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Risk factors for perinatal deaths in Pakistan

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Abstract

Aim: The aim of this study was to identify the risk factors for perinatal deaths in Pakistan, where perinatal mortality is still very high.

Materials and Methods: This prospective cohort study was conducted in Sindh Government Lyari General Hospital, Karachi from 1 May 2006 to 30 April 2008. During this period, all perinatal deaths and each live infant delivered following every perinatal death (which were taken as controls) were enrolled. Demographic information, birthweight, booking status, associated obstetric risk factors, stillbirth or neonatal death and the cause of death were recorded. Univariate logistic regression was used to determine the effect of categorized weight, booking status, sex and the obstetric risk factors on perinatal death.

Results: A total of 1103 deliveries were conducted during this period with 119 perinatal deaths. Stillbirths constituted 68.9% while there were early neonatal deaths in 31.1% cases. Booking status, gestational age, weight of fetus and the presence of obstetric risk factors were found to have significant (P-value < 0.05) association with perinatal deaths. Among the obstetric risk factors, abruptio placentae was the commonest (13.4%) and the commonest cause of death was identified as birth asphyxia (44.5%). There was a strong association between birthweight and perinatal death.

Conclusions: The high perinatal death rate in this study is comparable to other hospital-based studies and indicates the poor health status, inadequate prenatal and intranatal care and lack of services in our setup. In order to achieve the Millennium Development Goals-4, much work is needed to improve the quality of care, to identify high-risk cases and to carry out their proper management.

Key words: birthweight, causes of perinatal death, perinatal mortality, risk factors.

Introduction

Perinatal mortality rate (PMR) is the most sensitive index of health status of women and quality of maternal and child health services. According to the World Health Organization (WHO), the number of perinatal deaths worldwide is greater than 7.6 million, with 98% of the deaths occurring in developing countries.[1] In India, the PMR is reported as 74 per 1000 total births.[2] A multicentre survey by the Society of Obstetricians and Gynaecologists of Pakistan showed that the PMR was 92 per 1000 total births with 72% being contributed by stillbirths, while other local studies reported 54 and 97.2 per 1000 total births, respectively.[3–5] This rate measures the difficulties and complications of pregnancy and delivery rather than the effects of diseases that kill infants after delivery.[6] Achieving the Millennium Development Goal (MDG) probably remains a dream in our setup and in order to achieve the MDG-4, the PMR needs to be reduced. In the developing world it has declined over time due to better strategies for preventing complications and improved medical care, as reported from Nepal and Thailand where the PMR has been reduced by up to 10.8 and 5.1 per 1000 total births, respectively.[7,8] The alarmingly high PMR in Pakistan makes it a major health problem, necessitating a precise definition of the factors that contribute to its high incidence. Research to measure the determinants of

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perinatal death is necessary for the future reduction of the PMR. Recently, local studies showed that common factors responsible for perinatal death were hypertensive disorders of pregnancy, antepartum hemorrhage, preterm delivery and mechanical factors during labor.[5,9]

This study was aimed to identify the risk factors responsible for perinatal death in the low socioeconomic settlement of Karachi, Pakistan.

Materials and Methods

This study was conducted in Sindh Government Lyari General Hospital, which is situated in a low socioeconomic settlement of Karachi and is a tertiary care hospital. The duration of the study was from 1st May 2006 to 30th April 2008. This was a prospective cohort study. All patients who delivered a singleton baby during this period with the end result of perinatal death were included in this study and allocated to group A. Perinatal death is defined as a total of all stillbirths occurring at or over 22 completed weeks of gestation or a fetus weighing at least 500 g and neonatal death occurring within the first 7 days of life (WHO definition). The perinatal death rate in this study was defined as the number of perinatal deaths of singleton babies expressed as a proportion of 1000 total singleton births occurring in Sindh Government Lyari General Hospital during the study period. For the control group, every delivery following a case ending in perinatal death was enrolled and allocated to group B.

Information was collected and recorded on a predesigned proforma regarding the maternal age, parity, gestational age, booking status, other obstetric risk factors, fetal weight, sex, Apgar score at birth, stillbirth or neonatal death and the cause of death. Gestational age was calculated by the date of the last menstrual period and, if not remembered, then by early dating ultrasound. Gestational age was categorized into three groups (22–34 weeks gestation, 35–37 weeks and >37 weeks) to determine the effect on perinatal death (PND). The criteria for booking status were a minimum of three antenatal visits during pregnancy and those with fewer than three visits were considered non-booked. Obstetric risk factors responsible for perinatal death were classified according to the Aberdeen Classification.[10] Pre-eclampsia was classified as mild, moderate or severe according to blood pressure (BP) level and proteinuria. Mild pre-eclampsia was defined as BP 140/90 to 150/100 mmHg and 1+ dipstick proteinuria, moderate pre-eclampsia as BP 150/100 to 160/110 mmHg and 2+ dipstick proteinuria and severe pre-eclampsia as BP > 160/110 mmHg and >2+ proteinuria. Fetal weight was categorized into three groups of <2.5 kg, 2.5–3.5 kg and >3.5 kg and the data were analyzed for perinatal mortality in relation to birthweight. The causes of perinatal deaths were analyzed according to Wigglesworth classification into macerated fetus, congenital anomalies, immaturity, asphyxia and other specific conditions.[11]

Data were analyzed with SPSS version 18.0. Mean age, parity, gestational age and birthweight of both groups were compared using the Student's *t*-test. Frequency of booking status, sex, categorized birthweight, risk factors and cause of perinatal death were also calculated with the descriptive method and compared with the χ^2-test. Univariate regression was utilized to see the effect of categorized weight, gestational age, booking status, sex of baby and the obstetric risk factor on perinatal deaths. A P-value ≤ 0.05 was taken as significant.

Results

During the study period, the total number of deliveries were 1103 and 119 perinatal deaths occurred, producing a perinatal death rate of 107.08 per 1000 births. There were 82 (68.9%) stillbirths and 37 (31.1%) early neonatal deaths.

Mean age and parity of both groups were statistically insignificant but there was a significant difference in the mean gestational age and birthweight of both groups (Table 1). Perinatal death occurred more frequently in non-booked women than in booked women. Early booking (<20 weeks) occurred in 40% and 50% of women in group A and group B, respectively.

The obstetric risk factors according to the Aberdeen classification were also found to be an important determinant of perinatal death in group A as compared to group B (P-value < 0.005). In group B no risk factor was found in 77.1% of cases as compared to 22.9% in group A. Table 2 depicts the commonest risk factor as abruptio placentae (13.4%), followed by hypertension (8.4%), malpresentation (7.6%) and premature rupture of membranes (6.8%). Out of nine pre-eclampsia patients in group B, four had moderate pre-eclampsia, four presented with severe pre-eclampsia and one had eclampsia, while in group A, three had moderate pre-eclampsia, five presented with severe pre-eclampsia and two had eclampsia. Other factors found were placenta previa, obstructed labor, fetal congenital anomalies, cord prolapse, anemia, bad obstetric history and

Table 1 Comparison of means of maternal age, parity, gestational age and birthweight

Group	Group A (Mean ± SD)	Group B (Mean ± SD)	*P*-value
Age (years)	28.1 ± 5.0	27.5 ± 4.4	0.18*
Gestational age (weeks)	32.8 ± 4.8	37.9 ± 2.1	<0.001*
Birthweight (Kg)	2.0 ± 1.0	2.9 ± 0.5	<0.001*
Parity (No.)	2.0 IQR† = 3 (1–4)	2.0 IQR = 4 (0–4)	0.758‡

*Student's *t*-test. †Interquartile range (IQR) (25th–75th percentile). ‡χ^2-test with likelihood ratio.

Table 2 Frequency of associated risk factors in both groups

	Group A		Group B	
	n	%	*n*	%
None	30	22.9	101	77.1
Pregnancy-induced hypertension	10	52.6	9	47.4
Abruptio placentae	16	94.1	1	5.9
Malpresentation	9	90.0	1	10.0
Premature rupture of membranes	8	80.0	2	20.0
Placenta previa	6	100.0	0	0.0
Anemia	4	66.7	2	33.3
Fetal anomalies	5	83.3	1	16.7
Obstructed labor	5	100.0	0	0.0
Intrauterine growth restriction	4	80.0	1	20.0
Others	5	100.0	0	0.0
Cord prolapse	4	100.0	0	0.0
Diabetes	3	75.0	1	25.0
Bad obstetric history	4	100.0	0	0.0
Polyhydramnios	3	100.0	0	0.0
Ruptured uterus	2	100.0	0	0.0
Infections	1	100.0	0	0.0

Pearson's χ^2-test test: d.f. = 16; $P < 0.001$.

intrauterine growth restriction. The other five patients in group A presented with postdate pregnancies and oligohydramnios (two cases), shoulder dystocia (two cases) and thalassemia minor (one case). Booking status had a significant impact (*P*-value < 0.005) on perinatal death and 72.3% were non-booked in group A as compared to 36.1% in group B. In group A, 20 patients presented with a late booking and 79% of women delivered preterm as compared to 33% in group B. There was no statistically significant difference in the infant's sex between the two groups ($P = 0.23$).

PND on General Linear Model (GLM) univariate analysis showed a correlation with booking status, gestational age and weight of baby, while the sex of the baby was not identified as a risk factor (Table 3).

The commonest cause of death according to the Wigglesworth classification was birth asphyxia (44.5%) followed by immaturity (21.8%). Causes of death due to macerated fetus and congenital anomalies of fetus remained low (11.8%) while the other specific conditions, such as neonatal infections and jaundice, contributed to 10.1% of perinatal deaths.

Discussion

Perinatal mortality is a global problem and especially for low-income countries. The PMR needs to be reduced in these countries by 25–50% in order to achieve the MDG by 2015. The InterAcademy Medical panel in Beijing, China in April 2006 endorsed the proposal for planning the strategy and its implementation. In this study, the PMR was 107.08/1000 births, which is comparable to figures reported from other hospital-based studies.[5,9] However, national data for the PMR obtained from a selected community-based study by WHO reports 66/1000 total births.[12] This discrepancy may be due to the fact that most of the institutional deliveries are referrals due to obstetric complications, thus not truly representing the community at large while in the community, many of the deaths are unregistered. The tertiary-level hospitals receive most of the complicated cases from the peripheral small private and public hospitals. The high perinatal death rate shown here is a reflection of inadequacy and inaccessibility of maternity services in our country and the socioeconomic and educational status of our population.

The majority of PND are stillbirths or late fetal deaths rather than early neonatal deaths. This is in contrast to a study from India that showed that only 52.3% of the PND was due to stillbirths.[13] Considering maternal age and parity, there was no statistically significant difference between the groups, although other authors reported more perinatal deaths in younger mothers and in grand multiparous women, but they were not case–control studies.[14]

Table 3 Univariate analysis of risk factors for perinatal death

Tests of between-subject effects Dependent variable: group					
Source	Type III sum of squares	d.f.	Mean square	F	*P*-value
Booking status	0.794	1	0.794	5.972	0.015
Sex	0.009	1	0.009	0.067	0.797
Gestational age	2.151	2	1.076	8.089	<0.001
Weight group	2.088	2	1.044	7.851	0.001

In our study, the majority of women in group A were non-booked, which had a significant effect on the PMR. The impact of perinatal care on reducing perinatal deaths has been well established but it is uncertain whether lack of prenatal care per se is responsible for high PN deaths or it is because of increased incidence of associated antenatal high-risk conditions that are frequently seen among women with no prenatal care.[15] In this study, a patient was considered booked if there were three prenatal visits because many studies, including those by the WHO, found improved pregnancy outcome and reduction in PND in these patients. During these visits, a detailed history, especially in relation to risk factors, was taken, including anemia, blood pressure, edema, weight gain and fetal growth and the patient's wellbeing was monitored and basic investigations, including a first-trimester dating scan and an anomaly scan around 22 weeks were carried out.[16] Vintzileos *et al*. concludes in their study that prenatal care is associated with a decreased neonatal death rate regardless of gestational age at delivery and the presence of antenatal high-risk conditions.[17] It is also documented that the protecting effect of prenatal care in reducing PND is mostly by reduction in fetal deaths and to a lesser extent by neonatal deaths. Shaheen *et al*. reported a PMR of 111/1000 live births in non-booked cases as compared to 17/1000 live births in booked groups.[18]

Infant sex was not found to be a statistically significant risk factor in this study, in contrast to one local study reporting more frequent deaths in male infants.[19] The commonest associated risk factor in this study was abruptio placentae, followed by hypertensive disorders, which is similar to other studies from Pakistan.[9,20] One study from Pakistan reported pregnancy-induced hypertension as the leading factor.[5] Abruptio placentae is an important cause of perinatal morbidity and mortality in the developing countries.[21] Its exact cause is unknown but it is commonly associated with pregnancy-induced hypertension and malnutrition, which can be rectified by proper prenatal care. Most of the fetal deaths and premature deliveries are associated with this factor.

Intrapartum causes, like malpresentation, obstructed labor, cord prolapse and ruptured uterus, also contributed significantly to PND, as was reported in a Kenyan study.[16] Cases presenting with malpresentations were mostly referrals with breech presentation or transverse lie with hand prolapse in advanced labor and the main cause of death in these cases was birth asphyxia resulting in either stillbirth or neonatal deaths despite urgent cesarean section. Similar was the outcome in patients with obstructed labor due to birth asphyxia. In order to reduce PND due to these causes, women should be motivated to have pregnancies registered and the service providers (including traditional birth attendants) should be trained to perform a full range of pregnancy checkup procedures, making obstetric examination and early referrals if they detect malpresentation or cephalopelvic disproportion at term. Communal health centers should be properly equipped, particularly with equipment and instruments and the staff for emergency cesarean section facilities. These facilities in peripheral hospitals should be identified and upgraded to reduce the PND due to delay in getting the required care. Polyhydramnios per se without diabetes and congenital anomalies were found in three cases and resulted in PND due to its related labor complications, although the literature reveals its independent relation with PND.

Categorization of causes of death according to the Wigglesworth classification revealed birth asphyxia as an important cause (44.5%) of perinatal death, followed by immaturity. A study from Vietnam also revealed these two as leading causes of perinatal mortality.[6] Prematurity is responsible for high PND despite the hospital policy of use of tocolytics, steroids and intensive neonatal care but with one major limitation of non-availability of ventilatory support for all babies. The main determinant of PND in prematurity is a low birthweight and its related complications. Efforts should be done to identify the risk factors for preterm birth (e.g. positive cervicovaginal fetal fibronectin and cervical length < 10th percentile) so that appropriate measures can be taken for its prevention.[22] Birth asphyxia resulted mainly due to intrapartum complications, such as obstructed labor, prolonged labor, cord prolapse or ruptured uterus. Congenital defects accounted for 11.8% of deaths. The causative factor for this is mostly unknown, however early detection might help parents to decide whether to carry a fetus with a lethal anomaly to term or not. Macerated stillbirths also contributed significantly in PND as reported in other studies.[8] Strategies to reduce stillbirths should focus on reduction or elimination of risk factors (e.g. control of smoking and medical conditions), better antenatal monitoring of those with risk factors followed by early delivery of the fetus found to be at risk (i.e. intrauterine growth restriction and pre-eclampsia). A WHO study also reported that neonatal deaths contributing to perinatal mortality result from complications of preterm birth, asphyxia or trauma during birth, infections, severe malformations, or other specifically perinatal causes.[23]

The association between birthweight and perinatal mortality is one of the most studied topics within perinatal epidemiology and the weight-specific mortality curve has an inverse J pattern that is the highest mortality for the smallest birthweight.[24] Our study also shows similar results, with a PMR of 854.16/1000 births for fetuses weighing < 2.5 kg. The lowest mortality was seen in the 2.5–3.5-kg birthweight group. Thus, to reduce perinatal mortality, special emphasis should be put on early identification of preterm labor, use of tocolytics and steroids and availability of ventilator support for preterm babies. Also, efforts should be made to identify high-risk factors before pregnancy, during pregnancy and intranatally by providing appropriate care as these can reduce late fetal deaths. Although cigarette smoking is an important factor contributing to PND, we excluded this factor from analysis because of the small number of patients who smoked in both groups. It is therefore important for clinicians to use the correct tool to assess fetal size. Prenatal maternal dietary supplementation reduces intrauterine growth restriction and thus can substantially reduce the perinatal deaths due to low birthweight.

A multilayered approach should be implemented for in-depth analysis of perinatal mortality utilizing different classifications answering what, when and why the death occurred, which will help in an audit of perinatal health management and its prevention as quoted by Gordijin *et al*.[25]

Conclusion

Unfortunately, we are still facing a great challenge in trying to achieve the MDG-4 by 2015 because of high perinatal mortality. The requisite changes in antenatal and neonatal care are slow in coming. Provision of readily accessible antenatal care, safe motherhood services and emergency obstetric and neonatal care will help in reducing perinatal deaths but this can only be achieved by identifying gaps in our community, targeting resources for prevention activities and mobilizing the community to action.

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