

Risk factors of perinatal mortality in a tertiary care centre: A case control study

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Abstract

Background: Perinatal mortality has remained a major public health problem in India, this study aims to analyze the perinatal deaths and the risk factors attributed to perinatal mortality.

Methodology: This is a case-control study, we studied 72 cases and 72 controls. Cases were the patients admitted in labour room with gestational age >28 weeks who gave birth to stillborn or whose babies died within first 7 days of life and controls were ones who gave birth to live babies and whose babies survived more than 7 days of life. The analysis was done using appropriate epi info statistical package and regression analysis was done to quantify independent risk factors in perinatal mortality.

Results and Interpretation: Of the 72 cases, 55 cases had stillbirths contributing to 76.3% and the 17 cases had early neonatal deaths contributing to 23.7% of perinatal mortality. The mean maternal age for cases was 26.4 and for controls, it is 25.1. Controls had regular ANC's (75%) compared to cases (45.4%) with OR of 0.26(0.10-0.67). Cases that were referred to as IUDs contributed majorly for perinatal mortality. Early preterm births were more common among cases (58.3%) with OR 34.82(11.06-109.6) and P value <0.001. Gestational hypertension was the most common medical complication found among the cases (15.3%). 10 Anomalous babies were seen in cases. (48.6%) of cases had preterm delivery compared to controls with (8.3%) and rate of LSCS was high 7.3 times higher in cases compared to the control group. Low birth weight babies were 7.7 times more common among cases with P <0.001. Low APGAR at birth was more among cases compared to controls. Birth asphyxia was the commonest factor found in early neonatal deaths and 41.1% of babies died on day 1.

Conclusions: Lack of regular ANC's, late referrals of high-risk patients, complications like gestational hypertension, IUGR, prematurity, anomalies among babies, low birth weight, low APGAR score at birth, birth asphyxia were some of the factors found ascribed to perinatal mortality.

Keywords: Perinatal mortality, tertiary care centre, public health problem, gestational hypertension

Introduction

Although life begins well before birth, it is just before, during, in the very first hours and days after birth that life is most at risk. Babies continue to be vulnerable throughout their first week of life, after which their survival chances improve markedly.

Perinatal mortality is calculated from the number of stillbirths and early neonatal deaths

(those occurring in the first week of life) per 1000 total births. The Perinatal mortality rate is calculated as total number of perinatal deaths per total number of births (stillbirths + live births) x 1000 ^[1].

Newborn survival and health and prevention of stillbirths are not specifically addressed in the Millennium Development Goal (MDG4) framework and consequently received less attention and investment. Newborn deaths and stillbirths are reducing at a slower rate than under-5 deaths and maternal deaths ^[2].

The perinatal mortality rate is widely used as a health indicator for new-born care and reflects prenatal, intrapartum and newborn care. It also depends on several factors and important determinants that need to be assessed before reaching conclusions about quality-of-care issues.

In developed countries, perinatal mortality is a rare event. According to International Comparisons using gestational age cut-off of 28 weeks, perinatal mortality ranged from 1.7 to 4.9 per 1000 for fetal deaths and 1.3 to 4.0 per 1000 for neonatal deaths ^[3]. More than three-quarters of the world's newborn deaths occurred in South Asia and Sub-Saharan Africa, which have both the highest neonatal mortality rates among regions and the largest number of annual births ^[4].

In developing regions PMR is 5 times higher than developed regions. Consequently, intrapartum stillbirths are on average 14 times greater in developing than developed regions. The current PMR in India is 48 and in Kerala, it is 15 per 1000 live births ^[5]. In Southern India, a population surveillance study has reported perinatal mortality rates of 68.8 per 1000 in rural and 62.8 in urban areas. Research on risk factors for perinatal mortality in India has been limited and has not considered the multiple causes. Every birth is crucial, mothers who deliver a stillborn or whose babies die in neonatal period bear a significant effect on their mental status. Hence the present study aims to, identify and quantify the risk factors for perinatal mortality to direct preventive measures in the community.

Methodology

This was a case-control study conducted in a tertiary care center in Alappuzha, Kerala in Jan 2015 to Jan 2016. The sample size of 72 cases and 72 controls in 1:1 ratio was calculated taking into consideration the incidence of perinatal mortality. Cases were patients admitted in the labour room with gestational age >28 weeks weighing >1000g, who gave birth to stillborn or whose babies died within the first 7 days of life. Controls were selected as every third patient after the case, admitted in labour room who gave birth to a normal baby. Institutional review board and ethical committee approval were taken. Written informed consent was obtained from patients on a separate proforma after explaining the nature of the study. Subjects were interviewed regarding the risk factor variables by using the questionnaire. Hospital records reviewed as well to obtain information regarding conditions of the mother and baby. Data was entered into the excel sheet. Analysis was done using appropriate epi info statistical package. The quantitative variables were expressed as proportions or percentages with 95% confidence interval and qualitative variables were expressed as mean with standard deviation. Association between risk factors was checked using chi-square and the strength of association was determined using the odds ratio. Regression analysis was done to quantify independent predictors of risk factors in perinatal mortality.

Results

Magnitude of perinatal deaths

72 cases and 72 controls were taken in the study and the perinatal mortality obtained from our study is 15.97.

Table 1: Distribution of Perinatal deaths

Total deliveries	4508	
Stillbirths	55	76.3%
Early neonatal deaths	17	23.7%
Total	72	100%

Sociodemographic factors

Table 2: Comparison of mean maternal age between cases and controls

Group	Mean age in years	Standard deviation
Early neonatal deaths (n=17)	25.12	4.36
Stillbirths (n=55)	25.78	4.78
controls	25.15	4.38
P value (Unpaired t test) = 0.009		

The mean age for early neonatal deaths was 25.12 and for stillbirth 27.78. The mean age for controls 25.15. The difference in mean maternal age between cases and controls was statistically significant with p value of 0.009 with unpaired t test.

Table 3: Comparison of Sociodemographic profile between cases and controls

Socioeconomic status	Cases	Controls	OR (95%CI)
Lower Class	17(23.6%)	13(18.1%)	0.66(0.13-2.74)
Upper Lower	24(33.3%)	17(23.6%)	0.49(0.18-1.35)
Lower middle	14(19.4%)	17(23.6%)	0.63(0.23-1.73)
Upper Middle	13(18.1%)	20(27.8%)	1.07(0.41-2.79)
Upper Class	4(5.6%)	5(6.9%)	1(reference)
Fishers exact p=0.46			

Cases were mainly from upper lower class (30.9%) and lower class (23.6%), few were from the upper class (18.2%) according to modified Kuppuswamy classification. Controls had similar pattern of status.

Maternal factors

There were 4 twins seen in cases and none in controls. Among them, 3 were MCDA and 1 DCDA type. Abruptio was seen in DCDA twins. Among MCDA, 1 was ART conceived but had absent end-diastolic flow at 29wks and had LSCS but ended up with NND on day 3, whereas other 2 MCDA twins had PPROM delivered preterm.

Among controls, 77.8% subjects were booked in the institution and 22.2% elsewhere. Whereas in cases 51.4% were referred & 48.6% were booked. hence, was statistically significant.

Antenatal visits, here 25% of cases had no antenatal visits, henceforth (27.3%) of stillbirth and (17.6%) of early neonatal deaths had no antenatal visits. Among controls, 54 cases (75%) had 3 or more ANC's.

54.2% were primi and 45.8% were multi. But there was no significant association with regards to parity of cases and controls.

Mean gestational age for cases was 34.1 and 38.3 for controls. This was statistically significant with p less than 0.05 (0.0001). Gestational age is divided early preterm (28-34w), late preterm (34-36w) and term (>37w). 58.3% cases were early preterm, 15.2% were late preterm and 26.4% were term. Among controls 87.5% were term.

1 case and 3 controls had bad obstetrical history with previous perinatal deaths. But this did

not add much to the factors contributing to perinatal mortality in our study.

Table 4: Comparison of maternal factors among cases and controls

Maternal factors		
No of fetus	cases	Controls
single	68(94.4%)	72(100%)
multiple	4(5.6%)	0
Referral status	cases	Controls
referred	37(51.4%)	16(22.2%)
Booked	35(48.6%)	56(77.8%)
Number of ANC visits	cases	controls
3 or more	32 (44.4%)	54 (75.0%)
1-2	22 (30.6%)	10 (13.9%)
missing	18 (25%)	8(11.1%)
Parity	cases	Controls
Multipara	39(54.2%)	32(44.4%)
Primi	33(45.8%)	40(55.6%)
Gestational age	cases	Controls
Early Preterm	42(58.3)	4(5.5%)
Late preterm	11(15.2)	5(6.9%)
Term	19(26.4%)	63(87.5%)
Previous stillbirth	cases	controls
number	1(1.4%)	3(4.2%)

Antenatal factors

Gestational hypertension was seen foremost in medical complications group. 11 cases had gestational hypertension contributing to (15.3%), whereas in control groups 5 subjects (6.9%) had GHTN. A similar proportion of other factors were found in both groups and was statistically not significant. Also, IUGR and anomalies were picked up in 10 cases and controls emphasizing its role in perinatal mortality.

Table 5: Antenatal factors among study subjects

Antenatal factors	Cases	Controls
Gestational hypertension	11(15.3%)	5(6.9%)
Chronic hypertension	1(1.4%)	3(4.2%)
Heart disease	1(1.4%)	1(1.4%)
Hypothyroidism	6(8.3%)	6(8.3%)
Anaemia	2(2.8%)	2(2.8%)
Gestational diabetes	2(2.8%)	4(5.6%)
IUGR	10(13.9%)	6(8.3%)
Anomalies in babies	10(13.9%)	1(1.4%)
PROM	7(9.7%)	2(2.8%)
APH	6(8.3%)	2(2.8%)
Amniotic fluid abnormalities	5(6.9%)	4(5.6%)
Post datism	6(8.3%)	5(6.9%)
Abnormal Doppler	3(4.2%)	0
Malpresentations	2(2.8%)	3(4.2%)

Intrapartum events

Very few intrapartum events like Fetal distress, MSAF, Maternal pyrexia and dysfunctional

labour were the found in subjects. No cord accidents noticed.

There were 6 APH cases. Among which 4.1% cases noted to have abruption, 2.7% cases and controls had placenta previa, 1 case had vasa previa and nuchal cord was seen in 2 patients in control group.

72.7% of controls had full-term normal delivery compared to the preterm and interventional deliveries. Hence highlights the mode of delivery has a significant impact on perinatal mortality, being statistically significant with odds of 25.27 for preterm delivery and 7.73 for LSCS.

Table 6: Intrapartum events among the subjects

Labour events	Cases	Controls
Fetal distress	4(5.5%)	1(1.4%)
MSAF	3(4.1%)	2(2.7%)
Maternal pyrexia	1(1.4%)	1(1.4%)
Dysfunctional labour	0	1(1.4%)
Placenta abnormalities and cord	Cases	Controls
abruption	3(4.1%)	0
Placenta previa	2(2.7%)	2(2.7%)
Vasa previa	1(1.4%)	0
Nuchal cord	0	2(2.7%)
Mode of delivery	Cases	Control
Preterm vaginal delivery	35(48.6%)	6(8.3%)
LSCS	22(30.6%)	13(18.1%)
Instrumental vaginal delivery	3(4.2%)	1(1.4%)
Full term vaginal delivery	12(16.7%)	52(72.2%)

Assessment of neonatal factors

Mean birth weight of babies among cases was 1.83 kg and controls weighed 2.93 kg. Hence low birth weight was found to be majorly contributing to perinatal mortality.

34.7% cases had LBW and 40.3% had VLBW compared to 18 cases (25%) with normal birth weight, in control group 84.7% had normal birth weight.

29.4% of the babies had APGAR score of 0-3 at 1min, whereas only (5.8%) cases compared to (89.3%) of controls had APGAR of 7-10.

At 5min, (35.2%) babies born to cases had APGAR score of 0-3 and (17.6%) had APGAR score of 3-7, compared to 100% controls with APGAR score of 7-10.

Table 7: Association between birth weight and perinatal mortality

Birth weight	Cases	Controls
Normal birth weight	18(25%)	61(84.7%)
Low birth weight	25(34.7%)	11(15.3%)
Very low birth weight	29(40.3%)	0
APGAR score at 1min	Cases	Controls
0-3	5(29.4%)	1(1.3%)
3-7	7(41.1%)	4(5.5%)
7-10	1(5.8%)	67(89.3%)
unrecorded	4(23.5%)	
APGAR score at 5min	Cases	Controls
0-3	6(35.2%)	0(0%)
3-7	3(17.6%)	0(0%)
7-10	8(47%)	72(100%)
Chi square-60.75 P value 0.0000 (0.0001)		

Early neonatal deaths

Birth asphyxia came first in the list among the factors ascertained for early neonatal deaths followed by prematurity and sepsis.

7 out of 17 babies (41.1%) died on day 1, 2 deaths on day 2, 3 deaths on day 3, 2 deaths on day 4, 3 deaths on day 5. this was the pattern of early neonatal deaths. Anomalies noted were CHD and omphalocele.

Discussion

Ours is a case control study with sample size of 72 cases and 72 controls. Total deliveries during the study period were 4508, PMR calculated is 15.97.

Other studies conducted on similar topic in kerala like Lakshmi *et al.* [5] found the PMR to be 31.1 and Brahmanandan *et al.* [6] got the rate to be 29.6%, both of which is higher compared to PMR in Kerala which is 10. The reason being the study is conducted in a tertiary referral hospital with large number of referrals. Another Study by mavalankar *et al.* [7] found the perinatal mortality rate of 79 per 1000 births which is very high, but not dissimilar to that reported in other Indian hospital-based studies.

Several factors were considered and were analyzed from patients for the risk attribution to perinatal mortality are discussed below.

In our study the mean age for early neonatal deaths was 25.12 and for stillbirth 27.78. The mean age for controls 25.15. Compared to the reference range of 20-24yrs, 15-19yrs age group had lower odds of perinatal mortality. Study by Yemirsach getiya *et al.* [8] concludes, the mean age of the mothers for cases and controls were 26.47 and 26.95 respectively.

23.6% of cases and 18.1% of controls were from lower class, rest of the subjects were in the category of upper lower and lower middle class. This was in contrast to studies conducted by Bhandari *et al.* [9] who emphasises the socio-economic factor is important influencing factor in perinatal mortality.

(44.4%) cases had 3 or more antenatal visits, 30.6% cases had 1-2 antenatal visits, 25% cases had no antenatal visits. And among controls 75% had 3 or more ANCs which was statistically significant 0.26 (0.10-0.67). and adjusted odds of 0.41. This was in conformation to study conducted by Mavalankar *et al.* [7], the total absence of antenatal care was associated with an increased risk of stillbirth and early neonatal deaths.

In a study conducted in Rajasthan by Bhandari *et al.* [9] it was found that perinatal deaths were four times higher in mothers with poor antenatal care.

45.8% cases were primi and 54.2% cases were multi and the parity for most mothers at time of index pregnancy did not exceed three. study done by Mavalankar *et al.* [7] which states that parity greater than three were significantly associated with an increased risk of stillbirth, but not of early neonatal death.

42 cases (58.3%) were early preterm, 11 cases (15.2%) were late preterm and 19 cases (26.4%) were term. Whereas in control group 5.5% belongs to early preterm 6.9% were late preterm and 87.5% where term hence was statistically significant. Similar results of high relative risks for preterm births were obtained in study by Yemirsach getiya *et al.* [8] suggesting that it is an important determinant of perinatal mortality.

Gestational hypertension, Gestational diabetes, Hypothyroidism, Asthma, Cardiac diseases were some of the factors obtained among the sample. In our study 15.3% cases had gestational hypertension compared to controls (6.9%). And was the common medical complication found but statistically insignificant.

This was in conformation to study done by Lakshmi *et al.* [5], Hypertensive disorders of pregnancy was the most important antenatal complication leading to prematurity. Cases had 7.6 times higher odds with IUGR and 15.3 times higher odds with anomalies. Similar study

conducted by Yemisrach Getiye *et al.* [8] states that Congenital anomaly occurred 20 times more likely in cases (16%) than controls (0.4%).

Either group had similar proportion of obstetric complications like APH, Amniotic fluid abnormalities, PROM and PPRM, Malpresentations, Reduced fetal movements, Rh negative pregnancy. A study done by Mmbaga *et al.* [11] found Obstructed/prolonged labour and Hypertensive disorders of pregnancy as the major conditions among the obstetric complications and maternal diseases respectively, with highest risk for medically referred mothers.

The Following Intrapartum events were present among the cases. PROM in 7 cases (9.7%), NRFHS in 2 cases (2.8%), MSAF in 2 cases (2.8%), Maternal pyrexia in 2 cases (2.8%), Dysfunctional labour in 1 case (1.4%) and Fetal distress was found in 1 case (1.4%). since there were very few intrapartum events, it was statistically found insignificant. On the other hand, study by kimambo *et al.* [12] in Tanzania states Intrapartum complications have a bearing especially on fresh stillbirths and early neonatal deaths. In this study 62% of cases had intrapartum complications, the most common being fetal distress and obstructed labour. Placenta and cord abnormalities were noted few in number unlike the Dutch study classifying a cohort of 750 stillbirths according to the Tulip classification, placental pathology was the cause of death in 77.6% of all term stillbirths. The placentas from all infants that died (APD, IPD and ND cases) had an incidence of 23-24% of overcoiled umbilical cords. The incidence of overcoiling in placentas from neonates admitted that the NICU was 15%.

In our study it was found that 54 cases (75%) had low birth weight compared to 18 cases (25%) who were normal weight. Study by Getachew Bayou *et al.* [8] states that Newborns with very low and low birth weight were responsible for 27.2% of the total perinatal deaths with case fatality rate of 87.8% and 55.6%, respectively. Very low and low birth weight had 3.95-and 2.52-times increased risk of ENND than those who had normal birth weight, respectively.

APGAR at 1 and 5 minutes was studied on babies of cases and controls, excluding stillbirths. Which resulted as 83.3% babies had low APGAR at birth of 0-3 and almost all babies had APGAR of 0-3 when APGAR noted at 5minutes and in controls 90% of the babies had APGAR of 7-10 at 5min. Similar study by Kimambo *et al.* [12] concluded that APGAR score at 5 minutes was recorded and 45% of these had severe asphyxia APGAR score <5. Over two thirds of early neonatal deaths died within the first day. Twenty nine percent died within the first hour, of these 23% died within the first five minutes. Eighty seven percent had died within the first three days of life.

Early neonatal period is most crucial for the baby and found to have Birth asphyxia in 6 cases (35.2%), sepsis 3 cases (17.6%), prematurity 4 cases (23.5%), congenital anomalies 2 cases (11.7%), TTTS 2 cases (11.7%). Similar results were given by Lakshmi *et al.* [5], perinatal asphyxia was the major cause of perinatal mortality. The important factors contributing to perinatal asphyxia were prematurity (39%), abruptio placenta (19%) and MSAF (12%).

Many of the times the cause of mortality is idiopathic without any risk factors, Hence the couple should be encouraged to subject the babies for autopsy for chromosomal studies. Unfortunately, since the participants denied autopsy due to social practices, autopsy was not carried out in our study.

Various interventions have been taken like WHO Essential Newborn Care Package, initiatives by NRHM through Save the children's saving the newborn lives program. Also, the government has integrated diverse systems of emergency referral transport services and other initiative programs and the country has managed to get PMR from 37% to 29%. but we still have long way to go to achieve goals of further reducing perinatal mortality.

Conclusions

In our study following were the major risk factors found, Irregular ANC's, late referrals, prematurity, gestational hypertension, congenital anomalies in fetus, Low birth weight, birth asphyxia, low APGAR at birth.

The enhancement in the knowledge and understanding of risk factors and early detection is required.

Preconception counselling, Compulsory regular antenatal visits, the conduct of antenatal classes, early detection of high-risk factors and timely referral of such antenatal mothers, strengthening the referral facilities, close monitoring of the patients during the intrapartum period, improving the neonatal resuscitation units are some of the recommendations suggested.

Since the etiology of many deaths are unknown, effort has to be made to send babies for autopsy to know the intrinsic abnormalities.

References

1. USAID. Measure evaluation population and reproductive health, perinatal mortality rate. [www.cpc.unc.edu/measure/evaluation/population and reproductive health](http://www.cpc.unc.edu/measure/evaluation/population%20and%20reproductive%20health) (Accessed on August 18/2014).
2. WHO, UNICEF Every newborn: an action plan to end preventable deaths. February, 2014.
3. Ashna D, Mohangoo Mail, Béatrice Blundell, *et al.* International Comparisons of Fetal and Neonatal Mortality Rates in High-Income Countries: Should Exclusion Thresholds Be Based on Birth Weight or Gestational Age? PLOS ONE, 2013 May, 8(5).
4. Save the children, healthy newborn. 2009 WWW. Healthy newborn network.org [accessed on august 11, 2014
5. Lakshmi S, Menon Nalini Sekharan, Aravind R. Factors Contributing to Perinatal Mortality: Optimizing Outcome. Journal of Evidence based Medicine and Health care. 2015 March ;2(12):1730-1734.
6. Brahmanandan M, Murukesan L, Nambisan B, Salmabeevi S. Risk factors for perinatal mortality: a case control study from Thiruvananthapuram, Kerala, India. Int J Reprod Contracept Obstet Gynecol. 2017;6:2452-8.
7. Mavalankar DV, Trivedi CR, Gray RH. Levels and risk factors for perinatal mortality in Ahmedabad, India. Bulletin of the WHO. 1991;69(4);435-442.
8. Getiye Y, Fantahun M. Factors associated with perinatal mortality among public health deliveries in Addis Ababa, Ethiopia, an unmatched case control study. BMC Pregnancy Childbirth. 2017 Jul;17(1):245.
9. Bhandari B, Mandowara SL. Perinatal mortality in South East Rajasthan. Indian Pediatr. 1983;20:599-602.
10. Mmbaga BT, Lie RT, Olomi R, Mahande MJ, Olola O, Daltveit AK. Causes of perinatal death at a tertiary care hospital in Northern Tanzania 2000-2010: a registry-based study. BMC Pregnancy Childbirth. 2012;12:139.
11. Kimambo NR. Analysis of perinatal death reviews factors contributing to perinatal mortality in Tanzania. MSc thesis, London School of Hygiene & Tropical Medicine. Available from: https://researchonline.lshtm.ac.uk/2115558/1/2008_PHP_MSc_Kimambo_NR.pdf. Accessed on 7th January 2019.