

Effect of facilities in decreasing the perinatal mortality rate in Misurata Teaching Hospital, Libya

Salima Alburke, Bashir Ashur* and Muktar Assadi

Pediatric Department, Faculty of Medicine, Misurata Teaching Hospital, Misurata University, Libya.

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ABSTRACT

Infant and under-5 childhood mortality rates in developing countries have declined significantly in the past 2 to 3 decades. World leaders agreed on a critical goal to reduce deaths of children <5 years by two thirds, but this may be unattainable without halving newborn deaths, which now comprise 40% of all under-5 deaths. Approximately 99% of neonatal deaths take place in developing countries, but review of the impact of interventions on neonatal health and survival in developing countries has not been reported. This study aimed to: (1) measure the perinatal mortality rate (PNMR) in Misurata; (2) identify risk factors of perinatal death; and (3) compare the estimated perinatal mortality rate with previous results in Misurata hospital before application of new facilities. A descriptive, retrospective study based on hospital files records. From January 2012 to December 2012, information was collected from admitted newborn in neonatal unit and the registration book at labour room including operating theatre. The information collected include, history, clinical examination, investigation, treatment and outcome. Also data from 2005 were collected to be compared with. The total number of delivery in Misurata hospital were 6520 births, include 36 stillbirth (1.16%) and 6474 were live births. 850 babies out of the total live birth were admitted to neonatal ICU after delivery. 48 babies (0.74%) died in the first week of life and 70% (34) of the first week death died in the first 24 h. The main reasons of admission to neonatal unit were preterm delivery, sepsis, meconium delivery, birth asphyxia and congenital malformation. Perinatal mortality rate was 13/1000 total births (57% death in the first week of life and 43% still birth). The main causes of early neonatal deaths were RDS 45%, congenital malformation 18%, birth asphyxia 12.5%, CHD 10% and sepsis 6%. About 12 (25%) of death were full term and 36 (75%) were PT, 35% of these PT between 32 and 36 weeks gestation, 20% between 24 and 28 weeks and 18% between 28 and 32 weeks gestation. Regarding birth weights, 27% of death their weight between 1 and 1.5 kg, 25% more than 3 kg, 18% between 1.5 and 2 kg, 12% between 2 and 2.5 kg and 8% were less than 1 kg. While, perinatal mortality rate was 28/1000 total births in 2005 before application of new facilities. In conclusion, although our PNMR still high in comparison with developed countries but it is better in comparison with previous result in same unit, in 2005 was 28/1000 and this is due to availability of facilities e.g. nasal bubble CPAP and surfactant. The vast majority of perinatal mortality is secondary to preterm delivery, birth asphyxia and sepsis which usually increased in presence of maternal risk factor. Prevention, early recognition and management of birth asphyxia, infection and LBW infants with development of indicators and simple management tools (guidelines) for assessing and monitoring health system performance for perinatal and newborn care at national level, are recommended.

Keywords: Perinatal mortality, stillbirth, neonate, infant death.

*Corresponding author. E mail: bmashur@yahoo.com.

INTRODUCTION

Neonatal deaths and stillbirths have many common causes and determinants. For the last 50 years, the term "perinatal mortality" has been used to include deaths that

might somehow be attributed to obstetric events, such as stillbirths and neonatal death in the first week of life. This approach does not raise-the question whether babies

above a certain weight or gestational age (and thus showing some potential for survival) showed any signs of life at birth or not. The perinatal mortality indicator plays an important role in providing the information needed to improve the health status of pregnant women, new mothers and newborns. That information allows decision-makers to identify problems, track temporal and geographical trends and disparities and assess changes in public health policy and practice. Perinatal mortality is an important indicator of maternal care and of maternal health and nutrition; it also reflects the quality of obstetric and pediatric care available. Although social factors exert the main influence on the outcome of a birth, as societies advance good medical care tends to play a greater role (WHO, 2006).

Intrapartum deaths (that is, those occurring during delivery) are closely linked to place of, and care at, delivery. In developing countries, just over 40% of deliveries occur in health facilities and little more than one in two takes place with the assistance of a doctor, midwife or a qualified nurse (Ahmad et al., 2000).

Death occurring in this period is largely due to obstetric causes. More than 3.3 million stillbirths and over 3 million early neonatal deaths are estimated to take place every year. In the year 2000, over 6.3 million perinatal deaths occurred worldwide: almost all of them (98%) occurred in developing countries stillbirths represent more than half of perinatal deaths, while in developed countries, where interventions have largely eliminated excess early neonatal mortality, over 6 out of 10 perinatal deaths are stillbirths. More than one third of stillbirths take place intrapartum, that is, during delivery, and are largely avoidable. The perinatal mortality rate is five times higher in developing than in developed regions: 10 deaths per 1000 total births in developed regions; 50 per 1000 in developing regions and over 60 per 1000 in least developed countries (UNDESA, 2002).

Not surprisingly, third world nations have the highest rates of perinatal mortality. The Ivory Coast has the dubious distinction of the highest perinatal mortality rate at 96/1000. While the lowest rates occur in countries that have widespread access to modern obstetrics; Perinatal mortality rate (per1000) for Denmark, Finland, France, Germany, Japan, Netherlands, United kingdom and United states are 8, 6, 7, 6, 7, 8, 8 and 7 per 1000, respectively (WHO, 2006).

Intrapartum deaths (that is, those occurring during delivery) are closely linked to place of, and care at, delivery. In developing countries, just over 40% of deliveries occur in health facilities and more than one in two takes place with the assistance of a doctor, midwife or qualified nurse (WHO, 2005).

So, this study was conducted with the following objectives:

1. To measure the PMR in (NICU) misurata central hospital.
2. To identify risk factors of perinatal deaths.

3. To compare the neonatal unit statistics with the previous years.

PATIENT AND METHODS

A descriptive, retrospective study based on hospital files records. From January 2012 to December 2012, information was collected from admitted newborn in neonatal unit and the registration book at labour room including operating theatre. The information collected include, history, clinical examination, investigation, treatment and outcome. Also data from 2005 were collected to be compared with.

Criteria of admission in neonate department of Misurata Central Hospital

- a) Presence of respiratory distress signs whatever the birth weight or gestational age or audible respiratory sounds as congenital stridor.
- b) Birth weight equal or less than 2 kg.
- c) Temperature instability.
- d) Reluctant to feed or persistent vomiting
- e) Major congenital malformation.
- f) Symptomatic congenital heart diseases.
- g) Infant of diabetic mother
- h) Pathological jaundice or positive family history of exchange transfusion.
- i) Clear evidence of chorioimmunitis (laboratory or clinically).
- j) Birth Asphyxia (a 5-min appgar score of 0-3, hypoxic ischemic encephalopathy (altered tone, depressed level of consciousness).

In our study the following definitions were adapted:

Live birth is the complete expulsion or extraction from its mothers of a product of conception, irrespective of the duration of the pregnancy, which, after such separation, breathes or shows any other evidence of life, such as beating of the heart, pulsation of the umbilical cord, or definite movement of voluntary muscles, whether or not the umbilical cord has been cut or the placenta is attached; each product of such a birth is considered liveborn.

Stillbirth is death prior to the complete expulsion or extraction from its mother of a product of conception, after 22 to 24 completed weeks of gestation; the death is indicated by the fact that after such separation the fetus does not breathe or show any other evidence of life, such as beating of the heart, pulsation of the umbilical cord or definite movement of voluntary muscles.

The perinatal period commences at 22 completed weeks of gestation and ends seven completed days after birth.

The neonatal period begins with birth and ends 28 complete days after birth. Neonatal deaths may be subdivided into early neonatal deaths, occurring during the first seven days of life (0 to 6 days).

The Preterm baby born before 37 weeks gestation.

The Low birth weight (LBW) baby born with weight less than 2.5 kg.

Statistical analysis

The collected data was analyzed using (SPSS) statistical software program (version 18), and displayed in appropriate tables and graphs. Data was summarized and expressed as frequency and percentage. Significance of difference was tested by chi-square test and the results is considered significant when $P \leq 0.05$.

RESULTS

There is a high statistical significant increased incidence

Table 1. Early neonatal deaths according to their gestational age.

	Gestational age (weeks)	Number of admission	Number of deaths	% from total admitted	% from total death
1	22 - 24	29	1	3.4%	2%
2	- 28	58	10	17.2%	21%
3	- 32	101	9	8.9%	19%
4	- 36	154	16	10.4%	33%
5	> 37	508	12	2.4%	25%
	Total	850	48	5.6%	100%

Chi Square = 33.7; $p < 0.001$ (highly significant).

Table 2. Early neonatal deaths according to their birth weight.

	Weight (g)	Number of admission	Number of deaths	% from total admitted	% from total death
1	< 1000	9	4	44.4%	8%
2	-1500	47	13	27.6%	27%
3	-2000	79	9	11.4%	19%
4	-2500	148	6	4.1%	13%
5	-3000	132	4	3.1%	8%
6	> 3000	435	12	2.7%	25%
	Total	850	48	5.6%	100%

Chi Square = 82.3; $p < 0.001$ (highly significant).

Table 3. Early neonatal deaths according to presence of maternal risk factors.

	Maternal risk	Number of admission	Number of deaths	% from total admitted	% from total death
1	Diabetes mellitus (DM)	45	4	8.9%	8%
2	Gestational hypertension	62	4	6.5%	8%
3	Chorioamnionitis	59	2	3.4%	4%
4	Chorioamnionitis + DM	14	2	14.3%	4%
5	Rupture of uterus	3	2	66.6%	4%
6	folic acid deficiency	9	1	10.1%	2%
	Total	192	15	7.8%	30%

Chi Square = 17.2; $p < 0.01$ (significant).

of neonatal deaths among neonates aged 24 to 28 weeks (17.2%) than in other age groups (Table 1).

There is a high statistical significant increased incidence of neonatal deaths among neonates weighted < 1500 g (72%) than those > 1500 g (Table 2).

There is a statistical significant increased incidence of neonatal deaths among neonates born to mothers with rupture uterus, those with folic acid deficiency and diabetic mothers (66.6, 10.1 and 8.9%, respectively) (Table 3).

There is no statistical significant difference in the incidence of neonatal deaths among male and female neonates (Table 4).

There is no statistical significant difference in the incidence of neonatal deaths among those delivered by normal vaginal delivery and those delivered by Cesarean

section (Table 5).

Most of neonatal deaths were among those with apgar score less than 7 (about 52%) (Table 6).

Most of neonatal deaths had occurred within the 1st day of life (about 71%) (Table 7).

The highest incidence of neonatal deaths was among neonates with congenital anomalies and those with neonatal sepsis (9 and 6.3%, respectively) (Table 8).

There is a high statistical significant reduction in the perinatal mortality in 2012 after application of facilities than that in 2005 before application of facilities (1.29 and 2.77%, respectively).

The total number of delivery in Misurata hospital were 6520 births, include 36 stillbirths and 6474 were live births. 48 babies died in the first week of life and 70% (34) of the first week death died in the first 24 h (Table 7).

Table 4. Early neonatal deaths according to sex.

Sex	Number of admission	Number of deaths	% from total admitted	% from total death
1 Male	519	30	5.8%	63%
2 Female	327	16	4.9%	33%
3 Ambiguous genitalia	4	2	50%	4%
Total	850	48	5.6%	100%

Chi Square = 0.16; p = 0.34 (Non Significant).

Table 5. Early neonatal deaths according to mode of delivery.

Mode of delivery	Number of admission	Number of deaths	% from total admitted	% from total death
1 Normal vaginal delivery	468	22	4.7%	46%
2 Cesarean section	382	26	6.8%	54%
Total	850	48	5.6%	100%

Chi Square = 1.37 p = 0.12 (non significant).

Table 6. Early neonatal deaths according to apgar score in first minute of life.

Apgar score	Number of deaths	% from total deaths
Less than 7	25	52%
More than 7	23	48%
Total	48	100%

Table 7. Early neonatal deaths according to postnatal age.

Postnatal age	Number of deaths	% from total deaths
< 24 hours	34	71%
1 day - 1 week	14	29%
Total no.	48	100%

Table 8. Main causes of death in early neonatal life.

Cause of admission	Number of admission	Number of deaths	% from total admitted	% from total death
Respiratory distress syndrome	467	23	4.9%	48%
Congenital anomalies	101	9	9%	19%
Birth asphyxia	113	6	5.3%	13%
Cyanotic heart disease	89	5	5.6%	10%
Neonatal sepsis	48	3	6.3%	6%
Inborn error of metabolism	32	2	6.2%	4%
Total	850	48	5.6%	100%

Chi Square = 2.55; p = 0.76 (non significant).

The main reasons of admission to neonatal unit were preterm delivery, sepsis, meconium delivery, birth asphyxia and congenital malformation.

Regarding birth weights, 27% of death their weight between 1 and 1.5 kg, 25% more than 3 kg, 18% between 1.5 and 2 kg, 12% between 2 and 2.5 kg and

8% were less than 1 kg (Table 1).

12 (25%) of death were full term and 36 (75%) were PT, 35% of these PT between 32 and 36 weeks gestation, 20% between 24 and 28 weeks and 18% between 28 and 32 weeks gestation (Table 2).

Presence of maternal risk factors associated with (15)

Table 9. Comparison of perinatal mortality and early neonatal mortality rates before and after application of new facilities to NICU.

Calculated rates	Application of new facilities to NICU				Chi square	P-value
	Before application (year 2005)		After application (year 2012)			
	N/Total	%	N/Total	%		
Stillbirth (stillbirth/total birth)	77/6616	1.16	36/6520	0.55	13.7	< 0.001 *
% of live birth admission to NICU	810/6539	12.4	850/6484	13.1	1.4	> 0.05
Neonatal deaths in 1 st week of life/Total live birth	106/6539	1.6	48/6484	0.74	20.8	< 0.001 *
Perinatal mortality (Stillbirth + Neonatal deaths in 1 st week of life/total birth)	183/6616	2.77	84/6520	1.29	35.2	< 0.001 *

* Highly significant.

31% of deaths in neonatal unit. Maternal risk factors associated with death were chorioimmunitis 8%, diabetes mellitus 13%, pre-eclampsia toxemia 8% and rupture of uterus 4% (Table 3).

Results of our study showed that 63% of neonatal deaths were males, 33% were females and 4% were with ambiguous genitalia (Table 4). And regarding to delivery method, 46% of neonatal deaths were delivered by normal vaginal delivery, while 54% were delivered by cesarean section (Table 5). 52% of neonatal deaths were with apgar score less than 7, while 48% were with apgar score more than 7 (Table 6).

Perinatal mortality rate was 13/1000 total births (57% death in the first week of life and 43% still birth). The main causes of early neonatal deaths were RDS 45%, congenital malformation 18%, birth asphyxia 12.5%, CHD 10% and sepsis 6% (Tables 8 and 9).

The ratio of nurse to newborn was 1:4.

DISCUSSION

When one considers that pregnancy-related causes (maternal risk factors associated with 30% of death in neonatal department), delivery-related causes (birth asphyxia associated with 13% of early neonatal deaths), each account for large percentage of neonatal deaths (USA, 2001).

Skilled care during delivery is universally recognized as major long-term priority for improving the care of mothers and newborns, and plans for advancing health system capabilities for providing this care are paramount based on a consideration of the fact that most births and neonatal deaths occur at early neonatal period, due to birth asphyxia and/or infections, and among LBW infants with maternal risk factors (Bhutta et al., 2003).

The true burden of bacterial neonatal infections in our hospital settings is also unclear. Narrowing this information gap is vital; to devise optimal antibiotic

treatment strategies for neonatal infections (Zaidi et al., 2005). We need to know the agents of life-threatening infections in the hospital and their antibiotic susceptibility patterns because some neonate with RDS and clinically septic baby with negative blood culture. The other factor that properly associated with increase infection in our study is the nurse to patient ratio, 1:4 (Darmstadt et al., 2000).

There is additional need for validated algorithms for accurate and rapid identification of infected neonates. We also must advance antibiotic-treatment strategies for serious infections, which may include simplified antibiotic-delivery system and/or regimens (Coco et al., 2002).

This study stated that the majority of newborns who die in our hospital are preterm baby (36) 75%, 60% due to RDS.

Improved strategies for both prevention of and care for preterm infants are urgently needed. These strategies include interventions to reduce preterm births and improve neonatal unit facilities in terms of number of nurses, and shortage of medical equipment. Prevention may also be achieved by improved maternal nutrition and detection and treatment of maternal infections. Family size and short interpregnancy intervals are also critical factors to reduce LBW and improve the perinatal health (Mahy, 2003; Tartin and Park, 1999).

Lack of accurate, regional and country-specific data on the magnitude and causes of perinatal and neonatal morbidity and mortality currently is limiting advocacy and program planning in newborn health (Coco et al., 2002). If we compare our hospital perinatal mortality rate with other hospital we found PNMR in Alkhadra hospital in 1995 was 25.8/1000 total births, and Algalla hospital in 1999 was 26.3/1000 total births (Abushhaiwia et al., 2009).

Our study revealed that PNMR in (2012) is about 12.9/1000. Although this PNMR still high in comparison with developed countries but it better in comparison with previous result in same unit, in 2005 that was 27.7/1000

and this is due to availability of facilities e.g. nasal bubble CPAP and surfactant. The reduction in PNMR in 2012 after application of facilities than that in 2005 before application of facilities is highly statistically significant.

We chose to use similar definition which adapted in 2005 in the same hospital and the same neonatal unit. Both nasal CPAP and surfactant reduce needs for mechanical ventilator because survival rate after mechanical ventilator still not good especially if patient stay more than 5 days and those babies died from nosocomial infection. So our experience in mechanical ventilator is not optimum and we need further training.

Strengthening of information system, including birth and death registration, and dissemination of information at local levels (between hospital inside and outside the country) about causes of newborn morbidity and mortality (and their determinants), are needed to guide resource allocation and program and research priorities. Moreover, as programs incorporate newborn care, their impact must be monitored and accurate data fed back to those involved in health policy and program decision-making to enable them to use scarce resources more effectively.

Integral to documenting and monitoring newborn health status is enable more accurate determination of causes of perinatal and neonatal death in our hospital and to assess the contribution of sociocultural and logistic factors. Perinatal audit may also be a powerful tool for identifying avoidable factors in death and mobilizing change in hospital to improve maternal and neonatal health care.

Intrapartum hypoxia and birth asphyxia are widely regarded as major causes of morbidity and mortality in developing countries (Ellis et al., 2000; Kumar, 1995). 'Birth asphyxia' or failure to establish breathing at birth, comprises just a portion of the burden of early death from hypoxia (Dommissie, 1991).

In our study, 11% of admission to neonatal unit was secondary to birth asphyxia and about 13% of early neonatal death is attributed to birth asphyxia (the second commonest cause of early neonatal deaths).

For every neonatal death from asphyxia, there seems to be 1 additional fresh stillbirth that occurs due to intrapartum hypoxia (Rutstein, 2002). However, the precise burden of stillbirth is not yet well defined. Evidence for birth asphyxia as a major cause of neonatal mortality is well established; however, the contribution of intrapartum hypoxia and birth asphyxia to cerebral palsy and the overall burden of handicap in developing countries is unclear (Bhutta, 1997).

Previously, it was estimated that for every case of mortality due to asphyxia or intrapartum hypoxia, another 4 newborns survived but suffered sequelae (Swyer, 1975). However, more recent data suggest that this may be a gross overestimation of the burden of handicap, because most newborns in developing countries with severe asphyxia die (Ellis et al., 2000).

Approaches to improving birth asphyxia-related

outcomes may include prevention through improved antenatal care such as birth preparedness; intrapartum care such as the presence of a skilled birth attendant and fetal monitoring (eg, use of a partograph); or improved management (eg, resuscitation) of newborn who do not breathe adequately at birth.

The important role of neonatal resuscitation in immediate newborn care is well accepted and forms a cornerstone of immediate newborn care in developed countries, but there are particular challenges to making this intervention feasible in our hospital. Training hospital staff in India and China in newborn resuscitation has been shown to reduce asphyxia-related deaths (Deorari et al., 2000; Zhu et al., 1997).

The legal requirements for registration of fetal deaths and live births vary between and even within countries. WHO recommends that, if possible, all fetuses and infants weighing at least 500 g at birth, whether alive or dead, should be included in the statistics.

Underreporting remains a problem, especially with regard to deaths and stillbirths in particular. Data on stillbirths are less frequently available than data on deaths after birth, and are most prone to underreporting. Stillbirth data are available for fewer countries and are less consistent than early neonatal and mortality data. In many instances, stillbirths reported in surveys in developing countries accounted for half, or even one third, of the early neonatal deaths, which is counterintuitive, as the same factors causing early neonatal death also come into play before birth. In our study 42% stillbirth and 58% died in the first week. Stillbirths should equal, or more likely exceed, early neonatal deaths, as shown by data from developed countries, historical datasets (Zaidi et al., 2005; Bhutta et al., 2003; Darmstadt et al., 2000) and hospital data. Underestimates associated with perinatal death in high-mortality setting may be as high as 5% for stillbirths and 3% for early neonatal deaths. These estimates are based on Egyptian survey data for 1993 and 2000 (Abdel-Azeem et al., 1993; Egypt Directorate of Maternal and Child Health Care, 2000).

As noted above, some of the most challenging questions in perinatal health care relate to how to most effectively deliver services to newborns in an integrated way within existing programs for maternal and child health (Darmstadt et al., 2003; Bhutta et al., 2004). Although difficult, determining the answers to these questions requires that many packages and combinations of interventions be tested through effectiveness trials in health system settings.

Conclusion

The vast majority of perinatal mortality is secondary to preterm baby, birth asphyxia, and sepsis which increased in presence of maternal risk factors. Targeting these

causes of perinatal mortality is very important issues to reduce the perinatal mortality rate. As the health of the newborn infant is inexorably tied to the health of the mother, strategies to improve the health and care of women in low-resource hospital are also expected to improve both pregnancy and neonatal health outcomes. However, although it is true that dysfunctional health system is adversely affect maternal and child health in many hospitals (including our hospital), this is relatively difficult to change in the short term.

Appropriate perinatal and neonatal care requires an integrated and holistic program of intervention at various levels .Interventions must not only include health-related measures that have a direct bearing on perinatal and/or neonatal outcomes but several other ancillary measures of equal importance. These measures include poverty alleviation; improved opportunities for female education; and improvement of women's social status which is not discussed in our study.

The results of this study emphasize the importance of health systems research and evaluation of interventions. The study offers compelling support for using research to identify the most effective measures to save newborn lives from birth asphyxia, infection and preterm delivery. It also may facilitate dialogue with policy makers about the importance of investing in neonatal health.

RECOMMENDATIONS

1. Improving health systems' capacity for providing essential preventive and special curative neonatal health care.
2. Preventing and improving recognition and management of birth asphyxia.
3. Preventing and improving recognition and management of infections:
4. There is an urgent need to identify how the burden and severity of maternal infections relate to perinatal outcomes.
5. Preventing and improving care for LBW infants.
6. Improving information on the magnitude and causes of neonatal mortality.
7. Development of indicators and simple management tools (guidelines) for assessing and monitoring health system performance for perinatal and newborn care at the national level.
8. Encourage policy makers (e.g. hospital directors) commitment to newborn health at the regional, national, and local levels.
9. Tools for rapidly assessing the situation, prioritizing program activities, and accurately monitoring and documenting program effectiveness are urgently needed.

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