Avoidable Factors in Perinatal Mortality Identified by Clinical Audit at Tikur Anbessa Hospital

Research Proposal

Addis Ababa Ethiopia

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Abbreviations

AAUSM – Addis Ababa University, School of Medicine

LBW - Low birth weight

MDG - Millennium Developmental Goal

MAS - Meconium aspiration syndrome

NICU - Neonatal Intensive Care Unit

PMR - Perinatal mortality rate

PMTCT - Prophylaxis of mother to child transmission

PNM - Perinatal mortality

GA - Gestational age

WK - Week

WHO - World Health Organization

Project summary

Perinatal Mortality (PNM) is high in developing countries when compared to high income countries. The major causes of PNM are infection, birth asphyxia and complications related to prematurity. The current perinatal mortality rate in Ethiopia is 37 per 1000 births. Clinical audit has emerged as a powerful methodology for determining cause of mortality and identifying potential avoidable factors that contributed to the death. Systematically analyzing deaths in this way is important in order to improve clinical management and introduce new measures to reduce PNM in the future.

This study is a prospective investigation of stillbirths and early neonatal deaths that was conducted for a six month period (from June 1st to November 30th 2012) among inborns at Tikur Anbessa Hospital. The audit was conducted by a multi-disciplinary team comprised of obstetricians, midwives, pediatricians and neonatal nurses. The audit process was involved medical record review; interview of relevant health staff; and interview of families (after informed consent). The cause of death and potential avoidable factors was assessed for each case. The findings was collected and presented in a publishable-quality manuscript. Feedback was given to clinical and administrative leaders at Tikur Ambessa Hospital to inform new measures to be implemented to decrease PNM.

Contents

Background

At the global level, an estimated 7.5 million perinatal deaths take place each year, most of which are in developing countries (1, 3, 8). The perinatal mortality vary between different regions for instance, it ranges from less than 10 per 1,000 in most developed countries to up to 60 per 1,000 in certain regions of Asia and Africa (1, 3).

The perinatal mortality rate (PMR) has been widely used to assess the outcome of late fetal and early neonatal life and is generally regarded as an index of how well society looks after women in their reproductive years and the quality of antenatal care, delivery, and newborn care (1, 8). PNM includes stillborn babies (SB) of more than 28 weeks of gestation and deaths occurring within the first week of life (early neonatal deaths) (1). The perinatal mortality rate (PMR) reflects both the characteristics of reproductive health and the level of economic development of a community (1). The main achievement of Millennium Developmental Goal No 4 (MDG4) is to reduce child mortality by two third between 1990 – 2015, MDG 4 will not be met without sizable reduction in neonatal mortality which accounts about 40 % of Under Five Mortality rate. This requires substantial increment in advocacy, funding and activities to support newborn health (1, 8, 13). The problem in many developing countries include challenge of translating knowledge in to practice , HIV/AIDS, increased poverty particularly in Sub-Saharan Africa, lack of global investment in child survival despite 10.6 million death every year and slow progress in reducing global neonatal mortality (8).

A number of maternal and perinatal factors that account for perinatal loss in developing countries include Eclampsia, low birth weight (LBW), maternal infection, birth asphyxia, neonatal hypothermia and hypoglycemia.

Eclampsia

Eclampsia is a significant cause of maternal and perinatal morbidity and mortality, particularly in developing countries, where the incidence is still high 1.6% in Nigeria and 2.2% in India(1). This high incidence shows failure to prevent eclamptic convulsions in a significant number of pregnant women. It has been shown that most patients with

eclmapisa present with convulsion or late in the disease process and most of them had inadequate antenatal care (1). In a study done in Nigeria in 2006 to see obstetrical complication in booked and unbooked mother there was a positive correlation between unbooked mothers and adverse maternal and perinatal outcome(1).

Low Birth Weight and maternal infections

Low birth weight (LBW) is the main contributor to neonatal morbidity and mortality. In some countries like India and Bangladesh up to 70% or more in neonatal deaths is caused by LBW (2, 3, 8). Around 2/3 of infants in developing countries with low birth weight suffer from IUGR whereas in developed countries the majority of infants with LBW are premature. Risk factors for IUGR include low pre–pregnancy maternal weight, low caloric intake during pregnancy, pre-eclampsia and maternal infection, especially malaria (2). Preterm labor may be responsible for one-quarter of all perinatal death in the developing world (2, 8). Administration of antibiotics to pregnant women with prolonged rupture of membranes may decrease the risk of preterm birth. Urinary tract infection, and sexually transmitted disease, including HIV, syphilis, gonorrhea and Chlamydia have been associated with increased risk of premature birth (2).Treating asymptomatic bacteriuria, symptomatic urinary tract infection and bacterial vaginosis may reduce the incidence of preterm birth.

The impact of HIV infection on perinatal and neonatal outcome appears to be associated with increased risk of spontaneous abortion, stillbirth, preterm birth and IUGR. Administration of prophylaxis of mother to child transmission (PMTCT) care reduces the risk of infection by around 40% with single antiretroviral or a combination of HAART and elective cesarean section can reduce MTCT to as low as 2%(2).

Birth Asphyxia

In low income countries, where skilled professionals attend fewer than half of the deliveries, and each year 60 million births occur outside facilities, the burden of neonatal morbidity and mortality due to intrapartal asphyxia remains very high. Intrapartum asphyxia is responsible for an estimated of 814,000 neonatal deaths and also one million still births each year (2, 3), with an estimated one million disabled survivors with long term neuro-developmental injury (cerebral palsy, mental retardation , blindness, long term intellectual impairment and behavioral problems) (3). The final cause of neonatal death is identified as hypoxic ischemic encephalopathy (HIE), meconium aspiration syndrome (MAS) and persistent pulmonary hypertension of the newborn (PPHN) (9). High risk pregnancies, abnormal fetal heart rate, thick meconium, growth restricted fetus and premature delivery were all risk for perinatal asphyxia (2, 4, 8). At delivery most neonates can be successfully resuscitated by simple techniques such as tactile stimulation and in some cases, clearing of the upper airway secretion. The use for bag and mask ventilation is required only in 10 % of cases (2, 9), therefore it should be required that everyone involved in the birth of an infant and neonatal care be qualified in the neonatal resuscitation (9).

Hypothermia

Hypothermia is a common problem in developing countries , affecting more than half or all newborns in the communities, and is associated with increased risk of morbidity and mortality(2). Morbidity includes increased risk of neonatal infection, coagulation defect, acidosis, delay in fetal to newborn circulatory adjustment, hyaline membrane disease and brain hemorrhage (2). Hypothermia can be prevented by simple measures such as providing a worm environment during delivery, early breast feeding, and skin to skin contact with the mother(2).

Perinatal death and days of week

In a study done in Canada, rate of still birth and early neonatal death were examined by weekend birth versus week day birth over three periods. It showed that there is a slightly crude risk of still birth and early neonatal death for infants born on weekends in Canada 6 % and 11% respectively, 17 % and 29 % in Australia and 27 % in USA. The death was explained by high proportion of preterm birth on weekends with the lower frequency of elective term delivery by weekends (5).

Perinatal Mortality in Ethiopia

According to the Demographic Health Survey in Ethiopia perinatal mortality rate was 52 per 1000 births and 37 per 1000 births in 2000 and 2005 respectively.

A study on perinatal mortality was done by Naeye and Teferi in 1974 – 75 in Tikur Anbassa teaching hospital where Post-mortem examination was done on 1019 stillbirths from clinics and hospitals: 744 (73 %) were stillborn after 20 weeks of gestation. The perinatal death rate for the entire study was 65.3 per 1000 births (7).

The current neonatal mortality rate in Ethiopia is 39 per 1000 births with an annual neonatal death of 120,000. The annual under five deaths is 376,900, with neonatal mortality rate being 32 per 1000 of under five deaths. Neonatal infections are the commonest cause of death 36%, followed by birth asphyxia 25% and preterm birth 17 % (6). In a study done from 2006 to 2007 at Yekatit – 12 hospital (which is one of the referral hospital in Addis Ababa) the neonatal death rate was 25.6 per 1000 live births and 50% of the newborn death were within the first 24 hrs while 75 % of the deaths occurred in the first week of age(6).

Avoidable factors

Hospital based studies in low income countries have shown that 3 out of 4 perinatal deaths may be due to sub optimal care, therefore reduction of PMR and improvement

of maternal and child health requires identification of services related factors leading to perinatal death. In different well developed and low income countries perinatal mortality audit in obstetrics are done to determine primary and final cause of death as well as suboptimal factors and missed opportunities in order to improve the management in the future(9, 10, 11).

These preventable factors are classified in to: health care factor such as failer to provide adequate service, or administration related like unavailability of transport and medication or it can be patient related due to lack of awareness about danger sign or delay to seek help.

In general, clinical audit involve peer review in which clinicians evaluate their practice and compare with the standard quality of care against patients medical record after preparing un agreed protocol by auditing group and member of the department i.e. obstetricians, midwifes pediatricians and neonatal nurses (10, 11).

There are five steps to evaluate the system: 1- establish criteria, 2- evaluate the practices 3- giving feedback, 4- implement the change, 5- re-evaluate the practices and give feedback (11, 12).

Therefore the main purpose of this study is to improve the quality of care and subsequent reduction of PNM through systematic analysis of all perinatal deaths to identify potential avoidable factors in morality at a hospital where PMR is known to be high (10, 11, 12).

Goals/Objectives/Activities

Goal

To improve quality of care at Tikur Anbessa Teaching Hospital.

Objective

To identify avoidable factors in perinatal deaths in order to enable the design of targeted interventions aimed at reducing PMR.

Activities

1) To prospectively determine the PMR in TAH over a 6 month period
2) To identify the cause of each perinatal death
3) To determine if one or more avoidable factors contributed to each perinatal death and, if so, to describe those factors
4) To document findings of this investigation in a publishable-quality manuscript in order to (a) inform the design and implementation of quality improvement interventions at Tikur Ambessa Hospital; and (b) disseminate findings to stakeholders working in similar contexts in sub-Saharan Africa.

Methodology

Definitions

We define stillbirth as dead fetus at least 28 wk of gestational age or if gestational age is unknown birth weight 1000gr or more. Early neonatal death are those born alive and died in the first week of post natal age and late neonatal death defined as those died after 7 days of life but before 28 completed days. Perinatal mortality includes both still births and early neonatal deaths, whereas neonatal death includes both early and late neonatal deaths. Perinatal deaths will be classified according to Wigglesworth's classifications. (Wigglesworth, 1980)

Study Site

The study was conducted in Tikur Anbessa Teaching Hospital which is the only tertiary referral hospital in the country with well organized neonatal care unit which receives patients from the town as well as neighboring regions. The delivery ward at Tikur Anbessa Hospital is running its activity by senior obstetricians, residents, interns and midwifes. The annual number of delivery is about 3500, among these the majority of them are high risk pregnancy which are referred from different hospital. About 60 % of deliveries are either caesarian section or instrumental (forceps or vacuum) deliveries. Almost all high risk neonates are admitted to NICU and evaluated by the NICU team.

There is a relatively well organized Neonatal Intensive Care Unit (NICU) on the same floor which is about 60 meters away from labor ward, where newborns are admitted from different hospitals, health centers including home deliveries. The unit has senior pediatricians, fellows, residents, interns and nurses, in addition guest neonatologists and nurses from Vermont Oxford Network (VON) with different subspecialty and expertise are coming to improve the quality of care and give lectures on different topics.

Audit Team

A perinatal mortality audit group was established for the purposes of this investigation that was comprised of obstetricians, a senior midwife in charge of the labor ward, a neonatologist, the principal investigator, and the head nurse of the NICU. This audit group comprehensively reviewed each perinatal death using a standardized data collection form (see description below). The group identified (1) cause of death; (2) whether an avoidable factor contributed to the death; and (3) a description of the specific avoidable factor(s) if one or more was present. The group met once a month. The PI trained the audit team in how the audit process should be conducted.

Data Collection Form

A data collection form completed for each perinatal death. A member of the Audit Team (in most cases the Principal Investigator) was responsible for completing the data collection form. The data collection form included four components:

- Part I: Data abstracted from medical records; socio-demographic variables included were: age, address, socioeconomic status of parents, and obstetric history;
- Part II: Data obtained by interview with health staff (physicians and nurses) involved in the care of the stillbirth or baby; this interview was conducted using a pretested and structured questionnaire that incorporates a modified verbal autopsy instrument developed by WHO;
- Part III: Data obtained by interview of mothers; this interview conducted using a pretested and structured questionnaire that incorporates a modified verbal autopsy instrument developed by WHO; this interview incorporate socio demographic, reproductive, medical and obstetric risk factors for PNM.
- Part IV: Findings of the Audit Team; recorded on this portion of the data collection form (1) agreed upon cause of death, (2) whether or not the death was deemed to have avoidable factors, (3) description of specific avoidable factors (if present).

The data collection form (and data collection process) pre-tested on 3 cases to ensure its practicality and feasibility prior to initiation of the main investigation.

After the investigation began, each fully completed data collection form submitted for the audit group for review at their monthly meetings.

Study Design

This was a prospective investigation of all perinatal deaths (stillbirths and early neonatal deaths) that occur from June 1st to November 30th 2012.

Inclusion Criteria

- All stillbirths who were delivered after the mother was admitted to TAH delivery ward with the gestational age of 28 completed weeks or birth weight 1000gr or more.
- All deaths which occurred in the first seven days of life after being delivered in this hospital (GA 28 wk and more or birth weight 1000gr or more) and admitted to NICU were followed.

Exclusion Criteria

- All late neonatal deaths.
- All deaths in NICU who were admitted from other hospital, health center and home deliveries.

Study Procedures

The study procedure was:

- Identification of cases of stillbirths (as defined above) and early neonatal deaths by daily examination of the hospital's birth register
- Part I of the data collection form was completed by abstracting information from medical records. This includes data that describes socio-demographic, complications and its severity.
- Part II of the data collection form was completed by interviewing medical staff involved in the case.
- Part III of the data collection form was completed by interviewing the mother (or family member) after obtaining proper consent.
- The data collection form was presented at the monthly meeting of the Audit Team, and each case was discussed amongst the group.
- The Audit Team determined (a) the diagnosis and immediate cause of death; (b) whether or not the death was preventable; (c) if preventable, what specific avoidable factors contributed to the death.

- The PI was documented findings of the Audit Team for each case on Part IV of the data collection form.
- The PI was collated findings and prepared a first draft of the study manuscript.

Sampling techniques

All perinatal deaths that meet inclusion criteria from June 1st to November 30th 2012 were included. We did not expect to miss any cases.

Ethics and Consent Procedures

1- Ethical clearance for the study was secured from the Department of Pediatrics and Child Health of Addis Ababa University Ethiopia. Informed written consent to participate in the study was obtained from mothers (or other family members) of all perinatal deaths.
2- All data was managed in a confidential manner. Each case was assigned an identification label comprised of random numbers and letters. The data collection form was only contained the anonymous identification label. The "code" that matches the patient name with the identification label was kept on piece of paper in a locked file cabinet in the Principal Investigator's office at Tikur Ambessa Hospital. The PI was the only person with a key to the file cabinet and shared the code with nobody else. At the end of the investigation, the code was destroyed.

Data Processing

Data was electronically recorded using Epiinfo version 3.5. Data was entered twice for 10% of the data collection forms to ensure validation. The analysis was done using Epii info version 3.5.

Data analysis

The frequency of PNM was reported as a rate. Neonatal mortality was reported as number of deaths per 1,000 live births. Stillbirths reported as number of deaths per 1,000 births. Perinatal mortality reported as number of deaths per 1,000 births. Association of outcome of interested cross tabulated and analyzed using appropriate parametric and non parametric tests.

Results

During the study period of six months from June 1st to November 30th 2012 there were a total of 1,225 deliveries in Tikur Anbassa Hospital. Two newborns were excluded from analysis due to inadequate information and 15 cases of still births excluded because of their weight being less than 1000gr or 28 weeks of gestation. There were a total of 61 perinatal deaths of which 30 were stillborn and 31 died within 7 days of life making the perinatal mortality rate (PMR) 49.8 per 1000 births (95% CI of 37.6 -62 per 1000). The ratio of still birth to early neonatal death was 1:1. Among the still births 24 (80 %) of the intrauterine deaths occurred before arrival to the hospital and the other 6 (9.8 %) were having fetal heart beat at arrival.

Table -1 summarizes the socio-demographic characteristics of parturients with perinatal mortality. The highest perinatal mortality was among women in maternal age group of 20 to 39 years (n=58 (95%)). Perinatal death among primigravide was 29 (47.5%) while 32(52 %) perinatal losses in multiparous women. Regarding the gestational age, prematurity less than 37 weeks of gestation is the leading cause of death (57.3%, n= 35) and the other 26 (42.6%) were more than 37 weeks. The majority (72.1%) of perinatal losses were among women residing in Addis Ababa. Almost 80% of women with perinatal loss had some level of education. Mode of delivery 27 (44.2%) were spontaneous vertex delivery whereas emergency cesarean delivery accounted for 26 (42.6%) of deliveries and only one case was elective cesarean delivery. Among early neonatal deaths 18 (29 %) were during week end or duty hours and the other 13 (21.3%) died during week day or working hours.

Table 2 describes the cause of death among still births and early neonatal deaths. The most common cause of deaths were prematurity related complications 19 (31.4%) followed by death caused by intrapartum related birth asphyxia 17(27.8%) and acute intrapartal events 13 (21.3%), and all congenital anomalies 14 (22.9%) and infection 7 (11.47%). Among the still births we identified 17 (27.8%) Institutional and administrative related avoidable factors like delay in decision making in the delivery ward and shortage of bed and transport 3 (4.9%), and patient related factors were delay in seeking help and no or inadequate antenatal care seen in 6 (9.8%). In the case of early neonatal deaths hypothermia was detected in almost all neonates admitted to NICU (n=30, 96.7%), both at the time of admission and at 24 hours of life. Inadequate preparedness of the NICU team (involvement in high risk delivery and early initiation of the management) was the main health service provider related avoidable factor which has indirectly contributed for the deaths in the first 24 hrs of life in 10 (32.3%). Failer to give antenatal steroid in emergency cesarean section delivery 10 (16.39%), delay in decision making in the labor word 7 (11.47%) , delay in referral to higher level hospital 6 (9.8%) and inadequate NICU care 5 (8.19%) are among institutional avoidable factors contributing for a total of 28 (45.9%) of deaths (Table-3).

Figure 4 shows the cumulative survival among neonates admitted live. The highest number of death occurred in the first day of life 19 (31.1%) and 33 (54.1%) within 3 days

Table 1 : selected socio-demographic characteristics of women with either still birth or Early neonatal death in Tikur Anbessa Hospital

Characteristics	Still birth (n=30)		ENND n=31		Total n=61	%
	n	%	n	%	n	%
Age group						
under 20	1	1.6	0	0	1	1.6
20-39	27	44.2	31	50.8	58	95
40 and above	2	3.3	0	0	2	3.3
gestational age grouped						
28-33	11	18.0	18		29	47.5
34-36	3	4.9	3	4.9	6	9.8
37 or above	16	26.2	10	16.4	26	42.6
Ante natal care						
0	3	4.9	1	1.6	4	6.5
1-4	21	34.4	23	37.7	44	72.1
5 or more	6	9.8	7	11.5	13	21.3
Parity						
1	14	22.9	15	24.6	29	47.5
2-4	15	24.5	15	24.6	30	49.2
5 or more	1	1.6	1	1.6	2	3.3
Address						
Addis Ababa	17	27.8	27	44.2	44	72.1
Out of Addis Ababa	13	21.3	4	6.5	17	27.8
Educational Status						
No education	8	13.1	4	6.5	12	19.7
Primary School	9	14.7	11	18.0	20	32.8
secondary School	8	13.1	14	23	22	36.1
Higher Level Education	5	8.2	2	3.3	7	11.5
Mode of Delivery						
SVD	18	29.5	9	14.7	27	44.2
Breech	3	4.9	0	0	3	4.9
instrumental Delivery	4	6.5	0	0	4	6.5
Emergency cesarean section	4	6.5	22	36.0	26	42.6
Elective cesarean section	1	1.6	0	0	1	1.6

Table -2: Cause of Death

Cause of death	Number	% within group	% of total
Intrapartum Stillbirth	**30**	**100**	**49.2**
Acute intrapartum event	13	43.3	21.3
Congenital cause	11	36.6	18.0
Infection	2	6.7	3.27
Other fetal	2	6.7	3.27
No condition identified	5	16.6	8.19
Early Neonatal Death	**31**	**100**	**50.8**
Preterm direct complications	19	61.3	31.4
Intrapartum related (birth asphyxia)	17	54.8	27.8
Infection	5	16.1	8.19
Congenital abnormalities	3	9.6	4.9
Other cause	1	3.2	1.6
No condition identified	0	0	0
Total	**61**		**100**

Table -3: Key Avoidable Factors Overall – Perinatal (stillbirth and early neonatal death)

Avoidable factors	Intrapartal still birth (30)	Early neonatal death (31)	Total (61)	%
Patient-related Factor				
No antenatal care	3 (4.9%)	3 (4.9%)	6	9.8
Inadequate antenatal care	1 (1.63 %)	1 (1.6%)	2	3.23
Delay in seeking help	2 (3.27%)	1(1.6%)	3	4.91
Unwanted pregnancy	0 (0%)	1(1.6%)	1	1.63
Not identified	10 (16.39%)	1(1.6%)	11	18.0
Administrative-related Factor				
Transport from home to hospital	2 (3.27%)	0(0%)	2	3.27
Availability of bed in the hospital	1 (1.63%)	2(3.27%)	3	4.91
Not identified	10 (16.4%)	1(1.67%)	11	18.0
Healthcare worker-related Factor				
Hypothermia	0 (0%)	30(49.18%)	30	49.18
Inadequate preparedness of NICU Team	0 (0%)	26(42.6%)	26	42.62
Failer of antenatal steroid Administration	0 (0%)	10(16.4%)	10	16.39
Delay in decision making at labor Ward	2 (3.27%)	5(8.2%)	7	11.47
Inadequate NICU care	0 (0%)	5(8.2%)	5	8.19
Delay in referral to higher level Hospital	6 (9.8%)	0(0%)	6	9.8

Figure 4 : cumulative survival of among neonates with ENND admitted to NICU

Discussion

The overall perinatal mortality in this study was 49.8 per 1000 births (95% CI of 37.6 -62 per 1000). The ratio of still birth to early neonatal death was 1:1. Since Tikur Anbassa Hospital is the only public referral tertiary hospital the majority of pregnant ladies were high risk and among operative deliveries almost all were emergency cesarean section. This PMR was very close to the report in the 2011 EDHS which was 46 per 1000 births (14). Reports from South Africa showed a PMR of 27.6/1000 which was almost half what was reported in this paper (9). However; it is comparable with a similar study in Tanzania (10) and less than what is reported in Pakistan (15).

Previous perinatal audit studies in Tanzania have indicated that the majority of perinatal mortality is actually preventable without extra resource inputs and reduced perinatal mortality from 71 to 39/1000 births following the introduction of new obstetric policy that emphasized the prevention of prolonged labor, the early detection of fetal distress and better recognition of women with high risk pregnancies (2, 10).

According to this study we identified 10 avoidable factors in 43 (70%) of cases which have directly or indirectly contributed to the deaths and affected the outcome.

Among the 31 alive newborns 30 (96.7%) of them were hypothermic with the average temperature of 34^{o} C and the lowest 32^{o} C. Of those admitted to NICU, after 24 hrs the temperature was corrected only for 4 infants and the other 13 remained hypothermic with the lowest reading being 34 degree Celsius and the other 17 infant died before 24 hrs of age. The hypothermic cases were all preterm newborn less than 36 weeks of gestation. Twenty (33%) of the neonates did not require cooling as a treatment modality as there was no practice of controlled cooling in the management of asphyxiated infants in the unit. Since hypothermia related morbidity includes increased risk of neonatal infection, coagulation defect, acidosis, delay in fetal to newborn circulatory adjustment, hyaline membrane disease and brain hemorrhage (2), it's mandatory to prevent hypothermia without major additional resources through implementation of simple interventions like termoneutral environment, skin-to-skin contact, perform resuscitation under radiant warmer and proper wrapping with warm blanket and using a transport incubator while transferring them to NICU (which is already available in the delivery ward). Hypothermia after admission to NICU should be corrected in few hours of age especially in preterm newborns where related complications are highly associated with significant morbidity and mortality (2).

In developing countries perinatal asphyxia is the second most common cause of perinatal mortality next to prematurity. Avoidable factors that contribute to perinatal asphyxia are mainly deficiencies within the health system and few are patient related. Among the still

births 80 % of the intrauterine deaths occurred before arrival to the hospital and this shows that there is a delay in referring patients and the inadequacy of the ANC follow up in identifying high risk pregnancies. Inadequate monitoring the fetus during labor, proper use of partogram and timely decision making were the main area in which health workers needs to improve (9, 10). But we had cases which are still difficult to be avoided like asphyxia following antipartal hemorrhage, sever preeclampsia and in a women who never had antenatal care (9). In order to improve the outcome it should be a requirement that every one evolved in birth of an infant and neonatal care be qualified in neonatal resuscitation. In all cases of planned deliveries, the NICU team has to be informed ahead of time and preparedness ascertained. After admission of asphyxiated infant to NICU, a proper fluid administration, adequate control of seizure disorder, monitoring of the blood glucose, proper nutrition (parenteral nutrition), initiation of systemic or head cooling therapy and ventilation are still challenging due to resource and manpower limitation.

Congenital malformations are among the cases which are difficult to be avoided in our study since either the diagnosis made very late or undiagnosed till labor starts. The commonest malformation identified was neural tube defect which can be decreased with the administration of Foliate in planned pregnancies (10).

In this study prematurity related complications are the leading cause of newborn death, since the preterm delivery is due to maternal indication for severe preeclampsia and other obstetric risk factors. Therefore early referral of high risk mothers to the place where they can get a better evaluation and management (including NICU care), timely administration of steroid, and involvement of the NICU team with well preparedness at the unit is mandatory. Even though the level of care at NICU level is not adequate (inavailability of parenteral nutrition, surfactant, mechanical ventilator and IV fluid perfuser) and still remains as a big challenge, failer to provide termoneutral environment, early initiate colostrum, intravenous fluid monitoring and failure to administer antenatal steroid contributes a lot for the morbidity and mortality and can be considered as an avoidable factors.

Maternal infection is among the risk factors for low birth weight and preterm delivery which can be decreased with administration of antibiotics to pregnant women with prolonged rupture of membrane and other infections. In the cases where infections were attributed for the cause of death, first line antibiotic was started except one case and investigation results were incomplete (CXR, blood culture and CBC results). Among the cases were the cause of death unknown, parental counseling and autopsy should have been done for poor obstetric history.

Conclusion

Regular perinatal audits to identify avoidable causes of perinatal deaths and feed back to the health care provider has the potential to reduce perinatal mortality and it should involve the hospital management. Priority should be given to proper monitoring in labor and delivery, timely decision making, proper neonatal resuscitation and care in the NICU. Antenatal care should focus on preparing the women for delivery and educating them.

Interventions

The following steps have been taken to improve the perinatal outcome:-

1. Continued medical education by retraining midwifes and doctors on neonatal resuscitation.
2. Create awareness on hypothermia related complications and prevent them by :-
   - Skin to skin contact in the deliver word
   - Use incububator and wind breaker bag to transfer them to NICU
   - Radiant wormer to keep NICU in termoneutral environment
3. Agreed to give antipartal steroid including in case of emergency cesarean section deliveries.
4. Strengthening of the interdepartmental communication
   - NICU team involvement in all high risk deliveries throughout 24 hours
   - Antipartal preparation of NICU team in counseling, planning and management

Future plans to be conducted

1. Establish an audit committee in the NICU to make a regular neonatal death audit on weekly bases to identify specific problems and make qualitative changes.
2. Documentation has to be stressed with a slogan **"Not documented not done".**
3. Implement activities to decrease Infection.
   - Further strengthening infection prevention especially during procedures.
   - Minimize the overcrowding of the unit.
4. Empowerment of the NICU nurses with knowledge and skill that enable them to identify, assess and act on common newborn problems.
5. Check and improve resuscitation skill each time when a new group comes to NICU for attachment should be regularly conducted as well as midwifes to labor ward.
6. ANC should also focus on educating mothers on:-
   - Preventive aspects of pregnancy related complications.
   - Benefits of exclusive breast feeding and side effects of mixed or replacement feeding (unless there is a contraindication).
   - Create awareness about danger signs in the newborn and when to seek medical help.

- Prevention of hypothermia by skin-to-skin contact and early initiation of breast feeding.

7. Emphasize higher officials about the importance of basic equipments and medications that can bring change in the outcome of a newborn.

Avoidable factors in perinatal mortality identified by clinical audit at Tikur Anbessa hospital

Unique ID for questionnaire [ ] [ ] [ ]

Medical Record Number of Mother [ ] [ ] [ ] [ ] [ ] [ ]

Medical record Number of Neonate [ ] [ ] [ ] [ ] [ ] [ ]

Date of Admission of neonate __/__/__(dd/mm/yr)

Date of death of the neonate __/__/__(dd/mm/yr)

Data collectors name _____

Date of data collection __/__/__(dd/mm/yr)

Fill this column only	Only for data coding only
1. Maternal age in completed years : __ __	**1 [ ] [ ]**
2. Parity: ___ ___	**2 [ ] [ ]**
3. Period of gestation in completed weeks ___ ___	**3 [ ] [ ]**
4. Antenatal care **0. No ◯** **1. Yes ◯**	**4 [ ]**
5. If yes how many ANC Visits, __ __	**5 [ ] [ ]**
6. Maternal drug (tick all that apply)	
6.1 Antibiotics 0. No ____, 1. Yes ____	**6.1 [ ]**
6.2 Steroids 0. No ____, 1. Yes ____	**6.2 [ ]**
6.3 HAART 0. No ____, 1. Yes ____	**6.3 [ ]**
6.4 Diazepam 0. No ____, 1. Yes ____	**6.4 [ ]**
6.5 Analgesia (narcotics) 0. No ____, 1. Yes ____	**6.5 [ ]**
6.6 Blood transfusion 0. No ____, 1. Yes ____	**6.6 [ ]**
7. Risk factor during pregnancy (tick all that apply)	
7.1 Any Infection 0. No ____, 1. Yes ____	**7.1 [ ]**
7.2 Pre-eclampsia 0. No ____, 1. Yes ____	**7.2 [ ]**
7.3 Hypertension 0. No ____, 1. Yes ____	**7.3 [ ]**
7.4 RH –ve mother 0. No ____, 1. Yes ____	**7.4 [ ]**
7.5 Maternal O blood group 0. No ____, 1. Yes ____	**7.5 [ ]**
7.6 Oligohydramnios 0. No ____, 1. Yes ____	**7.6 [ ]**
7.7 Polyhydramnios 0. No ____, 1. Yes ____	**7.7 [ ]**
7.8 Maternal diabetes 0. No ____, 1. Yes ____	**7.8 [ ]**
8. Obstetric risk factors (tick all that apply)	

8.1 Cephalopelvic disproportion 0. No ____, 1. Yes ____	**8.1 [ ]**
8.2 Antiparum hemorrhage 0. No ____, 1. Yes ____	**8.2 [ ]**
8.3 Grad III meconium stained amniotic fluid 0. No __ 1. Yes_	**8.3 [ ]**
8.4 Malpresentation 0. No ____, 1. Yes ___	**8.4 [ ]**
8.5 Cord prolapse 0. No ____, 1. Yes ____	**8.5 [ ]**
8.6 Abraptio placenta 0. No ____, 1. Yes ____	**8.6 [ ]**
9. Duration of labor in completed hours __ __	**9 [ ] [ ]**
10. Duration rupture of membranes in completed hours ___ ___	**10 [ ] [ ]**
11. Instrumental delivery: 0. No ____, 1. Yes ____	**11 [ ]**
12. Non-reassuring fetal heart pattern: 0. No ____, 1. Yes ____	**12 [ ]**
13. Date of delivery (tick all that applies)	**13.1 [ ]**
13.1 Weekend 0. No ____, 1. Yes ____	**13.2 [ ]**
13.2 Weekday 0. No ____, 1. Yes ____	**13.3 [ ]**
13.3 Night (duty hrs) 0. No ____, 1. Yes ____	**13.4 [ ]**
13.4 Day (Working hrs) 0. No ____, 1. Yes ____	
14. Number of fetal outcome **1. Singleton____,** **2. Twins_____,** **3. Triplet _____**	**14 [ ]**
15. Mode of delivery **1. SVD___,** **2. Breech_____,** **3. Instrumental delivery (forceps___, vacuum____),** **4. Elective Caesarean delivery: No ____, Yes ____** **5. Emergency caesarian delivery: No ____, Yes ____** **15.1 If yes for instrument or cesarean, what was the indication** **_____**	**15 [ ]** **15.1 [ ]**

16. Outcome: **1. alive ____** **2. dead (IUFD) before arrival ___** **3. dead (IUFD) after arrival ____** **16.1 if dead, what was the Cause (specify)** **_____**	**16 [ ]** **16.1 [ ]**
17. Apgar score: **17.1 1st min_____,** **17.2 5th min _____** **17.3 10th min _____**	**17.1 [ ] [ ]** **17.2 [ ] [ ]** **17.3 [ ] [ ]**
18 Resuscitation: **18.1 Upper air way cleaning 0. No ____, 1. Yes ____** **18.2 Bag mask ventilation 0. No ____, 1. Yes ____** **18.3 Intubation 0. No ____, 1. Yes ____**	**18.1 [ ]** **18.2 [ ]** **18.3 [ ]**
19 diagnosis at admission to NICU (specify) **_____**	**19 [ ]**
20 Congenital anomalies detected 0. No ____, 1. Yes ____	**20 [ ]**
21 Maternal educational states: **1. Illiterate ____,** **2. Completed primary school___,** **3. High school___,** **4. Higher level education____.**	**21 [ ]**
22 Maternal address: **1. Addis Ababa _____,** **2. Out of Addis Ababa _____.**	**22 [ ]**
23 Temperature at admission. ___ ___. ___ **Hypothermia after admission____ ____.____**	**23 [ ]**

24 Resuscitation at admission: 0. No ___, 1. Yes ___	**24 [ ]**
25 Congenital or chromosomal abnormalities: 0. No___, 1. Yes ___	**25 [ ]**
26 Type of feeding:	**26.1 [ ]**
26.1 NPO 0. No ____, 1. Yes ____	**26.2 [ ]**
26.2 Trophic feeding 0. No ____, 1. Yes ____	**26.3 [ ]**
26.3 Full nutritional feeding 0. No ____, 1. Yes ____	
27 Antibiotic started: 0. No ____, 1. Yes ____	**27 [ ]**
28 ART prophylaxis: 0. No ____, 1. Yes ____	**28 [ ]**
29 Direct Blood transfusion: 0. No ____, 1. Yes ____	**29 [ ]**
30 Exchange blood transfusion. 0. No ____, 1. Yes ____	**30 [ ]**
31 Oxygen administered	**31.1 [ ]**
31.1 with cannula 0. No ____, 1. Yes ____	**31.2 [ ]**
31.2 with CPAP 0. No ____, 1. Yes ____	**31.2 [ ]**
32 Surgery requiring general anesthesia 0. No ____, 1. Yes ____	**32 [ ]**
33 Cause of death:	
33.1 Respiratory failer 0. No ____, 1. Yes ____	**33.1 [ ]**
33.2 Asphyxia related 0. No ____, 1. Yes ___	**33.2 [ ]**
33.3 Birth defect 0. No ____, 1. Yes ____	**33.3 [ ]**
33.4 Sepsis 0. No ____, 1. Yes ___	**33.4 [ ]**
33.5 Hemorrhagic shock 0. No ____, 1. Yes___	**33.5 [ ]**
33.6 Hemorrhagic shock 0. No ____, 1. Yes ___	**33.6 [ ]**
33.7 Maternal disorder of pregnancy 0. No ____, 1. Yes _	**33.7 [ ]**
34 Age at the time of death in days : ___ ___(days)	**34**

35 Date of death		**35**
35.1 Week end	**0. No ____, 1. Yes ____**	**35.1 [ ]**
35.2 Week day	**0. No ____, 1. Yes ____**	**35.2 [ ]**
35.3 Day time (Working hrs)	**0. No ____, 1. Yes ____**	**35.3 [ ]**
35.4 Night time (duty hrs)	**0. No ____, 1. Yes ____**	**35.4 [ ]**

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Information Sheet

We are conducting an investigation to help improve quality of maternal and newborn health care in this health facility.

Protocol Title: **Perinatal Mortality Audit at Tikur Anbessa Hospital**
Description of Population being consented: **Women who gave birth at Tikur Anbessa Hospital during the study period that suffered a non-macerated stillbirth or early neonatal death**
Principal Investigators : Dr. Asrat Demtse
Version Date: **Version 1.0 (11 March 2012)**

Ethiopia has one of the highest perinatal mortality rates in the World and there are few studies conducted in-country to identify avoidable factors to mitigate the problem.

We are saddened to hear of your loss. The purpose of this study is understand better why this happened so that we can help improve care for mothers and babies in this hospital in the future.

By addressing these issues we hope to better inform policy makers, health providers and women key finding that will contribute towards devising interventions that will improve perinatal health in the country. In order to assess what might have been reasons for the perinatal loss, we will interview you using a structured questionnaire.

We would like to collect some information about the care provided to you and your baby by reviewing the medical records and by interviewing you. All information will be kept confidential and neither your name nor other identifying information will be recorded.

Participation is voluntary and confidential

It is your choice whether or not to take part in this research. You can choose not to participate. You are free to withdraw from the study at any stage for whatever reason and you will not be obliged to give any further information and this will have no bearing on any medical care you need or no consequences at all.

You will be interviewed in a location that ascertain your privacy and all information that you provide be strictly confidential and will be available only to the investigator. None of the documents will identify you by name. The information you provide will be analyzed as a group and in no way you will be identified.

What you should know about this research study

- The clinical care you receive will be no different whether or not you participate in the study
- No personal data will be collected or recorded

What is the purpose of this research?

The aim of this research study is to obtain information that will enable the design and implementation of quality improvement programs in this facility. The program aims to help healthcare workers to provide a high quality of medical care.

How long will I take part in this research study?

Your participation in the research study will be limited to (1) giving consent for the medical records to be reviewed; and (2) a brief interview.

What are the risks and possible discomforts?

There is minimal or no risk of harm to you.

- The results of the study will not be linked to you in any way.
- Participation is voluntary. There is no penalty if you choose not to participate.
- As with any research study there is a possibility of a risk of breach of confidentiality, but all efforts will be made to protect your privacy.

Are there any benefits from being in this research study?

We cannot promise any benefits to you from your taking part in this research study. However, there may be an improvement in medical care because of the results of this study.

What if I have further questions?

If you have questions about this project you should contact or about your and your baby's rights as a project participant please contact **Dr. Asrat Demtse**, investigator, by telephone at: 0911407009

Statement of Consent

Study Title: **Perinatal Mortality Audit at Tikur Anbessa Hospital**

Subject's Initials: ……. Subject's Name: ……

Date of Birth / Age: ……

i. I confirm that I have read the forgoing information or it has been read to me. I consent voluntarily to participate in the study

ii. I understand that my participation in the study is voluntary and that I am free to withdraw at any time, without giving any reason and without my medical care or legal rights being affected.

iii. I understand that if I consider any part of the study to be a sensitive issue, I can decline to any or all questions

iv. I understand that the sponsor of the clinical trial, others working on the sponsor's behalf, the Ethics Committee and the regulatory authorities will not need my permission to look at my health records both in respect of the current study and any further research that may be conducted in relation to it, even if I withdraw from the trial. I agree to this access. However, I understand that my identity will not be revealed in any information released to third parties or published.

v. I agree not to restrict the use of any data or results that arise from this study provided such a use is only for scientific purpose(s).

Name of subject ……. *Date* ……/……. /…

Signature of subject …….

Name of person obtaining consent …… Date ……/……/…..

Signature of person obtaining consent ……