ORIGINAL ARTICLE

Determinants of Early Childhood Mortality in Basso Liben Woreda, North West Ethiopia

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Abstract

World Health Organization (WHO) report shows the risk of childhood mortality is still the highest risk of mortality in the globe. However, the case is different in Ethiopia. There has been a remarkable decline, especially, since the year 2000. This study used a household-based quantitative cross-sectional study design to assess the determinants of early childhood mortality. The data were collected from a representative sample of 374 populations. The study participants were women of reproductive age (15-49) years. Bivariate and multivariate analysis was employed to determine the association between dependent and independent variables and analysis controlled for confounding factors of the respondents. The majority were rural residents (78.9%), urban residents (21.1%). The residence of the respondent, the child's postnatal checkup, place of delivery, the age of mother, and birth interval had a significant association with early childhood mortality. The finding shows that high proportion of mothers delivered at their homes. Thus, promotion of awareness creation among women about the importance of giving birth in healthcare facilities is found to be essential to reduce childhood mortality in the study area.

Keywords: Basso Liben, Childhood, Mortality, Health Care

Introduction

Early childhood mortality rates are not only important measures of the living and socio-economic conditions of a nation but are also powerful indicators of socioeconomic development and can be used to measure the overall health status of a country (Mulenga, 2011, Geremew et al 2020).

According to the World Health Organization, the total number of infant mortality cases around the world decreased from 12.8 million in 1990 to 4.9 million in 2022. From 1990,

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the under-5 mortality rate around the globe has reduced by 59% with 93 cases per 1000 live births in 1990 to 37 in 2022. In regards to the number of deaths from within the first twenty-eight days of life (neonatal), there were also declines globally (from 5.2 million in 1990 to 2.3 million in 2022). Also, within these years, the neonatal mortality decreased much more slowly than post-neonate under-5 mortality. Roughly 6300 newborns die every day, which is almost 47% of total child deaths under the age of five (WOH,2022).

In sub-Saharan Africa, approximately 2.7 million children die before they turn five years old due to the most potentially preventable leading causes of childhood deaths This indicates the limited access that children have to basic health interventions such as vaccinations, primary medical treatment, adequate nutrition, and clean water and sanitation (Dwomoh et al, 2019, Birhanie et al 2025).

In Africa, the main risk factors associated with a high number of infant deaths include lack of access to funds and infrastructure, access to education, lack of medical professionals, poverty, and discrimination (Avelino et al 2025). There is also a higher prevalence in the region of those diseases that infants are particularly vulnerable to, such as pneumonia, diarrhea, malnutrition, asphyxia, birth complications, and malaria (Birhanie et al, 2025). In addition, infant mortality rates vary across income groups, level of education, residence, maternal childbearing age, gender, ANC (Antenatal care) follow-up status, and geographical area (UNICEF, 2015; Kiross et al, 2019).

In Ethiopia, efforts to reduce child mortality have shown progress over recent decades. According to the 2016 Ethiopian Demographic Health Survey, under-five mortality rates reduced from 166 to 67 deaths per 1,000 live births in 2000 and in 2016 consecutively, a 60 percent decline over 16 years. Similarly, infant mortality decreased from 97 to 48 deaths per 1,000 live births (a 50% reduction), while neonatal mortality dropped from 49 to 29 deaths per 1,000 live births (a 41% reduction) over the same period. (CSA, 2016). Despite these progresses, there is still high child mortality (CSA, 2019). 1 in every 35 children dies within the first month, 1 in every 21 children dies before celebrating their first birthday, and 1 of every 15 children dies before reaching their fifth birthday (CSA, 2016).

Over two-thirds of childhood deaths in Ethiopia are caused by few and easily preventable conditions like infections, neonatal conditions, and malnutrition. The major direct causes of early childhood mortality, based on the 2014 Ministry of health estimates, are pneumonia (18%), diarrhea (9%), prematurity (11%), newborn infection (9%), asphyxia (14%), injury (6%), measles (2%), malaria (3%), congenital anomalies (4%), HIV (2%), and others (21%). Undernutrition is a major underlying cause contributing to nearly half of childhood deaths (Ministry of Health, 2015).

Child health is determined by many factors including parental education, access to health services, and income of families. Child mortality is also determined by a combination of socioeconomic, biological, environmental, and behavioral factors. Studies conducted in Ethiopia reported that under-five mortality is influenced by socioeconomic status, birth weight, mother's age, place of residence, mother's age, mother's education, place of delivery, birth order, sex of the child, the religion of parents, household headship, and household socioeconomic status (Gebretsadik et al 2016 and Geremew et al 2020). While examining early childhood mortality, it was important to consider various studies conducted in comparable other areas. However, these studies often differ significantly in terms of the population demographics, the availability of health services, and the quality of infrastructure facilities. Such variations can greatly influence the findings and implications of each study. It also highlights the complexity of addressing early childhood mortality across different contexts. Therefore, the main aim of this study was to assess the magnitude of early childhood mortality and identify the factors affecting early childhood mortality in Basso Liben Woreda.

Methods

Study setting and period

The study was conducted in Basso Liben Woreda Amhara Region, Ethiopia. This woreda (district) is found 326 kilometers away from Addis Ababa, the capital city of Ethiopia. The district has a total population of 168,571, of which 88,622 are females and 79,949 are males. Social infrastructure, like schools, health centers, and transportation, is underdeveloped, limiting access to education, healthcare, and economic opportunities (Basso Liben Woreda Administrative Office, 2019). The healthcare system in Basso Liben Woreda faces challenges in terms of resources, infrastructure, and healthcare workforce shortages. However, ongoing efforts by the government and its partners aim to improve access to and the quality of healthcare services for the population (Basso Liben woreda health office, 2019). Compared to other districts in the East Gojjam zone, Basso Liben lacks adequate health service which aggravates the early childhood mortality in the area. The study period was from March 2019 to June 2019.

Study design

A household-based quantitative cross-sectional study design was held to assess the determinants of early childhood mortality in the study area. While interviews and focus groups can provide useful insights, the study aimed for a broader approach using the quantitative approach for wider applicability. Time and resource constraints limited the inclusion of qualitative methods, which require more extensive data collection.

Source of population: All reproductive-aged women (15-49) and permanent residents of Basso Liben Woreda are considered as population source.

Study population: The study population was women of reproductive age (15-49 years) who gave birth in the past two years prior to the study.
Inclusion criteria: In this study mothers who have been given births in the past two years before the study and those who are the permanent residents of the woreda have been included.

E**xclusion criteria:** *Mothers who are mentally ill and involuntary to give a response, children, and women below age 15 and above age 49 have been excluded.*

Sampling Technique

First, all enumeration areas have been clustered into rural and urban. The rural enumeration areas were also being clustered into its closeness and farness to the health facility. Out of the urban areas, two clusters have been selected by using a simple random sampling method. From the total rural clusters, two clusters near to and two clusters far from the health facility have been selected by using a simple random sampling method to give equal chances for all selected clusters. Based on Baso Liben woreda health office report on the total number of women who have given birth in the two years prior to this study in the selected five clusters, the sample population in each cluster was taken proportional to the total sample size.

Sample size determination

The required sample size was determined by using a single population proportion formula with the assumption of 95% confidence interval, 5% error, and 50% prevalence of child mortality.

$$n = \frac{(Z\alpha/2)^2 \, p\,(1-p)}{d^2}$$

Where n= the desired sample size

$Z\alpha/2$=standard normal score (95%)

p=prevalence of early childhood mortality (50%),

d= error (5%)

Where,

$Z\alpha/2 = 1.96$

$$n = \frac{(1.96)^2 \times 0.5 \times (1-0.5)}{(0.05)^2}$$

$$n = \frac{3.841 \times 0.5 \times 0.5}{0.0025} = 384$$

Accordingly, 384 questionnaires was prepared and distributed. The researcher chose not to focus on the non-response rate, anticipating a high response rate that would enhance statistical precision. This decision reflects confidence in the methodology and the ability to obtain reliable data. Although research has been conducted in various areas on the same topic, the findings differ due to socio-economic conditions, methodology, variable selection, and availability of health services. For this reason, the researcher utilized a 50% prevalence rate of early childhood mortality.

Data collection instruments and procedures

Data was collected using quantitative methods. In the quantitative study, the structured questionnaires are adopted from the Ethiopian Demographic Health Survey (EDHS) questionnaire with some modifications from relevant literature being prepared in English version. Later on, the English version of the questionnaire was translated into the Amharic version. The selection of supervisors and data collectors was based on their educational accomplishments, with supervisors holding a completed first degree and data collectors having completed grade 12. Direct interviewing with face-to-face interaction between the interviewer and the interviewee by using a structured questionnaire at the household level was employed. Training was given to the supervisors and data collectors on the objectives of the study, the content of the questionnaire, the issues related to the confidentiality of the responses, and the rights of the respondents during data collection.

Dependent variable: The dependent variable is childhood mortality. This is a dichotomous/categorical variable, the existence of childhood mortality or not.

Independent variables: These are variables that contribute to the existence of childhood mortality or not.

Table 1: Socio-Economic and Demographic Variables Modeling Childhood Mortality in Basso Liben Woreda, 2019.

Variable name	Operational definition of variables	Type of variables	Coding of variables
Residence	Current place of residence at the time of the survey	Dichotomous	1= urban 2= rural
Antenatal Care (ANC) follow-up	Self-reported follow-up of antenatal care	Dichotomous	0= no 1= yes
Child Postnatal Care (PNC) checkup	Self-reported child postnatal care checkup at the time of the survey	Dichotomous	0= no 1= yes
Place of delivery	Place of delivery at the time of the survey	Dichotomous	1= home 2= health institution
Mothers education	Level of mothers' education reported at the time of the survey	Categorical	0= didn't attend formal education 1= primary education 2= secondary and above education
Mothers marital status	Self-reported marital status of the respondent at the time of the survey	Dichotomous	0= single 1= married
Media exposure	Women's exposure to media at the time of the survey	Dichotomous	0= no 1= yes
Monthly income of the respondent	Self-reported monthly income of the respondent at the time of the survey	Dichotomous	1= <2000 2= 2000+
Age of mother at last birth	Self-reported age of mothers at the time of the survey	Dichotomous	1= <20 2= 20+
Birth order	Self-reported birth order of children at the time of the survey	Categorical	1= 1-2 2= 3-4 3= 5-6 4= >6
Birth interval	Self-reported birth interval of children at the time of the survey	Dichotomous	1= 0-4 2= 4+

Data processing and analysis

After data collection, each completed questionnaire was checked for completeness. Then the data was entered into a computer by SPSS version 20. In this study, SPSS was selected for data entry due to the researcher's familiarity with the software, integration with planned statistical analysis, and compatibility with the existing workflow. Descriptive analysis like percentage was carried out to describe the study participants according to different characteristics. Bivariate analysis was computed to examine the crude association of predictors with childhood mortality. Selecting eligible variables using binary logistic regression models with the confounding effect of predictors on outcome variables. The odds ratio with their 95% confidence interval (CI) was used to determine the strength of the association. The P value less than 0.05 was considered as a level of significance.

Data quality

First, the questionnaires was prepared in English language and afterward translated into a local language. Then consent was taken from the respondents before the interview. The data was collected by data collectors and its completeness was checked before leaving the house. The data had also been checked for its clarity and consistency every day by principal supervisors. The data was entered and analyzed after having different coding.

Ethical clearance

The study has got approval from the College of Social Science and the Humanities ethical clearance committee at the University of Gondar. The study was commenced after written consent was obtained from Basso Liben Woreda's administrative office. Each respondent was informed about the objective of the study and assured of the study's confidentiality. Verbal consent was secured from each participant at the end of each interview session.

Results

In the following section, results of the study were presented by using univariate, bivariate, and multivariate analysis.

Socio-demographic characteristics

In Basso Liben Woreda, 374 women were interviewed, with 10 respondents, resulting in a non-response rate of 2.67%. The majority of the respondents were rural residents (78.9%) and the urban residents accounted for 21.1%. In relation to ANC follow-up, 73% of women attended antenatal care follow-up while 27% of the women did not at the time of their last pregnancy. Regarding to the PNC checkup, the majority of children (79.7%) did not get postnatal health care services. The results also indicated that the majority of mothers (62.8%) delivered at home, whereas the rest (37.2%) of mothers at health institutions. Only 14.4% of women had secondary and above education, and the remaining 67.6% of women did not attend any formal educations. In relation to the marital status of women, 24.6% and 75.4% of women were single and married, respectively. Regarding to media exposure, only 36.4% of the respondents had exposure to media, and the remaining majority respondents (63.6%) did not. The distribution of respondents by their monthly income also indicated that 73.8% of the respondents had monthly income below 2000 Ethiopian Birr. Regarding to age at last birth of women, the majority of women (89.6%) were age 20 and above.

Table 2: Socio-Economic and Demographic Characteristics of the Respondents in Basso Liben Woreda, 2019

Characteristics		Frequency	Percent
Residence	Urban	79	21.1
	Rural	295	78.9
ANC follow up	No	101	27
	Yes	273	73
Child PNC checkup	No	298	79.7
	Yes	76	20.3
Place of delivery	Home	235	62.8
	Health institution	139	37.2
Mothers education	Didn't attend formal education	253	67.6
	Primary	67	17.9
	Secondary and above	54	14.4
Mothers marital status	Single	93	24.6
	Married	281	75.4
Media exposure	No	238	63.6
	Yes	136	36.4
Monthly income of the respondent	<2000	276	73.8
	2000+	98	26.2
Age at last birth	<20	39	10.4
	20+	335	89.6
Birth order	1-2	122	32.9
	3-4	137	36.6
	5-6	104	27.5
	>6	11	2.9
Birth interval	0-4	307	82.1
	4+	67	17.9

Table 3: Early Childhood Mortality by Socio-Economic and Demographic Characteristics, Basso Liben Woreda, 2019.

		Early Childhood Mortality		Chi-square Test
Characteristics	Category	No N (%)	Yes N (%)	P- Value
Residence	Urban	76 (96.2)	3 (3.8)	0.002
	Rural	275 (93.2)	20 (6.8)	
ANC follow up	No	90 (89.1)	11 (10.9)	0.001
	Yes	259 (94.9)	14 (5.1)	
Child PNC checkup	No	279 (93.6)	19 (6.4)	0.041
	Yes	70 (92.1)	6 (7.9)	
Place of delivery	Home	216 (91.9)	19 (8.1)	0.013
	Health institution	133 (95.7)	6 (4.3)	
Mothers education	Didn't attend formal education	233 (92.1)	20 (7.9)	0.029
	Primary	65 (97.0)	2 (3.0)	
	Secondary and above	51 (94.4)	3 (5.6)	
Mothers marital status	Single	86 (92.5)	7 (7.5)	0.650
	Married	263 (93.6)	18 (6.4)	
Media exposure	No	218 (91.6)	20 (8.4)	0.006
	Yes	131 (96.3)	5 (3.7)	
Monthly income of the household	<2000	258 (93.5)	18 (6.5)	0.034
	2000+	91 (92.9)	7 (7.1)	
Age at last birth	<20	38 (97.4)	1 (2.6)	0.018
	20+	311 (92.8)	24 (7.2)	
Birth order	1-2	116 (95.1)	6 (4.9)	0.007
	3-4	123 (89.8)	14 (10.2)	
	5-6	101 (97.1)	3 (2.9)	
	>6	9 (81.8)	2 (18.2)	
Birth interval	0-4	287 (93.5)	20 (6.5)	0.003
	4+	62 (92.5)	5 (7.5)	

Multivariate Analysis

In this section, the adjusted and unadjusted analyses of determinants of early childhood mortality are presented. According to residents, the likelihoods of early childhood mortality at urban residents were less likely to die than rural residents in both the adjusted and unadjusted odds ratios. Regarding antenatal follow-up of women, the adjusted result shows that the likelihood of early childhood mortality of women who followed ANC was less

likely than a woman who did not follow ANC (AOR .986, 95% CI, (.525,1.850). However, in the unadjusted odd ratio, the result shows that the likelihood of early childhood mortality of women who followed ANC was more likely to die than a woman who did not follow ANC (UOR 2.64, 95% CI (1.707,4.034). This is consistence with (Adeyinka et al 2020). Children who have had postnatal care checkups were less likely to die than children who have not got postnatal checkups with the adjusted odds ratio (AOR 1.81, 95%CI, 1.009, 3.274) and unadjusted odds ratio (UOR 2.54, 95%CI, 1.522, 4.264). Place of delivery has a significant association with early childhood mortality in both adjusted and unadjusted results. Women who gave birth at a health institution were less likely to die than women who gave birth to their children at home. After adjustment, however, the odds of early childhood mortality highly dropped from 7.668 unadjusted odds ratios (UOR 7.66, 95% CI, 4.778, 12.305) to 4.046 adjusted odds ratio (AOR 4.0, 95% CI, 1.430, 11.45). Regarding on-maternal education, women who attend secondary and above education had a negative significant association with early childhood mortality with unadjusted odds ratios (UOR 14.66, 95%CI, 7.452, 28.87). However, after adjustment, maternal education has no significant association with early childhood mortality.

Table 4. The logistics regression model shows determinants of early childhood mortality in Baso Liben woreda, 2019.

		Early Childhood Mortality			
Characteristics	**Category**	**B`**	**Adjusted OR (95%CI)**	**B`**	**Crude/Unadjusted OR(95CI)**
Residence	Urban	-.007	2.380(1.352,4.188)**	-1.266	3.546(2.285,5.501)**
	Rural (Ref)	0	1	0	1
ANC follow up	No (Ref)	0	1	0	1
	Yes	-.014	.986(.525,1.850)	.965	2.624(1.707,4.034)**
Child PNC checkup	No (Ref)	0	1	0	1
	Yes	-.598	1.818(1.009,3.274)**	-.935	2.547(1.522,4.264)**
Place of delivery	Home (Ref)	0	1	0	1
	Health institution	-.398	4.046(1.430,11.45)**	-.037	7.668(4.778,12.305)**
Mothers education	Didn't attend formal education (Ref)	0	1	0	1
	Primary	-.051	2.861(1.393,5.875)	-2.455	11.652(6.210,21.86)
	Secondary and above	-.814	2.257(1.008,5.054)	-2.686	14.669(7.452,28.87)**
Media exposure	No (Ref)	0	1	0	1
	Yes	-.353	.702(.356,1.384)	-.328	.720(.465,1.117)
Monthly income of the household	<2000(Ref)	0	1	0	1
	2000+	-.116	.891(.416,1.906)	-1.057	.348(.223,.541)**
Age at last birth	<20(Ref)	0	1	1	1
	20+	-.797	.451(.113,1.791) **	-1.342	.261(.129,.528)**

	1-2 (Ref)	0	1	0	1
	3-4	.324	1.383(.527,3.629)	1.574	4.826(2.197,10.598)
	5-6	.438	1.550(.697,3.446)	1.099	3.002(1.582,5.695)
Birth order	>6	.065	1.067(.515,2.214)	.415	1.514(.859,2.670)
	0-4(Ref)	0	1	0	1
Birth interval	4+	-.867	2.380(1.352,4.188)**	-1.266	3.546(2.285,5.501)**

**Statistically significant at P<0.05.

(Ref) – Reference category

In relation to the age at last birth of women, women whose age at last birth was 20 and above, the likelihood of early childhood mortality was less likely to die than women whose age at last birth was less than 20 in both adjusted and unadjusted results. After adjustment, however, the odds of early childhood mortality slightly increased from 0.261 unadjusted odds ratios (UOR 0.26, 95%CI, .129,.528) to 0.451 with the adjusted odds ratio (AOR 0.45, 95%CI, .113,1.791). Table 4 also shows that the birth interval of children had a significant predictor of early childhood mortality. Children born with a birth interval of 4 and above were less likely to die than children born with a birth interval of less than four on both the adjusted and unadjusted odds ratios.

Discussion

The study aimed at examining the determinants of early childhood mortality in Basso Liben Woreda in 2019. The study showed that early childhood mortalities of urban residents were lower than rural residents. This implies that urban residents have access to health facilities for better health services at the time of pregnancy, delivery, and after delivery. It is also believed that urban areas were connected not only to access to health care services but also to good education and employment opportunities for mothers, implying a lower experience in early childhood mortality (Adeyinka et al 2020, Kaldewei, 2010 and Fikru et al 2019).

The results showed that the risks of early childhood mortality were lower among children who have received postnatal health care services than those who have no postnatal health care services. Mothers and their newborn babies are at the highest risk of dying during the early neonatal period, especially in the first 24 hours following birth and over the first seven days after delivery. If all newborns received high-impact and cost-effective interventions during the postnatal period, it is estimated that neonatal mortality could be reduced (Gizaw, 2015).

Place of delivery has a significant association with early childhood mortality in the study area. The finding showed that the likelihood of early child mortality was lower among children who were born at a health institution than those who were born at home. Children

born in a health institution and attended by trained medical staff reduced early childhood mortality and morbidity compared to home delivery (Ajaari, 2012). This probably be because a health facility delivery generally has a lower likelihood of complications likely to result in early childhood death.

The result shows that early childhood mortality was significantly associated with the mother's age at last birth. The probabilities of early childhood mortality were lower with the mother's age at last birth of 20 and above than the mother's age at last birth of less than 20. The evidence shows that adolescent mothers are more likely to have babies that are low birth weight or born prematurely, both of which are significant causes or contributing factors to newborn mortality (Libwea et al, 2019).

The length of time between two successive live births has a significant association with early childhood mortality. In this research, the probabilities of early childhood mortality were lower among children whose birth interval was 4 and above than children whose birth interval was 0-4. This may be short birth interval increases the risk of childhood mortality due to the physiological and nutrition depletion of the mothers which relates to premature childbirth and exposes the mother to pregnancy complications (Ministry of Health, 2015). As a result, low nutritional status is more common among children with short birth intervals. Thus, the relative risk of being underweight is significantly higher for children with shorter birth intervals (CSA, 2016).

The findings of this study have significant clinical and public health implications. The association between birth intervals and early childhood mortality highlights the importance of promoting optimal birth spacing as a strategy to improve child survival specifically for child health (WHO,2024). Child mortality is influenced by a variety of factors, including the findings previously mentioned, but it is also significantly affected by maternal nutrition. Unfortunately, the research did not directly assess maternal nutrition, which creates important gaps in our understanding of how nutrition impacts both birth intervals and child health outcomes. Without this critical information, it is challenging to fully grasp the relationship between a mother's nutritional status and the well-being of her children.

Conclusion

The study assesses factors affecting early childhood mortality in Basso Liben Woreda, North West Ethiopia. Mothers' place of residence, child postnatal care checkup, place of delivery, age of the mother, and the birth interval were all considered important factors in early childhood mortality. Children whose mothers living in urban areas had a greater chance of survival compared to children in rural settings as urban residents were more educated and had greater access to health services. Postnatal care service coupled with deliveries in health care institutions significantly lowered mortality rates. Maternal age

also affected early childhood mortality, with age greater than 20 having the lowest child mortality compared to mothers younger than 20.

This study points out the need to reduce early childhood mortality in the region through strategic initiatives that promote deliveries at health institutions, improve the quality of postnatal care services, and educate mothers on the advantages of extending the intervals between successive births. Improving set criteria comprehensively through greater access to healthcare services and intensive awareness campaigns will go a long way in addressing early childhood mortality issues in Basso Liben Woreda.

Declarations

Ethics approval and consent to participate

The study has got approval from the College of Social Science and the Humanities ethical clearance committee at the University of Gondar. The study was commenced after written consent was obtained from the Basso Liben Woreda administrative office. Written informed consent was not obtained from a parent or guardian for participants under 15 years old. However, each respondent was informed about the objective of the study and assurance of confidentiality.

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Competing interest

There is no competing interest.

Availability of data and materials

All necessary data analyzed for this study are available in SPSS readable format and all findings are presented in figures and tables in the manuscript.

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Consent to Publish

Not Applicable' in this section.

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