

Factors Affecting Stillbirth Rate in the Hospitals Affiliated to Babol University of Medical Sciences

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ABSTRACT

Background: Stillbirth is a sensitive indicator for health care quality, living conditions and equity in a society. The aim of this study was to determine the rate and contributing factors of stillbirth at Babol hospitals.

Methods: This cross-sectional, descriptive, analytical study was designed as an applied research, using census sampling in 2012-2013. A questionnaire was applied for data collection. The study samples included all fetal mortalities occurring between 22 weeks of gestation and birth. Data were analyzed using SPSS version 18 at the significance level of 0.05.

Results: Stillbirth rate was estimated to be 11.7 per 1000 cases. The age of mothers of stillborn babies ranged between 15 and 35 years with a mean of 26.94±5.995 years. Gestational age ranged between 22 and 41 weeks with a mean of 28.9±5.941 weeks. The range of weight at birth was 250-5500 g, with a mean weight of 1331.553±1068.468 g. Stillbirth had a significant correlation with gender, the number of babies in multiple gestations, congenital abnormalities, underlying maternal diseases and maternal conditions during pregnancy.

Conclusion: Stillbirth can be effectively prevented through screening high-risk women and referring them to appropriate care centers. Moreover, training and counseling these women and proper follow-up before, during and after pregnancy can aid with early detection and termination of high-risk pregnancies.

Keywords: Stillbirth; gestational age; congenital anomaly

Introduction

Rate of stillbirth, as one of the important signs of development in a society, is a sensitive indicator for the quality of health care, living conditions and equity (1-3). The causes of stillbirth, e.g., maternal infection, fetal asphyxia, trauma, congenital abnormalities, fetal/maternal hemorrhage and a number of other maternal medical conditions, are generally the same in developing countries (4, 5).

There are various definitions for stillbirth such as fetal death after 20 or 22 weeks of pregnancy (6, 7). Also, lack of vital signs including spontaneous breathing, heart rate or spontaneous movement of voluntary muscles at birth time or afterwards is among other definitions of stillbirth (8).

Intrauterine fetal deaths include about half of perinatal mortalities (9, 10). More than 98% of neonatal deaths (3.2 million to 3.7 million stillbirths per year) occur in developing countries (11, 12). The worldwide stillbirth rate has

declined by 14% (from 22.1 per 1000 births in 1995 to 18.9 per 1000 births in 2009) (13).

The highest rates of stillbirth are observed in South Asia and sub-Saharan Africa (1). Also, stillbirth rate is particularly high in Pakistan and the Caribbean (14). The rate of stillbirth in Pakistan is reported between 25-40 per 1000 cases and the rate of stillbirth in some rural areas ranged from 36 to 70 per 1000 cases (15). Stillbirth rate in the USA was reported to be 1 per 1000 cases, that is, approximately 26,000 stillbirths (16, 17). Additionally, the rate of stillbirth in Sweden ranged from 3 to 4 per 1000 births in 2003 (18).

Intrauterine fetal death occurs either before or during labour (13); however, little is known about the clinical causes of stillbirth (19, 20). Although several adverse birth conditions including poor fetal growth, low birth weight and pre-term birth have been linked to maternal underweight, the

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association between maternal underweight and stillbirth remains unclear (14).

Nevertheless, the growing incidence of stillbirth can be associated with the increase in prevalence of some important risk factors, such as advanced maternal age, obesity and multiple gestations (21). In 2007, 94% of all the stillbirths in England were delivered at 24-27 weeks of gestation and 55% of all stillbirths were due to low birth weight (14).

The contributing risk factors for stillbirth are pre-term birth, low birth weight and congenital anomalies (1, 2). In addition, previous delivery of a small gestational-age infant is considered as an important predictor of subsequent stillbirth, particularly if the infant is delivered pre-term (18).

Previous studies have suggested that the most common causes of stillbirth were obstetric conditions, such as cervical insufficiency, placental abruption, pre-term labor and abnormalities of the placenta. Other common causes included genetic or structural abnormalities of fetus, umbilical cord abnormalities, fetal infections, blood pressure disorders and other maternal medical conditions (17, 19).

The cause of intrauterine fetal death in 25-60% of cases is unknown. Other contributing factors can be divided into three major categories including maternal (e.g., diabetes and preeclampsia), fetal (e.g., congenital and genetic abnormalities) and placental (e.g., placental abruption and umbilical cord injuries) causes (16).

Factors such as maternal age, maternal smoking and the number of parities can affect the incidence of stillbirth (the stillbirth risk increases from the first pregnancy of smoking women and the mothers aged more than 35 years). Also, stillbirth is more common in fetuses less than 2500 g (22).

According to the literature, 80% of stillbirths occur pre-term and more than half of them before 28th weeks of pregnancy (8). Identification of the factors influencing fetal health is of utmost importance.

Given the fact that without determining causes of mortality it is impossible to provide, maintain

and promote health at the community level, the aim of this study was to determine the rate and risk factors of stillbirth in Babol hospitals, North of Iran.

Method

This cross-sectional, descriptive, analytical study was designed as an applied research. A census was obtained between 20th of March 2012 and 19th of March 2013 for the purpose of this study.

The data collection tool included a questionnaire prepared by the National System of Stillbirth Care at the Department of Infant Health, the Ministry of Health and Medical Education. The questionnaire was related to the neonatal deaths during delivery in the operation room or emergency unit. The main cause of mortality was registered based on ICD-10 (International Statistical Classification of Diseases and Related Health Problems, Tenth Revision).

The population of the study was all the fetuses that died between 22 weeks (154 days) of gestational age and birth. Data were analyzed using SPSS version 18 and χ^2 and Fishers exact tests were performed at the significance level of 0.05.

Results

Our results indicated that among a total of 8822 deliveries 6531 cases were cesarean sections (74.03%). There were 103 cases (1.17%) of stillbirth (CI 95%: 0.94-0.139) that were estimated as 11.7 per 1000 births.

Out of 103 stillbirths, 58 cases were male (56.3%), 44 cases were female (42.8%) and gender of one case was ambiguous (0.97%). Occurrence of stillbirth had no significant relationship with gender ($P=0.234$). Out of 8822 deliveries, gender of seven cases was ambiguous, among which one case of stillbirth was reported.

Stillbirth demonstrated a significant relationship with unknown gender ($P=0.003$). As the results showed, 60.8% of stillbirths had occurred in urban areas and 39.2% in rural areas. Table 1 presents maternal age, gestational age and birth weight of the samples.

Table 1. Frequency of mother's age, gestational age and weight of dead newborns in stillbirth cases in hospitals affiliated to Babol University of Medical Sciences (2012-2013)

Weight of product (g)	Frequency	Gestational age (week)	Frequency	Mother's age (year)	Frequency
W<1000	55(53.4%)	22≤G.A≤28	55(53.4%)	Age<18	2(1.9%)
1000≤W≤1499	10(9.7%)	28<G.A≤32	15(14.6%)	18≤Age≤35	92(87.4%)
1500≤W≤2499	19(18.4%)	32<G.A≤36	19(18.4%)	Age≥35	11(10.7%)
2500≤W≤4000	17(16.5%)	36<G.A≤42	14(13.6%)		
W>4000	2(1.9%)				

According to Table 1, the most stillbirths were in mothers between 18 and 35 years old (87.4%). Most stillbirths (53.4%) had occurred between 22 and 28 weeks of gestational age, with a mean of 28.961 ± 5.999 weeks. Also, most stillborn babies (53.4%) had weights below 1000 g. The weight range of stillborn neonates was between 250 and 5500 g with a mean of 1331.553 ± 1068.468 g.

Overall, 54 stillbirth cases had occurred in the primiparas and 36 cases (35%) had former gravidity. In 16.5% of cases, pregnancy interval from previous pregnancy was between 12 and 36 months and in 13.6% cases it was over 60 months.

On the whole, 74.6% of the deliveries were cesarean section, 24.2% vaginal and 0.98% were painless delivery. Moreover, 75.7% cases were single, 18.4% cases were twins and 5.8% were triplets. Stillbirth had a significant relationship with the number of babies of multiple gestations ($P=0.00$).

In Tables 2 to 5, the causes of stillbirth (e.g., congenital malformations, deformations and maternal and neonatal diseases that caused neonatal mortality) are surveyed according to ICD-10. According to our findings (Table 2), 13 out of 103 cases of stillbirth mortality had congenital malformations and deformations; abnormalities of nervous system, musculoskeletal system and cleft palate had the highest frequencies, respectively. In some individuals there were more than one abnormalities.

Generally, 19 abnormalities were observed in 13 cases, that the distribution per person was 1.46 abnormalities. There was a significant relationship between congenital abnormalities and stillbirth ($p=0.00$). The proportion of stillbirth risk to congenital malformation is approximately 18 times, $RR=17.80$ (CI 95%: 10.45-30.33).

Findings of the present study demonstrated that 22 out of 103 cases of stillbirth were diagnosed with one or more underlying maternal diseases (in total, 26 diseases). Diabetes, hypertension and other diseases had the highest frequencies, respectively. There were significant relationships between stillbirth and underlying maternal diseases ($P=0.00$), and the relative proportion of risk of stillbirth to underlying maternal disease was approximately 14 times, $RR=14.16$ (CI 95%: 9.07-22.11).

Table 4 shows the conditions related to pregnancy which can lead to death of fetus or newborn according to ICD-10. Based on these findings, out of 103 stillbirth cases, 83 cases had one or more underlying maternal diseases (in total 106 diseases and 20 cases had no conditions related to maternal diseases).

Table 2. Frequency of congenital malformations, deformations in stillbirth cases in hospitals affiliated to Babol University of Medical Sciences in 2012-2013

Congenital malformations, deformations	Category	Frequency	Percent
Congenital malformations of nervous system	Q00-Q07	6	31.59
Congenital malformation of eye, ear, face and neck	Q10-Q18	1	5.26
Congenital malformations of circulatory system	Q20-Q28	1	5.26
cleft lip and cleft palate	Q35-Q37	3	15.79
Other congenital malformations of digestive system	Q38-Q45	1	5.26
Congenital malformations of urinary system	Q60-Q64	1	5.26
Congenital malformations and deformations of musculoskeletal system	Q65-Q79	4	21.06
Other congenital malformations	Q80-Q89	1	5.26
Not classified elsewhere	Q90-Q99	1	5.26
Total	Q00-Q99	19	100

Table 3. Frequency of maternal underlying diseases affecting fetus and newborn (in stillbirth) at hospitals affiliated to Babol University of Medical Sciences in 2012-2013

Maternal underlying diseases	Category	Frequency	Percent
Fetus and newborn affected by maternal hypertensive disorders	P00.0	6	23.07
Fetus and newborn affected by other maternal circulatory and respiratory diseases	P00.3	3	11.54
Maternal diabetes mellitus (pre-existing) affecting fetus or newborn	P70.1	9	34.91
Fetus and newborn affected by maternal use of addiction drugs	P04.4	2	7.69
Other diseases such as maternal infections and Decolman	P00.8	5	19.23
Total	P00.0,P70	26	100

Table 4. Frequency of conditions related to pregnancy leading to death of fetus or newborn in hospitals affiliated to Babol University of Medical Sciences 2012-2013

Conditions related to pregnancy	Category	Frequency	Percent
Diabetes arising in pregnancy affecting fetus and newborn	P70.0	10	9.43

(syndrome of infant in mother with gestational diabetes)			
Fetus and newborn affected by maternal hypertensive (gestational hypertension)	P00.0	4	3.77
Preeclampsia affecting fetus and newborn	P00.0	5	4.72
Small for gestational age (slow fetal growth and fetal malnutrition)	P05.1 (P05)	4	3.77
Abruption placenta affecting fetus and newborn	P02.1	11	10.39
Fetus and newborn affected by premature rupture of membranes	P01.1	10	9.43
Fetus and newborn affected by other specified complication of labour and delivery (Premature delivery)	P03.8	50	47.18
Fetus and newborn affected by oligohydramnios	P01.2	6	5.66
Fetus and newborn affected by other maternal conditions	P00.8	6	5.66
Total	P00,P70	106	100

Table 5. Frequency of diseases associated with infant in stillbirth cases at the hospitals affiliated to Babol University of Medical Sciences (2012-2013)

Diseases associated with infant	Category	Frequency	Percent
Perinatal asphyxia	P20.9	8	8.60
Respiratory distress syndrome of newborn	P22.0	21	22.57
Neonatal aspiration of meconium	P24.0	13	13.98
Infections specific to perinatal period	P36	1	1.08
Intracranial non-traumatic hemorrhage of fetus and newborn	P52	2	2.15
Hydropsfetalis NOS	P83.2 P56	2	2.15
Newborn sclerema	P83.0	1	1.08
Congenital renal failure	P96.0	1	1.08
Fetal death of unspecified cause	P95	15	16.13
Other conditions originating in the stillbirth	P90-P96	29	31.18
Total	P20-P96	93	100

Pre-term labour, premature rupture of membrane and gestational diabetes were the most frequent complications, respectively. There was a significant relationship between stillbirth and maternal diseases ($P=0.00$). The relative risk of stillbirth to pregnancy-related diseases is about 119 times, $RR=119.96$ (CI 95%: 74.66-192.74).

Table 5 shows conditions related to diseases associated with stillborn infants based on ICD-10. According to our results, 93 out of 103 stillbirth cases suffered from neonatal diseases leading to fetal death and 14 cases had no diseases. Respiratory distress syndrome (22.57%) was the most prevalent, and fetal deaths with unknown causes were the second most frequent.

Discussion

The results of this study showed that the most of stillbirths occurred in males, at the gestational age of 22-28 weeks with weights under 1000 g. additionally, stillbirth had significant correlation with congenital malformations, deformations, underlying maternal diseases, certain pregnancy-related conditions and neonatal diseases.

It was found that stillbirth was more prevalent in males rather than females. Similar findings had been reported in previous studies both in Iran and other countries (9, 11, 23, 24). The index of stillbirth rate was 11.7 per 1000 births in the present study. This was in contrast with the results of other studies conducted in rural Congo (30 per 1000 births), sub-Saharan (28.1 per 1000 births) in 2009, eastern Mediterranean regions (27.2 per 1000 births), and south-eastern regions of Asia (22 per 1000 births) (13).

This index was measured to be 2.74 per 1000 births (23) in Rafsanjan, Iran. It is suggested that factors such as access to health care services and training about pregnancy might play an instrumental role in the reduction of stillbirth.

It is not worthy that this index was 6.3 per 1000 births in European regions (13), 7 per 1000 births in American regions (13) and more specifically, 3-4 per 1000 births in Sweden and the United States (18).

Therefore, stillbirth index can be lowered in developing countries through careful planning and strict monitoring of pregnancies. In this

survey, 18.4% of the samples were twins and 5.8% of them were triplets. Significant relationships were revealed between the number of babies in multiple gestations and stillbirth. This was in agreement with the results of other studies (24). It was found that the highest rate of stillbirth was between 22 and 28 weeks of pregnancy with birth weight below 1000 g.

As was reported in the related literature, more than 50% of stillbirths have occurred before 28 weeks of pregnancy (8). Other studies have propounded that stillbirths are more common in weights less than 2500 g (22). In Pakistan, most stillbirths were between 25 and 40 weeks of pregnancy (15) and in England, 94% of stillbirths were between 24 and 27 weeks of pregnancy and 55% of these cases had low birth weight (14).

In our study, the risk proportion of stillbirth with congenital anomalies was about 18 times. Congenital anomaly has been expressed as an important risk factor in stillbirth (1, 2, 7, 18, 19, 24, 25). Additionally, the relative risk of stillbirth with underlying maternal diseases was about 14 times. Maternal diabetes and hypertension had the highest frequencies.

In a study by Azargun and Moradan (7), chronic hypertension and diabetes had the highest frequencies, while in other studies hypertension was found as the most important risk factor (24). In another study, the odds ratio in diabetic mothers was 3.35 times (26). Relative risk of stillbirth with pregnancy related diseases has been 119 times. Pre-term delivery, placental abruption and premature rupture of membrane were the most influential factors in stillbirth, respectively.

Based on the results, numerous factors such as underlying maternal diseases, maternal conditions of pregnancy and neonatal diseases were the most influential causes of stillbirth. As a result, stillbirth can be largely prevented via screening high risk women and referring them to appropriate care services, training and counseling them before, during and after pregnancy, early detection and appropriate termination of high risk pregnancies, careful follow-ups, providing expert medical crews and prevention from premature deliveries.

Conflicts of interest

The authors declare no conflicts of interest.

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