

# Perinatal Mortality and Its Associated Risk Factors: A Study in the North-East of Iran

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## ABSTRACT

**Background:** Perinatal mortality rate is an important indicator of community health status. This study aimed to evaluate perinatal mortality and its determinants in Mobini Hospital of Sabzevar, Iran.

**Methods:** This descriptive, cross-sectional study was performed within a two-year (2011-2012) period at Mobini Hospital of Sabzevar. Our study population included all the cases of stillbirth and live birth after the 22<sup>nd</sup> week of gestation to full term, died within the first week after delivery. The data including maternal and neonatal/fetal age, parity, mode of delivery, history of stillbirth, gestational age, reason of death, gender, and weight of the fetus or newborn were obtained from patient records as well as interviews with the mothers and treating physicians. To analyze the data, independent sample t-test, and Chi T square/Fisher's exact test were run using SPSS, version 11.5.

**Results:** Perinatal mortality and stillbirth rates were 16.6 and 9.1 per 1000 births, respectively, while the rate of early neonatal mortality was 7.4 per 1000 live births. The most common reasons for neonatal death were pre-term labor and sepsis, while the most common reason for stillbirth was unknown etiology. There was a significant difference between stillbirth and early neonatal death in term of gestational age ( $P < 0.001$ ).

**Conclusion:** According to our results, perinatal mortality rate in our region was not high compared to other regions of the country, although it was higher than that of European countries. We found that premature labor was the cardinal cause of neonatal mortality, which can be prevented by careful perinatal care and improving hospital equipment, especially those of neonatal intensive care units.

**Keywords:** Neonatal mortality, Perinatal mortality, Prevalence, Stillbirth

## Introduction

Perinatal mortality rate is an important indicator of community health status (1). Annually, 5.9 million perinatal deaths (stillbirth and death within the first week of life) occur worldwide, about 99% of which happen in developing countries (2).

Reducing perinatal mortality rate and promoting neonatal health in health services are of utmost importance, and most countries aim their health development plans toward reduction of child mortality rates (under the age of five) (3). Approximately, 43% of child deaths under the age of five take place during the neonatal period.

In the recent years, as pediatric health improved, the rate of child death under the age of five plummeted dramatically. However, perinatal mortality rate did not decrease significantly. Therefore, neonatal and perinatal mortality rates account for much of the child deaths under the age of five (4).

According to the World Health Organization (WHO) guidelines, prenatal period commences from the 22<sup>nd</sup> week of gestation and continues to seven days after delivery (2). Perinatal mortality rate varies from 5 per 1000 cases in the United States to 50 per 1000 cases in most developed countries. Various factors, which are preventable in most cases, such as inadequate prenatal care, maternal malnutrition, and poor socio-economic condition can raise perinatal mortality rate (4, 5).

More than 4 million of 1300 million infants born annually die during the first week of life, 99% of which happen in developing countries. In Indonesia, neonatal death rate was reported to be 19 per 1000 live births (6). In a study by Hadavi et al., this rate was reported to be 19.46 cases per 1000 live births in the South-West of Iran (7). It was recognized that increased attention to perinatal mortality is essential to improve

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**Table 1.** Indicators of perinatal mortality according to gender in Mobini Hospital (2011-2012)

Variable	Total births (person)	Live births (person)	Stillbirths (person)	Early neonatal mortalities (person)	Perinatal mortality rate (1000 births)	Early neonatal mortalities rate (1000 live births)	Stillbirth rate (1000 births)
Female	7863	7793	70	51	9.5	6.5	8.9
Male	9125	9039	86	75	7.1	8.2	9.4
Total	16988	16832	156	126	16.6	7.5	9.2

neonatal health. In this study, we investigated the determinants and causes of perinatal mortality in Mobini Hospital of Sabzevar.

## Methods

In this descriptive, cross-sectional study, we retrospectively reviewed the medical records of 282 births with documented perinatal death among 16988 births, during March 2012-February 2013, at Mobini Women's Health Education and Research Hospital of Sabzevar, North-East of Iran.

All the births from the 22<sup>nd</sup> week of gestation until seven days after birth were included in this study. Deaths prior to the 20<sup>th</sup> week of gestation and non-Iranian cases were excluded. According to the WHO criteria, all neonatal and fetal deaths from the 22<sup>nd</sup> week of gestation to seven days after birth are considered as perinatal mortality.

Stillbirth is described as intrauterine death (not having any vital signs during labor) that occurs either before or during labor. Moreover, early neonatal mortality is known as neonatal death within the first week of birth. The rates of stillbirth and perinatal mortality are calculated per 1000 total births, while early neonatal mortality is calculated per 1000 live births.

Data regarding each case, who was registered as a perinatal death, were recorded in a form consisting mothers' data (age, parity, mode of delivery, history of stillbirth or neonatal death, and twin gestations) and fetal/neonatal data (birth weight, gender, gestational age, clinical diagnosis, and cause of death). Data were gathered using hospital records and interviews with the mothers and treating physicians. In case of more than one reason for death, the last reason according to the physician's opinion was considered as the cause of death. Infants who were discharged or referred to other health services prior to seven days after delivery were followed for prenatal death by telephone calls.

Data were analyzed using SPSS, version 11.5. Continuous variables were compared using independent sample t-test, and differences between the categorical variables were determined using

Chi-square or Fisher's exact test. P-value less than 0.05 was considered statistically significant.

## Results

The rate of perinatal mortality was 16.6 in 1000 births (282 out of 16832 births). Stillbirth and early neonatal mortality accounted for 55.3% and 44.7% of the deaths, respectively. The rate of stillbirth was 9.1 per 1000 births, and early neonatal mortality rate was 7.4 per 1000 live births. The obtained data, categorized according to gender, are shown in Table 1.

Overall, 76 (26.9%) of the 282 births were delivered by cesarean section and 206 (73.1%) were delivered by normal vaginal delivery. Their mean gestational age at perinatal mortality was 29.89 weeks. Mean birth weight was 1637.27 g; birth weight in 69.7% of the cases of stillbirth was below 2000 g, while this rate was 33.2 % in early neonatal mortality (Table 2). There was a significant difference between stillbirth and early neonatal death in terms of gestational age ( $P < 0.001$ ).

**Table 2.** Risk factors of perinatal mortality in Mobini Hospital (2011-2012)

Variable	Mean	Standard deviation	Perinatal mortality (%)
Gestation age (week)	29.89	5.76	
30>			154(54.6)
30-35			46(16.3)
35-40			60(21.3)
40<			22(7.8)
Birth weight (gram)	1637.27	1109.86	
999>			145(51.4)
1000-1499			43(15.3)
1500-2499			54(19.1)
2500<			40(14.2)
Maternal age (year)	27.86	6.47	
20>			33(11.7)
20-30			153(54.3)
30-40			87(30.8)
40<			9(3.2)

**Table 3.** Accompanying disorders in stillbirths and neonatal mortalities in Mobini Hospital

Stillbirth	Percent	Neonatal mortality	Percent
Unknown etiology	44.3	Respiratory distress syndrome	44.5
Premature rupture of amniotic sac	14.9	Asphyxia	27.7
Preeclampsia	10.4	Sepsis	11.3
Placental abruption	6.3	Meconium aspiration syndrome	7.8
Congenital deformities	8.3	Others	8.7
Others	24.1		

Among the cases of stillbirth, 58.9% were pre-term (gestational age < 35 weeks); this rate was 25.4% in early neonatal death. There was a significant difference between stillbirth and early neonatal mortalities in terms of prematurity ( $P < 0.001$ ). However, there was not a significant difference between stillbirths ( $26.7 \pm 1.6$ ) and early neonatal mortality in terms of mean maternal age ( $27.4 \pm 5.4$  years;  $P > 0/05$ ).

Overall, 76 (26.9%) of 282 cases of perinatal mortality were delivered by cesarean section and 206 (73.1%) were delivered by normal vaginal delivery. In general, 227 (80.5%) singleton pregnancies, 46 (16.3%) twin pregnancies, and 9 (3.2%) multifetal pregnancies were documented. In addition, 89.4% (228 cases) of the mothers did not have any history of stillbirth, while 10.6% (27 cases) had stillbirth in their past medical history.

In 124 (46.1%) of the births, delivery was performed by an obstetrician, in 134 (49.8%) of the cases by midwives, and in 11 (4.1%) of births by both. In this study, the most common cause of stillbirth was unknown etiology followed by premature rupture of the amniotic sac. Respiratory distress syndrome and asphyxia were also the most common causes of premature mortality, respectively (Table 3). The most common underlying diseases were cardiovascular diseases (18.4%) and diabetes (11.7%). Finally, 59.6% of the mothers did not sustain any underlying diseases.

## Discussion

Perinatal mortality rate in our study was consistent with the one reported in Esmaeelnasab et al. study (17.7 per 1000 births), which was conducted in West of Iran (8). In Kiasari et al. (2007) and Hadavi et al. studies, this rate was 27 per 1000 births in North of Iran (9) and 32 per 1000 births in South-West of Iran (7), respectively. In these studies, there were significant differences between the regions due to different economic and health statuses.

There were diverse reports regarding perinatal mortality rate in other parts of the world. In Tanzania, Eshmiglo et al. (2008-2010) reported perinatal mortality rate to be 52 per 1000 births (10), Croz-angioano et al. (1992-1993) reported 46.7 per 1000 births in Mexico (11), and Abdolvahab et al. reported this rate to be 29.4 in 1000 births in Sudan (12). In 2009, Esvit et al. reported perinatal mortality rate to be 20.7 per 1000 births in Turkey (13). In the same year, a cohort study conducted in Pakistan showed perinatal mortality rate of 70.4 per 1000 births (14). In 2011, an African study reported perinatal mortality rate as 31 per 1000 total births (15). In 2013, an Ethiopian study reported perinatal mortality rate as 50.22 per 1000 total births (16).

However, the rate of perinatal mortality in Mobini Hospital of Sabzevar, Iran, was lower than the aforementioned places. It seems that differences in maternal and prenatal care in various regions of Iran and other parts of the world as well as accessibility of neonatal intensive care unit are the reasons for this difference. Nonetheless, this rate is still higher than that of developed countries.

In Australia (2005), the rates of perinatal mortality, stillbirth, and early neonatal death were 12.7, 9, and 3.7 per 1000 births, respectively (17). In Scotland (2008), the rates of perinatal and stillbirth were 7.4 and 5.4 per 1000 births, respectively (18). Treurniet et al., in 2000, reported perinatal mortality rate to be 5.6 per 1000 births in England (19). These findings indicate the direct impact of perinatal care system and hospital equipment on reduction of perinatal mortality rate.

Our study suggested pre-term labor complications as one of the most important causes of early neonatal mortality. This result was consistent with those of other studies performed in Iran (7, 20, 21). Studies carried out in Turkey (13), Brazil (22), and Pakistan (6) also mentioned pre-term labor complications as the major causes

of perinatal mortality. However, recently, an African study reported asphyxia and pre-term labor as the most common causes of early neonatal death (23).

These findings indicate that despite higher accessibility of perinatal care in the recent years that has led to a great reduction in pregnancy complications, the prevalence of pre-term labor was not reduced. This could be due to improvement in infertility treatments, leading to an increased risk of pre-term delivery.

Asphyxia and sepsis were the other major causes of perinatal mortality in our study. Hadavi et al. also reported prematurity and septicemia as the main causes of early neonatal mortality (7). In the study by Eswit et al., asphyxia after pre-term labor was the major cause of early neonatal mortality (13).

In our study, the most common cause of stillbirth was unknown etiology. This finding is in accordance with those of Kiasary et al. study (9); however, Hadavi et al. (7) reported that rupture of the amniotic sac and placental abruptions were the major causes of stillbirth. In addition, Eswit et al. mentioned congenital anomalies as the cardinal causes of stillbirth (13). High percentage of stillbirth with unknown etiology could be due to congenital fetal anomalies. Considering the absence of accurate diagnostic equipment, fetal internal abnormalities cannot be diagnosed, which is the reason for not knowing the exact causes of stillbirth.

In the present study, most intrauterine mortalities (54.7%) happened during the 22<sup>nd</sup>-30<sup>th</sup> weeks of gestation and the mean gestational age was 29.89 weeks. In a study performed by Shiva in 2005, (3), 51.7% of intrauterine mortalities occurred in the second trimester, while 48.3% of them were in the third trimester; moreover, mean gestational age was reported to be 29.6 weeks. These results are highly consistent with our findings. In the current study, 10.6% of the mothers had history of stillbirth.

In some studies, the most prevalent causes of neonatal mortality were low birth weight (prematurity), congenital anomalies, and asphyxia during labor, respectively (24, 25). In other studies, educational level and quality of perinatal care were considered as the leading causes of perinatal mortality (11, 12), as mothers' educational level can affect their use of perinatal care. In addition, low quality of perinatal care can have a great impact on timely diagnosis and choice of proper treatment for eliminating the risk factors of perinatal mortality.

## Conclusion

Perinatal mortality rate in Sabzevar was lower than other regions of Iran, while it was higher than the rates reported from European countries. In addition, premature labor, as the most important cause of neonatal mortality, can be prevented by accurate planning of perinatal care and promoting the accessibility of hospital equipment, especially those in neonatal intensive care units.

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## Conflicts of Interest

The authors declare no conflicts of interest.

## Ethics

The study received ethical clearance from the Research Board of Faculty of Medicine, Sabzevar University of Medical Sciences, Sabzevar, Iran.

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