Underfive Mortality and Associated Factors among Children Born from 15-49 Years Old Mothers in Haramaya Town, Eastern Ethiopia

Mohammed Ahmed (✉ mamexahmed@gmail.com)

School of Public Health, College of Health and Medical Sciences, Haramaya University, Harar, Ethiopia
<https://orcid.org/0000-0003-4829-0214>

Melake Demena

School of Public Health, College of Health and Medical Sciences, Haramaya University, Harar, Ethiopia

Zelalem Teklemariam

School of Medical Laboratory Science, College of Health and Medical Sciences, Haramaya University, Harar, Ethiopia

Assefa Desalew

School of Public Health, College of Health and Medical Sciences, Haramaya University, Harar, Ethiopia

Nega Assefa

School of Public Health, College of Health and Medical Sciences, Haramaya University, Harar, Ethiopia

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Abstract

BACKGROUND

Globally, since 2000, a decline in the underfive mortality rate has been recorded, indicating that over 50 million children's lives have been saved. More than 80 countries globally, specifically 69 developing nations, have reduced the underfive mortality by half since 2000. In the eastern part of Ethiopia, evidence from the Kersa Health and Demographic Surveillance System in the Kersa district of East Hararghe Zone, Oromia Region, suggested a decline in the underfive mortality rate from 131.8 per 1000 live births in 2008 to 77.4 per 1000 live births in 2013. The death rates still remain far from the Sustainable Development Goals' target reduction to 25 or less per 1000 live births by 2030. However, the magnitude and determinants of underfive mortalities have not been studied in Haramaya town.

OBJECTIVE

To assess the underfive mortality rate and its associated factors among children born from 7th August 2015 to 6th August 2020 in Haramaya town, east Ethiopia, by 7th–31st August 2020.

METHODOLOGY

A quantitative cross-sectional population-based study was conducted on 391 pairs of 15- to 49-year-old mothers and their live-born underfive children selected using a systematic random sampling technique from Haramaya town to compare child mortality between the ≤ 24 and ≥ 25 mother's age groups. Data were collected using an interview-based questionnaire, double entered into EpiData 3.1, and then exported to the statistical package for social sciences program version 20.0 for analysis. Binary logistic regression analysis (p value < 0.20) was performed to examine the crude association of predictors with underfive mortality, and then multiple logistic regression analysis (p value < 0.05) was performed to measure the statistical association.

RESULTS

The deaths of 28 out of 372 live births resulted in an underfive mortality rate of 75 per 1000 live births. Children born in households with fewer than 6 members had 7.98 times higher odds of dying than those born in households with at least 6 members (AOR = 7.98, 95% CI = 1.59-40.17). Those children who did not feed colostrum were associated with a 17.45 times increased risk of underfive deaths compared to colostrum-fed children (AOR = 17.45, 95% CI = 6.54-46.55).

CONCLUSION

The study suggests that 75 per 1000 live births die before celebrating their fifth birth day. Household size and colostrum feeding are significantly associated factors.

RECOMMENDATION

All concerned should inform the mothers of the role of identified factors such as household size and colostrum feeding in child survival.

Introduction

1.1. Background

The child mortality rate (U5MR) has been widely used as an indicator of equality and human development [1]. The U5MR is defined as the probability (per 1,000 live births) that a child will die before reaching the age of five if subject to current age-specific mortality rates [2]. It is an important indicator that reflects the health of children and the development of the economy and culture of a country or region [3]. It is one of the health indicators used by the World Health Organization (WHO) to assess a country's progress with improving the health of its citizens. The mortality of children under 5 years of age forms Goal 3 of the Sustainable Development Goals (SDG 3) to reduce the U5MR to at least as low as 25 per 1000 live births by 2030 [4]. In 1990, the United Nations Development Program (UNDP) introduced the Human Development Index (HDI), which has three aspects: longevity, knowledge, and life standards measured by life expectancy at birth, a combination of adults' literacy and enrollment rate, and gross domestic product (GDP) per capita, with the main aim of creating a more comprehensive measure of the human development program [1].

Globally, since 2000, a decline in the under-five mortality rate has been recorded, indicating that over 50 million children's lives have been saved. More than 80 countries globally, specifically 69 developing nations, have reduced the under-five mortality by half since 2000 [5]. However, this progress is not equally distributed at the national and subnational levels [2].

From an ecological study in West and South Asian countries, the highest rate of decrease was related to India (167.6 to 59.9 in 100 live births from 1980–2010) and Iran (109.9 to 19.2 in 100 live births from 1980–2010) [1]. There are few studies on subnational child mortality (CM) in Iran, but a published report by the Iranian Ministry of Health showed that in 2010, more than 91% of mortality in the neonatal period and more than 63% of mortality 1 to 59 months after birth occurred in Iranian hospitals [2]. Deaths in neonates accounted for more than 50% of all deaths among children under age 5 during the 24 consecutive years under investigation in Beijing [6].

African children are nearly 16 times more likely to die under age five than children from high-income nations, although progress in Africa is being made [7]. U5MR in the sub-Saharan region has remained unabated [8]. Many countries, especially those from sub-Saharan Africa, were unable to reach the Millennium Development Goal for under-5 mortality reduction by 2015. The current U5MR (per 1,000 live births) was 133 in the Republic of Chad, 104 in the Democratic Republic of Congo, 95 in Mali, 127 in Niger, and 69 in Zimbabwe [8].

In Ethiopia, it declined substantially in most of the Health and Demographic Surveillance System (HDSS) sites during the last 10–15 years [3]. For instance, evidence from the Kersa HDSS in Kersa district of East

Hararghe Zone, Oromia Region, Eastern Ethiopia suggested the decline of U5MR from 131.8 per 1000 live births in 2008 to 77.4 per 1000 live births in 2013 [9]. The prevalence rate of underfive deaths in Ethiopia was 67 per 1000 live births from the Ethiopian Demographic Health Survey (EDHS) 2016 [10]. This represents a 60% decrease in underfive deaths over the period of 16 years since 2000, when there were 166 deaths per 1000 live births [5].

It seems that improving maternal education level, increasing age at marriage, and the birth gap between two births have an important role in decreasing U5MR in India [1]. For girls, there are also major benefits for the next generation: half of the reduction in under5 mortality achieved in the last 30 years may be attributable to increased maternal education [11].

1.2. Statement of the problem

In 2015, it was estimated that 5.9 million children aged under 5 years died, leading to a global U5MR of 43 per 1000 live births, which was still far from the target Sustainable Development Goals (SDGs) to end preventable deaths of children under 5 years by 2030 [1]. Evidence from the Ethiopian Mini Demographic Health Survey (EMDHS), 2019, shows 55 underfive deaths per 1,000 live births [12].

The younger the mother is, the higher the risk of complications both for her and the child, and childbearing before age 16 is of particular concern [13]. However, evidence from the Ethiopian Demographic and Health Survey, 2016 showed that approximately 40% of women had given their first birth before the age of 17 years old [14]. The World Health Organization estimates that infant deaths are 50% higher among babies born to mothers aged below 20 years. Infant mortality and morbidity, preterm birth, low birth weight, and asphyxia are also significantly higher among infants born to women under age 20 compared to older women [15]. A child born to a teen mother is twice as likely to die before the first birthday as the child of a woman in her twenties [16]. The majority of child (6.36%) deaths that occur due to the mothers' age at birth are less than 18 years in Ethiopia [17]. These high rates of mortality and morbidity may be, in part, due to immature physical structure, low utilization rates of maternal and child health services and low education levels among adolescents [15]. A range of demographic and socioeconomic factors are known to account for enormous disparities in the uptake of maternal health care in low- and middle-income countries.

Globally, almost 40% of all underfive deaths are due to preventable or treatable infectious causes, particularly bacterial pneumonia and diarrhea diseases, as well as birth complications and malnutrition. Several studies have shown that the Mother To Child Transmission (PMTCT) for HIV and malnutrition have an important influence on childhood mortality. There is also high neonatal mortality in many poor countries due to premature birth, birth asphyxia, and sepsis, whereas deaths in older children after the perinatal period have remained high due to low coverage of pneumococcal vaccines, poor sanitation and water supply, poor food security in low-income countries, and displacement of populations in countries with war or conflict. The U5MR increased by 7.20% from 2013 to 2015 in Beijing, China, where birth asphyxia, congenital heart disease, preterm/low birth weight, and other congenital abnormalities

comprised the top five causes of death [6]. Previous studies that examined child mortality found that the use of antenatal iron and folic acid (IFA) supplementation, tetanus toxoid (TT) vaccination during pregnancy, lack of skilled birth attendance, lack of antenatal care (ANC) visits, older maternal age, use of polluting fuel, higher parity, mortality inequality among poor households and mothers with no schooling were linked with child mortality [18]. Mothers with a previous death of a child who did not receive vaccines during pregnancy and those who were nonusers of contraceptives were at greater risk of having neonatal, postneonatal, infant, child and underfive mortality [18]. Differences in regions, educational attainment, birth in twins, place of delivery, availability of occupation of parents, age of mothers at first birth, breastfeeding status, birth order, religious belief, use of a contraceptive method, child vaccination, and family size play a significant role in the survival of underfive children [5]. In a study in the Ethiopian Somali Regional State, family size, preceding birth interval, birth order, breastfeeding status, and source of drinking water were significant determinants of underfive mortality in the region [19].

Generally, it was observed that the U5MR and maternal mortality rate had a decreasing trend from 1980–2010 [1]. One of the most important causes of this decrease was the improvement of the HDI; thus, by increasing educational levels, income per capita, and life expectancy, we might observe a substantial reduction in maternal and child mortality rates [1]. In a French study, it was seen that U5MR decreased from 1990 to 2011 in all low- and middle-income countries, and this decrease was influenced by factors such as improvement of health care and economic status [1]. The reduction in mortality was consistent with changes in the proximate determinants of child survival in Bangladesh, which included maternal factors, environmental contamination, nutrient deficiency, personal illness control, and injury [20]. Immunization and management of childhood illnesses are two important personal illness control measures that have contributed enormously to reducing underfive mortality [20]. Health and population programs have been effective in increasing immunization coverage, the use of ORS (oral rehydration solution) for managing diarrheal diseases, and contraceptive use [20]. India achieved an impressive decline in underfive mortality, from 167.5 in 1980 to 45.2 per 1000 live births in 2015, and reduced diarrhea mortality was an important contributing factor [21]. ORS use and reduction in stunting were the two key interventions, each accounting for approximately 32% of the lives saved during this period in the country [21]. Steadily increased contraceptive use during the last couple of decades from 40% in 1990 to 62% in 2014 has reduced the risk of CM associated with higher-order births, short birth intervals and large family size, which might have contributed to reducing overall CM [20].

The underfive mortality rates, although reduced from 67 per 1000 live births evidence from EDHS, 2016 [10] to 55 per 1000 live births from EMDHS, 2019 [12], remain far from the SDG target. To achieve child survival SDG targets, our findings indicate the need for community-based family planning interventions such as the promotion of contraceptives as well as universal coverage of two recommended doses of vaccines during pregnancy, and these interventions should target women from socioeconomically marginalized groups as well as those who have had previous death of a child [18]. Effective health facilities, improving the awareness of mothers about contraceptive methods and vaccination of the child for family planning and better child health strategies across all rural settings of the country, thereby equitably expanding health benefits as outlined in the SDGs, Goal 3 focuses on

health (ensuring healthy lives and promoting well-being for all at all ages) of the country [5]. The study analyzed data from the EDHS, 2016, based on secondary data. The major limitation was that some important determinant factors of underfive mortalities, such as previous death of a child and maternal TT immunization, were missed due to high missing values in the data. The other weakness of the study was the mother's recall of events that took place for the five years preceding the survey, which was subject to recall bias [14].

Knowledge about the current underfive mortality and its determinant factors plays a great role in adapting different strategies and methods to achieve the desired goal, but little is known about it. This knowledge is not only useful for enabling us to achieve the SDGs' desired target of reduction in underfive mortality but also with proper measures makes it possible to reduce the aftermath consequences for the country. Hence, further investigation had to be conducted, including variables not included in this study, and to use spatial models to account for the spatial variation of experiencing underfive mortalities since regional variations are significant [14]. However, the magnitude and determinants of underfive mortalities have not been studied in Haramaya town. Therefore, this study aimed to examine the underfive mortality rate and associated factors among those children born five years before the study in the town.

1.3. Significance of the study

The Haramaya Town Health Office and East Hararghe Zonal Health Department may utilize the findings of this study to reduce the mortality of children under age five. The results might have given clues for planning on the areas of relevant programs that were suggested by the study. The study also provides a basis for future studies.

1.4. Objectives

1.4.1. General Objective

- To assess the underfive mortality rate and its associated factors among children born from 7th August 2015- 6th August 2020 in Haramaya town, east Ethiopia, by 7th–31st August 2020.

1.4.2. Specific Objective

- To determine the underfive mortality rate among the last children born in the past five years in Haramaya town.
- To identify the factors associated with underfive mortality among the last children born in the past five years in Haramaya town.

Literature Review

2.1. Underfive Mortality Rate

Globally, approximately 5.6 million deaths of children under five years of age (under five deaths) have been reported. Of these deaths, three million occurred between 1 and 59 months of age, while the remainder occurred between birth and the first month of life [18]. An analysis of the Bhutan National Health Survey 2012 showed that Bhutan's UFM rate was 59 per 1000 live births [22]. Evidence from the Nepal Demographic and Health Survey (2001–2016) indicated a U5MR of 104 per 1000 live births [18]. In Ethiopia, it was approximately 67 per 1000 live births from the 2016 Nationwide Survey Data analysis; 4.1, 52.3 and 3.2 deaths per 1000 live births were attributable to being born to mothers aged <15, 15-25 and >25 years when they first gave birth, respectively [23].

2.2. Factors Associated with Underfive Mortality

2.2.1. Socioeconomic Factors

2.2.1. 1. Mother's education

Maternal education, especially secular education, is the single most important factor for improved child survival [20]. In a study conducted in 2015, the mean years of schooling showed a significant correlation with the decrease in mortality rates, meaning that as the education level increased, the health literacy of women rose as well, which led to better health, better care of their children, and more attention of women to the health of their family, thus reducing mortality and morbidity in West and South Asian countries [1]. Children of mothers with no schooling had 1.88 times higher mortality than those whose mothers had six or more years of schooling in Bangladesh [19]. The U5MR was found to be significantly lower among children born to parents who attended at least a high school education in Bhutan [22]. The odds of UFM were significantly lower, 62% and 77%, among children whose fathers had a high school and tertiary level of education, respectively, and 69% lower among those whose household head had received a high school education [22].

For instance, in South Africa, falling behind in school was the strongest risk factor for giving birth within the following two years [11]. The study results in Nigeria showed that the risk of childhood mortality is 26.7%, 39.7 and 45.9% lower among mothers with primary, secondary and tertiary education, respectively, than among those with no formal education [24]. One of the pathways by which mothers' education affects child survival is through improved child care [25]. This is probably because those with little education before marriage may be unable or poorly equipped to make appropriate reproductive health decisions that are important in reducing pregnancy-related complications [26]. Increased schooling has been associated with better health of women and their children in Zambia [13]. An analysis of the 2011 EDHS data reveals that the risk of dying for a child born to an uneducated mother was 2.13 times higher compared to a child whose mother had primary and higher education. Additionally, in Gilgel Gibe's field research of determinants of UFM, children born to mothers whose educational level was below elementary were 14 times more likely to die than children whose mothers' education was above elementary [25]. Similarly, evidence from EDHS 2016 data analysis

suggests that deaths among underfive children differed significantly with the level of mothers' education, with those of relatively higher education having a lower chance of experiencing underfive deaths (P value < 0.001) [14]. Children born to a mother with no education at all were associated with a 2.61 times increased risk of underfive deaths compared to being born to a mother with higher education (OR=2.610, 95% CI: 1.598, 4.265); children from mother with only primary education were 2.27 times more likely to be at the risk of underfive mortality (OR=2.271, 95% CI: 1.398, 3.687), while children born to mother with secondary education were 2.163 times more likely to die before celebrating their fifth birthday (OR=2.163, 95% CI: 1.184, 3.534) compared to being born to mother with higher education, keeping all other covariates constant [14]. Evidence from the Kersa HDSS in the Kersa district of Eastern Hararghe, Oromia, Ethiopia, also shows that maternal educational status was significantly associated with underfive children's mortality (OR 1.31 (1.13, 1.49)) [27].

2.2.1. 2. Income

Children from low asset category households had, on average, a 1.17 times higher mortality rate than those from high asset category households in Bangladesh [20]. The odds of UFM decreased significantly with increasing wealth quintiles and were lower among those born to working mothers [22]. The risk of childhood mortality was significantly lower in the middle, richer and richest (11.1%, 37.5 and 49%) economic quintiles, respectively, when compared to the risk of childhood mortality with a female spouse who is the poorest in Nigeria [24]. Low empowerment, indicated by low income and low decision-making power, is significantly associated with the likelihood of experiencing pregnancy complications in the study area, as those with low empowerment are (OR 3.962, CI 0.937-1.083, P<0.005) more likely to experience complications when compared with other categories [26]. Evidence from the Kersa HDSS in Kersa district of Eastern Hararghe, Oromia, Ethiopia also shows that a low household wealth index was significantly associated with underfive children's mortality OR 1.26 (1.10, 1.43) [27].

2.2.1. 3. Household size

Children born in households with at least 6 members experienced lower mortality rates. The likelihood of mortality was 66% lower (95% CI: 0.21–0.55) among children born in households with > 5 members than among those born in households with fewer than 6 members [22]. The possible influence of the interaction between household size and other variables (wealth index, mother's working status, mother's education level, and place of residence) on UFM was found to be not significant and is thus not reported. All variance inflation factors (VIFs) were < 10, suggesting that multicollinearity was not a concern in the regression analysis [22]. A study in an Ethiopian Somali regional state suggested that family size was a significant determinant of underfive mortality in the region [19]. According to the EDHS 2011 data analysis, the mortality risk of children increases as the size of the family increases in the region. The risk of dying for a child born in a family of size 4-6 is 1.879 times higher than that for a child born in a family of size 1-3 (reference category). Children born in a family with a size of seven and above have a significantly higher hazard rate than children born in a family with a size of 1-3, i.e., children

born in a family of size seven and above have a 2.164 (HR=2.164, 95% CI: 1.987, 8.215) times higher risk of death than children in the reference category [19].

2.2.1. 4. Occupation of mother

The employment status of mothers and husbands was identified as a significantly associated factor with underfive deaths (P value < 0.05). The odds of underfive mortalities were 18.4% (OR=0.816, 95% CI: .666, .999) lower among women who were to work at all compared to those who were skilled or manual workers. The probability of child mortality, under five, was 32% (OR=0.679, 95% CI: .533, .864) and less likely to occur among women with an unemployed husband and 22% (OR=.783, 95% CI: .618, .991) less likely to occur among women whose husbands were professionally employed compared with those who were working as sales and others [14].

2.2.1. 5. Availability of electricity

The likelihood of UFM was also significantly higher among children born in households without electricity, in the eastern and central regions, and those living in rural areas [22]. The odds of UFM were significantly higher among children born in households without electricity (AOR = 1.81, p = 0.026) and those born in the central (AOR = 1.72, p = 0.025) and eastern (AOR = 2.09, p < 0.001) regions [22].

2.2.2. Health-related Factors

2.2.2.1. Maternal TT immunization

Multivariable analyses revealed that the most common factor associated with mortality across all age subgroups was nonuse of tetanus toxoid (TT) vaccinations during pregnancy (aHR 2.28, 95% CI 1.68, 3.09 for neonatal; aHR 1.86, 95% CI 1.24, 2.79 for postneonatal; aHR 2.44, 95% CI 1.89, 3.15 for the infant; aHR 2.93, 95% CI 1.51, 5.69 for the child; and aHR 2.39, 95% CI 1.89, 3.01 for underfive mortality) [18].

2.2.2.2. Contraceptive use

Multivariable analyses revealed that nonuse of contraceptives among mothers was the most common factor associated with mortality across all age subgroups (aHR 1.69, 95% CI 1.21, 2.37 for neonatal; aHR 2.69, 95% CI 1.67, 4.32 for postneonatal; aHR 2.01, 95% CI 1.53, 2.64 for the infant; aHR 2.47, 95% CI 1.30, 4.71 for the child; and aHR 2.03, 95% CI 1.57, 2.62 for underfive mortality) [18].

2.2.2.3. Place of delivery

Nigeria observed that high stillbirth and early neonatal mortality rates have long been associated with unattended deliveries compared with hospital-based deliveries [26]. Evidence from Ethiopian Demographic and Health Survey, 2016 showed that the percentage of underfive mortalities is higher among home deliveries, which is approximately 27.6% compared to 24.7% among health facility deliveries [14]. Evidence from the Kersa HDSS in the Kersa district of Eastern Hararghe, Oromia, Ethiopia

also suggested that place of delivery was significantly associated with underfive children's mortality (OR 1.26 (1.10, 1.43) 1.016 (1.013, 1.12)) [27].

2.2.2.4. Colostrum feeding

Colostrum feeding practice after birth was associated with UFM, whereas the rest of the health-related variables were not found to be significant (COR =2.26, p = 0.042) [22]. According to a study conducted in the Afambo district of Afar Regional State, the chi-square test showed that colostrum feeding was significantly associated (p =0.035, p =0.006 and p =0.001) with the three indicators of child undernutrition (stunting, wasting and underweight) [28].

2.2.3. Biodemographic Factors

2.2.3.1. Mother's age

Mother's age was the key factor associated with UFM in Bhutan [22]. Multivariate analysis showed that having >1 under5 child deaths was associated with maternal age at delivery (<18 or >35) of mothers in a study conducted in Iran [29]. Compared to those born to younger (≤ 25 years) mothers, children born to mothers aged 36–40 years, 41–45 years, and more than 45 years had significantly lower odds of UFM [22]. Children born from mothers whose age is less than or equal to 24 have a significantly lower risk of underfive mortalities (OR=0.295, 95% CI: 0.227-0.383) than those born from mothers whose age is between 45 and 49 in Ethiopia [14].

2.2.3.2. Mother's age at first marriage

The U5MR was found to be higher among children whose mothers were older than 45 years and who were younger than 16 years when they first married [22].

2.2.3.3. Mother's age at first birth

Maternal age at first birth was identified as a strong predictor of underfive mortalities in both bivariate and multivariate analyses after controlling for the effects of other covariates [14]. A systematic review revealed that a mother's age at first birth is negatively correlated with infant mortality (IM) in Ethiopia. Its effect (except for children born to mothers older than 20 years of age at first birth) has a significant impact on CM [25]. Similarly, the age of the mother at first birth was significantly associated with underfive mortalities in Ethiopia (P value < 0.0001). The risk of underfive mortality was approximately 55.6% higher for births to mothers giving birth at an earlier age of 11 to 17 years compared with births to mothers 25 and older (OR=1.556, 95% CI: 1.243, 1.949) [14].

2.2.3.4. Sex of the child

In Bangladesh, the present analysis examined underfive mortality, in which neonatal deaths formed the major part due to a rapid decline in childhood mortality during ages 1–4 years of life, and the higher underfive mortality for males than females was due to lower female mortality during the neonatal

period [20]. The underfive mortality rate steadily declined over the years from 128/1000 in 1994 to 48 in 2014, and females had 8% lower mortality rates than males [20]. The U5MR was found to be higher among male children in Bhutan. Boys were 1.38 times more likely to die than girls ($p = 0.055$) [22]. The odds of underfive deaths were also higher for male children (AOR=1.30, CI= [1.07, 1.57], $P<0.008$) than females in Ethiopia [23].

2.2.3.5. Number of births

Several children is also another significant factor identified in the analysis; it was revealed that ever-experienced complications may likely increase with the number of children, an interesting finding in this study, particularly with low contraceptive use [26]. Children born to mothers who gave birth to more than 2 children had significantly higher odds of dying. The odds of death among children born to mothers who gave birth to 3–4 or more than 4 children were significantly higher than those born to mothers with less than 3 children [22]. The U5MR was found to be higher among children whose mothers had more than 4 births in Bhutan [22].

2.2.3.6. Previous death of a child

Multivariable analyses revealed that one of the most common factors associated with mortality across all age subgroups was mothers who reported previous death of a child [adjusted hazard ratio (aHR) 17.33, 95% confidence interval (CI) 11.44, 26.26 for neonatal; aHR 13.05, 95% CI 7.19, 23.67 for postneonatal; aHR 15.90, 95% CI 11.38, 22.22 for the infant; aHR 16.98, 95% CI 6.19, 46.58 for the child; and aHR 15.97, 95% CI 11.64, 21.92 for underfive mortality [18].

2.2.3.7. Birth order

An increase in children's birth orders showed a tremendous negative impact on IM in both 2000 and 2005 EDHSs; in particular, the 2nd and 3rd birth orders were dominant determinants. The estimated hazard ratios of mortality were higher for first birth orders than for second and third birth orders [25]. The study results in Ethiopia indicate that the hazard ratio of children who had a birth order of fifth and above was 1.683 [95% CI: 1.190, 2.380]. This means that children born at the fifth and above orders were 1.683 times more likely to die than children born at the 1st - 2nd order [17]. A study in an Ethiopian Somali regional state also suggested that birth order was a significant determinant of underfive mortality in the region [19]. According to this study, higher birth orders (>4) have the highest mortality risk. Children with these characteristics are 2.067 times more likely to die in age less than 5 relative to the reference group births of order one (HR=2.067, 95% CI: 1.098 to 8.256). Children of order two through four are dying at a rate 23.6% higher than a child of order one (HR=1.236, 95% CI: 1.031 to 12.199). The confidence intervals for higher birth order and birth order two through four indicate that the rate could actually be as high as 8.256 and 12.199 and as low as 1.098 and 1.031, respectively [19].

2.2.4. Environmental Factors

2.2.4.1. Safe drinking water

A study in an Ethiopian Somali regional state suggested that the source of drinking water was a significant determinant of under-five mortality in the region [19]. The risk of dying for a child born in a family without access to pipe drinking water is higher by 76% relative to those born in a family with access to pipe drinking water. The 95% confidence interval (1.421, 9.373) implies that the risk of death of children whose source of water is not pipe water is 1.421 as low and 9.373 as high as those in the reference group [19].

2.2.4.2. Safe sanitation facilities

The likelihood of UFM was 1.49 times higher for those children born in households without safe sanitation facilities than their counterparts ($p = 0.012$) [22].

2.2.4.3. Solid fuel use

Furthermore, the U5MR was significantly higher among children born in households that used solid fuel. The likelihood of UFM was 2.18 and 1.95 times significantly higher among children born in households without safe sanitation and those that used solid fuel for cooking, respectively [22].

2.3. Conceptual Framework

See Figure 1.

Methodology

3.1. Study Area and Period

Haramaya town is situated in the East Hararghe Zone, Oromia Regional State, Ethiopia. It is located 21 km northwest of Harar town and 505 km east of Addis-Ababa, the capital city of Ethiopia. The elevation at the site ranges from 2018 meters to 2422 meters above sea level (m. a. s. l). The watershed lies at a UTM (Universal Transverse Mercator) coordinate of 171212 East and 1040190 North. It is characterized by a "Woina-Dega" agroclimatic zone that receives a mean annual rainfall of 775.9 mm. The monthly rainfall at the site is more than 100 mm from April to September, except June 48.4 mm. The wettest month is August, 151.9 mm. The daily temperature at the site ranges from 10°C -25°C. The livelihood in the area is based on agriculture. Therefore, different agricultural practices are practiced within the Lake Haramaya watershed [30]. The town has one primary hospital and is divided into 3 administrative kebeles and 24 subkebeles, where 9, 7 and 8 of them belong to kebeles 01, 02 and 03, respectively. The estimated population of the town was 50960, of which 8373 were expected to be children under five years of age. Of the population, 19030 (3127 under-five), 18214 (2993 under-five) and 13716 (2253 under-five) were expected to live in kebeles 01, 02 and 03, respectively. The childhood mortality status in the town is still unknown. The study was conducted starting from August 07–31, 2020 (Figure 2).

3.2. Study Design

A community-based cross-sectional study design was selected.

3.3. Source and Study Population

3.3.1. Source Population

All pairs of 15- to 49-year-old mothers lived, and their children were born alive in Haramaya town in the past five years.

3.3.2. Study Population

All 15- to 49-year-old mother-live-born underfive child pairs who were living in randomly selected subkebeles of Haramaya town during the study.

3.4. Inclusion and exclusion criteria

3.4.1. Inclusion criteria

All 15- to 49-year-old mothers who had had live births in the past five years were included.

3.4.2. Exclusion criteria

Mothers who either had had multiple births like a twin or could not respond due to serious illness were excluded. Multiple births were excluded because of the known higher risk of neonatal mortality due to pregnancy complications and preterm birth among multiple births compared to singleton births to avoid potential confounding effects [18, 22].

3.5. Sample size determination

The sample size calculated using the single population proportion formula $n = (z_{\alpha/2})^2 \pi(1-\pi)/d^2$ for specific objective one (to determine the underfive mortality rate among the last children born in the past five years in Haramaya town) is as follows, where n is the sample size, π is population proportion and d is precision required in %.

$$= (1.96)^2 * 0.067(1-0.067) / 0.05^2$$

$$= 3.8416 * 0.067(0.933) / 0.0025$$

$$= 0.24 / 0.0025$$

=96

Furthermore, the sample size was also calculated with the double population proportion formula

$$N = \frac{2 * [(z_{cv} \sqrt{2p(1-p)} + z_{power} \sqrt{p1(1-p1) + p2(1-p2)})^2]}{(p1-p2)^2}$$

for specific objective two of this study: identify the factors associated with underfive mortality among the last children born in the past five years in Haramaya town as indicated in table 1 below using the following assumptions: confidence level of 95% and 5% significance level [14].

$r = n1/n2 = 1:2$

$Z_{\alpha/2} = 1.96$ (the value of the standard normal distribution curve corresponding to confidence interval 95%)

$Z_{\beta} = 0.84$ (the value of the standard normal distribution curve corresponding to 80% power

$de = 1.5$ (design effect)

$P1$ = percent outcome among unexposed

$P2$ = percent outcome in exposed

$P = \frac{P1 + P2}{2}$

2

Table 1: Sample size calculation.

Variable	P1 (%)	P2 (%)	P (%)	CI	Power	Unexposed to the exposed ratio	Total sample size
Maternal education	4.7	34.9	19.8	95%	80%	0.077	52
Maternal age	10.5	50	30.25	95%	80%	2.054	40
Age at first birth	17.7	33.5	25.6	95%	80%	0.218	237
Birth order	4.8	49	26.9	95%	80%	0.504	29

Since the sample size calculated for specific objective two accommodated the largest sample size, it was $(237 \times 1.5) + 10\% = 391$. Therefore, the minimum total sample size considered to undertake the study was 391 after considering a design effect of 1.5 and a nonresponse rate of 10%.

3.6. Sampling procedure/technique

Participants were selected using two-stage sampling among 638 mothers 15-49 years old who were identified before the study and whose births had been registered by the vital events registration agency. A simple random sampling method was used to select subkebeles from all 3 kebeles of Haramaya town proportional to their population size. Accordingly, 3 of the 9 subkebeles of kebele 01 (subkebeles 1, 4 and 7), 2 of the 7 of 02 (3 and 6) and 2 of the 8 of 03 (2 and 7) were selected. Then, systematic random sampling was performed to select participants independently from the selected subkebeles proportional to their respective number of mothers of underfive children identified. Since the sampling interval was 1 for all subkebeles, the sample was taken starting from the first cases. Finally, the study was conducted on 391 participants, as shown in Figure 3 below.

3.7. Data collection methods

3.7.1. Data Collection Tool

The data collection tool consisted of socioeconomic, sociodemographic, environmental, and health-related characteristics that would affect underfive mortality. A questionnaire for primary data that included 17 structured and open-ended questions was adopted from different studies included in its review as socioeconomic, biodemographic, environmental, and health-related factors (14, 18, 19, 22, 23, 31) in English and then translated into Afan Oromo by language experts. Again, the Afan Oromo version was translated back into English to make it consistent. Data were collected using the Afan Oromo structured and open-ended questions.

3.7.2. Data collectors

Three nurses who had previous experience in data collection were selected among my coworkers and given training. Then, they collected data according to the schedule already set.

3.7.3. Data collection procedures

Data were collected home-to-home using an interview-based questionnaire from fifteen study participants daily for the first twenty-two days and then from fourteen participants daily for the last three days based on the time available for data collection. The data collection process was supervised and continuously followed up by the principal investigator throughout the data collection period.

3.8. Variables

3.8.1. Dependent variable

1. Underfive mortality.

3.8.2. Independent variable

1. Mother's age
2. Mother's education
3. Household size
4. Mother's age at first marriage
5. Income
6. Number of births
7. Birth order
8. Occupation of mother
9. Sex of the child
10. Previous death of a child
11. Safe drinking water
12. Safe sanitation facilities
13. Solid fuel use
14. Maternal TT immunization
15. Contraceptive use
16. Place of delivery
17. Colostrum feeding

3.9. Operational definitions

Underfive mortality: Mortality of the last child born in the past five years (yes, no).

Previous death of a child: Underfive deaths of any child other than the last child (yes, no).

Income: Economic/wealth status of the household in ETB (Ethiopian Birr) per month; (<1700 ETB, $\geq$ 1700 ETB) [31].

Safe drinking water: Households have access to a protected drinking water source (yes, no); piped tap, protected well and protected spring are safe water sources, whereas surface water such as a river and pond are unsafe.

Safe sanitation facilities: Households have access to improved sanitation facilities (yes, no); water-flush toilets, ventilated improved pit latrines and traditional pit latrines are safe sanitation facilities, whereas communal latrines, fields or anywhere are unsafe.

Use of solid fuel: Use charcoal, wood or kerosene for cooking (yes, no).

Maternal TT immunization: Tetanus toxoid injection status of mothers (one or no TT, two or more TT).

Contraceptive use: Use of contraceptives in the mothers' experience (ever used, never used).

Place of delivery: place of delivery for the last birth under five years (health facility, home).

Colostrum feeding: Feeding colostrum soon after birth to the last child under five years (yes, no); colostrum is secreted with its potential benefits within 1 hour of birth [32].

3.10. Data quality control

To maintain the quality of the data, data collectors were trained in data collection procedures. The questionnaire was carefully designed and prepared in the English language first and then translated into Afan Oromo by language experts, and again, the Afan Oromo version was translated back into English to make it consistent. Finally, the Afan Oromo version was used to collect data. Before the actual data collection time, the questionnaire (tool) was pretested for validity and reliability in 10% of the sample in Aweday town. Data quality was also controlled by daily cleaning of data.

3.11. Methods of data analysis

Data were double entered into EpiData version 3.1 and then cleared, coded, processed and analyzed using computer, statistical package for social sciences (SPSS) version 20.0. For descriptive statistics, frequencies and percentages were used. The U5MR was calculated as 'deaths per 1000 live births'. Multicollinearity was not checked among the independent variables. Binary logistic regression analysis (odds ratio, 80% CI and P value 0.20) was performed to examine the crude association of predictors with under-five mortality, and then multiple logistic regressions (odds ratio, 95% CI and P value 0.05) were performed to measure the statistical association. In the multivariate analysis, the backward logistic regression method was used with the Hosmer and Lomeshow goodness-of-fit test, and the value of 0.431 was insignificant, which means that the final model was correct. Finally, the results are presented in the text, tables, and figures.

Results

4.1. Sociodemographic characteristics

Out of the calculated sample of 391 mothers included in this study who had had singleton live births from 7 August 2015 to 6 August 2020, 372 (95.14%) responded to the home-to-home interview. The median age of the current mothers was 24.5, with a standard deviation of ± 5.81824 . The range of mothers' ages was 15 to 45. The majority of the births (52.4%) were males; 64.2% were in households with no more than 5 members. Of the mothers, 86.0% fed their child colostrum (Table 2).

4. 2. Underfive Mortality Rate

Out of 372 singleton live births from 7 August 2015 to 6 August 2020, 28 (7.5%) died. This gave a weighted U5MR of 75 per 1000 live births. Children born in households with fewer than 6 members experienced higher mortality rates. Significantly higher U5MR was also recorded among children who did not feed colostrum (p <0.001).

Table 2: Sociodemographic characteristics and distribution of underfive mortality rates in Haramaya town, east Ethiopia, 2016-2020 (n=372).

Variables	N (%)	Underfive mortality		U5MR ^a (95% CI ^b)
		Yes (%)	No (%)	
Mother's education				
No formal education	120 (32.3)	9 (7.5)	111 (92.5)	75 (27.0, 123.0)
Primary school	150 (40.3)	13 (8.7)	137 (91.3)	87 (41.0, 132.0)
Secondary school & above	102 (27.4)	6 (5.9)	96 (94.1)	59 (12.0, 105.0)
Income (ETB)				
<1700	34 (9.1)	7 (20.6)	27 (79.4)	206 (63.0, 349.0)
>=1700	338 (90.9)	21 (6.2)	317 (93.8)	62 (36.0, 88.0)
Household size				
<=5	239 (64.2)	22 (9.2)	217 (90.8)	92 (55.0, 129.0)
>5	133 (35.8)	6 (4.5)	127 (95.5)	45 (9.0, 81.0)
Occupation of mother				
House wife	232 (62.4)	13 (5.6)	219 (94.4)	56 (26.0, 86.0)
Government employee	40 (10.8)	5 (12.5)	35 (87.5)	125 (18.0, 232.0)
Daily laborer	26 (7.0)	5 (19.2)	21 (80.8)	192 (30.0, 355.0)
Others	74 (8.6)	5 (6.8)	69 (93.2)	68 (9.0, 126.0)
Maternal TT immunization				
One or no TT	43 (11.6)	5 (11.6)	38 (88.4)	116 (16.0, 216.0)
Two or more TT	329 (88.4)	23 (7.0)	306 (93.0)	70 (42.0, 98.0)
Contraceptive use				
Never used	164 (44.1)	16 (9.8)	148 (90.2)	98 (52.0, 143.0)
Ever used	208 (55.9)	12 (5.8)	196 (94.2)	58 (26.0, 90.0)
Place of delivery				
Home	67 (18.0)	6 (9.0)	61 (91.0)	90 (19.0, 160.0)
Health facility	305 (82.0)	22 (7.2)	283 (92.8)	72 (43, 101)
Colostrum feeding				
Yes	320 (86.0)	11 (3.4)	309 (96.6)	34 (14.0, 54.0)
No	52 (14.0)	17 (32.7)	35 (67.3)	327 (195.0, 459.0)
Mother's age				
<=24	187 (50.3)	12 (6.4)	175 (93.6)	64 (29.0, 100.0)
>=25	185 (49.7)	16 (8.6)	169 (91.4)	86 (46.0, 127.0)
Mother's age at first marriage				
<18	372 (100.0)	28 (7.5)	344 (92.5)	75 (48.0, 102.0)
>=18				
Sex of the child				
Male	195 (52.4)	16 (8.2)	179 (91.8)	82 (43.0, 121.0)
Female	177 (47.6)	12 (6.8)	165 (93.2)	68 (30.0, 105.0)
Number of births				
>4	87 (23.4)	8 (9.2)	79 (90.8)	92 (30.0, 154.0)
3-4	119 (32.0)	7 (5.9)	112 (94.1)	59 (16.0, 102.0)
<=2	166 (44.6)	13 (7.8)	153 (92.2)	78 (37.0, 120.0)
Previous death of a child				
Yes	59 (15.9)	6 (10.2)	53 (89.8)	102 (22.0, 181.0)
No	313 (84.1)	22 (7.0)	291 (93.0)	70 (42.0, 99.0)
Birth order				
>=Fourth	133 (35.8)	10 (7.5)	123 (92.5)	75 (30.0, 121.0)
Second or third	156 (41.9)	10 (6.4)	146 (93.6)	64 (25.0, 103.0)
First	83 (22.3)	8 (9.6)	75 (90.4)	96 (32.0, 161.0)
Safe drinking water				
Yes	372 (100.0)	28 (7.5)	344 (92.5)	75 (48.0, 102.0)
No				
Safe sanitation facilities				

Solid fuel use	Yes	95 (25.5)	8 (8.4)	87 (91.6)	84 (27.0, 141.0)
	No	277 (74.5)	20 (7.2)	257 (92.8)	72 (42.0, 103.0)
	Yes	356 (95.7)	26 (7.3)	330 (92.7)	73 (46.0, 100.0)
	No	16 (4.3)	2 (12.5)	14 (87.5)	125 (-57.0, 307.0)

^a Weighted underfive mortality rates as 'deaths per 1000 live births'; ^b Confidence interval; TT = tetanus toxoid

4.3. Factors Associated with Underfive Mortality

In bivariate analysis ($p < 0.20$), households earning less than 1700 ETB per month, households with fewer than 6 family members, mothers working as house wives, mothers who had never used any contraceptive, children not colostrum-fed, mothers aged ≤ 24 years, and mothers who had more than 4 births were found to be candidates for multivariate analysis (Table 3).

Table 3: Crude association of predictors with underfive mortality of children in Haramaya town, east Ethiopia, 2016-2020 (n=372 and $p < 0.20$).

Variables	N (%)	Underfive mortality		COR (80% CI)	P value
		Yes (%)	No (%)		
Mother's education					
Secondary school & above	102 (27.4)	6 (5.9)	96 (94.1)	1.00	.
No formal education	120 (32.3)	9 (7.5)	111 (92.5)	0.77 (0.28, 2.11)	0.735
Primary school	150 (40.3)	13 (8.7)	137 (91.3)	1.04 (0.44, 2.46)	0.958
Income (ETB)					
>=1700	338 (90.9)	21 (6.2)	317 (93.8)	1.00	.
<1700	34 (9.1)	7 (20.6)	27 (79.4))	2.77 (1.18, 6.50)	0.127
Household size					
>5	133 (35.8)	6 (4.5)	127 (95.5)	1.00	.
<=5	239 (64.2)	22 (9.2)	217 (90.8)	10.56 (3.52, 31.72)	0.006
Occupation of mother					
Daily laborer	26 (7.0)	5 (19.2)	21 (80.8)	1.00	.
House wife	232 (62.4)	13 (5.6)	219 (94.4)	0.23 (0.08, 0.62)	0.060
Government employee	40 (10.8)	5 (12.5)	35 (87.5)	0.54 (0.17, 1.70)	0.493
Others	74 (8.6)	5 (6.8)	69 (93.2)	0.53 (0.15, 1.86)	0.518
Maternal TT immunization					
Two or more TT	329 (88.4)	23 (7.0)	306 (93.0)	1.00	.
One or no TT	43 (11.6)	5 (11.6)	38 (88.4)	2.29 (0.89, 5.92)	0.262
Contraceptive use					
Ever used	208 (55.9)	12 (5.8)	196 (94.2)	1.00	.
Never used	164 (44.1)	16 (9.8)	148 (90.2)	2.42 (1.26, 4.64)	0.084
Place of delivery					
Health facility	305 (82.0)	22 (7.2)	283 (92.8)	1.00	.
Home	67 (18.0)	6 (9.0)	61 (91.0)	1.48 (0.68, 3.24)	0.522
Colostrum feeding					
Yes	320 (86.0)	11 (3.4)	309 (96.6)	1.00	.
No	52 (14.0)	17 (32.7)	35 (67.3)	21.45 (10.64, 43.22)	0.000
Mother's age					
>=25	185 (49.7)	16 (8.6)	169 (91.4)	1.00	.
<=24	187 (50.3)	12 (6.4)	175 (93.6)	0.33 (0.13, 0.88)	0.146
Sex of the child					
Female	177 (47.6)	12 (6.8)	165 (93.2)	1.00	.
Male	195 (52.4)	16 (8.2)	179 (91.8)	0.80 (0.42, 1.52)	0.655
Number of births					
<=2	166 (44.6)	13 (7.8)	153 (92.2)	1.00	.
>4	87 (23.4)	8 (9.2)	79 (90.8)	10.60 (1.67, 67.444)	0.102
3-4	119 (32.0)	7 (5.9)	112 (94.1)	1.596 (0.57, 4.47)	0.560
Previous death of a child					
Yes	59 (15.9)	6 (10.2)	53 (89.8)	1.00	.
No	313 (84.1)	22 (7.0)	291 (93.0)	1.65 (0.64, 4.27)	0.498
Birth order					
First	83 (22.3)	8 (9.6)	75 (90.4)	1.00	.
>=Fourth	133 (35.8)	10 (7.5)	123 (92.5)	0.55 (0.09, 3.24)	0.666
Second or third	156 (41.9)	10 (6.4)	146 (93.6)	0.90 (0.33, 2.43)	0.888
Safe sanitation facilities					
Yes	95 (25.5)	8 (8.4)	87 (91.6)	1.00	.
No	277 (74.5)	20 (7.2)	257 (92.8)	0.48 (0.22, 1.03)	0.220
Solid fuel use					
Yes	356 (95.7)	26 (7.3)	330 (92.7)	1.00	.
No	16 (4.3)	2 (12.5)	14 (87.5)	1.86 (0.53, 6.51)	0.528

COR= crude odds ratio; CI= confidence interval; TT = tetanus toxoid

In multivariate analysis, household size and colostrum feeding status were significant factors associated with underfive-year mortality in children (Table 4). Children born in households with fewer than 6 members had 7.98 times higher odds of dying than those born in households with at least 6 members (AOR =7.98, 95% CI =1.59-40.17, P <0.05). Those children who did not feed colostrum were associated with a 17.45 times increased risk of underfive deaths compared to colostrum-fed children (AOR =17.45, 95% CI =6.54-46.55, P <0.001). The wide confidence intervals might be attributable to the small sample size of the study.

Table 4: The factors associated with underfive mortality of children in Haramaya town, east Ethiopia, 2016-2020 (n=372 and p <0.05).

Variables	N (%)	Underfive mortality		AOR (95% CI)	P value
		Yes (%)	No (%)		
Income (ETB)					
>=1700	338 (90.9)	21 (6.2)	317 (93.8)	1.00	.
<1700	34 (9.1)	7 (20.6)	27 (79.4)	2.40 (0.73, 7.93)	0.149
Household size					
>5	133 (35.8)	6 (4.5)	127 (95.5)	1.00	.
<=5	239 (64.2)	22 (9.2)	217 (90.8)	7.98 (1.59, 40.17)	0.012
Occupation of mother					
Daily laborer	26 (7.0)	5 (19.2)	21 (80.8)	1.00	.
House wife	232 (62.4)	13 (5.6)	219 (94.4)	0.25 (0.06, 1.02)	0.053
Government employee	40 (10.8)	5 (12.5)	35 (87.5)	0.54 (0.11, 2.74)	0.458
Others	74 (8.6)	5 (6.8)	69 (93.2)	0.53 (0.10, 2.89)	0.466
Contraceptive use					
Ever used	208 (55.9)	12 (5.8)	196 (94.2)	1.00	.
Never used	164 (44.1)	16 (9.8)	148 (90.2)	2.33 (0.90, 6.05)	0.083
Colostrum feeding					
Yes	320 (86.0)	11 (3.4)	309 (96.6)	1.00	.
No	52 (14.0)	17 (32.7)	35 (67.3)	17.45 (6.54, 46.55)	0.000
Mother's age					
>=25	185 (49.7)	16 (8.6)	169 (91.4)	1.00	.
<=24	187 (50.3)	12 (6.4)	175 (93.6)	0.38 (0.10, 1.41)	0.147
Number of births					
<=2	166 (44.6)	13 (7.8)	153 (92.2)	1.00	.
>4	87 (23.4)	8 (9.2)	79 (90.8)	5.01 (0.75, 33.42)	0.096
3-4	119 (32.0)	7 (5.9)	112 (94.1)	1.31 (0.35, 4.88)	0.686

AOR= adjusted odds ratio; CI= confidence interval

Discussion

The prevalence rate of underfive deaths in this study was 75 per 1000 live births, which is higher than the 59 underfive deaths per 1000 live births reported by the Bhutan National Health Survey

2012 [22] and the 67 per 1000 live births in Ethiopia reported by the 2016 Nationwide Survey Data analysis [23]. However, it is lower than 104 mortalities per 1000 live births evidence from the Nepal Demographic and Health Survey (2001–2016) [18]. The explanation for this difference might be due to differences in sample size, study setting, and operational definition.

In this study, household size was significantly associated with underfive mortality. This study found that household size was inversely associated with underfive mortality, consistent with the finding from Bhutan [22]. The findings support the view that larger households may have better resources, such as more experienced child care providers and more working-age adults, contributing to household income. In contrast, another finding in the Ethiopian Somali Regional State suggested that the mortality risk of children increases as the size of the family increases [19]. In this view, a larger family size may indicate more children, leading to intrasibling competition for limited resources and inadequate attention and care for children heightening their mortality risk. However, the findings in this study suggest that a larger family size is protective against UFM in Haramaya town, possibly through more people caring for the child and resources.

The other prominent factor associated with underfive mortality in this study was colostrum feeding practice after birth. The death rate was significantly higher among children not colostrum-fed, in line with the study findings from Bhutan [22]. Colostrum is the first milk containing proteins, vitamin A and maternal antibodies. A study conducted in the Afambo district of Afar Regional State showed that colostrum feeding was significantly associated with stunting, wasting, and underweight [28]. The rest of the variables were not significantly associated with UFM in this study. For instance, there was no association between UFM and mother's age, unlike the study result in other parts of Ethiopia, which stated that it was significantly lower among children born from mothers whose age was less than or equal to 24 compared to those born from the reference group [14]. Mother's education was also not associated with UFM in Haramaya town. A similar report was obtained in a study from Ethiopian Somali Regional State [19] and in other parts of Ethiopia [23]. The findings of this study suggest that strengthening health education, particularly on exclusive breastfeeding practices, can improve child survival.

Strengths and Weaknesses of the Article

Clear concept and explanation of the article with proper information is its key strength. Author's approach and interest in the study is another strong side of the article. Tabular presentation of data in the article also makes it strong. No weakness of the article than the need for references to be cross checked due to inline reference.

Conclusion

The study suggests that 75 per 1000 live births die before celebrating their fifth birth day in Haramaya town. Household size and colostrum feeding status are the factors associated with the underfive mortality of children in the town.

RECOMMENDATIONS

Based on the findings of this study, the Haramaya town health office should disseminate information to mothers about the benefits of feeding their children colostrum and promote the practice. The office, in collaboration with other relevant sectors and programs, should do its best in strengthening child care services.

The East Hararghe zonal health department should take part in the allocation of a sufficient budget for all these activities, including research. It should also closely monitor and evaluate changes that will occur.

In addition, further research at the regional and national levels will enable us to understand the magnitude and associated factors of children's mortality under age five using a larger sample size and including variables not included in this study, such as mother's age at first birth.

Declarations

Ethical Considerations

The study was conducted after the proposal was approved by HU, CHMS IHRERC (Haramaya University, College of Health and Medical Sciences Institutional Health Research Ethics Review Committee). Informed, voluntary, written and signed consent was obtained from each mother or husband in case of a minor. The privacy and confidentiality of the participants were assured. The selection of the mothers was also equitable and fair. There was no risk of participating in this study compared to taking a few minutes from their time. The findings from this research revealed important information for the local health planners even though there was no direct payment for participating in the study. They also had the right to participate or not and could even withdraw at any time once they decided to participate.

Availability of Supporting Data

Supporting data and materials owned by the corresponding author are available upon necessary request.

Conflict of Interest

None.

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We did not receive any funding from anywhere.

Authors' Contributions

MA and MD designed the writing, and MA conducted the literature review. MD and ZT took part in the analysis and interpretation of data for the work. AD and MA critically revised the manuscript for

important intellectual content. Finally, NA approved the version to be published.

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Abbreviations

CM: Child Mortality; EDHS: Ethiopian Demographic Health Survey; ETB: Ethiopian Birr; HDI: Human Development Index; HDSS: Health and Demographic Surveillance System; IHRERC: Institutional Health Research Ethics Review Committee; IM: Infant Mortality; ORS: Oral Rehydration Solution; SDG: Sustainable Development Goal; U5MR: Underfive Mortality Rate; UFM: Underfive Mortality

Figures

Figure 1

Conceptual framework illustrating factors influencing the underfive mortality of children adapted and modified from different reviewed studies.

Figure 2

Location map of the study area.

Figure 3

Sampling procedure for selecting subkebeles and study participants in Haramaya town.

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