RISK FACTORS OF STILL BIRTH IN INDIA: A SYSTEMATIC REVIEW ARTICLE

1 Prof (Dr) Nirmali Gogoi, 2 Ms Navaneeta Kalita, 3 Ms Lakhimi Gogoi,

Associate Dean Research, Faculty of Nursing, Assam down town University, Guwahati, Assam, India.
Assistant Professor, Faculty of Nursing, Assam down town University, Guwahati, Assam, India.
Assistant Professor, Faculty of Nursing, Assam down town University, Guwahati, Assam, India.

Corresponding Author:

*Prof.(Dr) Nirmali Gogoi,

HOD, Faculty of Nursing, Assam down town University.

Abstract

Stillbirths constitute a major part of perinatal deaths, yet they largely remain invisible Worldwide about 2.65 million babies were born as stillbirth in 2008. Out of these about 98% of the third-trimester stillbirths occurred in low-income and middle-income countries. Although officially, India has been able to reduce its stillbirth rate (i.e. the number of stillbirths per 1,000 total births) from 6.0 in 2011 to 4.0 in 2018. However, a recent report published by the United Nations Inter-agency Group for Child Mortality Estimation (UN IGME) shows that India's stillbirth rates (i.e. stillbirths per 1,000 total births) were 29.6 in 2000, 20.2 in 2010 and 13.9 in 2019 – much higher than what is reported officially. Several risk factors have been associated with an increased risk of stillbirth: including maternal medical factors, maternal characteristics, fetal factors, socio-demographic factors and behavioral factors.

Even though there are certain risk factors for stillbirth, most individual stillbirths are remained unidentified. Identification of risk factors of stillbirths is crucial to facilitate designing of a stillbirth prevention strategy.

Key words: Risk factors, stillbirth, maternal factors, fetal factors

Introduction

Stillbirth is typically defined as fetal death at or after 20 or 28 weeks of pregnancy, depending on the source. It results in a baby born without signs of life. A stillbirth can result in the feeling of guilt or grief in the mother. The term is in contrast to miscarriage, which is an early pregnancy loss, and Sudden Infant Death Syndrome, where the baby dies a short time after being born alive¹.

Stillbirths constitute a major part of perinatal deaths, yet they largely remain invisible.^[1] Worldwide about 2.65 million babies were born as stillbirth in 2008. Out of these about 98% of the third-trimester stillbirths occurred in low-income and middle-income countries. However, most of the high quality epidemiological studies have been conducted in high income countries^[1] leading to a worldwide 10/90 gap in health research; only 10% of the research addresses 90% of the burden.^[2] This gap is wider in low income countries, where very few studies have been conducted. [3] Hence, better information on the extent of stillbirths, their causes and risk factors is needed from low- and middle-income countries for planning prevention programmes.^[1,2,4] Globally, India has been ranked first in the absolute number of stillbirths.^[4,5] However, the sample registration system (SRS) of India has estimated stillbirth rate to be only 5 per 1000 births in 2013.^[6] Whereas, Blencowe et al. (2016) have estimated it to be 23 per 1000 live births.^[5, 6]

Commenting on the recently released fifth round of National Family Health Survey (NFHS-5) data for 17

states and five Union Territories (UTs) in an article published in The Indian Express (dated 6th January, 2021), Arvind Subramanian and his co-authors have stated that India has made progress on certain outcomes, including infant mortality rate (IMR), underfive mortality rate (U5MR) and neonatal mortality rate (NNMR). Relying on various rounds of NFHS data, the authors have stated that the country has been able to reduce child deaths (i.e. neonatal, infants and under-5), among other outcomes related to children's health and nutrition, over the years. It should be noted here that the NFHS does not provide data on stillbirths. Although data on stillbirth rate is officially reported by the Sample Registration System of the Office of the Registrar General & Census Commissioner, there are serious concerns about the quality of stillbirth data that is collected in low- and lower-middle income countries (we will discuss this elaborately in the next section). Officially, India has been able to reduce its stillbirth rate (i.e. the number of stillbirths per 1,000 total births) from 6.0 in 2011 to 4.0 in 2018. However, a recent report published by the United Nations Interagency Group for Child Mortality Estimation (UN IGME) shows that India's stillbirth rates (i.e. stillbirths per 1,000 total births) were 29.6 in 2000, 20.2 in 2010 and 13.9 in 2019 – much higher than what is reported officially.7

A Neglected Tragedy: The global burden of stillbirths -- Report of the UN Inter-agency Group for Child Mortality Estimation, 2020 (released in October 2020) shows that 173 out of 1,000 stillbirths in the world took place in India during 2019. Prepared jointly by the United Nations Children's Fund (UNICEF), World Health Organisation (WHO), World Bank Group and United Nations, Department of Economic and Social Affairs, Population Division, the report has estimated that nearly 0.34 million of the 1.97 million stillbirths globally in 2019 occurred in our country. In comparison to 2019, India bore a higher global burden of stillbirths in the past years. About 296 out of 1,000 stillbirths of the world happened in India during 2000, which fell to nearly 227 out of 1,000 stillbirths in 2010.⁸

Aim: This review was conducted with the aim to emphasize to find out the risk factors of still births in India.

The researchers were trying to answer the following questions in this study:

1. What are the common risk factors of still birth in India?

Methodology:

The present study was conducted in several stages including accurate determination of the problem under study, collection, analysis and interpretation of the findings; additionally, preferred systematic reviews and meta-analysis (PRISMA) guidance system was used. Therefore, all stages of the research, such as search, selection of studies, qualitative evaluation, and data extraction were carried out independently by two researchers. The literature for this review article was started from 18th January, 2023, to identify the published articles that reported the risk factors of still birth in India. Search was done mainly using search engines google search and google scholar, Medline (PubMed), web of science, open access articles were accessed and data were extracted. Articles were searched based on the keywords, risk of still birth, still birth, studies related to still birth in India, statistics related to still birth, WHO Report on still birth, news article etc were also included. Around 130 articles were rejected due to problems like missing information and non-availability of full text of the literatures. Out of 130 papers 8 papers were examining. The reporting of this study was conducted according to the Preferred Reporting Items for Systematic reviews and Meta-Analyses (PRISMA) guidelines.⁹

Data extraction

The present research investigated 8 selected papers that were eligible to enter the secondary analysis process. Descriptive details of the articles are presented in Table-1. Standardized forms were used to facilitate the data extraction. Regarding stillbirths, the form consists of 3 modules: 1. General information 2. Characteristics of the study 3. Stillbirth reporting data a form comprised of three parts was designed in this section. Then, the basic data required for analysis, including bibliographic data, title, the name of the journal and author, methodology information including the method of study and type of plan, as well as information on the risk factors of stillbirth were collected [**Table 1**].

Inclusion of studies: Studies explaining the risk factor in India were included irrespective of their methodology and there was no time limit, however the language was English.

Results

After applying inclusion and exclusion criteria on 110 records, a total of 8 studies met the inclusion criteria for this review (Fig-1)





Baseline characteristics of reviewed studies

In this review study, eight studies examined the association between risk factors and stillbirth; of which, 1 study in North India, 1 study in South India, 1 study in Chandigarh, 2 studies in Bihar, 1 is in Hariyana and 1

study in Maharastra out of 8 studies 4 were crosssectional study, 3 were case-control study and1 prospective study.6 studies were community based and 2 studies were hospital based. (Table-1)

Sl No	Authors	Study Design	Participant	Place	Setting	Outcome
1	ShivDuttGuptaet.al.(2020)	Case-control study	Women of stillbirth and live birth	North India	Hospital based	Risk factors of stillbirth
2	Rajshekher V. et al.(2017)	Observational prospective study	Women of stillbirth and live birth	South India.	Hospital based	Prevalence and Risk factors
3	Newtonraj A (2014)	Cross- sectional study	Women of stillbirth and live birth	Chandigarh	Community based study	Risk factors of stillbirth
4	Neogi SB et. al. (2018)	Case–control study	Women of stillbirth and live birth	Bihar	Community based study	Risk factors of stillbirth
5	Negandhi PH et al. (2015)	Case–control study	Mothers	Haryana	Community based study	Risk factors of stillbirth
6	Avachat SS	Cross- sectional study	Mothers	Maharashtra	Community based study	Prevalence, causes and Risk factors
7	Noon Altijani et al.(2018)	Secondary analysis of cross-sectional study	Mothers	Madhya Pradesh, Chhattisgarh , Rajasthan, Uttarakhand, Jharkhand, Odisha, Bihar, Assam and Uttar Pradesh.	Community based study	Prevalence and Risk factors
8	Dandona R et al.(2017)	Cross- sectional study	Mothers	Bihar	Population based study	Prevalence and Risk factors

Risk Factors of stillbirth in India

Data shows that the significant risk factors of still birth in India are SSD(SEX SELEACTION DRUG), Economical condition of the family, tobacco chewing, intrauterine malperfusion, placental malperfusion, pre -eclampsia, pre-term birth, lack of timely attention of health care, poor skill of health care provider, nutritional

deficiency during pregnancy, inappropriate health care facilities for delivery. (Table-2) Among the significant risk factors in different studies in different states of India, Maternal age, Preterm baby and hypertensive disorder identified as most common risk factors of stillbirth in India.

Table 2: Risk Factors of stillbirth in India				
Odds ratio with 95% confidence interval				
(95% CI 2.95-55.00; p <0.001)				
12.54 (95% CI 3.95-39.00; p <0.001).				
OR 1.90, 95% CI 1.10-3.27; p <0.02).				
(OR 4.02, 95% CI 1.38-11.69).				
(OR: 22.33, 95% CI: 15.35–32.50),				
(OR: 21.87, 95% CI: 15.69–30.48),				

Congenital malformation	(OR: 11.24, 95% CI: 6.99–18.06),		
Abruption	(OR: 10.14, 95% CI: 6.43–15.97),		
Oligohydramnios	(OR: 4.88, 95% CI: 3.23–7.39),		
Hypertensive disorder	(OR: 3.01, 95% CI: 2.03–4.46)		
Chandigarh,			
Maternal age	(aOR 1.1, 95%CI 1.0-1.2),		
Vaginal delivery	(aOR 8.1, 95%CI 2.6-26),		
Induced labour	(aOR 2.6, 95%CI 1.5-4.5),		
Green or light brown liquor	(aOR 2.0, 95%CI 1.1-3.8),		
Preterm delivery	(aOR 6.4, 95%CI 3.7-11)		
Smaller household size	(aOR 1.2, 95% CI 1.1-1.3).		
Bihar			
Complications during labour	(OR 2.3;1.7–3.1),		
Untreated hypertension during pregnancy	(AOR 2.9; 95% CI 1.5–5.6)		
Haryana			
History of intake of SSDs	OR) 2.6, 95% confidence interval (CI) 1.5, 4.5]		
Preterm <37 weeks	(OR 3.5, 95% CI 2.1, 6.0),		
History of previous stillbirths	2.6, 95% confidence interval (CI) 1.5, 4.5]		
Complications during labour	(OR 3.3, 95% CI 2.1, 5.3).		
Maharashtra			
Gestational age	P value <0.001		

Discussion

Stillbirth is one of the most devastating of losses, affecting over 25,000 families each year. Stillbirth touches families of all races, religion and socioeconomic status. Placental factors such as a placental abruption are found in six percent of stillbirths. A history of placental abruption increases the risk of stillbirth. The risk of stillbirth is 15/1000 for birth weights less than the 2.5th percentile and 25/1000 for birth weights less than the 5th percentile. Many stillbirths occur at full term to apparently healthy mothers, and a postmortem evaluation reveals a cause of death in about 40% of autopsied cases.

The causes and the risk factors associated with stillbirths are now well known and studied in various countries including India. Higher maternal age, rural residence, maternal complications during pregnancy, especially hypertension, eclampsia, severe anemia and antepartum and intrapartum hemorrhage, and preterm birth have been found to be associated with the increased risk of stillbirth.

Out of 2.6 million global stillbirths, 1.8 million stillbirths occur only in 10 countries with India on the top of the list, accounting for almost half of the global stillbirths. More recently, the Lancet special series has brought to focus the enormity the problem of stillbirth and issues and challenges of high stillbirths faced by the developing countries.

The present review study identified the significant risk factors of still birth in India are SSD(SEX SELEACTION DRUG), Economical condition of the family, tobacco chewing, intrauterine malperfusion, placental malperfusion, pre –eclampsia, pre-term birth, lack of timely attention of health care, poor skill of health care provider, nutritional deficiency during

pregnancy, inappropriate health care facilities for delivery. (Table-2) among the significant risk factors in different studies in different states of India, Maternal age, Preterm baby and hypertensive disorder identified as most common risk factors of stillbirth in India.

Gupta SD et al. in a hospital-based case-control study in medical college women's hospital in north India identified the risk factors of stillbirth using Multivariate logistic regression and Odds Ratio (OR) analysis. Rural residence, sex of the baby, pregnancy induced hypertension/eclampsia and preterm deliveries were statistically significantly associated with occurrence of stillbirth. The study revealed that the risk of stillbirth was 10 times or more with pregnancy induced hypertension and preterm delivery, the adjusted OR being 12.75 (95% CI 2.95-55.00; p < 0.001) and 12.54 (95% CI 3.95-39.00; p <0.001). Higher maternal age was also associated with significantly higher and independent risk of stillbirth (OR 1.90, 95% CI 1.10-3.27; p <0.02). Male fetus was more likely to be stillborn (OR 4.02, 95% CI 1.38-11.69). There effect was independent of all other risk factors in the model. The effect of rural residence was not significant in multivariate model. The study showed a strong evidence of association pregnancy induced hypertension and preterm birth as risk factors for stillbirth. Maternal age and sex of the child also showed statistically significant risk of stillbirth. Rural residence which showed significant association in bivariate analysis, but it was removed in the model when adjusted for other risk factors.^[10]

An observational prospective study in south India included pregnant women with stillbirth beyond 20 weeks of gestation or fetal weight more than 500 grams. Stillbirths were classified according to the simplified causes of death and associated conditions (CODAC)

classification. Association between the risk factor and stillbirths was calculated with chi-square test and odds ratio with 95% confidence interval. Results were 171 stillbirths (2.97%) among total 5755 births. The SBR was 29.71/1000 births. Risk factors such as preterm delivery (OR: 22.33, 95% CI: 15.35-32.50), anemia (OR: 21.87, 95% CI: 15.69-30.48), congenital malformation (OR: 11.24, 95% CI: 6.99-18.06), abruption (OR: 10.14, 95% CI: 6.43-15.97), oligohydramnios (OR: 4.88, 95% CI: 3.23-7.39), and hypertensive disorder (OR: 3.01, 95% CI: 2.03-4.46) were significantly associated with stillbirths. The proportion of intrapartum stillbirths was found to be 5 (3%) among the study population. Highest prevalent risk factors associated with stillbirth are anemia and prematurity. Intrapartum stillbirths can be reduced significantly through evidence-based clinical interventions and practices in resource-poor settings. There is a need to provide and assure access to specialized quality antenatal care to pregnant women to control the risk factors associated with stillbirths.^[11]

In a population based study in Chandigarh Union Territory of India, Newtonraj A et al., identified the risk factors of stillbirth. Among maternal conditions, hypertension (18.2%) and chorio-amnionitis (13.8%), and among foetal conditions, growth restriction (19.9%) and congenital anomalies (18.8%) were the leading causes. In about half of the stillbirths foetal (48%) and maternal (44.7%) causes were unidentifiable. Risk factors of stillbirths were: higher maternal age (aOR 1.1, 95%CI 1.0-1.2), vaginal delivery (aOR 8.1, 95%CI 2.6-26), induced labour (aOR 2.6, 95% CI 1.5-4.5), green or light brown liquor (aOR 2.0, 95%CI 1.1-3.8), preterm delivery (aOR 6.4, 95%CI 3.7-11) and smaller household size (aOR 1.2, 95% CI 1.1-1.3). Risk factors amenable to interventions were infections. hypertension, congenital malformations, foetal growth restriction, pre-maturity and household size. Therefore, better maternity ante-natal and intra-natal care is required to achieve a single digit stillbirth rate. [12]

In a case-control study among 400 Mothers of stillborn babies in Bihar. Of all the factors studied, 22 risk factors were independently associated with stillbirths. Health system-related factors were: administration of two or more doses of oxytocics to augment labour before reaching the facilities (OR 1.6; 95% CI 1.2-2.1), any complications during labour (OR 2.3;1.7–3.1), >30 min to reach a facility from home (OR 1.4;1.05-1.8), >10 min to attend to the pregnant woman after reaching the facility (OR 2.8;1.7-4.5). In the final regression model, modifiable health system-related risk factors included: >10 min taken to attend to women after they reach the facilities (AOR 3.6; 95% CI 2.5-5.1), untreated hypertension during pregnancy (AOR 2.9; 95% CI 1.5-5.6) and presence of any complication during labour, warranting treatment (AOR 1.7; 95% CI 1.2–2.4). Among mothers who reported complications during labour, time taken to reach the facility was significantly different between stillbirths and live births (2nd delay; 33.5 min v/s 25 min; p < 0.001). Attributable fraction for any complication during labour was 0.56 (95% CI 0.42–0.67), >30 min to reach the facility 0.48 (95% CI 0.31–0.60) and institution of management 10 min after reaching the facility 0.68 (95% CI 0.58–0.75). Reaching a facility within 30 min, initiation of management within 10 min of reaching the facility and timely management of complications during labour could have prevented 17%, 37% and 20% of stillbirths respectively. ^[13]

Negandhi PH et al. conducted a population-based casecontrol study was undertaken in Haryana. Cases of stillbirths were identified from the Maternal Infant Death Review System portal of Haryana state for the months of August-September 2014. A consecutive birth from the same geographical area as the case was selected as the control. The sample size was 325 per group. Mothers were interviewed using a validated tool. Bivariate analyses and logistic regression were conducted to examine the association between risk factors and stillbirth. Attributable risk proportions (ARP) and population attributable risk proportions (PARP) were estimate, The socio demographic profiles of the cases and controls were similar. History of intake of SSDs [adjusted odds ratio (OR) 2.6, 95% confidence interval (CI) 1.5, 4.5] emerged as a risk factor. Other significant factors were preterm <37 weeks (OR 3.5, 95% CI 2.1, 6.0), history of previous stillbirths (OR 4.0, 95% CI 2.1, 7.8), and complications during labour (OR 3.3, 95% CI 2.1, 5.3). Estimates of the ARP and PARP for intake of SSDs were 0.60 (95% CI 0.32, 0.77) and 0.1 (95% CI -0.13, 0.28), respectively. It concluded that SSDs could be attributed as a risk factor in a fifth of the cases of stillbirths. The number needed to harm for the use of SSDs in causing adverse effect of stillbirths was 5. suggesting thereby that for every five mothers exposed to SSDs, one would have stillbirth. Greater efforts are required to inform people about the harmful effects of SSD consumption during pregnancy.^[14]

Noon Altijani et al. conducted a study to assess the rate of stillbirth and associated risk factors across nine states in India. The design was adopted Secondary analysis of cross-sectional data from the Indian Annual Health Survey (2010-2013). Nine states in India: Madhya Pradesh. Chhattisgarh, Rajasthan, Uttarakhand, Jharkhand, Assam, Odisha, Bihar, and Uttar Pradesh. Participants: 886 505 women, aged 15-49 years. Main outcome measures: Stillbirth rate with 95% CI. Adjusted OR to examine the associations between stillbirth and (1) socioeconomic, behavioural and biodemographic risk factors and complications in pregnancy (anaemia, eclampsia, other hypertensive disorders, antepartum and intrapartum haemorrhage, obstructed labour, breech presentation, and abnormal fetal position). Results revealed that overall rate of stillbirth was 10 per 1000 total births (95% CI 9.8 to 10.3). Indicators of socioeconomic deprivation were strongly associated with an increase in stillbirth: rural residence (adjusted OR (aOR) 1.27, 95% CI 1.16 to 1.39), female illiteracy

(aOR 1.43, 95% CI 1.17 to 1.74), low socioeconomic status (aOR 2.42, 95% CI 1.82 to 3.21), schedule caste background (aOR 1.11, 95% CI 1.04 to 1.19) and woman not in paid employment (aOR 1.15, 95% CI 1.07 to 1.24). Women from minority religious groups were at higher risk than the Hindu majority (Muslim (aOR 1.33, 95% CI 1.25 to 1.43); Christian (aOR 1.42, 95% CI 1.19 to 1.70)). While a few women smoked (<1%), around 9% reported chewing tobacco, which was associated with an increased odds of stillbirth (aOR 1.11, 95% CI 1.02 to 1.21). Adverse pregnancy and birth characteristics were also associated with stillbirth: antenatal care visits <4 (aOR 1.08, 95% CI 1.01 to 1.15), maternal age <25 years (aOR 1.29, 95% CI 1.21 to 1.37) and ≥ 35 years (aOR 1.16, 95% CI 1.04 to 1.29), multigravida (aOR 3.06, 95% CI 2.42 to 3.86), multiple pregnancy (aOR 1.77, 95% CI 1.47 to 2.15), assisted delivery (aOR 3.45, 95% CI 3.02 to 3.93), caesarean section (aOR 1.73, 95% CI 1.58 to 1.89), as were pregnancy complications (aOR 1.42, 95% CI 1.33 to 1.51). According to this study India is an emerging market economy experiencing a rapid health transition, yet these findings demonstrate the marked disparity in risk of stillbirth by women's socioeconomic status. Tobacco chewing and maternal and fetal complications were each found to be important modifiable risk factors. Targeting the 'at-risk' population identified here, improved recording of stillbirths and the introduction of local reviews would be important steps to reduce the high burden of stillbirths in India.^[15]

A retrospective study to assess the extent of stillbirths in a teaching hospital located in rural area. To study various causative and contributing factors for stillbirths. All the case records of the deliveries occurred in the study setting during study period (April 2009 to March 2010) were evaluated with the help of a predesigned proforma. Total 3,458 deliveries occurred, of them 141 were stillbirths. Total 75.6% stillbirths occurred to the women in the age group of 20-35 years. Most of the stillbirths were preterm (67.3%) as compared to term or post-date deliveries. Significant association was observed between gestational age and stillbirth. Total 82 (58.15%) babies had low birth weight. Maternal factors were responsible for majority of stillbirths (53.19%) while 34% stillbirths were idiopathic. More than half of the stillbirths were associated with maternal factors like pregnancy-induced hypertension, antepartum hemorrhage and anemia. Improvement in availing essential obstetric care can reduce the magnitude of stillbirths.^[16]

Rakhi Dandona et al. verbal autopsy interviews were conducted for deaths including stillbirths that occurred from January 2011 to March 2014 in a sample of 109,689 households (87.1% participation) in 1,017 clusters representative of the state of Bihar. The Population Health Metrics Research Consortium shortened verbal autopsy questionnaire was used for each interview and cause of death was assigned using the Smart VA automated algorithm. A stillbirth was defined as a foetal death with a gestation period of ≥ 28 weeks wherein the foetus did not show any sign of life. The study reported stillbirth incidence was 21.2 (95% CI 19.7 to 22.6) per 1,000 births, with it being higher in the rural areas. A total of 1,132 stillbirths were identified; 686 (62.2%) were boys, 327 (29.7%) were firstborn, and 760 (68.9%) were delivered at a health facility. Of all the stillbirths, 54.5% were estimated to be antepartum. Only 6,161 (55.9%) of the women reported at least 1 antenatal care visit, and 33% of the women reported not consuming the iron folic acid tablets during pregnancy. Significant differences were seen in delivery-related variables and associated maternal conditions based on the place of delivery and type of stillbirth. Only 6.1% of the women reported having undergone a test to rule out syphilis. For 34.2% of the stillbirths, the possible risk factor for stillbirth was unexplained. For the remaining 65.8% of the women who reported at least 1 complication during the last 3 months of pregnancy, maternal conditions including anaemia, fever during labour, and hypertension accounted for most of the complications. Obstetrics complications and excessive bleeding during delivery contributed to nearly 30% of the cases as a possible risk factor for stillbirth, which was highlighting the need for better skilled care during delivery.^[17]

Conclusion

In developing countries, lack of access to obstetrical care contributes to high stillbirth rates. Most stillbirths in the developing world result from long and difficult labor, preeclampsia, and infections. Present review study has found many factors that increase risk for stillbirths in India. SSD(SEX SELEACTION DRUG), Economical condition of the family, tobacco chewing, intrauterine malperfusion, placental malperfusion, preeclampsia, pre-term birth, lack of timely attention of health care, poor skill of health care provider, nutritional deficiency during pregnancy, inappropriate health care facilities for delivery found as significant risk factors of stillbirth. Among the significant risk factors in different studies in different states of India, maternal age, preterm baby and hypertensive disorder identified as most common risk factors of stillbirth in India.

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