Review of Causes of Stillbirths in a Rural Referral Hospital in South India: A Cross-Sectional Study

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Abstract:
Introduction: This research assessed the stillbirth causes in southern India's rural regions by the referral pattern. **Materials and Methods:** This prospective observational research of stillbirths was conducted at the JSS hospital in Mysore, from the year 2014 to 2023. Data was collected from the departments of obstetrics and gynecology and neonatology's monthly and annual perinatal audits. 220 stillbirths were documented during the study period. **Results:** The age range of the women that made up the majority (43.6%) was between 21 and 25 years. The lower middle-class category made up more over half of the female population (55%). Low birth weight occurred in 23.2% of babies (1-1.49 kg). The most common risk factor was found to be severe pre-eclampsia (13.6%), followed by pre-eclampsia (10%), abruption (9.5%), hypothyroidism (6.8%), GDM on insulin (6.4%), cord causes (3.2%) and PPROM (3.2%). Other high-risk factors noted were Rh negative (2.27%), followed by cervical incompetence (1.36%), Polyhydramnios (0.91%), and SLE (0.91%). **Conclusion:** The rate of stillbirth may be lowered by early detection of problems and timely referral. Sufficient antenatal care, identifying the high-risk patients, and prompt referral. Since it is a referral center, we had high number of stillbirths which states the causes and leads to prevention.

Keywords: Abruption, Stillbirths, Pre-eclampsia, Gestational diabetes, Hypothyroidism

1. Introduction

A stillbirth is commonly described as the delivery of a fetus that shows no signs of life or can't be resuscitate after birth, after a predetermined gestation period and even before complete expulsion by its mother [1] The fetus ≥ twenty weeks of gestation that shows no evidence of life is regarded as stillborn in India [2]. The commonest adverse outcome of pregnancy is stillbirth. One of the greatest distressing situations for both the parents and the obstetrician is the death of a viable fetus. It is also a sensitive indicator of the equity as well as quality of healthcare. The most recent

statistics show that there were 13.9 stillbirths / 1,000 live births globally last year. This translates to one stillborn child every 17 seconds, or one stillbirth out of total 72 births. Yet, this number can be underestimated because underreporting of stillbirths is common [3]. 98 percentage of stillbirths occur in LMICs (low- to middle-income countries), with India accounting for 592,100 of them annually at a rate of 22/1000 babies born as per WHO (World Health Organization) [4,5]. By 2030, ENAP i.e., Every Newborn Action Plan in the year 2014 called for a rate of stillbirth of 12 or less per 1000 births [6]. According to the 2019 Progress Report of ENAP, 59% of the reporting nations won't be able to meet the interim objective of 14/1000 or even less stillbirths by the year 2020.6 Globally, there have been 2% fewer stillbirths per year than in the previous year, which is less than the declines under-five mortality (4.5%) and in maternal mortality (3%) [7]. Although stillbirths constitute a larger proportion of avoidable deaths, it is difficult to find their cause because the fetus is not observed directly at the time of death or throughout the events prior to it. Also, there is a knowledge gap regarding the conditions and circumstances before the occurrence of stillbirth. In order to achieve the world goal of reducing stillbirth, the 2019 ENAP progress report advises expanding investigation into the factors that contribute to stillbirth and allowing the outcomes of these findings direct policy developments. Prioritizing interventions to increase birth outcomes in places with limited resources can be helped by determining the stillbirth cause and establishing its connection with various fetal and maternal factors. In a tertiary care referral center in southern India, the current research attempted to determine potential causes as well as their links with stillbirths.

2. Method

Study Setting

The current observational, prospective study was carried out in the Obstetrics and Gynecology (OBG) Department at JSS Hospital at Mysore, South India, from 2015-2023. Consultants, as well as postgraduates from the obstetrics and gynecology (OBG), anesthesiology and pediatrics departments supervise the labor ward 24 hours or more. The high-risk cases management is governed by institutional evidence-based protocols.
Study Participants

Inclusion Criteria

All of the women who were brought into the labor ward and who gave birth to a stillborn child gave their consent to be enrolled in the investigation. All participants in the study provided their written, informed consent.

Exclusion Criteria

Having live births was the exclusion standard for gravidas.

The Institutional Ethics Committee of JSS Hospital in Mysore provided its institutional ethical approval for the current work.

Data Collection Procedure

A team of obstetricians reviewed the study proforma in a departmental review meeting and discussed as well as confirmed it. The data of stillbirth was collected in the Department of Obstetrics and Gynecology. A professor in Department of Obstetrics and Gynecology assigned to the project did their verification. Data was collected from monthly and annual perinatal audits of the departments of obstetrics and gynaecology, and neonatology, and causes of stillbirths along with details of each case were systematically reviewed by doctors. Details of antenatal examinations, medical conditions, the presence of obstetric difficulties, and other important disorders were assessed. In this research, stillbirth is defined as the baby showing no life signs delivered with a ≥1000 g [1] birthweight or after 28 gestation weeks. A woman who went to four or more antenatal appointments and got two tetanus toxoid doses was defined to be a booked case. The remainder were classified as unbooked. According to protocol of institution, each stillbirth was thoroughly discussed during the perinatal death audit in the OBG department of the institution. A multidisciplinary team, made up of a neonatologist as well as senior obstetrician, then specified the death cause based on the clinical examination, history, as well as available investigations. Input of data was saved into the excel spreadsheet. Descriptive statistics of the explanatory and outcome variables were calculated by frequency and proportions for qualitative variables.

3. Results

Our findings showed that the majority of the female population (43.6%) belonged to the 21 to 25 year age group, followed by the 26 to 30 year age group (28.2%). Most of them were educated between 8th to 10th std (35%), followed by 24.5% who were educated till PUC. More than half of the women were from the lower middle-class groups (55%). Nearly 100% were booked cases. (Table 1)

Table 1. Demographic details of the study subjects

Variables		Frequency	Percent
Age group	< 20	27	12.3
	21-25	96	43.6
	26-30	62	28.2
	31-35	29	13.2
	36-40	6	2.7
Education	< 7th std	2	0.9
	8-10th std	77	35
	PUC	54	24.5
	Graduate	49	22.3
	Postgraduate	38	17.3

SES	Lower middle class	121	55
	Middle class	65	29.5
	Upper lower class	14	6.4
	Upper middle class	20	9.1
ANC registration	Booked	219	99.5
	booked	1	0.5
Total		220	100

A total of 116 (52.7%) women were multigravida, with about 33% of them having gestation between 32.1 and 37 weeks (33.2%). About 54.6% of the babies delivered were males. 23.2% of the babies had low birth weight (1-1.49 kg). Around 98% of the study subjects delivered their babies by vaginal route. (Table 2)

Table 2: Labour details of the study subjects

Variables		Frequency	Percent
Gravida	Primi	104	47.3
	Multi	116	52.7
Gestational age (weeks)	≤ 20	5	2.3
	20.1-24	18	8.2
	24.1-28	31	14.1
	28.1-32	56	25.5
	32.1-37	73	33.2
	> 37	37	16.8
Sex of the baby	Female	100	45.5
	Male	120	54.6
Birth weight (kg)	≤ 0.5	32	14.5
	0.51-0.99	41	18.6
	1-1.49	51	23.2
	1.5-1.99	32	14.5
	2-2.49	33	15.0
	≥ 2.5	31	14.1
Mode of delivery	Emergency LSCS	3	1.4
	Forceps assisted delivery	1	0.5
	Vaginal delivery	216	98.2

According to our research, idiopathic causes accounted for 26.8% of all stillbirths among the women. The most common risk factor was found to be severe pre-eclampsia (13.6%), followed by pre-eclampsia (10%), abruption (9.5%), hypothyroidism (6.8%), GDM on insulin (6.4%), cord causes (3.2%) and PPROM (3.2%). Figure 1 displays the stillbirth risk factors identified in this study.

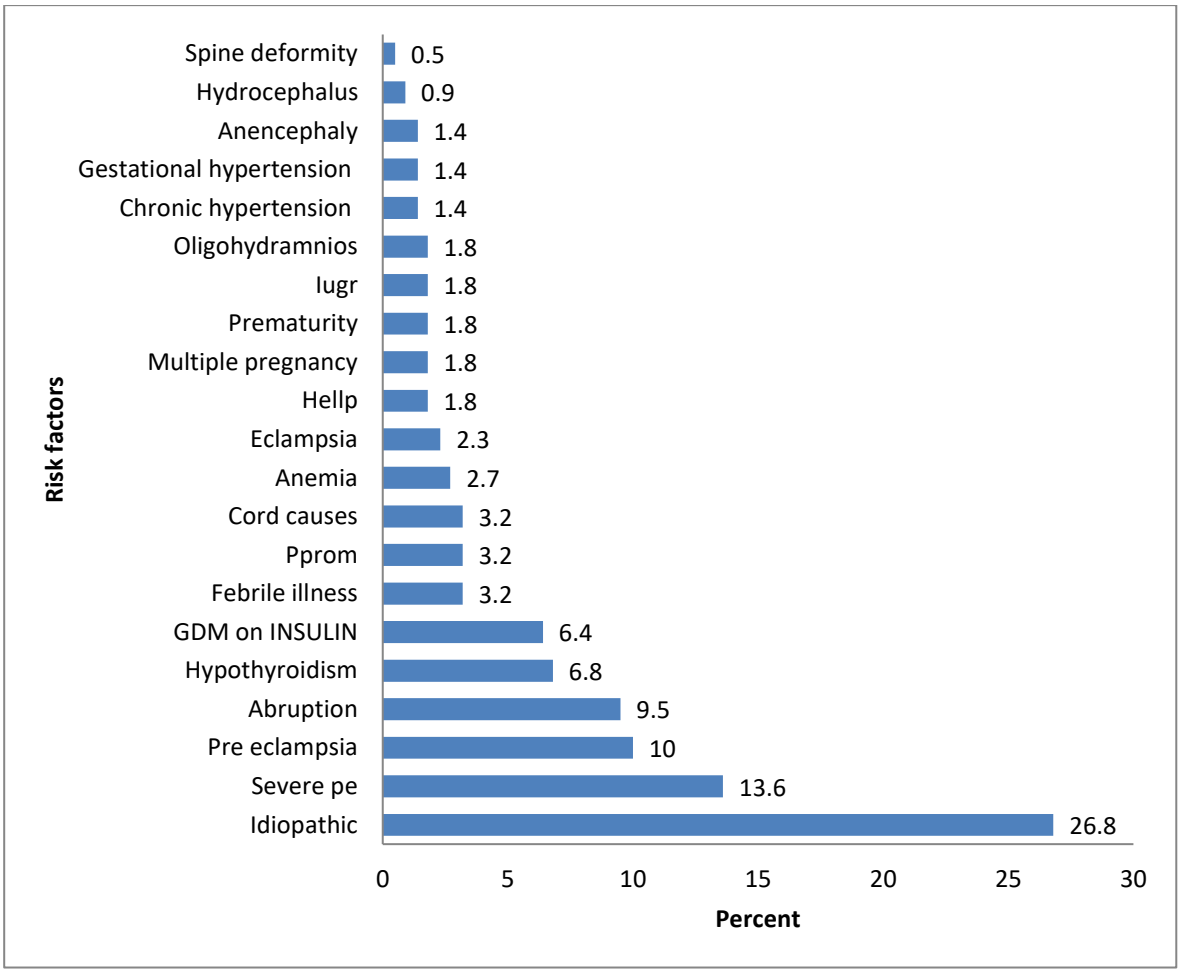

Figure 1. Risk factors for stillbirth among the study subjects

Other factors of high-risk observed in 220 study participants included Rh negative (2.27%), followed by cervical incompetence among (1.36%), Polyhydramnios (0.91%), and SLE (0.91%), etc. (Table 3)

Table 3. Other Risk factors for stillbirth among the study subjects

Other high risk	Frequency	Percent
	196	89.09
Acute kidney injury (AKI)	1	0.45
Cardiac failure	1	0.45
Cervical incompetence	3	1.36
Corrected congenital	1	0.45

heart disease (CHD)		
Disseminated intravascular coagulation (DIC)	1	0.45
Fibroid uterus	1	0.45
Hepatitis B surface antigen (HBsAg) positive	1	0.45
Lupus nephritis	1	0.45
Peripartum cardiomyopathy	1	0.45
Polyhydramnios	2	0.91
Cholestasis of pregnancy	1	0.45
Retro positive	1	0.45
Rhesus factor (Rh) negative	5	2.27
Seizure disorder	1	0.45
Systemic lupus erythematosus (SLE)	2	0.91
Uterine rupture	1	0.45
Total	220	100

Discussion:

A stillbirth occurs when a baby dies either during or before delivery. Both the phrases stillbirth and miscarriage refer to the loss of a pregnancy, although they have differences depending on when the loss takes place. Stillbirth has numerous international definitions; with no one definition being universally accepted. It is usually challenging in comparing data on the stillbirth frequencies because there is no consistency on what defines a stillbirth [8]. A baby born at or after twenty-eight gestation weeks without any life signs is the definition approved by the WHO for international comparison [9].

In the current research, the 21 to 25 years (43.6%) age groups, followed by 26 to 30 years (28.2%) saw the highest rates of stillbirths, this could be compared to earlier Indian research studies where mothers between the ages of 20 and 30 years showed maximum stillbirths occurrence which is similar to study findings of Asalkar et al. from the Maharashtra, Lakshmi et al. from the Chennai, as well as Saxena et al. in Uttarakhand [10–12], this is because in India, a prevalence of early marriage as well as family completion among women is higher before 35 years of age which explains the greater stillbirths numbers as well as number of births in this group of age. This issue is intensified by a lack of knowledge with respect to difficulties associated with pregnancy and poor accessibility to obstetric care facilities. The findings obtained in a study carried out in Nepal were also similar, where the majority of patients i.e., 55.3%,

were between the ages of 20 and 30 years old, sharing cultural similarities with Indians [13].

Outcomes of pregnancy are also influenced by women's literacy levels as well as socioeconomic status. A well-educated mother takes on more responsibility when it comes to family planning and makes appropriate use of maternal services. According to this survey, 35 percent of the women who experienced stillbirths had completed their formal education between the 8th and 10th grades, and 24.5% had completed their PUC. In a normal Indian setting, where women are less educated and not aware of all the resources, more than half of the women (55%) belonged to the lower middle-class group. This can be compared to research study done by Saxena V et al., where 38.2% of the participants were illiterate, and Roy MP et al., where 40% of the participants were illiterate [12-14]. and the majority of patients in the study conducted in Nepal showed similarity as they had lower levels of education [15]. The majority of the women in the current investigation were from lower middle and middle socioeconomic backgrounds. In earlier Indian studies, a very substantial correlation between socioeconomic status as well as educational status was discovered. According to Kumari C et al., 84.2% of women came from class of lower socioeconomic background, and 79% of them were illiterate [15]. In a general scenario, low birth rates as well as mortality rates is seen in regions or nations with high literacy ratios in female. In Kerala, women are more likely to be literate than in other Indian states (74.04%), and the rate of stillbirths are 6% and 22%, respectively, as per NHFS [17,18].

Low birth weight (1 to 1.49 kg) was prevalent in the study populace at a rate of 23.2%. According to Mali et al., 143 (83.62%) of the research population showed low birth weight (< 2.5 kg), with very low birth weight (1000 to 1499 grams) as well as extremely low birth weight (500 to 999 grams) prevalences [19]. Sharma et al. (78%) also found similar outcomes [20]. Low birth weight stillbirths have a number of contributing factors which includes prematurity as well as fetal development restriction. In this research, it was discovered that there were 216 vaginal deliveries (98.2%), 1 (0.5%) forceps-assisted delivery, and 3 emergency LSS (1.4%). Contrarily, Mali et al. study's revealed that among stillbirths, 136 (79.53%) were delivered vaginally and 35 were cesarean sections (20.47%) [19]. Unless there is any contraindication, antepartum stillbirths are induced and delivered vaginally because there was high number of antepartum stillbirths in the Mali et al research study [19]. Similar findings were obtained by Saxena V. et al. in their study, which found that 85.6% of patients gave birth vaginally, 7.2% required C. section delivery, whereas 4.8% required an instrumental delivery.12 Most IUD patients give birth by vaginal route, though a C section may be necessary due to CPD (macrosomic baby) in some cases or any other obstetrical reasons.

As seen in studies by Ashish K. et al. in Nepal and Saxena V. et al. in Uttarakhand both of which found that multigravida was more prevalent among the study populace, increasing parity also contributed to stillbirths at a rate of (41.6%) [12,21]. However, according to Dasgupta S., primigravidas and women who become pregnant for the fifth time or more have a higher chances of stillbirth risk [22]. Hence,

as seen in studies by Ashish K. et al in Nepal as well as Saxena V. et al in Uttarakhand (41.6%) stillbirths are also contributed by increasing parity [12,21]. In our investigation, a higher percentage of stillbirths were seen in male neonates in comparison to female babies (54.6% vs. 45.5%). In comparison to female stillbirths (range 20 to 43 weeks, median gestation 30.5 weeks), male stillbirths are more likely to happen at a later gestation (range 20 to 40 weeks, median 25 weeks) [23,24]. It has been claimed that biologically boys are weaker compared to girls [25,26]. The male gender of the fetus was linked to greater stillbirth odds, according to two other Indian research study [27,28].

In investigations by Saxena V. et al. , Nayak as well as Dalal et al., who reported 22.2% of cases as unexplained and 16.8% of cases as unexplained stillbirth in their studies, there were more cases around 26.8% of cases where the aetiological factors were not found, indicating a greater rate [12,29]. Risk factors like severe preeclampsia, preeclampsia, abruption, hypothyroidism, gestational diabetes on insulin, cord causes, and PROM with prevalence rates were 26.8%, 13.6%, 1%, 0.5%, 6.8%, 6.4%, 3.2%, and 3.2%, respectively. Preterm delivery was 1.8% prevalent, and according to a study by Mali et al., there were 135 (78.94%) preterm births of all deliveries, 33 (19.29%) hypertensive disorders of pregnancy, 27 (15.79%) abruption cases, and 25 (14.62%) congenital malformations with stillbirths [19]. According to Neogi et al., mothers who have preterm babies are 4.5 times more likely to experience stillbirth than mothers who deliver full-term babies [30]. The preterm stillbirths in this research include both naturally occurring preterm deliveries plus preterm births that were induced due to various medical and obstetric issues. Several research conducted in India and other nations found a strong link between maternal hypertension and stillbirth [4,23,31,32]. Due to the fact that abruption is frequently linked to hypertensive disorder of pregnancy, women with preeclampsia must be carefully monitored, and prompt intervention is essential for lowering the burden of stillbirths linked to these disorders. There were 1.8% cases of oligohydramnios. In a study by Zile et al., it was discovered that oligohydramnios had a higher odd [24]. The febrile sickness was identified in 18% of instances, whereas gestational hypertension (47%) as well as diabetes were discovered in 27% of cases, respectively, by Lakshmi et al. from Chennai in south India [11] 25 % of stillbirths might occur because of maternal infection, according to Robert et al. [33] Direct fetal infection, chorioamnionitis, or placental damage are a few of the different mechanisms that might result in stillbirth. Early-stage pregnancy infections can result in subsequent congenital abnormalities and later stillbirth. The authors of the current investigation discovered 6.4% of instances suffering diabetes with stillbirth. APH associations were found by Ravikumar et al in 9.8% of cases and by Nayak and Dalal et al in 12.9% of cases. Uchil reported preeclampsia in 39.7% of cases [28,29,34]. According to a meta-analysis of factors of risk in developed nations, women who develop pregnancy-induced hypertension, eclampsia, or pre-eclampsia have a greater stillbirth risks [35]. Among the 220 participants in the study, other factors of

high-risk were RH negativity (2.27% Of), cervical incompetence (1.36%), polyhydramnios (0.91%), and SLE (0.91%),etc.

When compared to early gestational fetal mortality, which is thought to be caused by congenital abnormalities, intrauterine growth restriction, sepsis, and also underlying maternal medical conditions such as renal disease and APLA, late gestational fetal mortality seems to be caused by both maternal health conditions like gestational diabetes mellitus as well as obstetric events that typically occur at the moment of delivery, like previa and placental abruption, as well as other labor and delivery complications which includes shoulder dystocia, rupture uterus, obstructed labor, or unexplained cause.

The majority of intrapartum stillbirths occur in developing nations, where there is a great requirement for obstetric care [36]. Improved obstetric care, however, might be able to prevent many of these deaths [37]. In developed nations, there is a relatively low intrapartum stillbirth rate, which is mostly attributable to timely c - section delivery [30]. In addition, the availability of cesarean sections in developing nations was linked to a decline in the rate of intrapartum stillbirths [37,38]. But still, the lack of emergency obstetric care, in particular the need for a cesarean section, has been linked to an increased risk of intrapartum stillbirth, specially in situations of prolonged labor [39]. Though c- sections can be a life-saving interposition for both child as well as mother, research suggests that its usage, mainly in low-resource settings, may be linked to an increased perinatal mortality risk, particularly when it is carried out at a late stage [40].

4. Conclusion

This research demonstrates that the stillbirths incidence is linked to anemia, low socioeconomic status, living in rural regions, abruption, multiparity, gestational diabetes, hypothyroidism and severe pre-eclampsia. The stillbirth rates can be decreased with appropriate screening and antenatal care. A considerable proportion of stillbirths can be avoided with proper antenatal care. Awareness of antenatal care will rise as a result of increased female literacy as well as health education. At the first point of contact with the pregnant woman, medical and paramedical workers need to be emphasized on the significance of providing sufficient antenatal care, identifying high-risk cases, and timely referring them. Every antenatal appointment gives a healthcare professional the chance to screen the woman for any associated obstetric or medical high-risk conditions and institute treatment to address them, lowering the stillbirth risks. Improved access to appropriate obstetric care should significantly lower stillbirth rates in developing countries, especially during labor.

Conflicts of Interest:

There are no conflicts of interest for this study.

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