

Original Article

Etiologies and contributing factors of perinatal mortality: A report from southeast of Iran

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Abstract

Objective: The aim of this study was to investigate the etiology and risk factors of perinatal mortality in Rafsanjan, Iran.

Materials and methods: This case-control prospective study was conducted on 321 perinatal deaths (as case group) and 321 live births who were alive until 28 days after birth (as control group) during a 2-year period. Data about demographic characteristics of mother, fetus, and newborn and also mother's obstetrics and clinical status was recorded in a questionnaire.

Results: The most important causes of newborn death were prematurity (63.24%), cardiac arrest (11.49%), and septicemia (5.75%) as well as premature rupture of membrane, pregnancy-induced hypertension, placenta decolman, and congenital abnormality for stillbirth. A significant association was found among the fetal weight, gestational age, and amniotic fluid volume with stillbirth.

Conclusion: Prematurity, cardiac arrest, and septicemia were the most important causes of neonatal mortality. It is concluded that attention to the following points is very important: adopting program for pregnancy care improvement, finding and removing risk factors of premature birth, control of infection in mother's and newborn's wards, examining of personnel skill about correct newborn resuscitation methods, and arrangement of training courses.

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Keywords: Mortality; Perinatal; Stillbirth

Introduction

Conventionally, perinatal mortality is used as a health care indicator at birth time. The perinatal mortality definition is broad and contains all kinds of newborn death [1]. The main and logical cause of classification of this kind of death is the similar causes and prohibition methods, although the etiological differences between newborn mortality and stillbirth have been cleared in previous years [2]. Although the rate of perinatal mortality has decreased, the speed of this reduction is slow in many industrial countries. Stillbirth includes the major

portion of perinatal mortalities [3]. Annual rate of stillbirths has been reported to be 3.3 million and that 97% of them occur in developing countries [4,5].

As only 4% of developing countries epidemiological documents are available [6], it is estimated that about 1–2 million stillbirths has not been reported. Even after many investigations, the real mechanism of stillbirth has not been understood yet [7–10]. Stillbirth rate is variable from 5 in 1,000 birth in United States and most of developed countries to 30–40 in 1,000 in developing countries [11]. The maximum stillbirth rate (25–40 per 1,000) belongs to South Asia. Stillbirth rate is 38 per 1,000 total births in Afghanistan [12]; and in Pakistan, it varies from 36 to 70 in 1,000 (in some rural area) [6,13–15].

The cause of difference between mortality rate in developed countries and other countries may be because of different

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definitions applied in these countries because stillbirth apply to deaths after 20th week of gestation [15], whereas in some developed countries, such as Sweden, stillbirth is defined as deaths after 28th week of gestation [12–17].

More than 4 millions of 130 million newborns born in year would die in the first year of life [14] and 99% of mortalities occur in developing countries [18]. Newborn mortality rate in Indonesia has been reported to be 20 per 1,000 live births in 2002 [19], which according to the World Health Organization report (19 per 1,000 live birth) is similar to other Southeast Asian countries [20]. According to the children right agreement [21], neonates deserve to enjoy the best health standards. Recently, the study of children mortality has shown that the ratio of mortality in children younger than 5 years is growing [22]. The main causes of fetal death are placenta insufficiency, intrauterine infection, and severe congenital abnormalities. In premature neonates, respiratory distress syndrome, severe immaturity, and intracerebral hemorrhage; and in term newborns, congenital abnormalities, asphyxia, and infection were the main causes of mortality [23]. One of the methods of reducing mortality rate is recognizing its effective factors and improving them. In most cases, deaths with known causes are preventable easily. The problem is more difficult in death with unknown causes.

The goal of this study was to determine the effective causes and risk factors of perinatal mortality to take necessary action for reducing the perinatal mortality and improving the society health.

Materials and methods

This case-control study was conducted on 321 perinatal mortalities (as case group) and 321 live births who were alive up to 28 days after birth (as control group) during a 2-year period (2006–2007). All cases of stillbirths and newborn mortalities that occurred in the hospitals of Rafsanjan city (South East of Iran) were included in the case group.

The Ethics Committee of Rafsanjan University of Medical Sciences approved the study protocol. Informed consent was obtained from the parents before enrollment.

The term perinatal mortality applied to deaths after 20th week of gestation to 28th day after birth. Stillbirth was defined as the births with dead neonate that occurred after 20th week of pregnancy and before delivery. Newborn mortality was defined as the deaths through the first 28 days after birth. The mortality rates were considered as the death number per 1,000 births.

Amniotic fluid index of 5–24 cm was considered as normal amniotic fluid and values greater than 24–25 cm and 5 cm or less were considered as polyhydramnios (increase of amniotic fluid volume) and oligohydramnios (decrease of amniotic fluid volume), respectively [24].

Data about maternal and fetal/neonatal demographic characteristics and mother's clinical and obstetric condition were collected in a questionnaire. The data were gathered from mother, hospital files (including maternal ultrasound report), the nurse, and person who had done delivery and filled in the questionnaire.

Data analysis

The data were analyzed by SPSS software (version 15 for Windows; SPSS, Inc., Chicago, IL, USA) using χ^2 test and independent sample *t* test to determine the causes and risk factors of mortality. A *p* value of 0.05 or less was considered as significance level.

Results

Total prenatal mortality rate (stillbirth and newborn mortality) was 32.2 per 1,000 as well as 29.1 and 34.9 per 1,000, for girls and boys, respectively. Newborn mortality rate was 19.46 per 1,000 live births. Details of results have been shown in Table 1.

The results showed that 33.4% of newborn mortalities occurred at morning, 38.4% at night, and 28.2% at afternoon. The maximum mortality occurred at morning, between 8 AM and 9 AM.

In terms of time, 38.5% of mortalities occurred at the 1st day of birth, 51.2% between 2nd and 7th days, and 10.3% between 8th and 28th days after birth. Some risk factors were compared between case and control groups (Table 2).

The most important causes of newborn mortalities were immaturity (63.24%), cardiac arrest (11.49%), and septicemia (5.75%). It was found that 68.2% of newborns who died before 28th day of their life had some problems, such as immaturity and cyanosis at birth. This rate was only 2.8% in live newborn and this difference was statistically significant (*p* < 0.000).

The main causes of stillbirth were premature rupture of membrane (PROM) (27.7%), pregnancy-induced hypertension (8.9%), decolman placenta (6.3%), and congenital abnormalities (5.4%). Fetus gender in 57.7% of stillbirths was male and in 42.3% was female. No significant difference was found between the two groups.

There was a significant difference between birth weight of stillbirths and live newborns (*p* < 0.001) and birth weight of 70.5% of stillbirths versus 35.1% of live newborns was less than 2,000 g. Gestational age of 63.4% of stillbirths as well as 26.8% of live newborns was less than 32 weeks (*p* < 0.001). There was no significant difference between maternal age in live births and stillbirths groups (26.97 ± 6.13 years vs. 27.89 ± 7.11, respectively). Our results showed that women with a previous history of stillbirth were at higher risk for stillbirth in subsequent pregnancies (*p* = 0.016). Also, no significant difference was found in maternal job and education, family income, condition of residence, prenatal care, and presentation between stillbirth and live newborns groups.

Table 1
Perinatal mortality rate according to sex

Variables	Stillbirth rate (per 1,000)	Newborn mortality rate (per 1,000)	Stillbirth	Newborn mortality	Birth rate
Girl	11.26	17.93	54	86	4,795
Boy	14.11	20.88	73	108	5,173
Total	12.74	19.46	127	194	9,968

Table 2
Comparison of some risk factors in dead newborn and control groups

Variables	Dead newborn (n = 321)	Control (n = 321)	p
Gender (%)			
Male	52.6	40.5	0.13
Female	47.4	59.5	
Twins (%)	19.2	2.5	0.001
Apgar less than 4 in first minute (%)	26.3	2.5	<0.001
Clear abnormality at birth time (%)	5.4	0	0.036
Maternal age (%) <20 and >35	25.8	12.7	0.044
Previous maternal disease (%)	12.5	0	0.003
Pregnancy Weight gain (kg) (mean \pm standard deviation)	5.92 \pm 4	11.23 \pm 4.79	<0.001
Residence (%)			
Urban	80.4	48.7	<0.001
Rural	19.6	51.3	
History of perinatal mortality (%)	17.9	0	<0.001
Primigravid (%)	22.1	41.8	0.008
Gravid <4 (%)	11.7	2.5	0.026
Gestational age (wk) (mean \pm SD)	31.15 \pm 4.96	38.38 \pm 1.60	<0.001
Amniotic fluid volume (%) ^a			
Low	2.2	2.8	<0.001
High	8.7	0	

^a Amniotic fluid index >24–25 cm and \leq 5 cm were considered as polyhydramnios (high) and oligohydramnios (low), respectively.

Discussion

Determination of mortality rate and its effective factors have been one of the most important priorities of social health programs. Mortality rate in this study was 32.2 per 1,000, which is different from the study reported by Esmailnasab et al [25] (17.7 per 1,000). This difference may be because of difference in the maternal and neonatal care and facilities in these two provinces in Iran or even difference in definitions.

Stillbirth mortality rate was 12.74 per 1,000 in the present study. Stillbirth rate has been reported as 7 [26] and 36 per 1,000 in United States and Afghanistan, respectively [12]. These reports highlight the importance of health care quality that affects stillbirth rate and reduce it. Newborn mortality rate in the present study (32.2 per 1,000) was similar to that of Afghanistan (36 per 1,000) [12] and World Health Organization report for Southeast Asia [19]. Around 33.4% of mortalities occurred at morning, 38.4% at night, and 28.2% in evening shift. Stewart et al [27] also studied 107,206 files and showed that mortality rate in newborns that were born from 9 PM to 8.59 AM was higher than those born from 9 AM to 8.59 PM. This may be explained by long time spending, feeling sleepy, and using low-skilled personnel at night shifts.

More frequency of mortality rate in our study was seen between 8 AM and 9 AM. Newborn's file study and new prescribe controlling can be the cause of this finding. Around 38.5% of mortalities occurred at the 1st day, 51.2% between

2nd and 7th, and 10.3% between 8th and 28th days after birth. These rates in Esmailnasab et al [25] study were 54%, 21%, and 25%, respectively.

The small size of newborn is one of the strongest predictor of newborns mortalities [27]. A study in Bangladesh also showed that about 75% of low-birth weight newborn mortalities were related to prematurity [28]. The most common causes of stillbirth in the present study were PROM, pregnancy-induced hypertension, placental decolman, and maternal abnormalities. The most important causes of newborn mortalities were prematurity, cardiac arrest, and septicemia. In a research by Azad et al [29] in Bangladesh, stillbirth rate (53.5%) was slightly more than newborn mortalities (46.5%). In that study, asphyxia was the most important cause of mortality.

A study in Kenya showed that 53% of perinatal mortalities were related to labor complications and other complications, such as ante partum hemorrhage, eclampsia, abnormal presentation, prematurity, and PROM played important role [30]. In our study, maternal age was not a risk factor for stillbirth, but this finding was different from other studies [31–33].

Stillbirth mortality increased significantly in abnormal amniotic fluid volume. This subject was similar to textbook's mortality rate (normal amniotic fluid 1.97, polyhydramnios 4.12, and oligoamnios 109.4 per 1,000) [34]. In the present study, no significant role was found for social or economical situation of family and stillbirth history in stillbirth mortality, although some articles have mentioned it. Despite significant improvement in prenatal and neonatal care, there are yet some important problems about perinatal mortality. Considering this perinatal mortality rate, programming for prenatal care improvement, recognition and removal of effective factors of low-birth weight and premature births, prevention and early diagnosis and treatment of asphyxia, maternal and neonatal infection control, assessment of personal skill in neonatal cardiopulmonary resuscitation, and organization of retraining courses is necessary.

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