

Causes of Neonatal Mortality in the Neonatal Intensive Care Unit of Taleghani Hospital

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ABSTRACT

Background: Neonatal survival is one of the most important challenges today. Over 99% of neonatal mortalities occur in the developing countries, and epidemiologic studies emphasize on this issue in the developed countries, as well. In this study, we attempted to investigate the causes of neonatal mortality in Taleghani Hospital, Tabriz, Iran.

Methods: In this cross-sectional study, we studied causes of neonatal mortality in neonatal intensive care unit (NICU) of Taleghani Hospital, Tabriz, Iran, during 2013-2014. Data collection was performed by the head nurse and treating physician using a pre-designed questionnaire. Most of the data were extracted from the neonatal records. Information regarding maternal underlying diseases and health care during pregnancy was extracted from mothers' records.

Results: A total of 891 neonates were admitted to NICU of Taleghani Hospital of Tabriz, Iran, during 2013-2014, 68 (7.5%) of whom died. Among these cases, 37 (54.4%) were male, 29 (29.4%) were extremely low birth weight, and 16 (23.5%) weighed more than 2.5 kg. The main causes of mortality were congenital anomalies (35.3%), prematurity (26.5%), and sepsis (10.3%), respectively.

Conclusion: Congenital anomaly is the most common cause of mortality, and the pattern of death is changing from preventable diseases to unavoidable mortalities.

Keywords: Causes, Neonatal mortality, NICU, Tabriz

Introduction

Neonatal survival is one of the most important challenges today (1). Out of the 130 million births worldwide, 4 million newborns die during the first month of life. Further, 40% of deaths in children under the age of 5 years are related to neonates. Two-thirds of neonatal mortalities occur in 10 countries, which are mostly Asian ones (2). Ninety-nine percent of neonatal mortalities occur in the developing countries, which is two times higher than the rate of mortality due to AIDS (1).

Iran is located in west of Asia, where neonatal mortality rate (NMR) is 27 per 1000 live births. Iran is considered to be a country with average mortality (3). NMR in Iran is 12-15 deaths per 1000 live births, while NMR in the developed countries is 5 per 1000 live births. Death pattern in Iran is neither similar to the developed countries nor to developing ones, showing an

epidemiologic transition (4).

In general, 99% of neonatal mortalities are reported in the developing countries, and epidemiologic studies emphasize on this issue in the developed ones (5). A wide range of studies revealed that the most common causes of neonatal mortality in the developing countries are infectious diseases, asphyxia, and congenital disorders, while in the developed countries, congenital disorders and prematurity account for most neonatal mortalities (3).

As reduced neonatal mortality indicates improvement in the health care system, it is deemed as a criterion for classifying a country as developed or developing. Thus, countries were encouraged to decrease their NMR until 2015 (1-4). In the current study, we investigated mortality pattern in our region and determined medical

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errors leading to death in order to prevent such events in future and improve our health system. In addition, we identified causes of neonatal mortality in Taleghani Hospital of Tabriz, Iran.

Methods

Subject recruitment and study design

This cross-sectional study was carried out from 2013 to 2014 on neonates who died during NICU stay in Taleghani Teaching Hospital of Tabriz, Iran, which is a referral center accepting mothers and neonates from four provinces. This hospital is a maternity hospital with 5000 births on an annual basis and includes a 20 bed NICU.

Data collection instruments

Data were recorded in a form by the head nurse and treating physician. Neonatal data were abstracted from the neonatal records. Information regarding maternal underlying diseases and health care during pregnancy were derived from mothers' records.

The underlying causes of mortality were determined by two neonatologists based on ICD-10. All the neonatal records were reviewed and medical errors leading to neonatal death were recorded by two neonatologists. Frequency (percentage) was estimated for the demographic data. Qualitative variables were compared using chi-square test in SPSS, version 16. P-value less than 0.05 was considered statistically significant.

Results

Of the 891 neonates admitted to the NICU, 68 (7.5%) died; in these cases, 37 (54.4%) were male. There was no significant relationship between gender and death. The most common clinical condition in the admitted newborns was respiratory distress syndrome (RDS; 91.2%). Further, 29.4% of the neonates had birth weight less than 1 kg and 23.5% weighed more than 2.5 kg. The most common causes of mortality in the infants with birth weight less than 2.5 kg was prematurity and congenital anomalies, while in newborns with birth weight higher than 2.5 kg, congenital anomalies were most common causes of mortality. Mortality rate was significantly higher in infants with gestational age of less than 28 weeks.

RDS was the most common (73.5%) cause of neonatal death alone or concomitant with malformation or sepsis. The most common malformation was congenital heart disease (22%). The route of delivery in 55.9% of the neonates was cesarean section, showing no significant

relationship between the route of delivery and death. Ten (14.7%) of the mothers were aged 20 years and 10.3% were older than 35 years. We did not find any link between maternal age and neonatal death. Thirty (44.1%) of the mothers had complications during pregnancy, but it was not significantly associated with neonatal death.

Our study demonstrated that administration of betamethasone significantly reduced neonatal mortality (Table 1). In addition, 35.3% of mortalities

Table 1. Characteristics of registered neonatal mortalities in neonatal intensive care unit of Taleghani Hospital during 2013-2014, Tabriz, Iran

Variables	N(%)	P-value	
Gender	Male	37(54.4)	0.35
	Female	30(44.1)	
	Unrecorded	1(1.5)	
Twin pregnancy	Yes	8(11.8)	0.19
Referral	No	37(54.4)	0.06
	Yes	31(45.6)	
Birth weight (gr)	<1000	20(29.4)	<0.001
	1000-1499	15(22.1)	
	1500-2499	17(25)	
	>=2500	16(23.5)	
Delivery	Cesarean section	38(55.9)	0.83
	Natural vaginal delivery	31(45.6)	
Gestational age (week)	<28	23(33.8)	<0.001
	28-32	28(41.2)	
	33-37	14(20.6)	
	>37	3(4.4)	
Death time (survive)	During the first day(24h)	14(20.6)	0.13
	2-7 day	38(55.9)	
	8-28 day	12(17.6)	
	>28 day	4(5.9)	
Abnormality	Nerves	3(4.4)	0.9
	Urogenital	1(1.5)	1
	Skeletal	7(10.3)	0.07
	Chromosomal	4(5.9)	0.47
	Cardiac	15(23.5)	0.95
	Gastric	6(8.8)	0.15
	Facial	4(5.9)	0.47
Other	9(13.2)	0.06	
Inevitable death	Yes	44(64.7)	<0.001
	No	24(35.3)	
Maternal age	<20	10(14.7)	0.93
	20-35	45(66.2)	
	>35	7(10.3)	
	Unrecorded	6(8.8)	
Corticosteroid description	Yes	17(25)	<0.05
	No	51(75)	
Pregnancy complication	Yes	30(44.1)	0.32
	No	37(54.4)	
	Unrecorded	1(1.5)	
Abortion history	Yes	6(8.9)	0.14
	No	49(72.1)	
	Unrecorded	13(19.1)	
History of child death	Yes	1(1.5)	1
	No	54(79.4)	
	Unrecorded	13(19.1)	
Gravid	1-3	54(79.4)	0.7
	>3	3(4.4)	
	Unrecorded	11(16.2)	
Para	0	35(51.5)	0.59
	1-3	21(39.9)	
	Unrecorded	12(17.6)	

Table 2. Cause of neonatal death in neonatal intensive care unit of Taleghani Hospital during 2013-2014 in Tabriz

Cause of death	N(%)
Congenital malformation	24(35.3)
Birth asphyxia	4(5.9)
Prematurity	18(26.5)
Respiratory distress syndrome	5(7.4)
Infection	7(10.3)
Pneumonia	5(7.4)
Others	5(7.4)

that were due to sepsis, pneumonia, and RDS were preventable. The most common causes of unavoidable mortality were congenital diseases and prematurity. In general, the most common cause of mortality was congenital anomalies (35.3%; Table 2).

Discussion

Neonatal intensive care has reduced the mortality rate among newborns (6, 7). As this study exhibited, reduction in neonatal mortality is due to high accessibility of facilities such as surfactant, ventilator, and trained staff. Our study also showed that 45.6% of mortalities in our hospital occurred in neonates referred from different cities of our province, indicating that neonatal transfer in our region still suffers.

Amenable mortality is divided into human errors and transfer errors (8). Transfer errors are mostly because of primary devices, improper vehicles, or lack of surfactant in the referring hospital. We noted that human errors whether by nurses or resident pediatricians were due to exhaustion from the many shifts they had during each month. The improper ratio of nurse to patient and limited number of pediatricians (four pediatricians covering the NICU from afternoon to the next morning) was another cause of these errors, which arises from insufficient budget. Early neonatal mortality within 24 hours substantially contributes to overall mortality (9).

Our study demonstrated that 20.6% of neonatal mortalities occurred within 24 hours after birth and 76.5% of the deaths occurred during the first week. This finding was in agreement with those of Joy et al. (75%) and Imtiaz (73%) (1, 2). Likewise, Naeri et al. in Tehran showed that 78% of mortalities occurred during the first week of life (10). These findings suggest that proper care within the first hours of NICU admission is critical to reduce the mortality rate. The most common causes of death in our center were respectively congenital anomalies (35.3%), prematurity (26.5%), and sepsis (10.3%). This finding was not in agreement with those of Joy et al. demonstrating that prematurity, sepsis, and

asphyxia were the most common causes of mortality (2).

A similar study was performed in Pakistan by Imtiaz et al., where prematurity, asphyxia, and sepsis were the most common causes of neonatal mortality (2). A similar study was conducted by Sereshta in Qazvin Province showing that sepsis, RDS, and asphyxia accounted for most neonatal deaths (4). Javanmardi proposed that prematurity, congenital anomalies, and RDS were the most common causes of neonatal death (3). These discrepancies in results may stem from differences in epidemiologic prevalence of diseases in various regions or the changing conditions by time. Promoting the quality of neonatal care is the main key for changing the pattern of mortality.

Conclusion

The most common causes of mortality in our study were congenital anomalies, prematurity, and sepsis. We also noted a high rate of amenable deaths (35.3%). To reduce this rate, we recommend performing prenatal screening tests and genetic consultation. Furthermore, maternal care should be improved during pregnancy in order to diminish the rate of preterm labor. NICUs require sufficient numbers of skilled nurses and physicians since ignoring caregiver to patient ratio due to financial issues may bring about healthcare disasters.

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Conflicts of interests

The authors of the present study declare no conflicts of interest.

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