education, wealth status, husband's education, residence, parity and numbers of ANC visit were strong attributers on uses of healthcare service within six weeks of childbirth. However, working status of women, religion, age and survival index of previous child were not strong predictors for uses PNC (see Table **3**).

Therefore, alike other many studies [12, 13], women who residing in urban area were in better position to utilize all three components of maternity care compared with women living in rural areas. For instance, in order to attain ANC for at least four times during pregnancy, women who residing in urban place were 2.2 times higher than women living in rural places (Table **2**). In most of developing countries, it is common that health facilities, such as health providers, health equipment, medicines etc. are not equitably distributed between urban and rural residences (UNICEF, 2011) [4], which became reason for poor quality of services and also low utilization of maternal healthcare services in rural places.

Compatible with other studies [7, 14] this finding also confirmed the strong positive association between women's education attainment and levels of utilization of maternity care (see Tables **2** & **3**). Women with higher education, respectively, showed 54, 206 and 145 percent more to use ANC, skilled assistance delivery and PNC compared to non-educated women (see Tables **2** & **3**). It is factual that better educated women could have more awareness for maternity care. Because, they might have better understanding about the outcomes of poor maternal healthcare; and they

expected to have enhanced knowledge to use required healthcare services effectively. Parallel to this, husband's education also found to be positive significant predictor for the number of antenatal visits, skilled delivery and postnatal care. It is also believed that partners from higher education have advanced information where and when his wife used important MHC services [14].

As we saw in many literatures, the result indicates that wealth status of women was one of tumbling factor to use maternal health care services in Ethiopia. Women with low wealth quintiles often showed lowermost maternal healthcare coverage. It is expected that demand and accessing of professional health care are mostly correlated with family's fortune or stipend to easily cover costs of transportation, treatment fees and other related supplies [11]. In this study we found that mother's age as one of important predictor variable that influences utilization of maternal health care services. However, the direction of effect on different components of maternity care was not persistent (see Tables **2** & **3**). The relation between mother's age and uses of ANC was positive. It is compatible with other studies [12, 15], which asserted mother's age as one character that could help to have experience and knowledge about the benefit of maternal health care. On other hand, in this study we found that high proportion of younger mothers practiced professionals' assistance during delivery that has quiet reverse direction compared with its effects on ANC. This might be due to older mothers have more experience about child-birth and have high confidence for labour that could affect their likelihood of receiving health professionals' assistance at time of delivery.

Hence, younger women found in better position to use skilled assistance during delivery compared to older age groups. Other studies are supported this concept [16, 17]; and also postulated other possible contributing factor, such as improvement of educational opportunities that could help younger generation to have better knowledge in utilizing of MHC services. Means, in Ethiopia high proportion of younger mothers have higher educational attainment compared to older women's due progressive improvement of education opportunities. However, the logistic regression result showed age of mother was not a significant factor on uses of postnatal care (see Table **3**). Similar finding conducted by Ethiopian Society of Population studies based on 2005 EDHS found that ages of women was not a strong predictor on uses of postnatal care [7].

From result, high proportions of Orthodox women were more likely to access ANC services than other religion groups. Moreover, there was no significant difference between Protestant, Muslim, Catholic and "Other" religion groups to use health care during pregnancy. Similarly, the logistic regression in Table **3** shows high proportions of Orthodox women were more alert to use skilled delivery than Muslim and Protestant women. Religion could affect individuals' belief, norms and values on health seeking behaviour that became reason for variation of outcome measures among different religion groups of women. For example, in bivariate analysis "Other" religion group was the lowermost category who used ANC service than Orthodox, Muslim, Catholic and Protestant women. Because "Other" religion follower of women mainly includes traditional followers who mostly practiced traditional beliefs that obviously have negative effect on utilization of modern health care services.

One of interesting result obtained in this study is also about sex of household head. Women who had better power on decision of their and family's interest were more likely to utilize PNC service. It is likely that having potential contribution on decision of household resource and related issues have positive outcome on uses of maternal health care [18]. Especially, in Ethiopia majority of men partners are regulator of household resources and decision makers when and where women should have health care services.

As expected, the result confirms that birth order or parity was a significant predictor on utilization of maternity care. High proportion of women with higher parity did not tend to use ANC, skilled assistance delivery as well as PNC service. Its effect has shown similar direction as other studies conducted based on 2000 and 2005 Ethiopia DHS data by Mekonen *et al*, (2003) and Ethiopian Societies of Population Studies (2008) [7, 13], respectively. It is thoughtful that women with no-child or few children moderately need to receive health care due to perceived risks. In addition to this modest confidence, women that have higher parities (high number of children) may face limitation of resources i.e. time and related properties [14].

At the last, the finding of this study shows a wide significant variation on utilization of professionals' assistance during delivery and postnatal care between women who used ANC and who did not used the service. It is not surprise that, a woman who had better understanding for utilization of antenatal care expected

to have also good awareness to access healthcare services during delivery and postnatal period.

Again, one of the important measures that have done in this study is identifying common and unique factors that influencing the three components of maternity care (Table **4**). It is important in process of promoting the utilizations of required healthcare services as long as the unique and common influential factors of MHC services are distinguished. Studies conducted by Mekonnen Y. *et al*. and Ethiopian societies of Population studies based on 2000 and 2005 Ethiopian DHS data, respectively, identified individuals' background factor, such as residence, education of women and wealth status found to be common significant determinants on uses of ANC, skilled delivery and PNC [7, 13]. In this study, these background factors have also showed consistently significant effect in all components of maternity care.

5. CONCLUSION AND RECOMMENDATIONS

In conclusion, the study has identified several important factors which were measurably influenced the uses of three components of maternity care (ANC, skilled assistance delivery and PNC). Even though the degree of association of the covariates are varied, the regression result displayed that women's place of residence, wealth status, women's and husband's education and parity found to be significant on utilization of antenatal, skilled assistance delivery and postnatal care. Whereas, mother's working status and husband's education were uniquely influenced the uses of ANC and PNC, respectively. Both religious affiliation and age of women were significant predictors on utilization of ANC and skilled delivery. Moreover, the proportion of mothers who used maternal healthcare in the country found to be very low and the rate was not equally distributed in all groups of women. Especially, those women who were living in rural areas and also those from low socio-economic groups exhibited less likelihood in using maternal healthcare services.

Hence, possible interventions are required through taking an account of these significant characteristics of the study population in order to promote uses of maternal healthcare services; and further to reduce children and mothers' morbidity and mortality in the country. It is also important to design appropriate package in order to address the services to those vulnerable groups, and then minimizing the devastating consequences associated at time of pregnancy and birth delivery. For instance, utilizations of ANC, skilled

delivery and PNC had direct relation with husband's education; uses of PNC were significantly influenced by sex of household head. Hence, it is important to consider the role of partners in promoting of using maternal healthcare services.

Moreover, I recommend that policy makers to consider the strong positive association of using antenatal care on choices of professionals' assistance during delivery and health check-up preference after childbirth.

ABBREVIATIONS

ANC   = Antenatal care

CI   = Confidence interval

EDHS   = Ethiopian demographic and health survey

MHC   = Maternal health care

MMR   = Maternal mortality ratio

OR   = Odds ratio

PNC   = Postnatal care

WHO   = World health organization

UNICEF = United nations international children's emergency fund

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