

*Original Research*

# Mode of Delivery in Women with Stillbirth: Results of an Area-Based Italian Prospective Cohort Study

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## Abstract

**Introduction:** The choice of the mode of delivery, in case of stillbirth (SB) (fetus non-viable >22 weeks' gestation), should consider maternal preference, gestational age, bishop score, the clinical condition of the woman, and her previous obstetric history. However, despite these clear indications, data on the effective implementation of the latter are lacking. The aim of our study is to evaluate the different modes of delivery in an Italian population of SBs, according to gestational age, parity, causes of death, obstetric history, and maternal characteristics. **Material and Methods:** This is an area-based, prospective cohort study conducted in Emilia Romagna, Italy between January 2014 to December 2020. Data included all cases of SB (>22 weeks). **Results:** From 2014 to 2020, 783 SB occurred out of a total of 232.506 births, with a SB rate of 3.3 per 1000. Labor was spontaneous in 85 (11%). Of remnant, 567 (73.6%) were induced and 118 (15.3%) had no labor. The mode of delivery was vaginal in most of the cases (649/770, 84.3%) and by cesarean section in 121/770 (15.7%) of cases. Emergency CS was most frequent and performed in 89/121 (73.5%) of total CS, representing 11.5% of SB deliveries. Mode of induction did not differ in relation to gestational age at stillbirth, while vaginal delivery was significantly higher in women induced with prostaglandins ( $p = 0.000$ ) respect to other methods. Nulliparous women had a significantly higher need for multiple methods of induction ( $p = 0.000$ ) respect multiparous and obese women used more frequently prostaglandins ( $p = 0.03$ ) than other methods. Women with a history of previous CS presented a significantly higher rate of repeated elective CS ( $p = 0.000$ ). Moreover, emergency CS was performed more frequent in obese ( $p = 0.02$ ), diabetic ( $p = 0.04$ ) and hypertensive ( $p = 0.04$ ) women and in SB caused by placenta disorders, namely in abruptio placentae ( $p = 0.000$ ). In the case of chorioamnionitis and funisitis women significantly were induced with prostaglandin ( $p = 0.000$ ) and delivered vaginally ( $p = 0.000$ ). **Conclusions:** The method of induction of labor and the mode of delivery in case of SB did not depend on gestational age at the diagnosis of death, while they are related to placenta disorders representing a relevant condition leading to emergency CS also after diagnosis of fetal death. These data could help obstetric providers in managing the deliveries of stillborn infants.

**Keywords:** stillbirth; delivery; induction; cesarean section; cause of death; ReCODE

## 1. Introduction

Despite the large number of stillbirths (SB) occurring every year (estimated at 2.6 million per year), global attention regarding this issue is still insufficient [1]. In Emilia-Romagna, a district in the North of Italy, a regional SB audit program has been implemented since 2014. SB rate in this area is one of the lowest in Europe (3.1 per 1000 births at 22 weeks, 2.3 per 1000 births at 28 weeks) [2]. There is a consensus among the reviewed guidelines that a thorough investigation is warranted, in case of SB, in order to identify the cause of death, ensure the appropriate management of the couple and prevent the recurrence in the subsequent pregnancies. As recommended by a recent review of the literature [3], this investigation should include a structured personal, obstetric, and family medical history of the mother, physical examination, laboratory tests (serology,

microbiological investigations), genetic analysis of the fetal and the placental tissues, histological examination of the placenta and postmortem autopsy.

The choice of the mode of delivery, in case of SB (fetus non-viable >22 weeks' gestation), should consider maternal preference, gestational age, bishop score, the clinical condition of the woman and her previous obstetric history [4–6]. As a rule, there is no need for an immediate birth and the timing of delivery should be planned according to women preferences, except for cases of signs of sepsis, preeclampsia, placenta abruptio or rupture of membranes at diagnosis of SB [7]. If delivery is postponed, it is recommended biweekly blood test execution to exclude DIC (disseminated intravascular coagulopathy) associated with prolonged retention of a dead fetus; uncommon event with an estimated risk of 10% after 4 weeks [8].



**Table 1. Maternal characteristics and pregnancy details.**

	Stillbirth (N = 783)
Maternal characteristics	
Mean maternal age	32.6 ± 5.9
Maternal age >35	299 (38.2)
Maternal education	
Low (<8 years)	147 (18.7)
Medium (8–13 years)	337 (43.0)
High (university)	187 (23.8)
unknown	112 (14.3)
Italian nationality	443 (56.6)
Country of origin	
Italy	416 (54.1)
East Europe	107 (13.9)
Central/West Europe	1 (0.1)
North African	89 (11.6)
Sub-Saharan African	80 (10.4)
Indopakistan	45 (5.8)
Chinese	7 (0.9)
Other far Eastern	1 (0.1)
SouthEast Asian	4 (0.5)
North American	2 (0.3)
South American	11 (1.4)
Other	20 (2.5)
Mean BMI	24.6 ± 5.5
BMI classes	
Underweight	37 (4.7)
Normal weight	392 (50.1)
Overweight	166 (21.2)
Obesity Class I	70 (8.9)
Obesity Class II	23 (2.9)
Obesity Class III	9 (1.1)
Unknown	86 (10.9)
Smoking habit	125 (16.0)
Alcohol consumption	1 (0.1)
Drugs use	42 (5.4)
Toxic substances	2 (0.3)
Pregnancy details	
Nulliparous	380 (48.5)
Twin pregnancy	57 (7.3)
Assistance	
Public	310 (39.6)
Private	192 (24.5)
None	268 (34.2)
≥2 ultrasounds	696 (88.9)
≥4 visits	562 (71.8)
Diabetes	93 (11.8)
Thyroid disease	123 (15.7)
Hypertension	
Chronic	35 (4.5)
Gestational	61 (7.8)
Lupus erithematosus	9 (1.1)

**Table 1. Continued.**

	Stillbirth (N = 783)
Cholestasis	5 (0.6)
Stillbirth	
Antepartum	722 (92.2)
Intrapartum	61 (7.8)
GA	32.3 ± 5.6
Classes of GA	
<27+6 w	199 (25.4)
28–33+6 w	202 (25.8)
34–36+6 w	137 (17.5)
37–40+6 w	210 (26.8)
≥41 w	17 (2.2)
Epidural analgesia	619 (79.0)
Congenital anomalies	58 (7.4)
IUGR	270 (34.5)

IUGR, intrauterine growth restriction; BMI, body mass index; GA, gestational age.

Vaginal birth, in the absence of absolute contraindications, is always recommended. The maternal request of cesarean section (CS), caused by the rejection of any “pain” related to the current pregnancy failure, should be discussed with the parents, giving them time to understand the situation and the risks for subsequent pregnancies such as placenta accrete or uterine rupture [9]. The CS should be performed only in particular circumstances (placental abruption, placenta previa, persistent transverse situation, etc.) or in presence of high risk of uterine rupture.

Several studies have evaluated methods for inducing termination of pregnancies in the second or third trimester [10,11]. These are various and included some drugs such as Dinoprostone (analogue PgE2), Misoprostol, Mifepristone and Oxytocin [11,12]; mechanical methods namely in women at high risk for uterine rupture, such as Cook Balloon or Foley [13] and alternative methods such as acupuncture, namely for women who refused pharmacological induction [14]. Misoprostol represents the most effective method under 28 weeks, as shown in the meta-analysis of Berghella V *et al.* [15] because was related to a shorter induction-delivery interval and a lower rate of complications respect with other methods. While Mifepristone should be used before Misoprostol for reduce the induction-delivery interval namely in cases of second trimester SB [16–18].

Finally, different studies [19,20] showed that the pharmacological analgesia must be offered and performed in every birth unit in case of SB at every gestational age.

However, despite these clear indications on the most appropriate practices to be adopted in the management of the delivery of stillborn babies, data on the effective implementation of the latter (and on their effectiveness) (in Italy) are lacking.

Thus, the aim of our study is to evaluate the different mode of delivery in a SB Italian population through a prospective cohort study, according to gestational age, parity, causes of death, obstetric history, and maternal characteristics.

## 2. Material and Methods

This is an area-based, prospective cohort study with information collected within the Surveillance System, active since 2014 in Emilia-Romagna, Italy. Data included cases of SB between January 2014 to December 2020. The diagnosis of SB was based on the World Health Organization (WHO) recommendation [4] and was defined as fetal death at 22 weeks (154 days) of gestation or greater, or a birthweight of 500 g if the gestational age was unknown. According to WHO's recommendation, late SB was defined as a fetus of 1000 g and/or 28 weeks of gestation or greater, and early SB as a fetus with a gestational age between 22 and 27. Maternal demographics (including maternal age, country of origin, and education level), obstetric history, presence of risk factors, antenatal investigations were collected. Gestational age at delivery, birthweight, placenta weight, induction of labor, mode of delivery, analgesia, and circumstances of the SB were recorded together with the list of tests of the diagnostic work-up included placental histology, stillborn autopsy, microbiological evaluation, maternal blood tests, maternal serologic status for infections, cytogenetic analysis, flow cytometry for the research of fetal-maternal hemorrhage and neonate inspection by a neonatologist.

Causes of death were attributed through a multidisciplinary local audit and primary and associated relevant conditions at death were categorized using ReCODE classification [21]. The multidisciplinary team included at least an obstetrician, a neonatologist, and a pathologist.

The present analysis of data was performed in agreement with the Regional Council's resolution [22] and requested by the Birth Regional Commission in order to evaluate mode of delivery in women with diagnosis of SB. Information was stored anonymously in a secure database. Informed consent for diagnostic work-up was not required because in Italy diagnostic investigation is mandatory by law in case of SB (D.M. 7/2014 and D.P.C. 170/99). Mother and fetus privacy was ensured during the phase of data collection and analysis.

### *Definitions and Statistical Analysis*

All relevant sociodemographic, pregnancy and perinatal variables (risk factors for SB, maternal diseases, causes of death, associated conditions, conditions at deliveries, mode of induction and quality of cares) were collected in a database. Because of privacy restrictions, and to create a safe and secure environment for audit participants, the database was anonymous.

Data were analyzed using statistical package Stata 16.1 (StataCorp. 2019. College Station, TX, USA). Continuous variables are reported as mean  $\pm$  standard deviation (SD). Categorical variables are reported as the absolute and percentage frequencies. All probability values were 2-tailed, and a probability value of  $<0.05$  was considered statistically significant. After interaction was verified, comparisons between the "mode of delivery" and "causes of death" and "mode of induction" and "causes of death", were made using the t-student test for continuous variables and the chi-square test for categorical ones. Multivariate analysis was performed to evaluate the variables associated with the risk for emergency CS, including obesity, diabetes, hypertension and placental disorders. Results of logistic regression are reported as the Odds Ratio (OR) with 95% confidence interval and Wald  $p$ -value.

## 3. Results

From 2014 to 2020, 783 SB occurred out of a total of 232,506 births, with a SB rate of 3.3 per 1000. Of these SB, 199 (25.4%) occurred before 28 weeks and 584 thereafter (74.6%), yielding a late SB rate of 2.5 per 1000. Sixty-one cases (7.8%) occurred after the onset of labor and were considered intrapartum. Fifteen seven cases (7.3%) originated from multiple pregnancies. Mean maternal age was 32.6 years, in line with the last Birth Report of the same area (32 years). The rate of women  $>35$  years was 38.2% in SB population comparing with 34.7% of the overall population [23].

Our population was heterogeneous in term of ethnicity: there were 416 (54.1%) Italian women, the others were from North Africa (11.6%), East Europe (13.9%), Sub-Saharan Africa (10.4%), Indian Subcontinent (6.8%) and other countries (3.2%). Other maternal characteristics and pregnancy details were reported in Table 1.

Data on the mode of delivery were recorded in 770/783 cases. Thus, labor was spontaneous in 85 (11%). Of remnant, 567 (73.6) were induced and 118 (15.3%) had no labor. Mode of delivery was vaginal in most of cases (649/770, 84.3%) and by cesarean section in 121/770 (15.7%) of cases. Emergency CS was most frequent and performed in 89/121 (73.5%) of total CS, representing 11.5% of SB deliveries.

The classification of causes of death by ReCODE found in our study is presented in Table 2.

Pregnancy details, risk factors according to mode of induction are showed in Table 3. Among induced women, the majority received prostaglandins (394/770), then 97/770 underwent to multiple methods induction and finally 72/770 received only Oxytocin. Mode of induction did not differ in relation with gestational age at stillbirth, while vaginal delivery was significantly higher in women induced with prostaglandins ( $p = 0.000$ ) respect than other methods. Moreover, nulliparous women had a significantly higher need for multiple methods of induction ( $p = 0.000$ )

**Table 2. Primary causes of Stillbirth according to ReCODE classification.**

	Primary Stillbirth causes (N = 770)	N	%	%
Group A: Fetus	A1. Lethal congenital anomaly	39	5.1	20.5
	A2. Infection	41	5.3	
	A3. Non-immune hydrops	4	0.5	
	A4. Isoimmunisation	1	0.1	
	A5. Fetomaternal haemorrhage	14	1.8	
	A6. Twin to twin transfusion	7	0.9	
	A7. Fetal growth restriction*	49	6.4	
	A8. Multivisceral hemorrhage	0	0.0	
	A9. Visceral or infartual lesions	2	0.3	
Group B: Umbilical cord	B1. Prolaps	0	0.0	13.0
	B2. Constricting loop or knot	54	7.0	
	B3. Velamentous insertion	4	0.5	
	B4. Other	42	5.4	
Group C: Placenta	C1. Abruptio	98	12.7	37.0
	C2. Praevia	0	0.0	
	C3. Vasa praevia	0	0.0	
	C4. Other “placental insufficiency”***	131	17.0	
	C5. Chorioamnionitis	37	4.8	
	C6. Other	18	2.3	
Group D: Amniotic fluid	D1. Intramniotic infection	2	0.3	0.3
	D2. Oligoidramnios	0	0.0	
	D3. Polidramnios	0	0.0	
	D4. Other	0	0.0	
Group E: Uterus	E1. Uterine rupture	8	1.0	1.0
	E2. Uterine anomalies	0	0.0	
	E3. Other	0	0.0	
Group F: Maternal diseases	F1. Diabetes	19	2.5	5.1
	F2. Thyroid diseases	3	0.4	
	F3. Essential hypertension	3	0.4	
	F4. Hypertensive diseases in pregnancy	13	1.7	
	F5. Lupus or antiphospholipid syndrome	1	0.1	
	F6. Cholestasis	0	0.0	
	F7. Drug misuse	0	0.0	
	F8. Other	0	0.0	
Group G: Intrapartum	G1. Asphyxia intrapartum	13	1.7	1.7
	G2. Birth	0	0.0	
Group H: Trauma	H1. External	2	0.3	0.3
	H2. Iatrogenic	0	0.0	
Group I: Unclassified	I1. No relevant condition identified	126	16.4	21.5
	I2. No information available	39	5.1	

\*\* histological diagnosis; \* <10th customised weight for gestational age centile.

respect multiparous and obese women used more frequently prostaglandins ( $p = 0.03$ ) than other methods.

Mode of delivery in relation with obstetric characteristics are resumed in Table 4. Women with history of previous CS presented a significantly higher rate of repeated elective CS ( $p = 0.000$ ) both in case of one or two previous CS. Moreover, emergency CS was performed more frequent in obese ( $p = 0.02$ ), diabetic ( $p = 0.04$ ) and hypertensive ( $p =$

$0.04$ ) women. However, at the multivariate analysis including obesity, diabetes, hypertension and placental disorder, the risk of emergency CS resulted statistically significant only for placental disorders (OR = 2.03, 95% CI 1.24–3.28,  $p = 0.004$ ).

Based on the primary causes of death (Table 3), women with SB caused by fetal or maternal causes used multiple methods for induction of labor ( $p = 0.008$ )

**Table 3. Pregnancy details and risk factors according to Mode of induction.**

	None (N = 205)	Oxytocin (N = 72)	Prostaglandin (N = 394)	Multiple method (i.e., Balloon) (N = 97)	<i>p</i> value
GA classes					0.56
<28	63 (30.7)	15 (20.8)	98 (24.9)	24 (25.5)	
28–33+6	52 (25.4)	17 (23.6)	107 (27.2)	27 (27.8)	
34–36+6	35 (17.1)	13 (18.1)	77 (19.5)	13 (13.4)	
37–40+6	52 (25.4)	24 (33.3)	103 (26.1)	30 (30.9)	
≥41	3 (1.5)	3 (4.2)	9 (2.9)	3 (3.1)	
Delivery Mode					0.000
Vaginal	89 (43.4)	71 (98.6)	392 (99.6)	96 (99.0)	
Elective CS	30 (14.6)	0	1 (0.2)	1 (1.0)	
Emergent CS	86 (42.0)	1 (1.4)	1 (0.2)	0	
Nulliparous	93 (45.4)	56 (77.8)	159 (40.5)	74 (78.7)	0.000
Previous CS					0.000
1	36 (41.0)	4 (13.3)	29 (7.4)	7 (7.2)	
2	5 (2.4)	1 (3.3)	1 (0.2)	0	
3	1 (0.5)	0	1 (0.2)	0	
Obesity	34 (16.6)	6 (8.3)	52 (13.2)	6 (6.2)	0.22
Diabetes	25 (12.2)	4 (13.3)	18 (11.0)	6 (15.0)	0.92
Gestational hypertension	18 (8.7)	3 (4.2)	23 (5.8)	17 (17.5)	0.03
Thyroid disease	29 (14.1)	10 (13.9)	57 (14.5)	27 (27.8)	0.12
LES	1 (0.5)	0	6 (1.5)	2 (2.1)	0.94
Country of origin					0.50
Italy	114 (55.3)	44 (61.1)	225 (57.1)	62 (63.9)	
Other	92 (44.6)	28 (38.9)	169 (42.9)	35 (36.1)	
Low maternal education (8 years)	34 (16.6)	10 (13.8)	85 (21.6)	18 (18.5)	0.83
Smoking habit	37 (17.9)	11 (15.3)	56 (14.2)	21 (21.6)	0.39
Assistance					0.000
Public	71 (34.5)	30 (41.7)	170 (43.1)	40 (41.2)	
Private	34 (16.5)	23 (31.9)	104 (26.4)	30 (30.9)	
None	101 (49.0)	19 (26.4)	120 (30.5)	27 (27.8)	
Primary cause of death ReCODE					0.008
A (Fetal)	36 (17.5)	12 (17.1)	85 (21.6)	23 (23.7)	
B (Cord)	24 (11.6)	10 (14.3)	53 (13.5)	13 (12.7)	
C (Placenta)	100 (48.5)	28 (40.0)	122 (31.0)	34 (34.1)	
D (Amniotic fluid)	0	0	2 (0.5)	0	
E (Uterus)	4 (1.9)	0	3 (0.8)	1 (1.1)	
F (Maternal disease)	3 (1.5)	3 (4.3)	24 (6.1)	9 (9.6)	
G (Intrapartum)	10 (4.8)	2 (2.8)	1 (0.2)	0	
H (Trauma)	1 (0.5)	0	1 (0.2)	0	
I (Unclassified)	28 (13.6)	15 (21.4)	102 (25.9)	17 (18.1)	

GA, gestational age; CS, cesarean section; LES, lupus erithematosus.

and women with unexplained SB used more frequently prostaglandin as a method of induction ( $p = 0.008$ ). Women with SB caused by placenta disorders did not use any method ( $p = 0.008$ ) because they frequently underwent a CS.

When analyzing the different placenta disorders, we found that in the case of abruptio placentae women significantly did not use any method of induction ( $p = 0.000$ ) and delivered by emergent CS ( $p = 0.000$ ); while in the case of chorioamnionitis and funisistis women significantly were induced with prostaglandin ( $p = 0.000$ ) and delivered vaginally ( $p = 0.000$ ).

## 4. Discussion

Our study on a large population of SB registered a rate of 3.3 per 1000, in line with other developed and European countries [4]. Most of those women delivered, as expected, with induction and only 15.7% with cesarean section. Appropriate methods for labor induction vary based on gestational age at the time of fetal death, previous obstetric histories such as cesarean section and maternal preference. In our population, SBs were induced equally with prostaglandins including misoprostol, multiple methods, and oxytocin regardless of gestational age, contrarily to what is reported by previous RCT data [18,24] and metanal-

**Table 4. Delivery Mode and obstetric characteristics.**

	Vaginal (N = 648)	Elective CS (N = 32)	Emergent CS (N = 89)	<i>p</i> value
Nulliparous	333 (51.4)	11 (35.5)	39 (43.8)	0.04
Previous CS				0.000
0	598 (92.3)	19 (59.4)	0.39	
1	47 (7.3)	11 (34.4)	0.02	
2	2 (0.6)	2 (6.2)	0.04	
3	1 (0.1)	0	0.04	
GA classes				0.39
>28	117 (27.3)	6 (18.7)	0.69	
28–33	161 (24.8)	11 (34.4)	0.86	
34–36	113 (17.4)	7 (21.8)	0.92	
37–40	181 (27.9)	7 (21.8)	0.30	
≥41	16 (2.5)	1 (3.1)	0.000	
Obesity	84 (12.9)	1 (3.1)	16 (17.9)	0.02
Diabetes	76 (11.7)	1 (3.1)	15 (16.8)	0.04
Hypertension	46 (7.1)	1 (3.1)	14 (15.7)	0.04
Thyroid disease	103 (15.9)	6 (18.7)	14 (15.7)	0.90
LES	9 (1.4)	0	0	0.69
Country of origin				0.86
Italy	375 (57.8)	20 (62.5)	0.04	
Other	274 (42.2)	12 (37.5)	0.90	
Low maternal education (8 years)	127 (22.4)	5 (17.2)	15 (19.5)	0.92
Smoking habit	105 (16.2)	9 (28.1)	12 (13.5)	0.30
Assistance				0.000
Public	273 (42.1)	5 (15.6)	0.30	
Private	167 (25.7)	4 (12.5)	0.000	
None	209 (32.2)	23 (71.8)	0.000	
Primary cause of death ReCODE				0.000
A (Fetal)	142 (21.9)	2 (6.2)	13 (14.6)	
B (Cord)	85 (13.2)	4 (12.5)	11 (12.4)	
C (Placenta)	217 (33.6)	16 (50.0)	51 (57.3)	
D (Amniotic fluid)	2 (0.3)	0	0	
E (Uterus)	4 (0.6)	0	4 (4.5)	
F (Maternal disease)	36 (5.6)	1 (3.1)	2 (2.2)	
G (Intrapartum)	13 (2.0)	0	0	
H (Trauma)	2 (0.3)	0	0	
I (Unclassified)	145 (22.4)	9 (28.1)	8 (8.9)	

GA, gestational age; CS, cesarean section; LES, lupus erithematosus.

ysis [15]. They indeed evaluated misoprostol (both oral and vaginal) as the most efficient method of induction before 28 weeks. In our population prostaglandins and oxytocin were used equally in second and third trimester as demonstrated by several studies [16,25–27]. In our population Mifepistone was not usually used, nevertheless Perritt *et al.* [17] demonstrated that Mifepristone (either 200 or 600 mg orally) can be used as an adjunct to misoprostol for induction of labor in the setting of SB because it reduces the time to delivery when compared with misoprostol alone.

Women with previous CS (either one or two) delivered in our study more frequently with elective CS. Moreover, our data showed that the mode of delivery is not influenced by the gestational age, indeed the rate of caesarean sections does not vary in relation to the gestational age classes. This

datum does not confirm the ACOG guidelines [28], where appears that mode of induction and delivery are related with gestational age (28 weeks) and previous uterine scar. Indeed, in these patients the ACOG guidelines recommend the use of mechanical method with Balloon or Foley and the individualization of the delivery plan in case of previous multiple CS, based on the specific circumstances and patient preference [6].

According to our results, we could speculate that Italian obstetric providers fear the uterine rupture, also in the management of stillborn delivery, in women with previous uterine scar. Nevertheless, in our population the rate of CS was about 16% of cases, lower respect with other Spanish study [29] where 22.9% of stillbirths ≥26 weeks gestation was delivered by CS, with a significant ( $p < 0.001$ ) differ-

ence between public hospitals (16.8%) and private hospitals (41.5%). Interestingly, in our stillborn population, the rate of emergency CS was 11%, and these were performed predominantly in obese, diabetic, hypertensive women, and in those cases of placental primary cause of death, confirming the higher incidence of acute events (i.e., abruptio placentae) in these pathologic women [30]. Thus, the need of emergent CS in these situations explains the physicians' attempt to save the baby and the uterus through a fast delivery.

Epidural analgesia was performed in most cases of SBs (80%), considering also that 16% of women underwent a CS. This data showed that, in the same area, in case of SB the request of epidural analgesia was significantly higher respect with the women who deliver a live fetus, who used this method in 25% of cases, while benefit from non-pharmacological methods in 73% of cases [23]. This datum confirms that our assistance respects recent guidelines [5] which recommend the use of labor analgesia services in cases of stillbirth, showing a better and sensible care than that offered by Japanese health, where epidural analgesia is poorly used [19].

Our assistance offered the possibility to delay the admission to the hospital for these patients, nevertheless only few cases experimented this plausible option as demonstrated by Muin DA *et al.* [31] who did not find significant difference regarding delivery mode, labor duration, use of intrapartum analgesia, need for episiotomy and risk of perineal injury and antepartum hemorrhage between the groups of immediate and delayed admission in a population of stillbirths.

The limitation of our study is the lack of data about the time between induction to delivery and the absence of cases that experimented the delayed admission to the hospital.

To the best of our knowledge, this is among the largest prospective area-based study on a stillbirth population where each case was carefully investigated and classified, evaluating then the mode of delivery as well as the mode of induction in relation with the different causes of death.

## 5. Conclusions

In conclusion our data showed that the method of induction of labor and the mode of delivery in case of stillbirth did not depend on gestational age at the diagnosis of death, while they are related to placenta disorders, representing relevant conditions leading to emergency CS also after diagnosis of fetal death. These data could help obstetric providers in managing the deliveries of stillborn infants.

## Consent for Publication

Authors obtained written informed consent for the study and publication.

## Availability of Data and Materials

The datasets generated during and/or analyzed during the current study are available from the corresponding author on reasonable request.

## Author Contributions

FM and FF conceived the study. CS, FM, VD, BM and FM managed the data collection. DM and IN managed the analysis of the data. Drafting of the manuscript was led by DM, FM with input from FF, who give the final approval of the version to be published. All authors have read and approved the final manuscript.

## Ethics Approval and Consent to Participate

The Ethical approval for this study was obtained from the local institutional review board (35265-24/11/21).

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## Conflict of Interest

The authors declare no conflict of interest.

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