

Factors Associated with the Completion of the Continuum of Care for Maternal, Newborn, and Child Health Services in Ethiopia. Multilevel Model Analysis

Abstract

Introduction: Assuring completion of a continuum of maternal health care is a key program strategy to minimize morbidity and mortality of maternal and child. We aimed to examine completion of a continuum of care and its associated factors. **Methods:** This cross-sectional study was analyzed from the 2016 Ethiopian Demographic and Health Survey data. Multilevel logistic regression was used to assess the relationship between completion of a continuum of care and independent variables, in which each individual woman (level-1) nested within a community (level-2). **Results:** About 9.1% of Ethiopian women complete the continuum of care. Odds of completing continuum of care was more likely among those women formally employed (odds ratio, OR = 2.14; 95% confidence interval, CI: 1.37–3.35), from the female-headed household (OR = 1.58; 95% CI: 1.08–2.31), and gave birth at health facility (OR = 4.85; 95% CI: 1.75–13.37) than their counterpart. Maternal health services during antenatal care, such as blood pressure measured (OR = 4.31; 95% CI: 2.47–7.52), informed about pregnancy complication (OR = 1.57; 95% CI 1.61–2.11), and received tetanus injection (OR = 2.04; 95% CI: 1.42–2.92) were associated with completion of continuum of care. Similarly, the perception of women that money is not a problem in accessing healthcare (OR = 1.40; 95% CI: 1.03–1.90) was significantly associated with completion of a continuum of care. **Conclusions:** Most women failed to complete the continuum of care. Factors related to individual, community, access to health services, and services provided during antenatal care were positively affect completion of the continuum of care. Therefore, effort should focus on the integration of maternal health care services and targeting those factors facilitating the completion of the continuum of care.

Keywords: Continuity of patient care, maternal health, postnatal care, prenatal care

Introduction

Although the impressive progress gained for maternal and child health during the millennium development goals era, over 5.6 million women and babies died in 2015 due to complications during pregnancy, birth, and in the first month of life.^[1] Sub-Saharan Africa accounts for 62% of the majority of maternal deaths occurred.^[2] And 1 in 12 children born will not celebrate their fifth birthday. Additionally, mortality among newborns remains a critical challenge comprise 45% of the under-5 childhood deaths globally.^[2]

Antenatal care (ANC), skilled birth attendants (SBA), and postnatal care (PNC) are crucial maternal healthcare services for improving many health outcomes of mothers and babies^[3,4] because these

services make sure early detection and management of complications, such as hemorrhage.^[5] Continuum of care for maternal, newborn health, and child health promote the continuity of care throughout the lifecycle—adolescence, pregnancy, childbirth, postdelivery period, and childhood.^[6] Service provided in continuum of care minimize maternal, neonatal and child morbidity and mortality.^[6-8]

A continuum of care (CoC) links crucial interventions across the pregnancy, delivery, and postpartum stages. The advantages of CoC are that each stage builds on the success of the previous stage.^[9] A lack of appropriate care at any stages of CoC is associated with poor maternal health outcomes.^[10-13]

Many studies were conducted to identify factors affecting antenatal care, skilled birth attendance, or postnatal care separately.^[14-16]

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We are interested to study from a perspective of a continuum of care using multilevel model analysis. No such kind of study has been conducted in Ethiopia. Thus, the study aimed to assess the status of completion of continuum of care and examine its associated factors.

Methods

Data sources and study participants

For this cross-sectional study design, the data were extracted from the 2016 Ethiopia Demographic Health Survey. This study was restricted to 1342 women who had reported that they have received at least four antenatal care visits and skilled birth attendance. Only the most recent live birth was considered in this study. This study approved by the ethical committee of Tehran University of Medical Sciences (code number: IR.TUMS.SPH.REC.1396.4802).

Variables

Completion of a continuum of care is the outcome variable. It is coded as complete when the women received at least four antenatal care (ANC4+), skilled birth attendance (SBA), and PNC; and coded as incomplete if the women received ANC4+ and SBA but not received PNC.

Independent variables include mother's age, mother's education, mother employment, marital status, religious, residence, region, sex of household head, birth order and place of delivery. Access to health service variables: perception of getting money, getting permission, and distance to a health facility. Maternal health service during ANC visit, such as blood pressure measured, blood sample has taken, urine sample was taken, received tetanus injection and informed about pregnancy complication.

Statistical analysis

A two-level multilevel logistic analysis was employed to a hierarchical structure data with an individual woman nested within a community. It enables partitioning of the total variation in the outcome into within-group and between-group components.^[17,18] The following equation was used to explain the multilevel model:

$$\text{Logit}(P_{ij}) = \beta_0 + \beta_1 I + \beta_2 C + u_j \quad (1)$$

Where, P_{ij} is the probability of the outcome of interest for women i^{th} in the community j^{th} ; β_0 is the random intercept that represents the unobserved heterogeneity in the overall response; β 's is a fixed effect coefficient measure the effect of independent variables; I and C refer to individual- and community-level independent variables respectively, and u_j is random effects at level-2 representing the effect of j^{th} community on outcome variable.

Model-0, Model-1, and model-2 fitted without explanatory variables, with individual-level, and both individual-level and community-level variables respectively. Chi-square

test, Wald test, and likelihood ratio test and Akaike Information Criterion were used in bivariate, multivariate analysis and in comparing models, respectively. Categorical data and continuous data were presented using proportion and standard error. Odds ratio (OR) along with 95% confidence intervals (CI) was used to measure association. The intraclass correlation coefficient (ICC) used to measure variation. The ICC expresses the proportion of total variance at community level and calculated as:

$$\text{ICC} = \frac{\sigma_u^2}{\sigma_u^2 + \pi^2/3} \quad (2)$$

Where, $\pi^2/3$ -within-community variance usual equal to 3.29 in multilevel logistic regression; $\sigma^2 u$ -between-communities variance.^[19] All statistically significant set at P value <0.05 . All statistical analyses were done using STATA 13.

Results

Descriptive information of respondents

The likelihood of completing continuum of care is higher among women living in Tigray than women living in another region. More than half of women in urban areas reported completing continuum of care compared to women from rural areas [Table 1]. Overall, only 9.1% of women had a completed continuum of care in Ethiopia [Figure 1]. A substantial number of women were drop out across the continuum at both delivery level and postnatal level [Figure 2].

Multilevel analysis

There is a significant variation in the odds of completing a continuum of care across communities. The variance in the odds of completing a continuum of care was attributed to between-community level is 24%. This variation remained significant however ICC decreased from 24% to 22.4% in model-1 and to 20.4% in model-2.

The odds of completing continuum of care was more likely among those women formally employed (odds ratio (OR) = 2.14; 95% confidence interval (CI): 1.37–3.35), gave

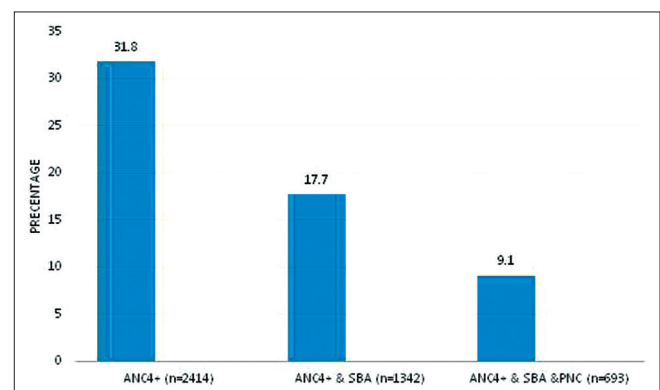


Figure 1: Percentage of women completing continuum of maternal health care among women who gave live births for the most recent live births in the last 5 years preceding the survey ($N = 7590$) in Ethiopia

Table 1: Percentage distribution of women with the completion of the continuum of care by selected factors, Ethiopia (n=1342)

Variables	Complete Continuum of Care		P [†]
	Yes	No	
Mother's age at last birth			0.3686
15-24	47.4	52.6	
25-34	54.0	46.0	
35-49	50.6	49.4	
Region			0.001
Oromia	34.5	65.5	
SNNP ^{††}	48.7	51.3	
Amhara	48.7	51.3	
Addis Abaa/Dire Dawa	64.4	35.6	
Tigray	64.5	35.5	
Others	54.4	45.6	
Marital status			0.038
Not married/in union	65.5	34.5	
Married/in union	50.6	49.4	
Sex of household head			0.018
Male	49.4	50.6	
Female	61.1	38.9	
Residence			0.174
Urban	54.8	45.2	
Rural	49.3	50.7	
Religion			0.012
Orthodox	57.4	42.6	
Protestant/other	46.5	53.5	
Muslim	43.0	57.0	
Getting permission to go to health facility			0.001
Big problem	38.1	61.9	
Not a big problem	55.0	45.0	
Getting money to self-care			0.007
Big problem	44.9	55.1	
Not a big problem	56.3	43.7	
Distance to health facility			0.039
Big problem	45.8	54.2	
Not a big problem	54.6	45.4	
Place of delivery			0.009
Home	23.3	76.7	
Health facility	52.4	47.6	
Informed about pregnancy complication			0.000
No	40.9	59.1	
Yes	58.4	41.6	
Blood pressure measured during ANC ^{†††}			0.000
No	20.0	80.0	
Yes	55.6	44.4	
Urine sample taken during ANC			0.000
No	33.2	66.8	
Yes	54.2	45.8	
Blood sample taken during ANC			0.001
No	32.0	68.0	
Yes	53.7	46.3	

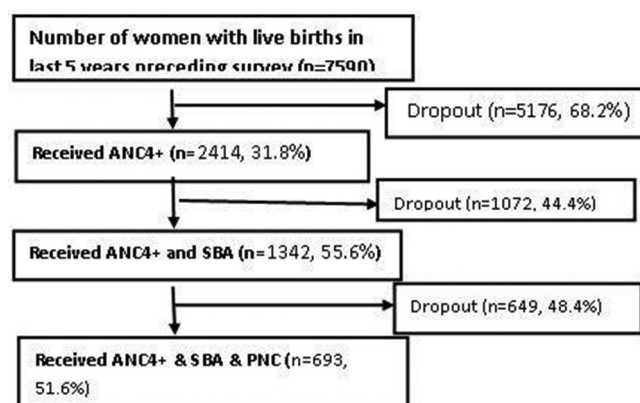
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Table 1: Contd...

Variables	Complete Continuum of Care		P [†]
	Yes	No	
Received tetanus injection during ANC			0.003
No	40.8	59.2	
Yes	54.3	45.7	

†Pearson Chi-square test ††Southern Nation Nationality People,

†††Antenatal care

**Figure 2: Percentage of women who drop out from a continuum of care, 2016 Ethiopian Demographic and Health Survey**

birth in a health facility (OR = 4.85; 95% CI: 1.75–13.37) and with six or more birth order (OR = 2.47; 95% CI: 1.31–4.69). Women from female-headed households (OR = 1.58; 95% CI: 1.08–2.31) and that perceived money is not a problem to access healthcare (OR = 1.40; 95% CI: 1.03–1.90) were more likely to completing continuum of care [Table 2].

Discussion

Overall, only about 9.1% of women completed the continuum of care. The finding is consistent with studies conducted in Ghana and Tanzania where completion of a continuum of care was 8%, and 10% respectively.^[9,20-22] However, it is inconsistent with the study done in Nepal, Pakistan, and Cambodia reported that 46%, 27%, and 60% of women completed the continuum of care respectively.^[23-25] The difference may be due to regional difference in term of health services accessibility and socioeconomics.

The study also showed almost equal dropped out across the continuum at delivery level and postnatal level. This finding contrast with a study done in Nepal and Cambodia that reported the highest dropout occurred at delivery level.^[25,26] Moreover, the finding was inconsistent with a study done in Ghana and Tanzania in which the highest dropouts reported at postnatal level.^[20,21]

Although the age of mother at last birth is significantly associated with completion of the continuum of care in a study done in Pakistan and Ghana, it found nonsignificant in this study.^[9,24] However, the finding was in line with the study done in Cambodia.^[20,23,26] In contrast to other studies

Table 2: Two-level mixed-effects logistic regression on completion of continuum of care among women with a live birth, Ethiopia

Variables	AOR (95% CI)		
	Model 0	Model 1	Model 2
Mother's employment status			
Agricultural employed		1.00	1.00
Unemployed		1.52 (1.09, 2.11)*	1.56 (1.12, 2.17)**
Unskilled manual		2.02 (1.02, 4.01)*	2.04 (1.02, 4.05)*
Formal employed		2.00 (1.29, 3.12)**	2.14 (1.37, 3.35)**
Sex of household head			
Male		1.00	1.00
Female		1.57 (1.08, 2.29)*	1.58 (1.08, 2.31)*
Birth order			
First		1.00	1.00
2-3		1.87 (1.30, 2.69)**	1.78 (1.22, 2.54)**
4-5		2.34 (1.41, 3.90)**	2.29 (1.37, 3.84)**
6+		2.72 (1.44, 5.11)**	2.47 (1.31, 4.69)**
Place of delivery			
Home		1.00	1.00
Health facility		4.64 (1.68, 12.78)**	4.85 (1.75, 13.37)**
Getting money for health service			
Big problem		1.00	1.00
Not a big problem		1.48 (1.09, 2.01)*	1.40 (1.03, 1.90)*
Told about pregnancy complication			
No		1.00	1.00
Yes		1.59 (1.18, 2.14)**	1.57 (1.16, 2.11)**
Blood pressure measured during ANC			
No		1.00	1.00
Yes		4.77 (2.72, 8.34)***	4.31 (2.47, 7.52)***
Urine sample is taken during ANC			
No		1.00	1.00
Yes		1.65 (1.00, 2.71)*	1.66 (1.02, 2.74)*
Received tetanus injection during ANC			
No		1.00	1.00
Yes		1.99 (1.39, 2.86)***	2.04 (1.42, 2.92)***
Residence			
Urban			1.00
Rural			2.07 (1.14, 3.76)*
Region			
Oromia			1.00
SNNP			1.67 (0.89, 3.15)
Amhara			2.43 (1.26, 4.67)**
Addis Ababa/DireDawa			3.63 (1.83, 7.20)***
Tigray			3.63 (1.88, 7.01)***
Others			2.54 (1.13, 5.72)*
Random effect			
Variance (SE)	1.033 (0.216)***	0.952 (0.226)***	0.843 (0.208)***
ICC ^{††††}	24%	22.4%	20.4%
PCV ^{†††††}	Reference	7.8	18.4
Model fit statistics			
AIC ^{†††††}	1767.872	1650.84	1639.89

* <0.05 , ** <0.01 , *** <0.001 . ^{††††}Intracluster correlation coefficient. ^{†††††}Proportion of change in variance ^{†††††}Akaike Information Criterion

unemployed, unskilled employed, and formally employed women were significantly associated with completion of a continuum in this study.^[20,24]

Mother's education, wealth quintile, exposure to media, and distance from a health facility were not significantly associated with completion of a continuum of care as

other studies elsewhere.^[23,26] However, belonging to higher wealth quintile,^[9,24,26] a higher level of educational,^[9,24] and exposure to mass media^[9] were significantly associated with completion of a continuum of care. Those women received maternal health care service during ANC were more likely to complete continuum of care. As a fact that women informed better about pregnancy and recognize the importance each service provided.^[26]

The limitation of this study is that the information about women who died due to childbirth-related complications was not included in the study sample and since that data collected retrospectively there is recall bias. The strength of this study lies in the national representative of data and in the use of multilevel model analysis.

Conclusions

Most women failed to complete the continuum of care. Employment status, female-headed household, delivery at health facilities, and living in the advantaged regional state were positively associated with completion of a continuum of care. Having the recommended maternal health care during ANC promotes the completion of the continuum of care. Therefore, effort should focus on increase completion of a continuum of care, tracking the progress of women along the continuum of care, and targeting those factors influence positively the completion of the continuum of care.

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Conflicts of interest

There are no conflicts of interest.

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