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Determine the Associated Factors Affecting the Quality of Delivery Service among Women Who Delivered Birth in Ethiopia Using a Multilevel Multinomial Logistic Regression Model

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Abstract

Introduction: Delivery service from a qualified partner is critical to reducing the risk of problems and infections that could kill mothers or gravely afflict babies. Ethiopia still has a low coverage rate for delivery services, even though using them is essential for improving the health of expecting mothers and infants. Thus, the goal of this study was to identify the relevant factors influencing the quality of delivery care among women who gave birth in Ethiopia by using a multilevel multinomial logistic regression model.

Method: The 2019 Ethiopian demographic and health survey, which was performed among an adjusted sample of 15,683 women overall, provided secondary data for the study. For the purpose of the current study, a multilevel multinomial logistic regression model was constructed.

Result: Out of a total of 15683 women who gave birth, 64.8%, 30.7%, and 4.5% of them gave birth at home, in public, and in private, respectively. Among the covariates, women live in urban residences (OR=1.79; 95% CI=0.47, 0.70; P-value=0.000). Religion of women (Catholic (OR=1.75; 95% CI=0.10, 1.02); P-value=0.017); Protestant (OR=1.32; 95% CI= 0.16; 0.39); value=0.000, Muslim (OR=1.34; 95% CI (0.19, 0.40), p-value=0.000), traditional (OR=2.34;95%CI (0.35,1.36), p-value=0.00), education level (primary OR=1.62; 95% CI (0.58, 1.38), p-value=0.000, secondary OR=1.99; 95% CI (0.85, 1.53), p-value=0.000, higher OR=1.57; 95% CI (0.64, 1.26), p-value=0.000), wealth status of women (middle (OR=0.64; 95% CI (-0.30,-0.1), p-value=0.003, rich women (OR=0.49; 95%CI (-0.95, -0.48), p-value=0.000) were significant effect on delivery service at public variation between regions in the delivery service for women who gave birth had a significant effect.

Conclusion: Place of residence, religion, education level, wealth status of women, and occupation of women had a significant effect on the quality of delivery service of women who gave birth in Ethiopia under multilevel multinomial logistic regression model consideration and when regional heterogeneity was included at a 5% level of significance. Healthcare professionals and health extension workers should raise awareness among uneducated, poor, and rural women in order to use institutional and private delivery.

Keywords: Multinomial logistic model; Multilevel multinomial model; Delivery service; Public deliver

Abbreviation: AIC: Akikas Information Criteria; BIC: Bayesian Information Criteria; ICC: Intraclass Correlation Coefficient; MNLR: Multinomial Logistic Regression; OR: Odds Ratio; PCV: Proportionate Change in Variance

Introduction

Background of study

Pregnancy-related health issues and postpartum care are critical to the mother's and the baby's survival and well-being. Reducing maternal and neonatal morbidity and death requires skilled care during pregnancy, labor, and the postpartum period. For the mother's life and the child's well-being, the medical treatment she receives during her pregnancy, during childbirth, and shortly after is crucial [1]. Every year, more than 20 million women become pregnant worldwide. In the world in 2014, skilled health workers assisted with over 71% of births, up from 59% in 1990 [2].

Around the world, one-third of births occur at home without the assistance of trained attendants, and qualified medical professionals attend less than half of births in Africa. Additionally, most deliveries in impoverished countries occur at home without the help of skilled birth attendants. The success rate of improving maternal health by optimizing important and useful maternal health metrics is low, despite the efforts of many poor countries [3-4].

The percentage of live births in Ethiopia that were attended to by a skilled provider remained basically unchanged for five years after 2000. Nevertheless, the percentage increased dramatically after 2005, going from 6% in the Ethiopia Demographic Health Surveys (EDHS) of 2000 and 2005 to 10% in 2011, 26% in 2016, and 50% in 2019 [5]. Maternal mortality dropped from an

expected 676 deaths per 100,000 in the 2011 EDHS to 412 deaths per 100,000 in the 2016 EDHS. This remarkable decline in mother mortality can be attributed to slight increases in facility delivery [6]. The Health Development Army's (HDA) involvement has been the driving force behind the remarkable progress made thus far in enhancing skilled delivery attendance, which was 26% in 2016 and 50% in 2019 EDHS [7].

On the other hand, 16%–33% fewer maternal deaths might result with institutional delivery. Ethiopian mothers prefer to give birth at home, even if giving birth in a medical facility is important. Using institutional delivery services is one of the most important and effective ways to enhance maternal health and wellness, lower maternal mortality, and ensure safe deliveries and fewer birth-related problems. Due to factors including distance, limited transportation options, and a lack of suitable facilities, accessing health facilities in rural locations is more challenging than in metropolitan areas. In Ethiopia, home delivery is still popular, especially in remote areas, despite efforts to increase institutional delivery. In the five years prior to the survey, 48% of live babies were delivered in a health facility [8].

A few prior studies conducted in various parts of the world have determined the causes of low health facility use for service delivery. The age, ethnicity, education, religion, and culture of the women, as well as their clinical need for treatment and ability to make decisions, are all associated with their socioeconomic position and place of residence. The coverage of institutional delivery is still low, despite the installation of programs such as the maternity waiting room, ambulance service, women development army, and pregnant women panel discussion programs to boost institutional delivery. Thus, the purpose of this study was to ascertain the Ethiopian women's delivery service element.

Materials and Methods

Study area and population

Ethiopia, which is divided into two city administrations and nine regions, was the site of the current study. Throughout the period of March 21, 2019, to June 28, 2019, women who were EDHS residents made up the study population.

Source of data

The study used secondary data of 2019 Ethiopian demographic and health survey.

Sampling technique and sample size

Two stages went into stratifying and choosing the 2019 EDHS sample. Twenty-one sampling strata were produced by divided each region into urban and rural areas. In two stages, separate samples of Enumeration Areas (EAs) were chosen for each stratum. At each of the lower administrative levels, implicit stratification and proportional allocation were accomplished by employing a probability proportional to size selection at the first stage of sampling and by sorting the sampling frame within each sampling stratum prior to sample selection, based on administrative units in various levels. 15,683 women of reproductive age from nine regional states and two administrative cities were included in this study after missing values were removed.

Inclusion criteria

All women of reproductive age (15–49 years) with gave birth were eligible for the current investigation.

Variables in the study

Dependent variable: For the purpose of our study, the response variable using any delivery service area for women is recoded as follows: Delivery service at home 0, delivery service at public 1, and delivery service at private 2.

Independent variables: Sociodemographic factors such as place of residence, religion, education, wealth status, occupation, age, and region of the women were some of the independent variables used in this study.

Data analysis

Both descriptive and inferential statistics are employed in the study; descriptive statistics are used to summarize the data, and inferential statistics are used to make conclusions from the available data. This study used multilevel multinomial logistic regression, one of the various forms of inferential statistics, to assess this effect.

Multinomial logistic regression

Multinomial Logistic Regression (MNLR) model for categorical variables with more than two categories. This model allows for the comparison of multiple contrasts. The multinomial logistic regression model and the normal logistic regression model employ the odds ratio to represent the influence of predictor variables. The multinomial logit compares various groups using a mix of binary logistic regressions. Comparing each dependent variable category to a reference category is now feasible as a result. It is common for the category with the highest numerical score to be identified as the reference. When the dependent variable has, let us say, n potential levels, the MNLR model will often contain an n-1 equation. Within differential logistic regression, there were extensions to models with multiple predictors.

The maximum likelihood estimation method would be used to estimate the parameters in logistic regression model. The method of maximum likelihood estimation yields to estimate values for unknown parameters which maximize the probability of obtaining the observed set of data. The likelihood ratio test, Pearson and Deviance goodness-of-fit used test of the overall goodness of fit and Wald test to test significance of individual parameter in the model. The model selection criterion was used to select the most appropriate model that provides the best fit to the data. There are several model selection criteria, Akaike's Information Criterion (AIC) and Bayesian Information Criterion (BIC): Aimed for model selection criteria. It is not a test on the

model in the sense of hypothesis testing; rather it is a tool for model selection.

Multilevel multinomial logistic regression analysis

For the current investigation, multilevel multinomial logistic regression analysis can be used, which combines both fixed-effect and random-effect models. Using extended structural equation modeling (with the logit link function) and the gsem Stata command, this statistical technique was carried out in Stata version 14 software. In addition, four distinct models that were nested were fitted. We have looked at four models: 1 is the null model (just contains outcomes); 2 is the empty model with random intercept; 3 is the random intercept with fixed effect; and 4 is the random coefficient with random intercept model. The study included the region as a random variable and the women's age, religion, region, place of residence, occupation, wealth status, and educational attainment as individual variables.

The most suitable model among them was chosen using Akaike's information criteria and log-likelihood, and this led to the final interpretation of the results. In order to choose the variables that would be included in the multivariable analysis, both bivariable and multivariable analyses were used. In the multivariable analysis, factors were retained and included if the P-value was less than 0.05. Ultimately, the multivariable analysis revealed that variables with p value<0.05 were significant predictors of the delivery service used by Ethiopian women giving birth. The Odds Ratio (OR) with 95% Confidence Interval (CI) was then shown. In the random-effects study, the Intra-class Correlation Coefficient (ICC) and Proportionate Change in Variance (PCV) were computed to evaluate the variability of quality of delivery service between clusters or areas.

Results

Table 1 showed that 5348 (34%) and 10335 (66%) of the 15683 women who were sampled overall lived in urban and rural regions, respectively. Of the people who live in cities, 41.7% gave birth at home, 20.8% gave birth in a public setting, and 15.8% gave birth in a private setting. Of the total number of women living in rural regions, 58.3% had their quality of deliveries done at home, 79% in a public hospital, and the remaining women in a private location.

Table 1: Summary of socio-demographic covariates that associated with quality of delivery service.

Covariate	Categories	Quality of delivery service					
		At home		At public		At private	
		Count	Percent	Count	Percent	Count	Percent
Type of place of residence	Rural	4234	41.70%	1003	20.80%	111	15.80%
	Urban	5930	58.30%	3812	79.20%	593	14.20%
Educational level of women	No education	3730	36.70%	2844	59.10%	459	65.20%
	Primary	3682	36.20%	1354	28.10%	177	25.10%
	Secondary	1790	17.60%	400	8.30%	48	6.80%
	Higher	962	9.50%	217	4.50%	20	2.80%
Religion	Orthodox	4689	46.10%	1593	33.10%	131	18.60%
	Catholic	54	0.50%	33	0.70%	4	0.60%
	Protestant	1823	17.90%	904	18.80%	87	12.40%
	Muslin	3537	34.80%	2200	45.70%	472	67.00%
	Traditional	32	0.30%	49	1.00%	3	0.40%
	Other	29	0.30%	36	0.70%	7	1.00%
Wealth status	Poor	3679	36.20%	2585	53.70%	454	64.50%
	Middle	1926	18.90%	824	17.10%	98	13.90%
	Rich	4559	44.90%	1406	29.20%	152	21.60%

When it comes to education, the majority of women overall have no education; 7033 (44.8%) were the same; 5213 (33.2%), 2230 (14.2%), and 1199 (7.6%) had completed elementary, secondary, and advanced schooling, respectively. Additionally, a significant portion of educated women used public and private spaces for childbirth, whereas the majority of illiterate women gave birth at home.

Of all the women, 40.8% identified as orthodox, 0.5% as catholic, 17.9% as protestant, 39.5% as Muslim, 0.5% as traditional, and 0.5% as adherents of other faiths. Orthodox women made up a sizable portion of the women who gave birth at home: 46.1% were orthodox, 0.5% were catholic, 17.9% were protestant, 34.8% were Muslim, 0.3% were traditional, and 0.3% belonged to other religions. While Muslims made up a substantial portion of women working in public service, the remaining 0.7% of women practiced other religions; around 33.1% were orthodox, 0.7% were catholic, 18.8% were protestant, 1% were traditional, and 45.7% were Muslims.

The data also revealed that, of the total number of women, the wealthiest percentages were 39.0%, middle-class women (18.2%), and impoverished women (42.8%). A little over 36.2% of low-income women receive deliveries at home, while 53.7% and 64.5% receive quality of deliveries service at public and private venues, respectively. Among the women who were classified as rich, 44.9%, 29.2%, and 21.6% gave birth at home, in a public hospital, and in a private one, respectively.

Univariate analysis of multinomial logistic regression model

The women's wealth status, occupation, place of residence, religion, and educational attainment were all significant at the 5% level of significance under the univariate multinomial logistic regression model. However, the women's age was not significant at the 5% significance level.

The results of the multinomial logistic regression model studies of home delivery services compared to public and private levels are displayed in **Table 2**. The analyses indicate that women's occupation, place of living, religion, education level, and wealth status had a significant effect.

Table 2: Multivariate multinomial logistic regression model.

Covariate	Categories	Coef.	Std. err.	Z	P>|z|	OR	(95% Conf. interval)
Delivery service at home	(Base outcome)						
Delivery service at public							
Place of residence (rural ref.)	Urban	0.56	0.05	11.38	0	1.75	(0.47, 0.66)
Religion (orthodox ref.)	Catholic	0.48	0.23	2.09	0.036	1.62	(0.03, 0.93)
	Protestant	0.2	0.05	3.71	0	1.22	(0.09, 0.30)
	Muslim	0.22	0.04	4.48	0	1.25	(0.12, 0.30)
	Traditional	0.81	0.23	3.44	0.001	2.25	(0.35, 1.27)
	Other	0.89	0.26	3.41	0.001	2.44	(0.38, 1.40)
Education level (no education ref.)	Primary	0.47	0.04	-10.91	0	1.6	(0.56, 1.39)
	Secondary	0.7	0.07	-10.25	0	2.01	(0.83, 1.56)
	Higher	0.42	0.1	-4.02	0	1.52	(0.62, 1.21)
Wealth status (poor ref.)	Middle	-0.2	0.05	-3.88	0	0.82	(-0.30, -0.09)
	Rich	-0.44	0.04	-9.91	0	0.64	(-0.52, -0.35)
Occupation	Professional	-0.21	0.14	-1.49	0.137	0.81	(-0.48, 0.07)
	Clerical	-0.46	0.22	-2.11	0.035	0.63	(-0.88, -0,03)

	Sales	-0.44	0.06	-7.59	0	0.64	(-0.55, -0.33)
	Agricultural	-0.16	0.05	-3.11	0.002	0.85	(-0.26, -0.06)
	Services	-0.39	0.12	-3.33	0.001	0.68	(-0.62, -0.16)
	Skilled manual	-0.08	0.1	-0.78	0.434	0.92	(-0.27, 0.12)
	Unskilled manual	-0.49	0.14	-3.38	0.001	0.61	(-0.77, 0.20)
	Others	-0.57	0.13	-4.33	0	0.57	(-0.83, -312)
_cons		-0.67	0.06	-10.58	0	0.51	(-0.79, -0.54)
Delivery service at private							
Place of residence	Rural	0.81	0.12	6.68	0	2.25	(0.57, 1.04)
Religion (Orthodox ref.)	Catholic	0.76	0.53	1.43	0.153	2.14	(0.28, 1.8)
	Protestant	0.27	0.14	1.86	0.06	1.31	(-0.01, 0.55)
	Muslim	1.02	0.11	9.34	0	2.77	(0.80, 1.23)
	Traditional	0.35	0.62	0.56	0.574	1.42	(-0.86, 1.55)
	Other	1.58	0.44	3.61	0	4.85	(0.72, 2.45)
Education level (no education ref.)	Primary	0.47	0.1	4.81	0	1.6	(0.66, 0.80)
	Secondary	0.57	0.17	-3.36	0.001	1.77	(0.91, 1.24)
	Higher	0.77	0.31	-2.52	0.012	2.16	(0.37, 1.17)
Wealth status (poor ref.)	Middle	-0.43	0.12	-3.59	0	0.65	(-0.66, -0.19)
	Rich	-0.72	0.1	6.86	0	0.49	(-0.92, -0.51)
Occupation (not working)	Professional	0.6	0.3	1.95	0.051	1.82	(-0.01, 1.21)
	Clerical	-0.41	0.74	-0.55	0.585	0.66	(-1.85, 1.04)
	Sales	-0.63	0.15	-4.35	0	0.53	(-0.92, -0.35)
	Agricultural	-0.48	0.12	-4.01	0	0.62	(-0.71, -0.24)
	Services	-0.14	0.25	-0.57	0.567	0.87	(-0.64, 0.35)
	Skilled manual	-0.38	0.27	-1.39	0.16	0.68	(-0.92, 0,15)
	Unskilled manual	-1.1	0.42	-2.62	0.009	0.33	(-1.93, -0.28)
	Others	-1.29	0.46	-2.82	0.005	0.28	(-2.19, -0.39)
_cons	-	-3.08	0.16	-19.59	0	0.05	(-3.39, -2.77)

Note: Base outcome-Delivery service at home, Ref.=Referenc e of categories

Goodness of fit the of model

The appropriateness of the fitted model must be ascertained once a multinomial logistic regression model has been fitted. The methods that are most frequently applied are the Deviance goodness of fit test and Pearson's *Chi-square*. **Table 3** demonstrates that there is enough evidence to draw the conclusion that the model fits the data well. A multinomial logistic regression model using predictor variables suggested an adequate fit, as demonstrated by Pearson *Chi-square* (p-value=0.4512) and deviance (p-value=0.2610).

Table 3: Goodness of fit statistics.

Deviance and Pearson goodness-of-fit statistics			
Criteria	**Value**	**Value/DF**	**Pr>*chi sq***
Deviance	11834.48	4.8	0.261
Pearson	11339	3.78	0.4521
LR	1688.55	-	0
Pseudo R^2=0.0688			

Multivariate analysis of multilevel multinomial logistic regression model

Table 4 indicates how the ICC in the null model indicated that variations between clusters and regions were responsible for approximately 14% of the variability in delivery service locations. While the final model's highest PCV indicated that both individual and regional factors accounted for roughly 22% of the variability of delivery service locations, model 3 was the best-fitted model in terms of fitness, having the highest log-likelihood and the lowest Akaike's information criteria.

Table 4: Comparison among multilevel multinomial logistic regression models.

Parameter	**Null Model**	**Model 2**	**Model 3**	**Model 4**
Cluster level variance	0.52	0.5	0.494	0.406
Intra class correlation coefficient	0.14	0.132	0.13	0.11
Proportional change in variance	Reference	0.038	0.05	0.22
Model fitness				
Log-likelihood	-122553	-110832	-122071	-110512
Akaike's information criteria	245111.9	221802.5	244179.4	221194.1*
Bayesian information criteria	245142.1	222497.9	244370.8	222050.7*
Note: *= Smallest AIC and BIC				

Table 5 findings indicate that the random effect's estimated variance is 0.061, which suggests a 0.247 standard deviation. Therefore, a change in the random effect of one standard deviation corresponds to a change in the relative-risk ratio of exp (0.247)=1.280.

Table 5: Analysis of related factors result of multilevel multinomial model analysis.

Covariate	Categories	Coef.	Std. err.	Z	P>|z|	OR	(95% conf. interval)
Delivery service at home	(Base outcome)						
Delivery service at public							
Place of residence (rural ref.)	Urban	0.58	0.06	10.23	0	1.79	(0.47, 0.70)
Religion (orthodox ref.)	Catholic	0.56	0.23	2.39	0.017	1.75	(0.10, 1.02)
	Protestant	0.28	0.05	4.72	0	1.32	(0.16, 0.39)
	Muslin	0.29	0.05	5.36	0	1.34	(0.19, 0.40)
	Traditional	0.85	0.26	3.3	0.001	2.34	(0.35, 1.36)
	Other	0.99	0.26	3.72	0	2.69	(0.47, 1.50)
Education level (no education ref.)	Primary	0.48	0.05	-9.33	0	1.62	(0.58, 1.38)
	Secondary	0.69	0.08	-8.37	0	1.99	(0.85, 1.53)
	Higher	0.45	0.09	-4.62	0	1.57	(0.64, 1.26)
Wealth status	Middle	-0.2	0.05	-3.83	0	0.82	(-0.30, -0.10)
	Rich	-0.43	0.046	-9.49	0	0.65	(-0.53, -0.35]
Occupation (not working ref.)	Professional	-0.22	0.14	-1.57	0.116	0.8	(-0.49,0.05)
	Clerical	-0.45	0.21	-2.07	0.039	0.64	(-0.89, -0.02)
	Sales	-0.43	0.06	-7.43	0	0.65	(-0.55, -0.03)
	Agricultural	-0.16	0.05	-3.1	0.002	0.85	(-0.25, -0.06]
	Services	-0.39	0.12	-3.32	0.001	0.68	(-0.63, -0.16)
	Skilled manual	-0.08	0.1	-0.76	0.44	0.92	(-0.27, 0.12)
	Unskilled manual	-0.49	0.14	-3.37	0.001	0.61	(-0.77, -0.20)
	Others	-0.49	0.13	-4.27	0	0.61	(-0.82, -0.31)
Constant	-	-0.78	0.14	-5.63	0	0.46	(-1.05, -0.51)
Delivery at service private							

Place of residence	Rural	0.79	0.13	6		0	2.2	(0.53, 1.04)
Religion (orthodox ref.)	Catholic	0.92	0.55	1.68		0.09	2.51	(-0.15, 1.99)
	Protestant	0.41	0.16	2.62		0.009	1.51	(0.10, 0.72)
	Traditional	0.36	0.7	0.51		0.61	1.43	(-1.01, 1.73)
	Other	1.77	0.47	3.78		0	5.87	(0.85, 2.70)
Education level (no education ref.)	Primary	0.47	0.1	4.75		0	1.6	(0.67, 1.28)
	Secondary	0.49	0.18	2.67		0.008	1.63	(0.85, 1.13)
	Higher	0.38	0.27	1.42		0.15	1.46	(0.89, 1.14)
Wealth status (poor ref.)	Middle	-0.44	0.15	-3.01		0.003	0.64	(-0.72, -0.15)
	Rich	-0.71	0.12	5.89		0	0.49	(-0.95, -0.48)
Occupation (not working ref.)	Professional	-0.66	0.35	1.88		0.061	0.52	(-0.03, 1.35)
	Clerical	-0.45	0.22	-2.01		0.039	0.64	(-0.88, -0.02)
	Sales	-0.43	0.06	-7.43		0	0.65	(-0.55, -0.32)
	Services	-0.39	0.12	-3.32		0.001	0.68	(-0.63, -0.16)
	Skilled manual	-0.08	0.1	-0.76		0.45	0.92	(-0.27, 0.12)
	Unskilled manual	-0.49	0.14	-3.37		0.001	0.61	(-0.77, -0.20)
	Others	-0.56	0.13	-4.27		0	0.57	(-0.83, -0.31)
M1-region effect								
_cons		-3.52	0.99	-1.77		0.007	0.03	(-7.43, -0.38)
var (M1)		0.061	0.48				1.06	(1.27, 2.96)

Place of residence is an important predictor of delivery service among women in Ethiopia, and the associated odds of delivery were 1.79 times greater for urban-dwelling women than for rural-dwelling women. The likelihood of a woman having a private delivery service is 2.20 times higher in urban regions than it is in rural ones.

Religion had a significant effect on the quality of delivery services for women in Ethiopia. Compared to women who follow Orthodox religions, the odds of women who follow Catholic, Protestant, traditional, and other religions were 1.75, 1.32, 1.34, 2.34, and 2.69 times higher to be delivered in public and 2.51, 1.51, 1.43, and 5.8 times lower to be delivered in private.

The educational level had a significant effect on the quality of delivery services for women in Ethiopia. Women with only a primary education had odds of delivery services that were 1.62, 1.99, and 1.57 times higher than those with no education were. Women with a primary education had odds of delivery services that were 1.60, 1.63, and 1.46 times higher than those with no education were.

Discussion

The main goal of this investigation was to determine the factors that influence a woman's delivery location at her final birth in Ethiopia by employing a multinomial and multilevel multinomial logistic regression model, with the respondents' area serving as a clustering variable for the multilevel model. The current study evaluates the socioeconomic, demographic, and health care characteristics that impact the location of delivery services for Ethiopian women giving birth, as well as the

differences in delivery service areas throughout Ethiopian regions.

The public delivery rate in this study was determined to be 30.7%. The results of this study are almost identical to those of Jimma and Debremarkos, where 28.7% of women gave birth in public [9,10]. The current conclusion, however, was less than research done in the districts of Anlemo, Southern Ethiopia, where 57.3 percent of women had their babies in public, and Fogera, Northwest Ethiopia, where 32.4 percent of women delivered their babies at public [11,12].

The overall home delivery rate was 64.8%; this figure was greater than that of studies done in Zala Woreda, Southern Ethiopia, where 6% of women gave birth there, and 48.5% of Ethiopian births were reported to occur at home, according to a meta-analysis. Geographical location, time intervals between population survey studies, and differences in the infrastructure available for convenient access to healthcare facilities could all contribute to the explanation of the mismatch [13].

Place of residence had significant effect on quality of delivery service among women give birth in Ethiopia. Compared to women in rural regions, metropolitan women had more institutional delivery experience. Compared to urban people, rural residents typically have less or no access to family planning and maternal health programs, which could account for this outcome [14]. Research was out in the Amhara regional state consistently yields consistent results [15].

One significant element influencing the quality of delivery services provided to Ethiopian women giving birth is their financial situation. In addition, the results indicated that compared to women in the poor quintile, those in the middle and affluent quintiles had a lower likelihood of giving birth at home. This could be because, despite the fact that expert delivery services are freely provided by Ethiopian government institutions, there might be direct and indirect associated fees that only the wealthiest women's families can afford. Broadly speaking, women in low-income families might not be able to afford the family's financial situation or the expenses associated with giving birth, including transportation. This outcome is in line with data from Ethiopia, which found that the percentage of births. This outcome is in line with studies done in Ethiopia, which found that women in the richest quintile had 5.11 times more skilled birth attendants attending their births in medical facilities than women in the poorest quintile.

The quality of delivery services provided to Ethiopian women is significantly impacted by their level of education. There was a notable distinction between educated and illiterate women at the delivery site based on the mothers' educational attainment. The results of this study revealed that educated women were more likely than uneducated women to deliver in public. This disparity might result from the fact that educated women are also seen to possess better knowledge and attitudes, and they can take advantage of competent maternity care that is offered to them. Research from Bahir Dar and Nepal also supports this constant finding, stating that educated women make up a higher percentage of public delivery than illiterate women.

Conclusion

Multilevel multinomial logistic regression model analyses of random intercept with a fixed slope model analysis showed that the quality of delivery service where women gave birth in Ethiopia was significantly influenced by the women's occupation, wealth status, place of residence, education level, and religion of the respondent. Additionally, regional heterogeneity was incorporated into the multilevel multinomial logistic regression model at the 5% significance level.

The quality of delivery service locations varies significantly amongst Ethiopian areas for women giving birth. Place of residence, educational attainment, and religion were among the significant covariates that had a positive significant impact on the delivery service locations for women in Ethiopia, whereas wealth status and occupation had a negative significant impact on both public and private delivery locations for women. Numerous multilevel multinomial logistic regression models were employed, including the random intercept with fixed slope multilevel multinomial model, the empty model with random intercept, the random intercept with fixed effect, and the random coefficient with random intercept model. The random intercept with fixed slope multilevel multinomial model was the most suitable model for this set of data. In order to use institutional and private delivery, health extension workers and healthcare professionals need increase knowledge among rural, impoverished, and illiterate women.

Limitation and Strength of Study

There is secondary data used in this study. Because of this, the study did not take into account some crucial variables, such as family size. There were no comparisons established in the cross-sectional descriptive investigation. The study assumed that all information provided was accurate and devoid of bias when gathering data. In order to improve guidelines for planners, administrators, and policymakers, more study should be done to examine additional factors that impede the community's use of safe quality of delivery services as well as the opinions of healthcare providers regarding how the services can be improved operationally.

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