

Analysis of Causes of Stillbirth in a Tertiary Care Hospital using ReCoDe Classification System: A Prospective Observational Study

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ABSTRACT

Introduction: Stillbirths account for a major proportion of perinatal deaths. In many cases of stillbirth, the cause remains unexplained. The ReCoDe system (classification of stillbirths by Relevant Condition at Death) is a frequently used classification system that has helped us to improve the understanding of the causes of stillbirths.

Aim: To identify factors associated with stillbirths and to classify the causes of stillbirths using the ReCoDe system.

Materials and Methods: A prospective observational study was conducted in the Department of Obstetrics and Gynaecology, Government Medical College and Rajindra Hospital, Patiala, Punjab, India, from February 2020 to January 2021. All the mothers with a history of antepartum and intrapartum foetal mortality with the diagnosis of intrauterine foetal death after 20 weeks of gestation were included in the study. A detailed

history of the mother was taken and an examination of the mother, stillborn babies, placenta, and umbilical cord was done. ReCoDe system was used to classify the causes of stillbirth. For statistical analysis mean and percentages were used.

Results: There were 287 women with intrauterine foetal death admitted during the study period. Maternal age ranged from 18-40 years, majority (n=157, 54.7%) women belonged to the age group of 24-29 years. The stillbirth rate was 78.95 per 1000 live births. The cause of stillbirth could be explained in 235 (81.89%) cases by using the ReCoDe system. Hypertensive disorders in 91 (31.71%) were the most common cause followed by foetal growth restriction in 46 (16.02%).

Conclusion: According to the present study ReCoDe system was useful in classifying the causes of stillbirths in the resource-limited settings.

Keywords: Foetal death, Foetal growth restriction, Hypertensive disorders, Perinatal mortality

INTRODUCTION

One of the most tragic outcomes of pregnancy is stillbirth. A foetus is termed as stillborn when it has been delivered after 20 weeks of gestation and its weight is 500 grams or more and does not show any signs of life after birth [1]. The frequency and factors that contribute to stillbirths vary significantly across the globe. The majority (98%) of these deaths take place in underdeveloped countries [2]. Numerous maternal, societal, and contextual factors as well as other elements have an impact on this [3]. Perinatal mortality is frequently considered as a measurement of obstetric and neonatal care. The major cause of perinatal loss is stillbirth [4]. Clinical categories of stillbirth depend upon various causes. Classification system helps in better understanding of the causes of stillbirth by clinicians and other healthcare providers. This serves as a guide for modifying healthcare services to improve the outcomes of pregnancies [5].

In the West Midlands Region (Perinatal Institute), a population-based cohort study (1997-2003) led to the development of the new ReCoDe classification system [6]. In contrast to other classification systems like the extended Wigglesworth classification [7] or the amended Aberdeen classification [8], which would only classify one-third of the causes of stillbirths, leaving the majority (66.2%) unclassified, the ReCoDe system classifies 85% of the conditions associated with stillbirth [6]. Most of the classification schemes are based on detailed investigations and foetal autopsies. Parents hesitate to participate in perinatal autopsies because of cultural and emotional reasons, and most of the time, physicians are reluctant to recommend them. Currently, the classification system specifically developed for the categorisation of causes of stillbirths is the ReCoDe system [9]. In developing countries where only minimal investigations are feasible, a clinically based ReCoDe system is most suitable. All cases of stillbirths

were evaluated using ReCoDe classification system to find out the causes and the factors responsible for the foetal loss.

The present study was conducted due to the paucity of knowledge regarding the causes of stillbirths in our country, due to the lack of resources in many tertiary care centres and to emphasise the importance of ReCoDe system in identifying the cause of stillbirths.

MATERIALS AND METHODS

This was a prospective observational study conducted in the Department of Obstetrics and Gynaecology, Government Medical College and Rajindra Hospital, Patiala, Punjab, India, between February 2020 and January 2021. Ethical approval was obtained from the appropriate authority (vide No. Trg.9 (310)39037). Following informed consent, subjects were chosen for recruitment. To detect intrauterine foetal death occurring beyond 20 weeks of gestation, all pregnant patients who were hospitalised in the department underwent screening.

Inclusion criteria: All the mothers with a history of antepartum and intrapartum foetal mortality after 20 weeks of gestation, stillbirths weighing more than 500 g were included when the gestational age was unknown.

Exclusion criteria: Women who did not consent to participate in the study were excluded from the study.

Study Procedure

A detailed history was taken including the age, parity, residence, previous stillbirth, and mode of delivery. Reliable dates or antenatal ultrasound performed in the first trimester were used to determine the gestational age. These women underwent a physical examination as well as all necessary tests to detect preeclampsia, diabetes, thyroid

dysfunction, etc. The stillborn child, placenta, and umbilical cord were examined after delivery. Estimating the foetal weight and taking specific note of the newborn's morphology, skin staining, maceration and colour (pale or plethoric) were all part of the examination of stillborn neonates. Weight of the placenta was taken and it was checked for structural anomalies such as circumvallate placentae or accessory lobes as well as blood clots, meconium stains, infarcts, oedema, and hydropic alterations. The umbilical cord was assessed for anomalies of insertion, entanglement, knots (true or false), haematomas, strictures, Wharton's jelly, and the number of vessels. Amniotic fluid's volume, colour, and smell were noticed.

The conditions affecting the foetus come first in ReCoDe systems, then the umbilical cord, placenta, amniotic fluid, uterus, mother, intrapartum variables, and trauma are listed. Each anatomical group is then subgrouped into pathophysiological conditions. The first thing that applies to a stillbirth case should be the primary condition. The final category in group A includes foetal growth restriction (denoted as A7). If none of the other particular prenatal abnormalities were present then a foetus below the 10th centiles should be classified in this category. Thus, it is simple to explain the reason for foetal death using this approach of classification. Birth weight below the tenth percentile for gestational age was considered small for gestational age. Gardosi J et al., classified the causes of each stillbirth using the ReCoDe approach [6].

STATISTICAL ANALYSIS

Data was entered into Microsoft (MS) excel windows software version 19, 2010. Analysis was conducted using descriptive statistics using means, standard deviations and percentages.

RESULTS

During the study period, there were 3635 total live births and 287 stillbirths. There were 78.95 stillbirths per 1000 live births. Maternal age ranged from 18-40 years; 157 (54.7%) women belonged to the 24-29 years age group. A total of 182 (63.4%) of them lived in rural areas. Out of 287 stillbirths, 12 were twins and two were triplets. Caesarean section was done in 48 stillbirths, 218 were delivered vaginally and assisted breach delivery was done in 21 stillbirths [Table/Fig-1].

Age group (Years)	Frequency (n)	Percentage (%)
18-23	66	23
24-29	157	54.7
30-35	58	20.21
36-41	6	2.09
Total	287	100
Mean±SD	26.62±4.20	
Median	27.00	
Range	18-41	
Residence	Frequency (n)	Percentage (%)
Rural	182	63.4
Urban	105	36.6
Total	287	100
Gestational age	Frequency (n)	Percentage (%)
20-24 ⁺⁶ weeks	1	0.35
25-28 ⁺⁶ weeks	38	13.24
29-32 ⁺⁶ weeks	56	19.51
33-36 ⁺⁶ weeks	104	36.24
≥37 weeks	88	30.66
Total	287	100
Mean±SD	33.88±4.17	
Median	35.00	
Range	24-41	

Parity	Frequency (n)	Percentage (%)
0	123	42.86
1	89	31.01
2	45	15.68
≥3	30	10.45
Total	287	100
Previous stillbirth	Frequency (n)	Percentage (%)
No	280	97.56
Yes	07	2.44
Total	287	100
Mode of delivery	Frequency (n)	Percentage (%)
Caesarean section	48	16.72
Vaginal	218	75.96
Assisted breech	21	7.32
Total	287	100

[Table/Fig-1]: Demographic profile of women with intrauterine foetal deaths.

In the present study, 176 infants were males, 109 were females and two had ambiguous genitalia. Out of the 287 cases 37 (12.89%) were fresh stillbirths, while 250 (87.11%) were macerated infants [Table/Fig-2].

Weight (grams)	Frequency (n)	Percentage (%)
500-1000	56	19.51
1001-2500	185	64.46
2501-3000	32	11.15
≥3001	14	4.88
Total	287	100
Mean±SD	1848.03±786.31	
Median	1900.00	
Range	500-4500	
Gender	Frequency (n)	Percentage (%)
Ambiguous	2	0.70
Female	109	37.98
Male	176	61.32
Total	287	100
Type of birth	Frequency (n)	Percentage (%)
Fresh stillbirth	37	12.89
Macerated stillbirth	250	87.11
Total	287	100

[Table/Fig-2]: Stillbirths: birth weight, sex, and fresh or macerated.

Out of all stillbirths, the maternal cause was present in 97 (37.8%) cases. Out of 97, hypertensive disorders of pregnancy were present in 91 (31.71%) cases. Three cases were having cholestasis of pregnancy and three were diabetic. Foetal causes were present in 49 (17.07%) cases, out of which 46 (16.02%) stillbirths were because of foetal growth retardation. Placenta, cord, and liquor abnormalities were seen in 55 (19.16%) cases. Thus, In the present study, it was possible to determine a cause in 235 (81.89%) stillbirth instances using the ReCoDe technique of classification and 52 (18.12%) cases were unclassified [Table/Fig-3].

Condition	Frequency (n)	Percentage (%)
Group A: Foetus		
Lethal congenital anomaly	2	0.69
Infection	-	-
Non immune hydrops	1	0.35
Isoimmunisation	-	-
Foetomaternal haemorrhage	-	-
Twin-twin transfusion	-	-
Foetal growth restriction	46	16.02

Group B: Umbilical cord		
Prolapse	12	4.18
Constricting loop or knot	-	-
Velamentous insertion	-	-
Others	-	-
Group C: Placenta		
Abruptio	32	11.15
Previa	9	3.13
Vasa previa	-	-
Placental insufficiency	-	-
Others	-	-
Group D: Amniotic fluid		
Chorioamnionitis	-	-
Oligohydramnios	1	0.34
Polyhydramnios	1	0.34
Other	-	-
Group E: Uterus		
Rupture	2	0.68
Uterine anomalies	-	-
Other	-	-
Group F: Mother		
Diabetes	3	1.05
Thyroid disease	-	-
Essential hypertension	-	-
Hypertensive diseases in pregnancy:	91	31.71
(i) Preeclampsia	65	22.6
(ii) Gestational hypertension	16	6.8
(iii) Eclampsia	5	1.7
(iv) HELLP syndrome	5	1.7
Lupus or antiphospholipid syndrome	-	-
Cholestasis	3	1.05
Drug misuse	-	-
Other	-	-
Group G: Intrapartum		
Asphyxia	35	12.19
Birth trauma	-	-
Group H: Trauma		
External	-	-
Iatrogenic	-	-
Group I: Unclassified		
No relevant condition identified	52	18.12
No information available	-	-

[Table/Fig-3]: Number of subjects according to classification system according to relevant condition at death (ReCoDe).

HELLP: Haemolysis, elevated liver enzymes, and low platelets

DISCUSSION

In the present study, it was possible to determine a cause in 235 (81.89%) stillbirth instances using the ReCoDe technique of classification in the present study. Lawn JE et al., also have found that in 85% of cases, ReCoDe classification is useful in determining the reason for stillbirths [3]. One of the four classification systems that did well on the Infokeep score was (CODAC, PSANZ-PDC, ReCoDe, and Tulip) [10]. ReCoDe classification is the one method that is used to categorise only stillbirths; the others are used to categorise all perinatal fatalities.

In the present study, there were 78.95 stillbirths per 1000 live births. In a study conducted by Sharma B et al., the average stillbirth rate was 67.9/1000 [11]. In the current study, 77.7% of stillbirths occurred between the maternal age of 18 and 29 years.

Maternal age and parity were not identified as independent risk variables in a study by Kumbhare Sonal A and Maitra NK, even though they were connected to stillbirth on univariate analysis [12]. However, other researchers have discovered a substantial correlation between higher maternal age and a higher chance of stillbirth [13]. Out of 287 cases, 37 (12.89%) were fresh stillbirths, while 250 (87.11%) were macerated infants. A similar study done by Newtonraj A et al., in Chandigarh, India, found that 68% were macerated stillbirths and 32% were fresh [14].

In the current study, 109 (37.98%) of the infants were females whereas 178 (62.02%) were males. Kumbhare Sonal A and Maitra NK, have shown that gender did not significantly increase the chance of stillbirth [12]. It has been demonstrated by Smith GC that the male gender-related elevated risk of stillbirth gradually decreases as birth weight rises [15]. Past history of stillbirth is a risk factor. In the current study, seven instances (2.44%) had a history of past stillbirths. After controlling the confounding variables Bhattacharya S et al., discovered that the odds ratio of a stillbirth recurrence in a subsequent pregnancy was 1.94 (99% CI 1.29-2.92) [16].

In the present study, 56 newborns (19.5%) had birth weights under one kilogram. One of the key contributing reasons to a poor foetal outcome is birth weight. Foetal growth limitation and stillbirth are closely related [17]. Both stillbirth and foetal growth restriction share many of the same risk factors and probable causes [18]. Other researchers have demonstrated a high association between stillbirth and growth retardation, with half of the stillborns weighing below the 10th percentile [19].

In the present study, the most significant factor related to stillbirth was the hypertensive disorder of pregnancy. There were 91 stillbirths (31.71%) in this group (preeclampsia 65 cases, gestational hypertension 16, eclampsia 5, Haemolysis, Elevated Liver enzymes, and Low Platelets (HELLP) syndrome 5). Similar outcomes have been shown by Simpson LL (2002) in the study on women with medical disorders in pregnancy [20]. In an antenatal care trial study, World Health Organisation (WHO) found that foetal deaths were higher in preeclampsia (2.2%) in comparison to gestational hypertension (1.4%) in 39615 pregnancies [21]. There were three cases of diabetes mellitus, which contributed to 1.05% of stillbirths. According to earlier studies, pregnant women with diabetes have a 1.5% stillbirth rate [6,7]. With the majority of foetal mortality occurring between 34 and 40 gestational weeks, this rate is five times higher than that of a pregnant population without diabetes [22]. In 2 (0.69%) cases, congenital abnormalities were detected. Many of these congenital abnormalities were having open neural tube defects. In a study by Wapner RJ and Lewis D (2002), 25% of stillbirths were due to congenital abnormalities [23]. Placental factors were responsible for a significant number of intrauterine foetal deaths. In the present study, 32 (11.14%) stillbirths were caused by abruptio placentae. Ananth CV et al., (2006) have stated that abruptio placentae have significant association with adverse perinatal outcomes [24].

In the present study, authors found that two women had rupture uterus and both were having a past history of caesarean section. In the present study, hypertensive disease in pregnancy (31.7%) was the most common cause of stillbirth followed by foetal growth restriction (16.02%). Similar findings have been observed by Chagede P et al., in their study of 275 stillbirths using ReCoDe classification in Mumbai, India [25]. In their study, majority of the mothers were in the age group of 26-30 years (32.7%), 98.5% were from urban areas and 31.2% were primigravidae. Maternal conditions (preeclampsia, diabetes, pre-existing medical disorders) as a group were the cause of maximum number (42%) of stillbirths either directly or as a contributory risk factor. They found that 53.8% of the stillborn babies were males, 58.9% were macerated stillbirths and hypertensive disease in pregnancy was the most common cause of stillbirths followed by foetal growth restriction.

Thus, with the help of ReCoDe classification, authors were able to find out the cause of foetal death in 235 (81.89%) women and this has added to our understanding the causes of still births. If we have the knowledge of cause of stillbirth, we can take necessary measures in the management of future pregnancies to prevent the adverse outcomes. Based on this knowledge, the parents and other family members can be counselled and the required efforts can be made to prevent stillbirths.

Limitation(s)

The present study was a single-centre study, therefore findings cannot be generalised to the entire population. Further studies can help to generalise the present findings as data is limited on this subject.

CONCLUSION(S)

Pregnancy-related hypertensive disorders were the most frequent reasons for stillbirth. A thorough analysis of the cause of death is essential for counselling the parents for planning future pregnancies. There is a need for regular follow-ups and early identification of symptoms and complications. In India, one of the most important factors is good family support for an antenatal mother, so that these complications of stillbirth can be avoided.

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