Statistical Analysis of Delivery Care Service Utilization of Women in Gurage Zone, Ethiopia

Kassahun Trueha[1], Ayele Gebeyehu[1] and Gedif Mulat[1]

[1]Wolkite University Department of Statistics

DOI: 10.29322/IJSRP.8.10.2018.p8265

http://dx.doi.org/10.29322/IJSRP.8.10.2018.p8265

Abstract: Delivery care through access to health facilities and skilled health personnel are the main important interventions for safe motherhood and the child. Despite the international emphasis on the need to address the unmet health needs of pregnant women and children, progress in reducing maternal mortality has been slow. This research was conducted to fill the gaps, mothers not delivering at health institution, by identifying factors which affect delivery care services utilization of mothers in Gurage zone and the prevalence of delivery care service utilization was also estimated. 1056 women who gave birth in the past five years have been considered in the study from two woredas (Gummer and Abeshige) and one city administration (Butajira). About 750 (71%) of the women delivered at health institution and about 306 (29%) of them delivered at home. Mothers level of education, job category of women, frequency of watching television, information about antenatal care, frequency of antenatal care service during pregnancy significantly affect place of delivery of women. But husband's level of education, place of residence, religion, age of women, distance from health institution did not affect place of delivery of women. Based on the finding of this research we recommend that the governmental and non – governmental organization should work hard to address delivery care service utilization among women in reproductive age. Awareness creation about the service and empowering women should be considered.

Keywords: Maternal Delivery, Logistic regression, Gurage zone

1. Background

Improving delivery care system is the main important interventions for safe delivery of child and life of the mother. Historically, increasing women's access to health facilities with the capacity to provide emergency obstetric care has been responsible for large drops in maternal mortality [1].

International and national organization are working hard to address the unmet health needs of pregnant women and children, but the progress in reducing maternal mortality has been slow. According to estimates by WHO, UNICEF, UNFPA, and the World Bank, 358,000 maternal deaths occurred worldwide from preventable complications during pregnancy and childbirth. Moreover, 99% of maternal deaths (355,000) in 2008 occurred in developing countries, and an estimated 87% (313,000) occurred in sub-Saharan Africa and South Asia (WHO, 2008).This is particularly worrying in sub-Saharan Africa where over 162,000 women still die each year during pregnancy and childbirth, most of them because of the lack of access to skilled delivery attendance and emergency care [**2-6]**.

With a maternal mortality ratio of 673 per 100,000 live births and 19,000 maternal deaths annually, Ethiopia is a major contributor to the worldwide death toll of mothers. Although improvements have been reported in regard to reducing infant and child mortality in the country, there has been slow progress regarding Millennium Development Goal 5, the cornerstone of maternal health [7].

According to 2011 Ethiopian demographic and health survey (EDHS), only 10% of births were delivered at a health facility (9% in a public facility and 1% in a private facility). Nine women in every ten have delivered at home. The percentage of deliveries in a health facility doubled by 5% from the 2005 EDHS, while home deliveries decreased slightly from 94% to the current level of 90%. A skilled birth attendant (4% by a doctor and 7% by a nurse or midwifery) assisted 10% of births, a health extension workers (HEW) assisted less than a relative, or some other person assisted only 1% of births. Similarly, from the report (2011 EDHS), 28% of births have assisted by a traditional birth attendants, while 4% of births were unattended. Skilled assistance at delivery increased from 6 to 10% in the last six years [8].

This study aims to determine the prevalence of maternal health care utilization and explores its determinant among women aged 15–49 years in Guraghe zone, SNNP, Ethiopia.

2. Materials and Methods

The study was conducted in Gurage zone, which consists13 Woredas and two cities admistration. The study population was all women in the reproductive age (15-49 years) who gave birth in the last 5 years. The estimated number of women in the reproductive age is about 375,109 (23.3% of the total population).
To get the appropriate respondents, two – stage cluster sampling was employed. From 13 woreda and two cities, three of them (Butajira city, Abeshige and Gumer woreda) were selected randomly and the respondents from each cluster were also selected accordingly.

Using statistical sample size determination formula (Cochran, 2002), considering all necessary inputs we found the sample size was 1,056, we taking proportion, p = 0.55 [9]

Structured questionnaire was used for data collection. In case of more than one delivery in last five year for particular respondent, we focused on the last delivery. Data collectors were recruited and trained by the researcher on how to use the research instrument and the easier way to collect data from respondents.

Variables

The response variable of this study was the place of delivery (place where mother's gave birth), and coded as 0 if a mother gave birth at health institute and 1 if at home.

The independent variables includes, items for socio demographic characteristics, socio economic factors, health system factors and cultural factors.

Binary Logistic Regression model

Binary logistic regression is typically used when the dependent variable is dichotomous and the independent variables are either continuous or categorical variables. One key assumption in regular binary logistic regression is that observations are independent of each other. Violations of the assumption of independence of observations may results in incorrect statistical inferences due to biased standard errors. [10]

The binary logistic regression model is defined as:

$$P(x_i) = \frac{e^{(\beta_0+\beta_1 X_{i1}+\cdots+\beta_p X_{ip})}}{1+e^{(\beta_0+\beta_1 X_{i1}+\cdots+\beta_p X_{ip})}} = \frac{e^{x\beta}}{1+e^{x\beta}} = \frac{1}{1+e^{-x\beta}}$$

Where, β_0 = the constant of the equation and β_i= the coefficient of the ith predictor

The relationship between the predictor and response variables is not a linear function in logistic regression; instead, the logarithmic transformation of equation yields the linear relationship between the predictor and response variables.

The logit transformation of $P(x_i)$ given as follows:

$$\text{logit}[P(x_i)] = \log\left(\frac{P(x_i)}{1-P(x_i)}\right) = \beta_0 + \beta_1 x_{i1} + \beta_2 x_{i2} + \cdots + \beta_p x_{ip} \quad i = 1,2,\ldots,n$$

The coefficient can be interpreted as the change in the log-odds associated with a one unit change in the corresponding independent variable or the odd increases multiplicatively by e^{β} for every one unit change increase in x.

Logistic regression is popular in part because it over – come many of the restrictive assumption of ordinals least square (OLS) regression. Like it doesn't assume linearity, the dependent variable need not normally distributed and so on.

Logistic regressions work with odds. The odds are simply the ratio of the probabilities for the two possible outcomes. If p is the probability that the event will occur, then 1 –p is the probability that the event will not occur: ,$odd = \frac{p}{1-p}$. In 2 × 2 tables, within row 1 the odds of success are $odd_1 = \frac{p_1}{1-p_1}$, and within row 2 the odds of success equal $odd_2 = \frac{p_2}{1-p_2}$,

The ratio of the odds from the two rows, which we call odds ratio, will be

$$P_i = \frac{odd_1}{odd_2} = \frac{\frac{p_1}{1-p_1}}{\frac{p_2}{1-p_2}}$$

Parameter Estimation

The general method of estimation that leads to the least squares function under the linear regression is called maximum likelihood. It is this method that provides the foundation for our approach to estimate the logistic regression model. In a very general sense the method of maximum likelihood yields values for the unknown parameters which maximize the probability of obtaining the observed set of data. In order to apply this method we must first construct a function called likelihood function. The maximum likelihood estimators of these parameters are chosen to be those values which maximize this function. Thus, the resulting estimators are those which agree most closely with the observed data.

Model Adequacy Checking

After the model is fitted it is important to check how the model adequacy is, which can tell us the goodness of fit of the model. For this research we used Hosmer – Lemeshow test, which measures the correspondence between the actual and predicted values of the dependent variable, and the Likelihood Ratio Test, which is a test of the significance of the difference between the likelihood ratio (-2LL) for the fitted model and the likelihood ratio for a reduced model.

3. RESULTS AND DISCUSSION

RESULTS

Descriptive Statistics and Chi-square Test of Association

The association between predictor variables and delivery care service utilization status was identified by conducting chi-square test of association.

From 1056 women respondents, 488 of them are from urban and 568 are from rural. Nearly half of them (49.6%) are orthodox, 34.8%) of them Muslim and the rest are Protestant and Catholic. About 750 (71%) of the women delivered at health institution and 306(29%) of them delivered at home. 73.4% of the women have information about ANC service.

Table 3.1 below reveals that mothers who lived in urban area have the lower home delivery status. More than half of the women (61.5%) in the study have a practice to visit for ANC more than four times. We can see all other results from the given table below.

Table 3.1: Maternal delivery status according to selected independent variables, 2017

Variables	N	Place of delivery		Chi-square value	DF	P - value
		Home	Health institution			
Place of residence						
Urban	488 (46.2%)	44(9%)	444(91%)	18.78	1	0.000
Rural	568 (53.2%)	103(18.1%)	465(81.9%)			
Mother's level of education						
Uneducated	385(36.6%)	69(17.9%)	316(82.1%)	19.35	3	0.001
Primary	380(36.1%)	57(15%)	323(85.0%)			
Secondary	121(11.5%)	6(5%)	115(95.0%)			
College and above	167(15.9%)	15(9.0%)	152(91.0%)			
Husband level of education						
Uneducated	293(27.9%)	64(21.8%)	229(78.2)	24.07	3	0.000
Primary	401(38.2%)	51(12.7%)	350(87.3)			
Secondary	160(15.3%)	13(8.1%)	147(91.9%)			
College and above	195(18.6%)	17(8.7%)	178(91.3%)			
Job category of mother						
Housewife	591(56.0%)	92(15.6%)	499(84.4%)	21.15	5	0.007
Merchant	156(14.8%)	23(14.7%)	133(85.3%)			
Causal laborer	74(7.0)	15(20.3%)	59(79.7%)			

Government institution	134(12.7%)	8(6.0%)	126(94.0%)			
NGO	29(2.7%)	0(0)	29(100%)			
Other	72(6.8%)	9(12.5%)	63(87.5%)			
Having information about ANC						
Yes	774 (73.4%)	91(11.8%)	683(88.2%)	9.95	1	0.002
No	281(26.6%)	55(19.6%)	226(80.4%)			
Frequency of ANC visit						
Not at all	72 (6.8%)	40 (55.6%)	32(44.4%)	100.66	3	0.000
One times	36 (9.4%)	15(41.7%)	21(58.3%)			
2-3 times	299 (28.3%)	31(10.4%)	268(89.6%)			
4 and above	649 (61.5)	61 (9.4%)	588 (90.6%)			
Frequency of watching TV						
Not at all	523 (50%)	89 (17.0%)	434 (83.0%)	19.5	3	0.000
Once a week	78(7.4%)	12(15.4%)	66 (84.6%)			
More than once in a week	80(7.6%)	15 (18.8%)	65 (81.3%)			
Always	366 (35.0%)	28 (7.7%)	338 (92.3%)			

Multi – variable Binary Logistic Regression Result

The significant variables from chi-square test of association and other additional variables were included in the multivariable binary logistic regression model. Six variables had significant joint impact in determining delivery care service utilization. The final binary logistic regression result is summarized in Table 3.2 below.

Table 3.2: Result of the Final Model, 2017

Variable	**Level**	***β***	**SE**	**Wald**	**Sig.**	**OR**
Mother Education	College and above (Ref.)					
	Uneducated	2.123	0.605	12.313	0.000	8.353
	Primary	1.681	0.580	8.404	0.004	5.371
	Secondary	0.084	0.638	0.017	0.895	1.087
Job category of women	Other (Ref.)					
	Housewife	-1.733	0.513	11.429	0.001	0.177
	Merchant	-2.113	0.552	14.645	0.000	0.121
	Causal labor	-2.224	0.599	13.790	0.000	0.108
	Gov. employed	-2.801	0.773	13.129	0.000	0.061
	NGO employed	-22.346	6.548	0.000	0.997	0.000
Distance		0.069	0.022	10.226	0.001	1.072
ANC	No (Ref.)					
	Yes	-0.523	0.226	5.334	0.021	0.593
ANC visit	Not at all (Ref.)					
	Only one time	-0.023	0.327	9.785	0.080	0.997
	2-3 time	-0.531	0.427	15.284	0.000	0.588
	4 and above	-0.789	0.273	18.809	0.000	0.454
TV	always (Ref.)					
	Not at all	2.448	0.256	91.578	0.000	11.570

	Once a week	1.566	0.370	17.891	0.000	4.787
	More than once	1.933	0.370	27.304	0.000	6.908

Based on table 3.2 the probability of delivery at home for mothers having no education is 8.353 times more likely than mothers having college and above level of education. The probability of delivery at home for mothers having primary education is 5.371 times more likely than mothers having college and above level of education but there is no significance difference on the place of delivery of women who have college and above education and women having secondary education when the effect of other variable is constant. The probability of delivery at home for mothers who have information about ANC is decreased by 40.7% (OR=0.593) than mothers who do not have information about ANC when the effect of other variables keep constant. There is no significance difference between mothers who do not have ANC visit and mothers having only one ANC visit during their pregnancy. The probability of delivery at home for mothers who have 2-3 times ANC visit is decreased by 41.2% (OR=0.0.588) than mothers who do not have ANC visit when the effect of other variables keep constant. The probability of delivery at home for mothers who have 4 and above times ANC visit is decreased by 54.6% (OR=0.454) than mothers who do not have ANC visit when the effect of other variable keep constant. The probability of delivery at home for mothers who do not watch TV is 11.570 (OR=11.570) more likely than mothers who watch TV always. The probability of delivery at home for mothers who watch TV once a week and more than once a week is 4.787 and 6.908 times more likely than mothers who watch TV always respectively by keeping the effect of other variables fixed.

Table 3.3: Hosmer and Lemeshow Test

Chi-Square	Df	Sig,
9.379	8	0.311

Based on table 3.3, P-value = 0.311 indicating no evidence of poor fit. This is good, since here we know the model is indeed correctly specified.

DISCUSSION

More than half of the women (61.5%) had a practice to visit health facility for ANC more than four times, this is different from Kifle (2014), in which only 54.5% of women got skilled attendance. This finding is also a little bit higher than research conducted in Nepal in 2013 where 644 pregnant women whose delivery location had been identified, 547 (85%) gave birth in a health care facility [11]. And also the above result tells us about 38% of the pregnant women fail to satisfy the minimum number of visit recommended by WHO.

Mother's literacy level is also important determinant of place of delivery as those with non-formal education tend to deliver at home, and those educated tend to give birth in health facilities. Similar result is also obtained in research conducted in Nepal which showed that there is relationship between education and place of deliver as those with poor education are more like to deliver at home compared to educated women who tends to deliver at health facilities [12]. Another study from Cambodia noted that women who attend at least seven years of school are six times more likely to deliver in health facilities compared to those who did not attended school [13]. All those literatures shows that level of education were strongly associated with delivery in health facility where by more educated women tends to deliver in health facility compared to non-educated, therefore increased enrollment of girls to secondary education and above could help to improve delivery in health facility.

Information about antenatal care also brings significant difference to deliver at health institution or not. Insufficient counseling during antenatal visit is another factor for low delivery in health facility, minimal time used by health workers for counseling pregnant mothers during antenatal clinic is the missed opportunity to educate women importance of delivery at health institution. Also information about pregnancy risk and labour complications are not well communicated during antenatal clinical visit.

Job category of women, frequency of watching television, frequency of antenatal care service during pregnancy significantly affect place of delivery of women. But husband's level of education, place of residence, religion, age of women, distance from health institution did not affect place of delivery of women. This result is consistent with the research conducted in Nepal using ordinal logistic regression model.

4. CONCLUSION AND RECOMMENDATION

CONCLUSION

About 1056 women in the reproductive age who gave birth in the past five years have been considered in the study from two woredas (Gummer and Abeshige) and one city administration (Butajira). From these respondents, 488 of them are from urban and 568 are

from rural. Nearly half of them (49.6%) are orthodox, 34.8% of them are Muslim, 14.3% of them are Protestant and the remaining (1.3%) of them are Catholic. About 71% of the respondents delivered at health institution were as the remaining 29% delivered at home.

Mothers' level of education, job category, frequency of watching television, information about antenatal care, frequency of antenatal care service during pregnancy significantly affect place of delivery. But husband's level of education, place of residence, religion, age of women, distance from health institution did not affect place of delivery of women.

RECOMMENDATION

Based on the finding of this research we recommend that the governmental and non – governmental organizations should work hard to address delivery care service utilization among women in reproductive age. Teaching women in reproductive age about antenatal care and the importance of delivering at health institution should be done by the concerned bodies. The government and the local administrators should work hard to improve women education which has influence on delivery care service utilization. The health workers should teach women about the risk of home delivery on the health of newborn and the mother. Additionally strong follow up and guidance is required to increase ANC visit during pregnancy and they have to provide detail information during the follow up period.

ACKNOWLEDGMENT

We are deeply indebted to thank Wolkite University for funding this research. I would like to pass my heartfelt gratitude and pleasure to Mr. Tadesu Hailu for his support and collaboration. And also I would like to thank Gurage zone health Center, Butajira City Administration health Unit, and Abeshige and Gumer woreda heath center unit for their collaboration.

Reference

1. Wang, W., Alva, S., Wang, S. & Fort, A., (2011).Levels and Trends in the Use of Maternal Health Services in Developing Countries, DHS Comparative Reports No. 26, ICF Macro Calverton, Maryland, USA.
2. United Nations. The Millennium Development Goals. New York: United Nations Report; 2010.
3. WHO, UNICEF, UNFPA. The World Bank estimates, Trends in maternal mortality: 1990 to 2010. Geneva, Swizerland: World Health Organization; 2012.
4. Ronsmans C, Graham WJ. Maternal mortality: who, when, where, and why. Lancet. 2006;368(9542):1189–1200. doi: 10.1016/S0140-6736(06)69380-X. [PubMed] [Cross Ref]
5. Lawn JE, Tinker A, Munjanja SP, Cousens S.(2006) Where is maternal and child health now. [PubMed] [Cross Ref]
6. Kinney MV, Kerber KJ, Black RE, Cohen B, Nkrumah F, Coovadia H, Nampala PH, Lawn J. (2010) Sub-Saharan Africa's mothers, newborns, and children: where and why do they die? [PMC free article] [PubMed] [Cross Ref]
7. Accorsi S, Bilal NK, Farese P, Racalbuto V. (2010)Countdown to 2015: comparing progress towards the achievement of the health Millennium Development Goals in Ethiopia and other sub-Saharan African countries.
8. CSA and ORC Macro, (2012), Ethiopia Demographic and Health Survey 2011, Addis Ababa, Ethiopia, and Calverton, Maryland, USA:,Central Statistical Agency and ORC Macro.
9. KIFLE Lentiro et al (2013): The prevalence of skilled delivery and associated factors among mothers in Abeshighie district, Guraghe zone, SNNPR, Ethiopia
10. Agresti, A., (2002).Categorical Data Analysis, Second Edition, Wiley Inc
11. Rajendra Karkee, Colin W Binns, and Andy H Lee (2013): Determinants of facility delivery after implementation of safer mother programme in Nepal: a prospective cohort study
12. Belam A, Manandhar DS, Shrestha P, Elis M, Malla K & Costello A (2006) Factors affecting home delivery in the Kathmandu Valley, Nepal
13. Yanagisawa et al (2006); Determinants of skilled birth attendance in rural Cambodia

AUTHORS

Kassahun Trueha, Applied Statistics (Msc), ktktantos@gmail.com

Ayele Gebeyehu, Biostatistics (Msc), gebeyehu29@gmail.com

Gedif Mulat, Biostatistics (Msc), gedifmulat@gmail.com

Correspondence Author - Kassahun Trueha, ktktantos@gmail.com, Kassahun.trueha@wku.edu.et