

## An Analysis of Cause of Stillbirth in a Tertiary Care Hospital of Delhi: A Contribution to the WHO SEARO Project

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### Abstract

**Background** Over 98% of the world's total stillbirths are believed to occur in developing countries and still have received very little research, programmatic or policy attention.

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**Aims and Objective** To collect data on epidemiological profile of cases experiencing stillbirths, to assess the associated antenatal high risk factors present and to find out the probable cause of stillbirth.

**Materials and Methods** This was a cross-sectional, observational study, which was done as part of WHO SEARO project after ethical clearance. The study included all stillbirths which occurred in the hospital during the study period August 2015–February 2017. Antenatal records were reviewed; maternal investigations were done. Baby was examined after delivery. Pre-structured pro forma was filled for every case. Finally, the relevant condition found was classified under CODAC system of stillbirth classification.

**Result** Out of 20,580 deliveries, 600 (2.9%) were stillborn. Maternal cause was noted in 145/600 (24.2%) cases, fetal

cause was noted in 181/600 (30.2%), and placental and cord origins were suspected in 128/600 (21.3%) and 12/600 (2%) cases, respectively. In 72/600 (12.0%) cases the reason for stillbirth was unknown and unclassifiable. Among the maternal causes the most common was hypertension (89/600, 14.8%) followed by infection including fever (5.7%); the most common infection was hepatitis. Among the fetal causes birth defect was the most common (106/600, 17.7%) followed by extreme prematurity in 42/600 (7.0%).

**Conclusion** Birth defects were the most important fetal cause of stillbirth; hypertension in pregnancy and fetal growth restriction were important associated factors.

**Keywords** Causes of stillbirth · CODAC classification · Birth defect · Fetal growth restriction

## Introduction

The term stillbirth refers to the delivery of a fetus after 20 completed weeks of gestation, weighing 500 g or more with new born baby showing no signs of life after delivery [1]. Most of the stillbirth cases occur in developing countries. The deaths are influenced by a wide range of maternal, fetal, social and circumstantial factors.

Lists of causes have been framed to classify and identify the reason of these deaths so as to avoid them in future. Accurate classification of causes of perinatal deaths helps obstetricians understand what went wrong during pregnancy and thus modify or bring changes in their clinical practices. Knowing the cause of the pregnancy loss can promote healthier grieving and decrease the blame and guilt that parents often face. It will also help to reduce the risk of fetal loss in subsequent pregnancies.

Despite the large number of stillbirths worldwide, the topic of stillbirths in developing countries has received very little research, programmatic or policy attention. In many developing countries, almost half of the deliveries occur at home, and underreporting of stillbirths is a significant problem. Reliable data about rates and causes are unavailable in many areas of the world. Nevertheless, of the estimated 3.2 million stillbirths that occur yearly worldwide, the vast majority ensue in developing countries [2]. Rates in many developing countries are tenfold greater than in developed countries. Studies in India have already identified specific pregnancy-related disorders as risk factors for stillbirth [3]. However, knowledge about distal factors would also enhance the understanding about stillbirth. It is shown by previous studies that the factors such as poverty and inequity, and the triad of low socioeconomic status, illiteracy and inadequate antenatal care is what contributes most to the likelihood of stillbirth

[1, 3, 4]. Therefore, the relative prevalence of causes that lead to stillbirth varies from region to region; therefore, the strategies needed to reduce it also vary. Knowing the causes is essential in developing correct strategies.

In 2014, World Health Organization—South-East Asian Region Office (WHO SEARO) created an online system of newborn-birth defects (SEAR-NBBD) database. The system was designed to support data management for newborn health, birth defects and stillbirths. Standardized forms for data collection are available online as well as through a mobile app, for submission to the system. This system is to develop capacity and establish a robust online database that can subsequently be migrated to national systems in the SEAR member countries. About 220 hospitals from 9 countries are currently registered as a part of the NBBD surveillance network and 170 hospitals from 7 countries are reporting data on birth defects since 2014. Nine member countries of Southeast Asia region have developed national plans on prevention and surveillance of birth defects. The aim is to establish a baseline assessment and monitor the occurrence of birth defects in the region, so that appropriate measures can be set.

In order to emphasize on counting of all stillbirth in the participating hospitals, Safdarjung Hospital in Delhi was made the nodal center for collection of data on stillbirth, eight other hospitals of Delhi were included, and Lady Hardinge Medical College was one of them. In a nation with an uneven economic distribution like India search for causes leading to stillbirth in a tertiary care center situated in the heart of capital city of India is expected to provide an insight into our healthcare delivery system.

The aim of the study was to collect data on epidemiological profile of cases experiencing stillbirths, to assess the associated antenatal high risk factors present, to find out the probable cause of stillbirth using the CODAC (causes of death and associated conditions) system of classification.

## Materials and Methods

This was a cross-sectional, observational study, which was done as part of WHO SEARO project after ethical clearance from the institute. The study included all stillbirths which occurred in the hospital during the study period Aug 2015–Feb 2017. All babies delivered after 20 weeks of gestation showing no sign of life after birth were considered stillborn.

A detailed maternal history with special reference to high risk factors for stillbirths in the present and previous pregnancies was elicited. General physical and systemic examination of the mother at the time of admission to the hospital was carried out. Antenatal records were reviewed to rule out any abnormal clinical findings. All routine

investigations such as hemoglobin, oral glucose tolerance test, blood grouping were done; additional tests such as serum antibody screening for infections, antiphospholipid antibody test, indirect Coombs test were done if required. Head to toe gross examination, weight and anthropometry of baby were done; the evaluation of the development (term or preterm) and the presence of maceration was done. Photograph of stillborn baby with gross congenital anomalies and infantogram was done. The placental and cord examination was done, placental membranes culture/sensitivity was sent if PROM was present. Histopathology of placenta was done if no cause was determined; pre-structured pro forma was filled for every case. Finally, the relevant condition found was classified under CODAC (cause of death and associated conditions) system of stillbirth classification.

Under CODAC system the causes were divided into those related to infections, fetal, maternal, placental, cord complications and intrapartum events. The causes were further divided into sub-causes in each group. Associated conditions such as anemia and fetal growth restriction were also looked into.

## Results

The study was carried out from August 2015 to February 2017 (18 months); the total number of institutional delivery during the study period was 20,580, out of which 600 (2.9%) were stillborn. The epidemiological profile of cases is given in Table 1. The maternal age ranged from 18 to 40 years; most of the women belonged to age group of 24–28 years (268/600, 44.7%). There were 253/600 (41.3%) nulliparous women; there was no previous loss in most of the cases. More than two-third cases did semi-skilled work with income between 10,000 and 20,000/month in 59% of the cases; most of the spouses did semiskilled work (493/600, 82.2%). Most of the women were literate (75.4%).

At least four antenatal checkups were done in 362/600 (60%) cases. There was twin pregnancy in 31/600 (5.2%) cases. Notable findings in cases on antepartum history and clinical examination are given in Table 2. The most common associated complication was hypertension in 124/600 (20.7%) cases followed by anemia (113/600, 18.8%); there was fetal growth restriction in 121/600 (20.2%) cases. The fetal heart beat was not present at the time of admission in 78.8% cases. In 54.7% cases stillbirth occurred after 32 weeks of gestation. Cesarean section or laparotomy for ruptured uterus was performed in 9% cases. Over half of the stillbirths were fresh (56%); rest were macerated. Approximately half of them weighed between 1001 to 2500 g (Table 3).

**Table 1** Epidemiological profile of cases with stillbirth

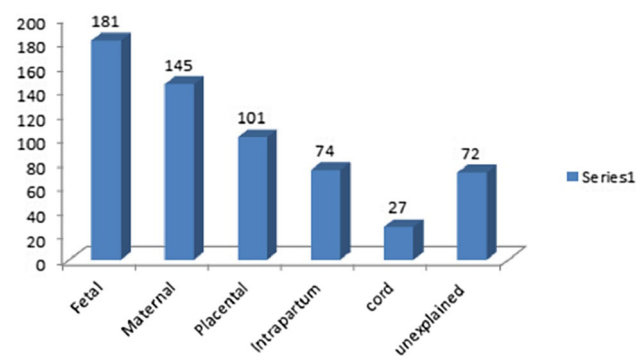
Epidemiological factors	Cases (n)	%
<i>Maternal age</i>		
18–23	197	32.8
24–28	268	44.7
29–33	98	16.4
34–38	35	5.8
> 38	2	0.3
<i>Parity</i>		
0	253	42.2
1	195	32.5
2	114	19
≥3	38	4.3
<i>Abortions</i>		
1	109	18.17
2	46	7.67
<i>Previous stillbirth</i>		
1	19	3.17
2	1	0.17
<i>Occupation husband</i>		
Skilled	93	13.5
Semiskilled	493	82.17
Unemployed	14	2.33
<i>Income</i>		
Low (below 10,000/month)	173	28.83
Middle (10–20 k)	355	59.17
Upper (21 k and above)	72	12.00
<i>Education (mother)</i>		
Illiterate	148	24.67
Primary	128	21.33
Middle	139	23.17
High	94	15.67
Graduate	86	14.33

**Table 2** Antenatal high risk factors in cases with stillbirth

Antenatal high risk factors	Cases	%
Hypertension	124	20.7
Fetal growth restriction	121	20.2
Anemia	113	18.8
Preterm rupture of membranes	71	11.83
Antepartum hemorrhage	50	8.33
Infection	36	6.0
Diabetes	19	3.2
Preterm labor	16	2.7
Cholestasis	9	1.5
Multiple pregnancy	31	5.2
Trauma	2	0.3

**Table 3** Delivery details of cases with stillbirth

Variables	Cases (n)	%
<i>Gestational age at delivery in years</i>		
20.1–24.6	45	7.5
25.1–28.6	91	15.2
29.1–32.6	136	22.7
33.1–36.6	145	24.2
≥ 37	183	30.5
<i>Type of labor</i>		
Induced	231	38.5
Spontaneous	369	61.5
<i>Mode of delivery</i>		
Vaginal cephalic	402	67.0
Vaginal breech	144	24.0
LSCS	54	9.0
<i>Birth detail</i>		
Fresh	336	56.0
Macerated	264	44.0
<i>Sex of baby</i>		
Female	282	47.0
Male	305	50.8
Ambiguous	5	0.8
<i>Baby weight in grams</i>		
500–1000	203	33.8
1001–2500	276	46.0
2501–3000	82	13.7
> 3001	39	6.5
<i>Placental weight in grams</i>		
< 150	120	20.0
151–300	247	41.2
301–500	168	28.0
> 501	65	10.8

**Fig. 1** Causes of stillbirth according to CODAC system of classification

The causes were divided into broad groups according to CODAC system, which constituted intrapartum, maternal, fetal, placental, cord and infections. Figure 1 shows the

**Table 4** Causes of stillbirth according to CODAC system of classification

Causes	Cases (n)	%
<i>Intrapartum (n = 74)</i>		
Fetal distress	59	9.8
Obstructed and prolonged labor	13	2.2
Malpresentation	2	0.3
<i>Maternal (n = 145)</i>		
Hypertension	89	14.8
Infection	34	5.7
Intrahepatic cholestasis of pregnancy	7	1.2
Diabetes	15	2.5
<i>Fetal (n = 181)</i>		
Birth defect	106	17.7
Extreme prematurity	42	7.0
Hydrops	24	4.0
Isoimmunization	1	0.2
<i>Placental (n = 101)</i>		
Abruption	48	8.0
Previa	3	0.5
Insufficiency	50	8.3
<i>Cord (n = 27)</i>		
Loop round the neck	16	2.7
Prolapse	10	1.6
Knot	1	0.2
<i>Unknown/unexplained</i>		
Unknown/unexplained	72	12.0

relative prevalence of different broad groups of causes. The sub-causes in each group are listed in Table 4. The antepartum causes were far more than intrapartum causes (18%). Maternal cause was noted in 145/600 (24.2%) cases, fetal cause was noted in 181/600 (30.2%), and placental and cord origins were suspected in 128/600 (21.3%) and 12/600 (2%) cases, respectively. In 72/600 (12.0%) cases the reason for stillbirth was unknown and unclassifiable. Among the maternal causes the most common was hypertension (89/600, 14.8%) followed by infection including fever (5.7%); the most common infection was hepatitis. Among the fetal causes birth defect was the most common (106/600, 17.7%) followed by extreme prematurity in 42/600 (7.0%). Among the birth defect, neural tube defects were the most common (31/600, 5.3%) and fetal hydrops was seen in 24/600 (4.0%) cases. In the placental causes, insufficiency was observed in 50/600 (8.3%) cases and abruption was noted in 48/600 (8.0%) cases. Among the abnormality of the cord, prolapse of cord was seen in 10/600 cases (1.6%) and loop round the neck was observed in 16/600 (2.7%) cases. The intrapartum deaths occurred in

74/600 (12.3%) cases; most common among them was fetal distress (59/600, 9.8%) followed by obstructed or prolonged labor 12/600 (2.2%).

## Discussion

The study was a part of WHO SEARO initiative of counting of stillbirth using CODAC system of classification. The highlight of the study was the collection of data from a tertiary care facility from the capital city of India. Among the maternal causes the most common was hypertension followed by infection including fever; the most common infection was hepatitis. Among the fetal causes birth defect was the most common.

While many developed countries have stillbirth rates as low as 3–5 per thousand births, most developing countries have rates that are tenfold higher [5]. In a prospective community-based, multi-country study, conducted in countries in South Asia, Latin America and Africa, stillbirth rates ranged from 9 in Argentina to 34 per 1000 in Pakistan [5]. The stillbirth rate was 29/1000 in the present study, which was similar to 30.5/1000 in a study from a tertiary hospital of Pune, Maharashtra [6]. In a large-scale, population-based household survey of women from Indian state of Bihar, stillbirth rate was found to be 20 per 1000 births [7]. Higher incidence in tertiary hospitals may be due to the high number of referred cases.

There are more than 30 classifications of stillbirth. After study on comparison of different classifications of stillbirth, Froen et al. [8] concluded that the CODAC system was one of the best options to supplement International Classification of Diseases (ICD). In the present study CODAC classification was chosen as it was recommended by WHO.

An important cause of stillbirth is hypertension during pregnancy, which occurs in about 7–10% of pregnancies worldwide. In a hospital-based study from Pakistan, hypertensive diseases including pregnancy-induced hypertension and eclampsia accounted for 24% of the stillbirths [9]. In a study from Karnataka, India, they were seen as cause in 34.6% of the cases [10]. In the present study hypertension was observed in 20.7% of cases; in 6% cases it was associated with other complications such as abruptio, placental insufficiency and diabetes.

Another important cause of stillbirth is infection, as it is believed to contribute to nearly half of the stillbirths in the developing countries [11]. But, in the present study infection was attributed to be the cause in 5.7% cases only. Similarly, in the study by Prassana et al. [10] infection was the cause in 2.7% cases.

Birth defect contributes to nearly a quarter of stillbirths in the developed countries; however, it is considered to be responsible for less than 5% of stillbirths in the developing

countries [12]. In the present study it contributed to 17.7% cases of stillbirth. In the study by Prassana et al. [10], it contributed to 4.6% of cases. The large number of cases due to birth defect in the present study might be due to the large number of referred cases.

Reductions in stillbirth rates in the developed countries are primarily due to the reduction in intrapartum stillbirth rates [13]. In the present study, the intrapartum death occurred in 12.3% cases and fetal distress was responsible for nearly 80% of the intrapartum death. Increased access to obstetric services including better intrapartum fetal monitoring and to cesarean sections appears to be associated with these decreases in stillbirth [14].

While analyzing the contributory factors leading to stillbirth in the CODAC system, fetal growth restriction (20.2%) and anemia (18.8%) were the most important factors, which are akin to previous studies [10]. In most geographic areas, in addition to the access to obstetric care at delivery, various other socio-demographic factors, including rural residence, low socioeconomic status, lack of education, have been associated with increased stillbirth rates [15]. Advanced maternal age is also considered to be a major risk factor for stillbirth in all areas of the world [6]. In the present study, however, two-third of the subjects were literate and more than half of them underwent four or more antenatal checkups. Most of the cases were young (77.5% were less than 28 years) with only 0.3% more than 38 years of age. Thus, factors like inadequate antenatal care, literacy and maternal age did not contribute significantly to stillbirth in the present study.

One of the important strategies to reduce the stillbirth is the reporting or counting of stillbirth. Using a uniform system of classification (e.g., CODAC) would help in data analysis and comparison and thus aid in formatting the strategy to deal with the problem, which is preventable to a large extent.

## Conclusion

Hypertension in pregnancy and its complications were the most important contributing factor to stillbirth. Recording of stillbirth using a uniform system such as CODAC is the first step toward reducing the burden of preventable stillbirth.

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**Compliance with Ethical Standards**

**Conflict of interest** There is no conflict of interest among authors.

**Informed consent** Informed consent was obtained from all individual participants included in the study.

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