Original article

Prevalence and associated factors of neonatal mortality in North Gondar Zone, Northwest Ethiopia

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Abstract

Background: Childhood mortality is often used as a broad indicator of the social development and health conditions of a country. Updated information on neonatal mortality does thus influence policy, improve services and lead to better health for newborns.

Objective: To assess the prevalence of neonatal mortality and associated factors in North Gondar Zone, Ethiopia.

Methods: Community based cross-sectional study was carried out from November 2009 to January 2010 in North Gondar Zone. Multi-stage sampling was adopted to get respondents and data was collected using structured questionnaires from 3600 mothers who gave live birth during the year 2005 to 2009.

Results: Neonatal mortality was found to be 214 out of 4888 live births with the rate of 43.8 per 1000 live births. The number of pregnancies the women, had (AOR =3.76: 95% CI, 2.73- 5.20), maternal morbidity (AOR =5.43: 95% CI, 2.90-10.17) and neonatal illness (AOR = 3.68: 95% CI, 2.41-5.62) were strongly associated with neonatal mortality. Small size neonates at birth were 2 times more likely to die compared with medium sized ones. Compared with illiterate mothers, secondary and above secondary educated mothers reduced the risk of neonatal deaths by 85% (0.04, 0.51) and 90% (0.01, 0.94), respectively.

Conclusion: Neonatal mortality was very high when compared with the national data of Ethiopia. Strategies to improve female education, reducing maternal morbidity, limiting the number of pregnancies, early intervention for neonatal illness, prevention and intervention in low birth weight neonates are recommended to reduce neonatal mortality. [*Ethiop. J. Health Dev.* 2012;26(2):66-71]

Introduction

The health of future societies depends on the health of the children of today and their mothers. The neonatal period is considered as the highest risk period (1). Childhood mortality is often used as broad indicator of the social development or a specific indicator of health conditions of a country. However, child health programs were given low attention, especially neonatal health (1-3). Globally each year over 4 million neonates died within 28 days of birth. Every minute 20 children under 5 die, leading to 8 million deaths before they reach their fifth birth day due to the conditions which could be either avoided or treated (4- 6). Neonatal mortality accounts for two thirds of deaths of infants, and nearly two fifths of all deaths in under- five children (4). Most neonatal deaths (99%) occur in low and middle income countries, where about half of the deaths occur at home (6-8). Six countries (including Ethiopia) account for 50% of worldwide deaths in children younger than age five (9). Many babies dies nameless and unrecorded, indicating the perceived inevitability of their deaths (4, 8). All neonatal deaths occurring in developing countries are largely attributable to infections, birth asphyxia, low birth weight and prematurity (1, 3, 4). The risk of neonatal death due to severe infection in very high mortality, it is about 11-fold higher than the risk in low mortality countries (4, 8). About 18 million babies are estimated to be born with low birth weight every year worldwide (4, 8, 10). Although these low-birth weight babies constitute only about 14% of children born, they account for 60–80% of neonatal deaths (4, 11). Many countries have reduced neonatal mortality in response to the Millennium Development Goals (MDGs), for example, Indonesia by 50%, and Bangladesh and Sri Lanka by 40% (12, 13).

Each year an estimated 472,000 children under-five die in Ethiopia, placing the country at sixth position in the world in terms of absolute number of under-five deaths (1, 3, 14, 15). Neonatal mortality (according to the 2005 DHS) was 39 per 1000 live births (2). The Amhara region of the country was at the top in infant and neonatal mortality rates (NMRs) with were 94 and 50 per 1,000 live births, respectively (2). Risk factors influencing neonatal mortality include maternal age, race, marital status, parity, birth weight, gestational age at birth, labor complications and frequency of antenatal visit, previous unfavorable outcomes like still birth and neonatal deaths and various other socioeconomic factors (3, 4, 14, 16). Other factors responsible for direct causes of neonatal deaths are infections, asphyxia, preterm birth, tetanus, congenital malformation and diarrhea (1, 3, 15, 17). With high mortality and poor health systems, early success in

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averting neonatal deaths could be possible through simultaneous expansion of clinical care for babies and mothers and to achieve the reduction in neonatal deaths needed to meet the MDG for child survival (8, 18). In general the absence of continuous information along with the limitation of facilities and lack of commitment among health care providers causes countless loss of newborns. Therefore, this research was conducted to find out the current rate of neonatal mortality and associated factors in North Gondar Zone, Ethiopia and the opportunities to reduce it.

Methods

Household survey was conducted in North Gondar Zone, Northwest Ethiopia from November 2009 to January 2010. The zone has 19 *woreda*s (districts) and is bordered on the North by Tigray region, on the south by Lake Tana, West Gojjam and Beneshangul-Gumuz Regions, in the East by Wag Hemra and in the West by Sudan. With an estimated area of 48,204.39 square kilometers, the zone has an estimated total population of 2,903,165, of whom 1,467,567 were men and 1,435,598 are women, with 14.1% being urban dwellers and an estimated population density of 60.23 people per square kilometer (19). According to the National census, the Amhara (89.7%), the Qemant (8.3%), and the Tigrayan (0.9%) constitute the three largest ethnic groups of the zone. The majority (95.3%) of the population follows Ethiopian Orthodox Christianity and 4.5% Islam. Amharic is the dominant (98.2 %) language in use (19).

The study design was community based cross-sectional and multistage sampling technique was used to select respondents. Initially five districts, four rural districts (Chilga, Tach Armachiho, Dembia and West Belesa) and one urban district (Gondar Town) were selected using a simple random sampling technique. Then one *kebele* from each rural district and *kebeles* 01 and 14 from Gondar town were selected also using a simple random sampling method. All households in the selected *kebeles* and then all eligible women were included for the study.

Sample size was calculated using the formula for a single population proportion by considering a prevalence of 39/1000 live births, 3% margin of error, 95% confidence interval (α=0.05) and 10% non-response rate and a design effect of 3. Data were collected by using semi-structured questionnaires from 3,600 mothers who gave live births during the year 2005 to 2009 after proportional allocation to each selected *kebele*.

Detailed information on the socio-demographics, pregnancies, births and neonatal history and episodes of neonatal deaths during the five years were collected carefully. The diagnosis of neonatal morbidity was made based on history captured using a questionnaire adapted from the Ethiopian Demographic Health Survey (EDHS). The diagnoses made from the questionnaire were also validated through reviews by clinicians.

The questionnaire was prepared in English and translated to Amharic [local language] and then back to English to verify the consistency and content of the questionnaire. To ensure data quality, data collection was made by two health extension workers for each rural site and two diploma nurses each for the two urban *kebeles*. In addition, one supervisor was was assigned for each data collection sites. Training was given to both data collectors and supervisors before data collection and the principal investigators regularly monitored and followed the data collection process. The questionnaires were pre-tested on mothers from different study sites before data collection and, based on the results, the questionnaires were further adjusted and contextually and terminologically modified.

Ethical clearance was obtained from the Ethical Review Board of the University of Gondar and permission to conduct the study was given by each of the district administrative offices. Verbal consent was also obtained from the study subjects after providing clear explanation on the purpose of the study.

Under-reporting of deaths is usually assumed to be higher for deaths that occur very early in infancy. Omission of deaths or misclassification of deaths as stillbirths may also be more common among women who have had several children or in cases where the deaths took place a long time ago. In order to assess the impact of omission on measures of child mortality, we used different indicators. The total number of pregnancies the mothers had and the total number of live births they gave were identified. Every day, at the end of data collection, supervisors along with the principal investigators checked the filled questionnaires for data consistency, completeness and accuracy. Data were entered into computer and cleaned using EPI-Info version 3.3.2 statistical software and then transported to SPSS Version 16.0 statistical software. Logistic regression was used to perform bivariate and multivariate analyses.

Results

The data were generated from 3,600 mothers. During 2005-2009 neonatal mortality was found to be 214 out of 4,888 live births with the mortality rate of 43.8 per 1000 live births. Out of 214 neonatal deaths, 115 (53.7%) were males, and most of the 188 (93.2%) of the deaths were reported from rural districts. Regarding the place of death, 70% occurred at home, while 17.7%, 10.0%, 2.3% occurred in hospital, health center and on the way to health facilities, respectively. Among the women who experienced neonatal mortality, 29% had an earlier record of miscarriage or stillbirth at least once and 8% already had experienced death of a child under-five years.

Most of the women, who had neonatal mortality, were sick before or during pregnancy. Women having tuberculosis and HIV/AIDS before or during pregnancy encountered 48% and 50% of the neonatal mortality,

respectively. Among all the 3,600 mothers who gave live births during the period of analysis, only 38% had antenatal (ANC) visits (among which 8.6% were single, 75.5% two, and 15.9% were three or more visits). On the other hand, 119 (55.6%) of the 214 those who faced faced neonatal mortality had never attended any ANC visit. From the study it was observed that most (89%) of deliveries took place at home, only 10% took place at public health facilities (hospitals and health centers), while the rest (1%) were reported to take place along the road to health facilities (Figure 1).

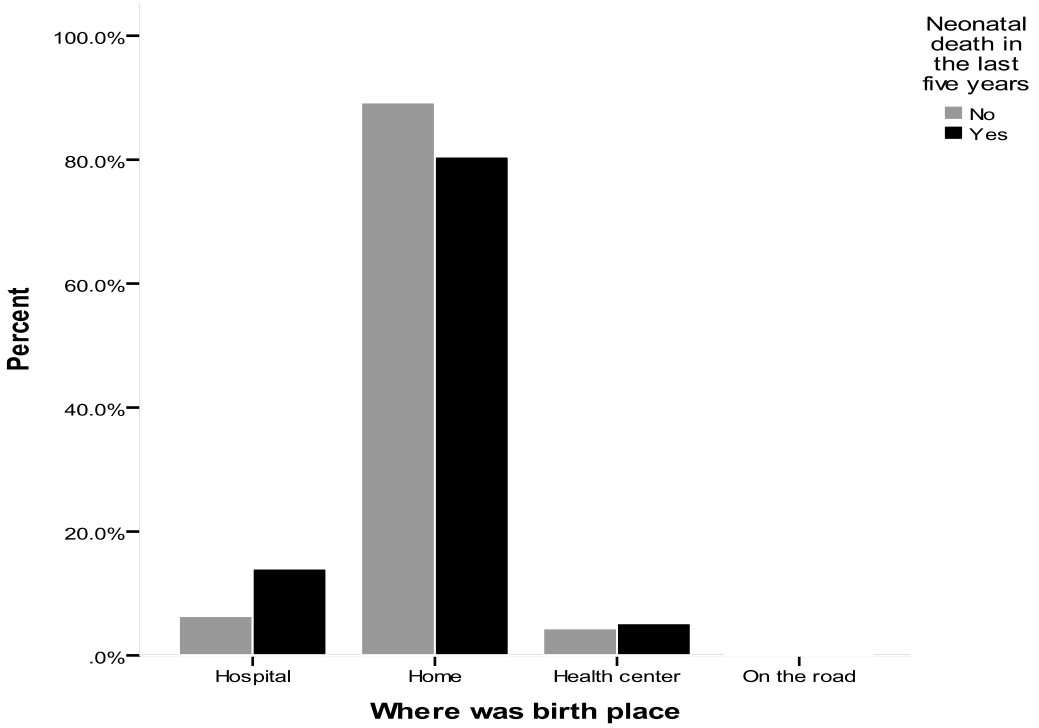

Figure 1: **Neonatal mortality by birth place in North Gondar Zone, Northwest Ethiopia during 2005-2009**

About 50.5%, 37.2%, 11.0% births were assisted by relative/family member, traditional birth attendant and other health professionals, respectively, while 1.3% births took place without assistance. Pneumonia, diarrheal diseases, and tetanus were the most common neonatal illnesses identified as contributing factors of deaths. Among the neonates that were reported to have died, 52%, 27%, 5% of them had histories of infection with pneumonia, diarrheal disease and tetanus, respectively.

Table 1 presents results from the logistic regression analysis of effects of selected factors on neonatal mortality. According to the analysis, maternal education is significantly associated with neonatal mortality. Compared with illiterate mothers, secondary and above secondary educated mothers had a less risk of neonatal death by 85% (0.04, 0.51) and 90% (0.01, 0.94), respectively. Similarly parity of the mothers was strongly associated with neonatal mortality (AOR (95% C.I.)=3.769 (2.73, 5.203). For every additional pregnancy, the probability of neonatal death was 3.8 times higher (2.7, 5.2) (Figure 2). If mothers had some disease or illness, the risk of neonatal death was 5.4 times higher (2.9, 10.2) compared to mothers without any illness. In relation to neonatal size at birth, neonates with small size at birth were likely to die 2 times (1.02, 3.5) more when compared with medium size babies. Neonates, who had any illness, were 3.7 times (2.4, 5.6) more likely to die compared with neonates with no illnesses. However, the multivariate analysis showed that maternal history of the use of contraceptive, mode of delivery, infant breast feeding and neonatal pre-lacteal feeding had no statistically significant association with neonatal mortality.

Table 1: **Multivariate analysis of predictors of neonatal mortality in north Gondar Zone, Northwest Ethiopia, (2005-2009)**

Variables		Neonatal deaths		Wald	Sig.	OR	95.0% C.I. for OR (Adjusted)	
		No (%)	Yes (%)				Lower	Upper
Mothers' education	Uneducated	91.8	8.2	12.851	.012*			
	Can read and write	93.8	6.2	.376	.540	.490	.050	4.788
	Elementary	89.4	10.6	.224	.636	.790	.299	2.092
	Secondary	95.1	4.9	9.133	.003*	.144	.041	.506
	Above secondary	96.8	3.2	4.049	.044*	.098	.010	.942
Number of pregnancy mother faced				65.074	.000*	3.769	2.730	5.203
Contraceptive use	No (reference)	91.1	8.9					
	Yes	94.4	5.6	1.085	.297	.763	.458	1.270
Maternal illness	No (reference)	93.5	6.5					
	Yes	59.3	40.7	27.921	.000*	5.432	2.900	10.177
Neonatal illness	No (reference)	94.6	5.4					
	Yes	76.2	23.8	36.636	.000*	3.685	2.415	5.621
Pre-lacteal BF	Yes (reference)	93.3	6.7					
	No	90.1	9.9	3.343	.067	1.455	.973	2.174
Immediate BF	No (reference)	88.0	12.0					
	Yes	93.4	6.6	2.622	.105	.669	.411	1.088
Newborn Size	Medium(reference)	92.8	7.2	5.934	.204			
	Large	95.1	4.9	1.050	.306	1.404	.734	2.685
	Very large	91.7	8.3	.209	.647	.695	.146	3.306
	Small	86.7	13.3	4.035	.045*	1.881	1.015	3.485
	Very small	91.0	9.0	2.929	.087	1.709	.925	3.156
Delivery Method	Normal vaginal (ref)	92.6	7.4	1.845	.397			
	Instrumental delivery	72.5	27.5	.076	.783	.811	.183	3.594
	Operational delivery	62.5	37.5	1.741	.187	2.711	.616	11.924
Constant				150.088	.000	.006		

*****Significant at 0. 05 α-value OR= Odds ratio, BF=breast feeding

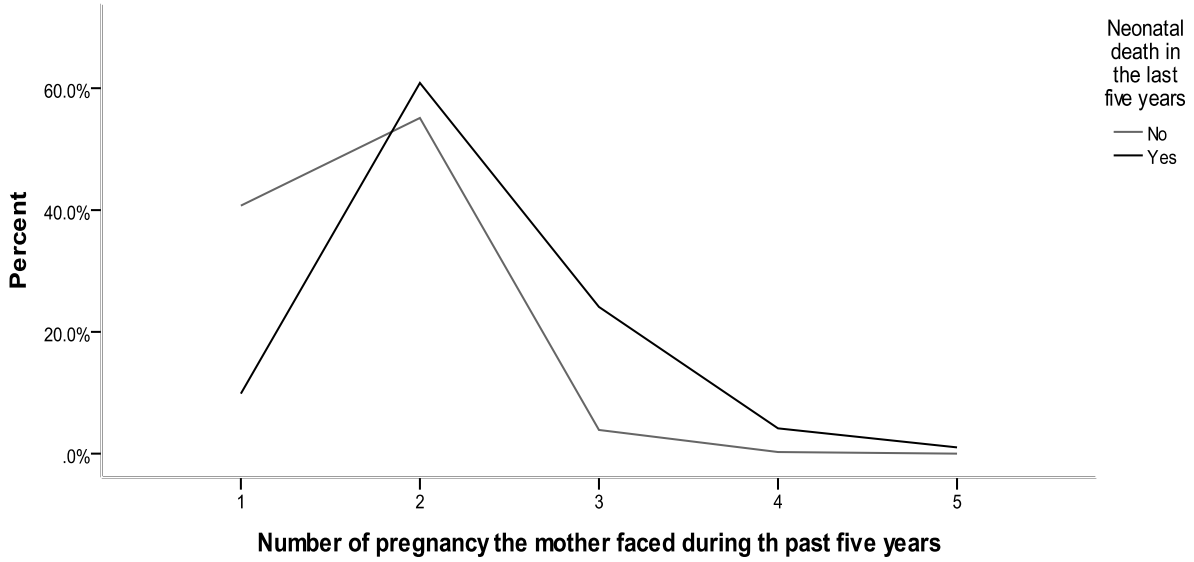

Figure 2: **Neonatal mortality by the number of pregnancy faced by the mother during 2005-2009 in North Gondar Zone, Northwest Ethiopia**

Discussion

The challenge, less frequently identified in policy analysis, is the slow progress in reducing global neonatal mortality. During the past decade, some regions of the World have made great progress in reducing neonatal mortality rate. However, there has been no considerable decline in the regional average neonatal mortality for sub-Saharan Africa (9, 20). To meet MDG-4, a

substantial decline in NMRs in high-mortality countries is needed and reducing deaths in the first month of life will be essential for progress (7, 13). This study showed that neonatal mortality of 43.8 per 1000 live births in North Gondar Zone is very high when compared with the results of the Ethiopian 2005 Demographic and Health Survey national figure of 39 per 1000 live births (2). The present finding is also higher than those studies from Meskan and Mareko districts (21), Gilgel Gibe Field Research Center (15), and Yekatit 12 Hospital in 2006-2007 (22). The higher cases of neonatal mortality in our case could be attributed to the low health care utilization of women while there may be difference in socio-cultural factors of the area. The main factors related to neonatal deaths in the present study were associated with small neonates birth size, birth place, mother education, maternal illness, parity, ANC visit, and delivery without health professionals assistance.

According to the analysis educational status of mother, the number of pregnancies a mother had, presence of maternal morbidity, neonatal illness and small size of child at birth were strong predictors of neonatal mortality. Contrary to a study carried out in Kenya in 2007 (20) and Tanzania in 2006 (23) no association was found between neonatal mortality and maternal age at delivery, sex of the newborn, maternal need of pregnancy (readiness) and ANC visit. However, this study showed a significant association of mothers' education with neonatal mortality which is consistent with the findings of studies carried out in rural areas of Bangladesh (24), and Tigray region of Ethiopia (25), thus supporting the role of maternal education in reducing neonatal mortality (26). According to the present study, for every additional pregnancy, the probability of neonatal death is 3.8 times higher as observed in similar studies carried out in Jimma, Ethiopia (27) and Bangladesh (28) but contrary to study done in Nigeria in 2006 (29). Moreover, maternal health and health care are important determinant of neonatal survival. This is because neonatal outcomes are affected by maternal health throughout the pregnancy period and chronic maternal disease. This study revealed strong association of neonatal size at birth with neonatal mortality as suggested in similar earlier study conducted in different hospitals in Ethiopia (30) and other studies (31). Neonatal infections account as the direct cause of neonatal mortality like similar studies done in Ethiopia. Our study revealed 3.7 fold increases in neonatal mortality due to infections (2, 4, 30, 32). In general substantial declines neonatal deaths will in the future will depend on increasing health services coverage with interventions that improve neonatal survival within the context of maternal and child health programs.

The findings of the study indicate the need for further strengthening activities aimed at encouraging mothers for regularly attending ANC as well as fir delivering their newborns at health facilities, as these are key factors in reducing the neonatal morbidity and mortality. Further attention should also be given for evidence-based neonatal infection prevention and interventions, especially for births taking place at home.

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