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Home-based optimal newborn care practice and associated factors among mothers in Ethiopia: a community-based longitudinal panel survey

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ABSTRACT

Objectives The objective of this study was to determine the level of home-based optimal newborn care practice and associated factors among mothers in Ethiopia.

Design A community-based longitudinal panel survey design.

Setting, participants and outcomes We used data from the Performance Monitoring for Action Ethiopia panel survey (2019–2021). A total of 860 mothers of neonates were included in the analysis. A generalised estimating equation logistic regression model was used to identify factors associated with home-based optimal newborn care practice and to account for the clustering nature of the data by enumeration area. An OR with 95% CI was used to measure the association between exposure and outcome variables.

Results The level of home-based optimal newborn care practice was 8.7% with 95% uncertainty interval ranging from 6% to 11%. After adjusting the effect of potential confounding factors, area of residence remained statistically significantly associated with mothers' optimal newborn care practice. The chance of home-based optimal newborn care practice was 69% times lower among mothers from rural areas compared with those in urban areas (adjusted OR=0.31, 95% CI=0.15, 0.61).

Conclusion The findings of this study showed that the level of home-based optimal newborn care practice was very low in Ethiopia. Also, home-based optimal newborn care practice was lower among mothers from rural areas in the nation. Therefore, health planners and healthcare providers, including health extension workers, should give priority attention to mothers from rural areas to improve their optimal newborn care practice by considering their context-specific factors or barriers.

STRENGTHS AND LIMITATIONS OF THIS STUDY

⇒ The generalised estimating equation model was applied to account the clustering nature of the data by enumeration area.
⇒ The study is less susceptible to recall bias because of short recall data collection weeks considered.
⇒ Being a longitudinal panel survey study, the issue of reverse causality will not be a problem in this study.
⇒ The study might be at risk of Hawthorne effect bias because of the study being a longitudinal panel survey study.
⇒ In the Performance Monitoring for Action project, there were no data on some important exposure variables, which might have confounded the true relationship between the exposure and outcome variables.

INTRODUCTION

The WHO and UNICEF strongly advised the global community to accelerate efforts to reach the global Sustainable Development Goal targets of less than 25 under-5 deaths per 1000 live births and less than 12 neonatal deaths per 1000 live births, by 2030.[1 2] Nevertheless, the 2019 UNICEF report indicated that globally, 52 million under-5 children will die from 2019 to 2030. From those under-5 deaths, half of them will be newborns if the basic maternal and child healthcare service utilisation and quality continue to be unimproved.[3 4] In Ethiopia, the decline in neonatal mortality is not as significant as the change in infant and child mortality in the last several years. Infant and under-5 mortalities per 1000 live births decreased from 59 and 88 in 2011 to 43 and 55 in 2019, respectively. On the other hand, neonatal mortality per 1000 live births slightly decreased from 37 in 2011 to 33 in 2019.[5 6]

Practice of optimal essential newborn care interventions is low in developing countries including Ethiopia because reaching mothers and newborns to encourage and support these practices is more challenging in settings, like Ethiopia, where many births occur at home.[7–11] As a result of this, Ethiopia has brought an alternative option to avail the necessary clean and essential newborn care services that could be provided by health extension workers at health posts or a household level.[10 11]

A field trial study conducted in rural India reported that home-based neonatal care is

acceptable, feasible, and reduced neonatal and infant mortality by nearly 50% among malnourished, illiterate and rural population.[9] Similarly, the Lancet neonatal health series suggests that 15%–32% of neonatal deaths can be prevented through the promotion of some essential practices, including clean home delivery, hygienic cord care, thermal care, early and exclusive breast feeding and care seeking for illness.[12] However, studies conducted in developing countries reported low prevalence of mothers' optimal essential newborn care practice, which ranged between 10% and 50%.[13–18] In Ethiopia, nearly three-quarters of mothers bathed their newborns during the first 24 hours of life (74.7%), approximately 20% applied butter and other substances on the infant's cord (19.9%) and over 40% did not give colostrum milk (44.5%).[8]

Previous studies reported that the likelihood of implementing optimal essential newborn care practice was higher in women who were urban residents, educated, with higher income, had antenatal and postnatal care follow-ups, had better knowledge of newborn danger signs and had information on essential newborn care practice.[13–16 18] However, the prevalence of optimal newborn care practice and associated factors was not well studied in Ethiopia. Therefore, understanding factors associated with optimal newborn care practice is very important to design or adapt behavioural change interventions on newborn care at home and health-seeking behaviour.[19] Panel data can give more information on temporal relationship between exposure and outcome of interest and improve precision of estimates by minimising recall bias. The objective of this study was to determine the level of home-based optimal newborn care practice and associated factors among mothers who gave birth at home in Ethiopia.

METHODS

Study design

In the Performance Monitoring for Action (PMA) Study, a longitudinal panel survey design was used to generate data in relation to maternal healthcare service utilisation and newborn care practices in the settings. Therefore, until now, we have produced two manuscripts using PMA-Ethiopia datasets including the current one. The first manuscript was entitled 'Receiving quality antenatal care service increases the chance of maternal use of skilled birth attendants in Ethiopia', and it was published in *PLOS ONE* journal in December 2022.[20] In both manuscripts, the data generation process was almost the same.

Study setting

The PMA-Ethiopia panel survey was conducted in six regions in Ethiopia, namely, Addis Ababa, Oromia, Amhara, Tigray, former Southern Nations, Nationalities and People's Region and Afar in 2019–2021. Women were recruited and enrolled during pregnancy, and followed at 6 weeks of postnatal period including their newborns. The details of the PMA-Ethiopia project design and settings can be accessed from the published PMA-Ethiopia project.[20]

Study population

The study population were all mothers of neonates who were enrolled during pregnancy, gave birth at home and interviewed between 6 and 8 weeks of postnatal period.

Patient and public involvement

It was not appropriate to involve members of the public in the design, or conduct, or reporting, or dissemination plans of our research because our study was initiated using the already collected datasets by PMA-Ethiopia survey.

Sample size estimation and sampling technique

The required sample size for this study was calculated using Stata V.16 software considering the following assumptions: a 10% outcome difference between exposed and unexposed, a 27% baseline level of received antenatal care service (key indicators) during pregnancy chosen from studies,[14] 5% level of significance and 80% power. The required sample size was increased by design effect (1.5). Hence, the estimated sample becomes 807.

The PMA-Ethiopia panel survey employed stratified two-stage cluster sampling design to select enumeration areas (EAs) (clusters) and households from the six regions. In the first stage, each region was stratified into urban and rural, then EAs were selected from both strata using Central Statistical Agency sampling frame, which contains information about the EAs' location, type of residence (urban, rural) and the estimated number of households in each EA. Clusters were selected using probability proportional to size sampling technique. At the second stage, 35 fixed numbers of households were selected from each cluster, and all pregnant women in a given household were enrolled and followed.

To increase the power of the study, all available 860 mothers of neonates who gave birth at home were included in the final analysis.

Data collection method

In the PMA panel survey, structured and standardised enrolment and follow-up forms were used for interviewing mothers to get information about maternal and newborn-related healthcare. Data were collected by using Open Data Kit system using tablet computers by trained field-workers. Baseline data on household location, housing and sanitation practices, economics and asset ownership, sociodemographic status and reproductive health details were collected at the time of enrolment by trained field-workers. Data on maternal and newborn healthcare practice were collected at 6–8 weeks of postpartum periods by trained female community health extension workers. The data collection was supervised by trained Masters of Public Health (MPH) professionals.

Measurements

Essential newborn care

This is defined as care provided to every newborn by mothers, which includes cord care, thermal care and feeding care.

Optimal newborn care practice

To measure optimal newborn care practice, a composite score of the three components (safe cord care, optimal thermal care and optimal feeding) was used and categorised into binary outcome. Mothers who optimally practised all the three components were categorised as 'practised optimal newborn care', otherwise categorised as 'practised suboptimal newborn care'.[8 16–18 21]

Safe cord care

This is defined as cord tie and cut with a new or boiled blade plus no substance applied to the cord stump except medically indicated medications, like chlorhexidine.[18 21] Then, a safe cord care practice was given a score of 1 if the mother practised both as per the recommendation, or else 0.

Optimal thermal care

This is defined as baby wrapped after birth plus baby bath after 24 hours of birth.[18 21] Optimal thermal care practice was given a score of 1 if the mother did the practice optimally as per the recommendation.

Optimal feeding practice

This is defined as the mother initiating breast feeding within an hour after delivery plus no additional feeding (no pre-lacteal) given other than breast milk.[18 21] Optimal feeding practice was given a score of 1 if the mother practised it as per the recommendation.

Household wealth

Household wealth was determined by giving scores based on the number and kinds of consumer goods they own, source of drinking water, and type of toilet facilities and flooring materials. Scores were derived using principal component analysis, and then households' wealth index was divided into quintiles according to the wealth score as 'lowest quintile', 'lower quintile', 'middle quintile', 'higher quintile' and 'highest quintile'.[6]

Data management and analysis

Data were formally requested and downloaded from the PMA-Ethiopia website.[22 23] Then, data were cleaned and prepared for merging using Stata V.16 software. The baseline and the 6-week follow-up visit data were merged using the study participant identity number (participant ID). Description of the study participants, unweighted and weighted frequency, by sociodemographic characteristics, was done and presented using tables. Sampling weight was applied to account the non-equal selection probability of the individuals and improve representativeness.

Generalised estimating equation logistic regression model was fitted to identify factors associated with the outcome variable, and to account the clustered nature of observations within an EA. OR with 95% CI was computed to measure the association between exposure and outcome variables, and interpreted.

Potential confounding variables were identified and selected based on a p value cut-off less than 0.2. Variables including mothers' area of residence (urban, rural), household income (lowest, lower, middle, higher, highest), mothers' age category (5 years' interval category), parity (<5, ≥5 live births) and number of antenatal care visits (≥4, <4 visits) were included in the final model to assess any confounding effect between them.

RESULTS

Sociodemographic characteristics of study participants

In this study, a total of 860 mothers who gave birth at home were included from six regions of Ethiopia. About 47% of the mothers were from Oromia, followed by Southern Nations, Nationalities and People's Region (27.1%) and Amhara (17.4%). Nearly 97% of the study participants were from the rural part of the regions. More than 55% of the mothers never attended formal education, followed by about 39% who attended primary school. Over half (51.2%) of the mothers were assisted by their family members during delivery and followed by 32.9% of mothers who were assisted by traditional birth attendants. Fifty-two per cent of the newborns were male by gender (see table 1).

Level of home-based optimal newborn care practices

In this study, the level of home-based optimal newborn care practice was 8.7% with 95% uncertainty interval ranging from 6% to 11%. Separately, nearly 38%, 37% and 43% of mothers practised safe cord care, optimal thermal care and feeding care, respectively (see table 2).

Factors associated with home-based optimal newborn care practice

In this study, first, the association between potential exposure and outcome variables was assessed. During binary analysis, mothers' area of residence, household income, mothers' age category, parity and number of antenatal care visits were statistically significantly associated with mothers' optimal newborn care practice at a p value less than 0.2. Mothers' area of residence remained statistically significant after adjusting the effect of potential confounding variables using a p value less than 0.05.

Compared with mothers from urban areas, the chance of home-based optimal newborn care practice was 69% times lower among mothers from rural areas (adjusted OR=0.31, 95% CI=0.15, 0.61) (see table 3).

DISCUSSION

In this study, we assessed the level of home-based optimal newborn care practice and associated factors among mothers who gave birth at home. This study revealed

Table 1 Sociodemographic characteristics of mothers who gave birth at home in six regions of Ethiopia (n=860), 2019–2021

Sociodemographic characteristics	Weighted per cent	Weighted N	Unweighted N
Region			
Tigray	4.4	38	67
Afar	3.6	31	159
Amhara	17.4	150	135
Oromia	47.4	406	234
Southern Nations, Nationalities and People's Region	27.1	233	261
Addis Ababa	0.1	2	4
Marital status			
Married/in union	97.1	832	835
Single	2.9	28	25
Women's age (in years)			
15–19	9.1	79	79
20–24	20.1	172	185
25–29	29.4	253	249
30–34	21.0	181	186
≥35	20.4	175	161
Religion			
Orthodox	28.9	249	237
Muslim	39.1	335	342
Protestant	29.9	256	262
Other*	2.1	20	11
Area of residence			
Urban	3.4	30	49
Rural	96.6	830	811
Household wealth index			
Lowest quintile	32.8	282	299
Lower quintile	26.1	224	202
Middle quintile	22.3	191	184
Higher quintile	16.7	144	151
Highest quintile	2.1	19	24
Education level			
Never attended	55.2	473	525
Primary	39.2	338	293
Secondary	5.6	49	42
Delivery assistant			
No one assisted	9.8	85	76
Family member	51.2	439	386
Traditional attendant	32.9	283	344
Health extension worker	6.1	53	54
Baby's gender			
Male	51.5	443	424
Female	48.5	417	436
Parity			
<5 live births	31.7	273	263
≥5 live births	68.3	587	597
Number of ANC visits			
≥4	87.7	754	760
<4	13.3	106	100

*Catholic, Wakefta or traditional.
ANC, antenatal care.

that the prevalence of home-based optimal newborn care practice was less than 10%. This study also showed that mothers from rural areas were less likely to practise home-based optimal newborn care.

Evidence has shown that 15%–50% of neonatal deaths can be averted by exercising optimal newborn care practices: cord cutting with a sterile blade and hygienic cord care, bathing the baby after 24 hours and giving appropriate thermal care, early and exclusive breast feeding and care seeking for illness.[9 12] The current study revealed that only nearly 9% of mothers practised optimal newborn care; however, previous works conducted in similar settings reported higher prevalence of optimal newborn care practice, which ranged from 10% to 50%.[13–16 18] The possible explanation for the higher prevalence could be due to majority of study participants had given birth at a health facility in the previous studies. As a result of this, the mothers might have the chance to receive advice on optimal newborn care practice. Evidence has shown that mothers who received counselling about essential newborn care during delivery were more likely to practise optimal newborn care.[21]

Table 2 The level of home-based newborn care practices among mothers who gave birth at home in Ethiopia (n=860), 2019–2021

Variables	Response category	Frequency	Percentage
Home-based optimal newborn care	Yes	75	8.72
	No	785	91.28
Safe cord care	Yes	325	37.79
	No	535	62.21
Optimal thermal care	Yes	314	36.51
	No	546	63.49
Optimal feeding practice	Yes	373	43.37
	No	487	56.63

Table 3 Assessment of factors associated with home-based optimal newborn care practice among mothers who gave birth at home in Ethiopia, 2019–2021

Variables	Optimal newborn care practice (n=860)		Crude OR (95% CI)	Adjusted OR (95% CI)
	Yes (%)	No (%)		
Area of residence				
Rural	60 (7.40)	751 (92.6)	0.26 (0.14, 0.47)	0.31 (0.15, 0.61)*
Urban	15 (30.61)	34 (69.39)	1.00	1.00
Household wealth index				
Lowest	22 (7.4)	277 (92.6)	0.39 (0.16, 0.96)	0.77 (0.28, 2.13)
Lower	14 (6.9)	188 (93.1)	0.34 (0.13, 0.87)	0.71 (0.25, 1.95)
Middle	15 (8.2)	169 (91.8)	0.40 (0.16, 1.01)	0.74 (0.27, 1.98)
Higher	18 (11.9)	133 (88.1)	0.60 (0.25, 1.45)	1.02 (0.42, 2.47)
Highest	6 (25.0)	18 (75.0)	1.00	1.00
Educational level				
Never attended	44 (8.4)	481 (91.6)	0.81 (0.35, 1.88)	—
Primary	25 (8.5)	268 (91.5)	0.66 (0.27, 1.61)	—
Secondary	6 (14.3)	36 (85.7)	1.00	
Parity				
<5 live births	31 (11.5)	232 (88.5)	0.71 (0.46, 1.07)	0.94 (0.56, 1.58)
≥5 live births	46 (7.6)	551 (92.4)	1.00	1.00
Women's age category				
15–19	4 (5.1)	75 (94.9)	0.46 (0.17, 1.22)	0.53 (0.18, 1.54)
20–24	11 (5.9)	174 (94.1)	0.51 (0.25, 1.02)	0.49 (0.22, 1.10)
25–29	21 (8.4)	228 (89.6)	0.72 (0.41, 1.28)	0.73 (0.38, 1.38)
30–34	19 (10.2)	167 (89.8)	0.94 (0.53, 1.66)	0.87 (0.48, 1.55)
≥35	20 (12.4)	141 (87.6)	1.00	1.00
Number of ANC visits				
≥4	65 (8.6)	695 (91.4)	0.99 (0.51, 1.94)	0.84 (0.43, 1.64)
<4	10 (10.0)	90 (90.0)	1.00	1.00
Visited/seen HEW during pregnancy				
Yes	26 (9.8)	240 (90.2)	1.03 (0.64, 1.66)	—
No	49 (8.2)	545 (91.8)	1.00	—

*Statistically significant CI.
ANC, antenatal care; HEW, health extension worker.

Previous studies reported that the chance of optimal newborn care practice was higher among mothers with the highest income, had good knowledge of newborn care, had formal education and had more than four antenatal care visits;[13–15 18] however, none of these factors were either not statistically significantly associated with optimal newborn care practice nor measured in the current study. The possible explanation could be that the association between the exposure and outcome variables might be confounded or surrogated by mothers' area of residence. Therefore, due attention should be given to mothers from rural areas to further improve their optimal newborn care practices.

The current study revealed that the chance of home-based optimal newborn care practice was 69% times lower among mothers from rural areas compared with mothers from urban areas. This finding was consistent with previous work that revealed mothers from rural areas practised suboptimal newborn care, such as inappropriate thermal care (baby not covered with clothe immediately after cord cutting and frequent bathing with cold water), inappropriate cord care (applying butter or ointment on the cord), inappropriate feeding practice (discarding colostrum and delayed initiation of breast feeding) and poor handwashing practice prior to contact with the newborn.[13–15 24] The possible explanation could be that mothers from rural areas might not have adequate knowledge of the health benefits of optimal newborn care and consequences of suboptimal newborn care. Evidence has shown that optimal essential newborn care practice

was lower among mothers who did not get any advice on essential newborn care or with poor knowledge of essential newborn care and with poor knowledge of newborn danger signs.[13 14 25–27]

As a longitudinal panel survey study, our study has many strengths. The unequal selection probability of mothers of neonates and the clustering nature of the data by EA were accounted in the analysis, so the findings can be reliable and used to make generalisation. The study was also less susceptible to recall bias, as mothers were inquired about the newborn care they provided to their baby before 6–8 weeks. As a limitation, this study might be at risk of Hawthorne effect bias, as the mothers who participated in the study might change their practice of newborn care because they knew their baby including themselves were being studied. This limitation might not be a problem in this study, as the misclassification was more likely to be non-differential in the EAs. In addition, in this analysis, the effect of mothers' knowledge and perception towards essential newborn care and knowledge of newborn danger signs on the outcome were not assessed due to data limitation in the PMA survey.

CONCLUSION

From the current findings, we can conclude that the level of home-based optimal newborn care practice was very low in Ethiopia. Home-based optimal newborn care practice was lower among mothers from rural areas in the nation. Therefore, health planners at different levels and healthcare providers, including health extension workers, should give priority attention to mothers from rural areas to improve their optimal newborn care practice by considering the context-specific factors or barriers.

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Competing interests None declared.

Patient and public involvement Patients and/or the public were not involved in the design, or conduct, or reporting, or dissemination plans of this research.

Patient consent for publication Not required.

Ethics approval This study involves human participants and the study proposal was reviewed and approved by the Institutional Review Board of the College of Health Sciences, Addis Ababa University (reference number: 027/22/SPH). This is a secondary data-based study and participants were not contacted directly.

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Data availability statement Data are available upon reasonable request. The data that support the findings of this study are available upon reasonable request from the Performance Monitoring for Action (PMA) website via https://datalab.pmadata.org/datasets. Additionally, the datasets used in this study can be provided by the lead author on reasonable request after approval of the PMA project owners.

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