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Incidence and Risk Factors Associated with Birth Asphyxia in South Indian Newborns—Part I

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Abstract

Birth asphyxia is the leading cause of preventable proportion of neonatal morbidity and mortality, has a high incidence in many Asian countries. The objective of the study was to determine the incidence and influence of various antepartum, intrapartum and neonatal risk factors associated with birth asphyxia in Ethnic Asian-South Indian newborns and to formulate appropriate Asian guideline as preventive strategy. The study comprised of 2,750 consecutive singleton live births, with 583 "Cases" of birth asphyxia and 2,167 "Controls" without asphyxia. Analysis was done using SPSS Version 21 for various risk factors associated with birth asphyxia presented at different intensity levels as odds ratio (OR), mean difference (95% CI), number or percent (%) by binary logistic regression and statistical significance set at 0.05. Incidence of birth asphyxia was 21.2%, peak births of asphyxiated cases occurred at 39 weeks, contrasted to 38 weeks in controls. High risk factors included primigravida OR 1.1 [CI 95%] 0.89-1.29, pregnancy induced hypertension OR 1.37, [CI 95%] 0.92-2.04, P=0.0001, breech presentation OR 20.6 [CI95%] 4.5-94.3, P=0.0001, meconium staining of liquor OR 29 [CI 95%] 19.78-42.65, P=0.0001, oligohydraminos OR 29 [CI 95%] 19.78-42.65, P=0.0001 and cord abnormalities OR 2.9 [CI 95%] 2.18-3.88, P=0.0001. Most asphyxiated cases were delivered by emergency lower segment cesarean section OR 4.91 [CI 95%] 3.94-6.10, P=0.0001, while elective or planned LSCS had low risk of birth asphyxia, Neonatal factors include prematurity < 37 weeks OR 1.36 [CI 95%] 1.03-1.79, P=0.032 and Low Birth Weight (LBW) < 2500g OR 1.51 [CI 95%] 1.21-1.98, P=0.0001. Thus judicious intervention in high risk pregnancy with delivery at 38 weeks, preferably by planned section, obviating intrapartum events will result in reduction of birth asphyxia, thus improving quality of life in survivors.

Keywords

Birth asphyxia, risk factors, preventive strategy, Asian population

1. Introduction

Birth asphyxia defined as failure to initiate or sustain adequate respiration requiring immediate resuscitation at birth, constitutes a preventable proportion of perinatal and neonatal morbidity and mortality in Asian countries with high perinatal mortality rates, unlike western countries who have almost eliminated birth asphyxia with digit figure perinatal mortality rates [1-4]. Globally the World Health Organization estimates that each year about 4 and 9 million newborns suffer from asphyxia, leading to an estimated 1.2 million deaths with more than a million infants developing severe disabilities. India has a population of over 1.3 billion with 124, 419, 96 thousand births

each year and 4%-6% fail to establish spontaneous respiration at birth, while WHO reports that globally 29% neonatal deaths are caused by birth asphyxia [4, 5]. The incidence of birth asphyxia varying between 20%-40% is high in many Asian countries with asphyxiated infants having 34.5-fold increased risk of dying as compared to non-asphyxiated infants [1-5], also the relative risk of death among asphyxiated versus non-asphyxiated neonates increased with increasing birth weight, indicating the fatal impact of asphyxia was more in larger babies who otherwise had a good chance of survival [1, 5].

This is just the tip of the iceberg as up to nearly half of survivors have permanent neurological deficits ranging from severe neurologic deficits such as cerebral palsy, mental retardation, seizures, blindness or severe hearing impairment, to mild effects of autism, cognitive impairment, inability to develop fine motor skills, memory and mood disturbances and reduced intelligent quotient scores, depending on the extent of insult [6-8]. Since mild perinatal hypoxia occurs more frequently than severe events, there is substantial long-term effect on the population with a larger proportion of adults at increased risk of low IQ score < 80 with poor scholastic performance [8].

Intrapartum factors have maximum impact on fetal and neonatal outcome as a result of oxygen deprivation causing fetal hypoxemia, hypercarbia and acidosis with metabolic imbalance, due to lactic acid accumulation occurring within minutes causing cell damage and necrosis followed by 'reperfusion injury' with release of oxygen free radical from damaged cells by lactate dehydrogenase, leading to progressive cerebral edema and programmed apoptosis due to accumulation of excitatory amino acid with malfunction of mitochondria causing secondary energy failure, encephalopathy, multi-organ complications and death [9]. Prevention pays and implementation of specific obstetric strategy in ethnic Asian-Indian population with timely intervention and immediate resuscitation at birth will result in improved fetal and neonatal wellbeing.

2. Aim

The retrospective study was undertaken:

- To determine incidence of birth asphyxia in South Indian new born.
- To identify various risk factors associated with birth asphyxia during antepartum and intrapartum and fetal or neonatal risk factors.
- To determine intensity levels between birth asphyxia and various high risk factors by binary logistic regression, as odds ratio (OR), mean difference (95% CI), number or percent (%).
- To formulate an effective preventive strategy in reducing birth asphyxia in ethnic Asian-Indian population, thereby improving fetal and neonatal outcome.

3. Methods

Neonates with gasping or absent respiratory efforts at birth, requiring resuscitation to initiate and sustain rhythmic respiration, termed as "cases" are compared to "controls" who establish spontaneous respiration at birth. The assessment of various ante partum risk factors or events occurring before childbirth in reference to maternal age, birth order, obstetric complications of PIH, diabetes and premature rupture of membrane (PROM) of the amniotic sac and chorion occurring more than one hour before onset of labor as well as intrapartum risk factors or events occurring during labor and delivery such as breech presentation, mode of delivery, cord abnormalities, meconium staining of liquor etc. including neonatal risk factors such as birth weight, gestation and gender.

A total of 2,750 consecutive singleton live births from January 1st 2015 to 31st May 2017 at Shifa hospital, a multispecialty center in the Metropolitan city of Bangalore, South India, were included in the study. Exclusion criteria were 22 twin delivery and 46 stillbirths. Sources of data were Labor room and neonatal records. Various risk factors associated with birth asphyxia presented at different intensity levels as odds ratio (OR), mean difference (95% CI), number or percent (%) by binary logistic regression, and statistical significance set at 0.05. Data analysis and statistical significance was done using SPSS Version 21. Mean and standard deviation were used for continuous data while frequency and percentage were calculated for categorical data. Risk factors were grouped into antepartum, intrapartum and fetal or neonatal variables.

4. Results

The incidence of birth asphyxia was 21.2%, comprising 583 cases of 2,750 singleton live births, who required resuscitation at birth to establish spontaneous rhythmic respiration and 2,167 controls with spontaneous onset of respiration.

4.1. Antepartum Risk Factors for Birth Asphyxia

4.1.1 Mother's Age

Teenaged mothers had a higher risk of birth asphyxia, followed by older mothers 25-29 years and those above 35 years. Mother's below 24 years were associated with OR 1.1 [CI 95%] 0.89-1.29 times compared to older mothers aged 25 years and above, seen in Table 1. The number of cases according to age of mother, revealed an equal distribution of 36.7% in both age groups of 20-24 and 25-29 years respectively, while controls peaked 40% at 20-24 years, seen in Figure 1.

Table 1. Antepartum risk factors associated with birth asphyxia

Category	Cases No. (%)	Controls No. (%)	CI/95%	P value	OR
		Mother's Age			
≤24	254 (46.4%)	995 (48.1%)	0.89-1.29	0.49	11.1
≥25	293 (53.6%)	1,074 (51.9%)	Ref		
		Gravida			
1	258 (44.8%)	634 (29.7%)	0.92-2.04	0.1	1.4
2	139 (24.1%)	670 (31.4%)	0.46-1.06	0.1	0.7
3	87 (15.1%)	495 (23.2%)	0.38-0.91	0.1	0.7
4	56 (9.7%)	217 (10.2%)	0.54-1.40	0.6	0.9
5			Ref		
		PIH			
Yes	66 (11.%3)	89 (4.1%)	2.14-4.16	0.0001	3.0
No	517 (88.7%)	2,078 (95.9%)	Ref		
		Diabetes			
Yes	37 (6.3%)	110 (5.1%)	0.86-1.86	0.227	1.3
No	546 (93.7%)	2,057 (94.9%)	Ref		
		PROM			
Yes	48 (8.2%)	152 (7%)	0.85-1.67	0.315	1.2
No	535 (91.8%)	2,015 (93.0%)	Ref		

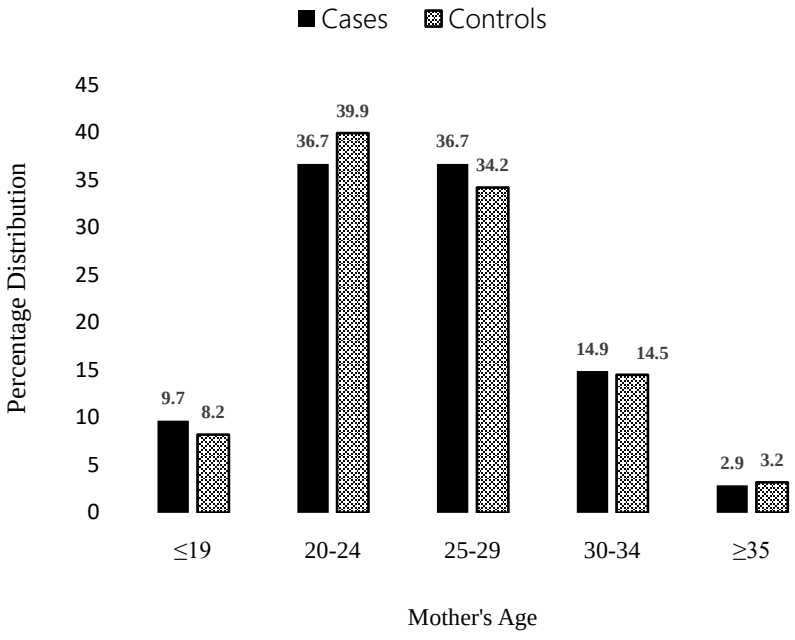

Figure 1. Percentage distribution of cases and controls in relation to mother's age.

4.1.2 Gravida

Primigravidity or first birth infants were thus associated with a higher risk OR 1.37, [CI 95%] 0.92-2.04, though not statistically significant P=0.124 seen Table 1. Primigravida mothers comprised a majority 258 (45%) of cases, compared to 29.7% controls without birth asphyxia. Second gravida mothers had a maximum 670 (31.4%) controls compared to 21.4% of cases seen in Figure 2.

4.1.3 Obstetric Complication

PIH

The obstetric complications of Pregnancy induced Hypertension (PIH) was associated with a statistically significantly higher risk of birth asphyxia at OR 2.981 [CI 95%] 2.14-4.16, P=0.0001. PIH occurred in 5.6% (n=155) live births, with 11.3% (n=66) asphyxiated cases compared to 4.1% (n=89) controls with PIH, seen in Table 1.

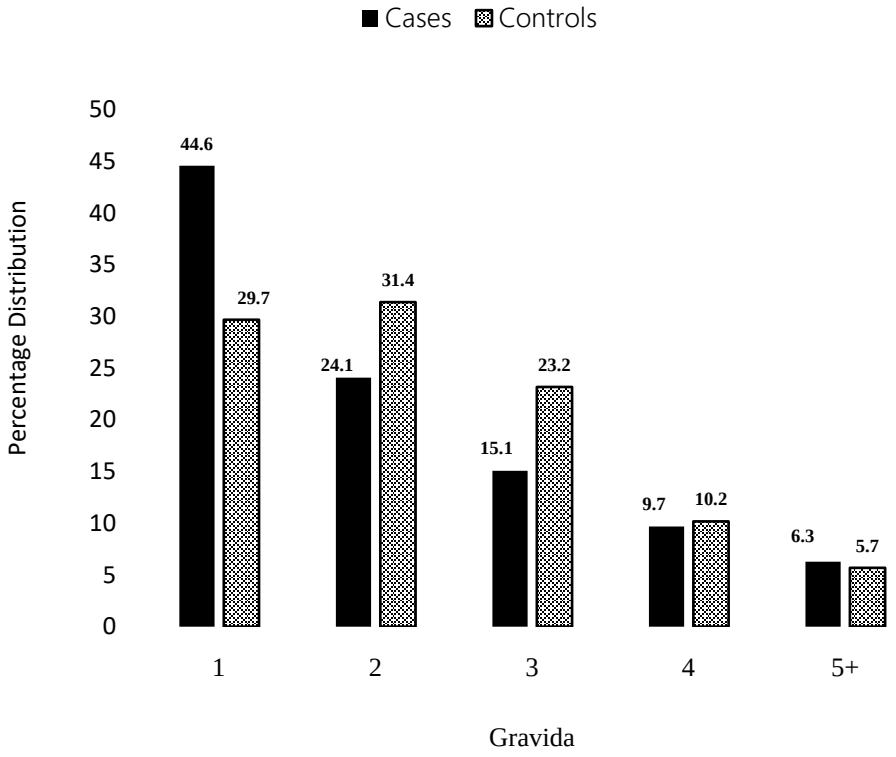

Figure 2. Percentage distribution of cases and controls in relation to gravida.

Diabetes

Gestational diabetes was associated with risk of birth asphyxia OR 1.27, [CI 95%] 0.86-1.86, not statistically significant P=0.227. Diabetes occurred in 5.3% (n=147) live births, with 5.1% (n=110) asphyxiated cases seen in Table 1.

PROM

So also, PROM or leaking membranes of more than one hour prior to onset of labor was associated with risk for birth asphyxia OR 1.19 [CI 95%] 0.85-1.67 though not statistically significant P=0.315. PROM occurred in 7.3% (n=200) live births, with 8.2% (n=48) asphyxiated cases compared to 7% (n=152) controls with PROM, seen in Table 1.

4.2. Intra-partum Risk Factors for Birth Asphyxia

4.2.1 Presentation

Intrapartum risk factors according to presentation revealed breech presentation with high risk of birth asphyxia OR 8.42 [CI 95%] 5.1-14 times of high statistical significance P=0.0001. While others such as transverse or oblique lie had even higher risk of birth asphyxia OR 20.6 [CI 95%] 4.5-94.3 times, also highly statistically significant P=0.0001 in contrast most controls were vertex presentations seen in Table 2.

Table 2. Intra-partum risk factors of Birth asphyxia

Category	Cases No. (%)	Controls No. (%)	CI/ 95%	P value	OR
		Presentation			
Vertex	518 (90.1%)	2,134 (98.8%)	Ref		
Breech	47 (8.2%)	23 (1.1%)	5.06-13.99	0.0001	8.4
Others	10 (1.7%)	2 (0.1%)	4.5-94.29	0.0001	20.59
		Amniotic Fluid Characteristics			
Clear	363 (62.4%)	2,072 (95.7%)	Ref		
Meconium stain	173 (29.7%)	34 (1.6%)	19.78-42.65	0.0001	29.04
Oligohydramnios	45 (7.7%)	52 (2.4%)	3.26-7.48	0.0001	4.94
		Mode of Delivery			
Normal	166 (28.5%)	1,284 (59.3%)	Ref		
Emergency LSCS	293 (50.3%)	462 (21.3%)	3.94-6.10	0.0001	4.91
Elective LSCS	53 (9.1%)	351 (16.2%)	0.84-1.63	0.358	1.17
Vacuum Ext	71 (12.2%)	68 (3.1%)	5.58-11.69	0.0001	11.7
		Cord Abnormalities			
Yes	89 (15.9%)	128 (6.1%)	2.18-3.88	0.0001	2.91
No	470 (84.1%)	1,967 (93.9%)	Ref		

4.2.2 Aminotic Fluid Characteristics

Fetal distress usually associated with meconium staining of liquor had a high risk of birth asphyxia, OR 29 [CI 95%] 19.78-42.65 being highly statistically significant P=0.0001. Almost all, 2072 (95.7%) controls had clear liquor; in contrast only two-thirds (62.4%) of cases had clear liquor. Meconium staining of liquor in 207 had a majority (83.5%) newborns asphyxiated at birth, while half (46%) of those with oligohydraminos OR 29 [CI 95%] 19.78-42.65suffered birth asphyxia, seen in Table 2.

4.2.3 Mode of delivery

According to mode of delivery 28.5% asphyxiated cases were born by normal vaginal birth compared to 60% controls, since most 50.3% of cases were delivered by emergency LSCS with OR 4.91, [CI 95%] being 3.94-6.10 times normal delivery, highly statistically significant P=0.0001. The incidence of LSCS was 42.1%. In contrast, most 59.3% of controls or well babies were born by normal vaginal delivery. While elective LSCS deliveries was associated with low risk of birth asphyxia, OR 1.67 [CI 95%] 0.84-1.63, being statistically insignificant P=0.358. Though vacuum extraction comprised 11% of births, it was associated with a significant higher risk of birth asphyxia, OR 8 [CI 95%] 5.58-11.69, being highly statistically significant P=0.0001, seen in Table 2 and Figure 3.

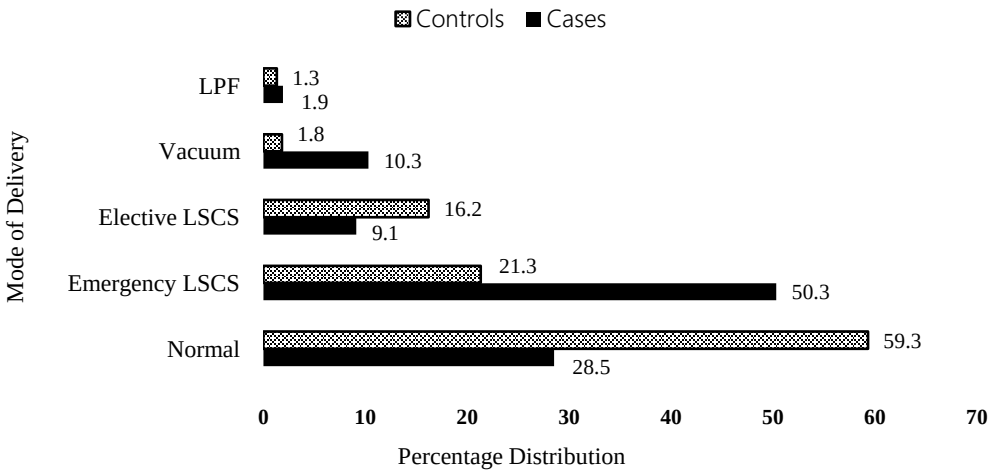

Figure 3. Percentage distribution of cases and controls according to mode of delivery.

4.2.4 Cord Abnormalities

Abnormalities of cord such as cord round neck, prolapse of cord etc.. was associated with high risk OR 2.9 [CI 95%] 2.18-3.88 times, being highly statistically significant P=0.0001, with twice as many 15% of cases had cord round neck, etc., compared to only 6% seen in Table 2.

4.3. Neonatal risk factors for birth asphyxia

4.3.1 Gestation

Premature newborns < 37 weeks gestation, were at a higher risk OR 1.36 [CI 95%] 1.03-1.79, when compared to newborns with term gestation 37 weeks and above, being statistically significant P=0.032. Majority peak births 24% cases with asphyxia took place at 39 weeks with 22% at 38 weeks. In contrast, most 27% controls or well babies were born earlier at 38 weeks followed by 24% at 39 weeks. Peak births of asphyxiated cases at 39 weeks compared to controls being statistically significant P=<0.001, seen in Table 3 and Figure 4.

Table 3. Neonatal risk factors of Birth asphyxia

Category	Cases No. (%)	Controls No. (%)	CI/ 95%	P value	OR
		Gestation in weeks			
<37	77 (14.0%)	221 (10.7%)	1.03-1.79	0.032	1.36
≥37	472 (86%)	1,838 (89.3%)	Ref		
		Birth weight in grams			
<2,500g	14 (24.6%)	382 (17.8%)	1.21-1.88	0.001	1.51
≥2,500g	433 (75.4%)	1,766 (82.2%)	Ref		
		Sex Distribution			
Male	305 (52.8%)	273 (47.2%)	0.95-1.37	0.168	1.14
Female	1,064 (49.5%)	1,084 (50.5%)	Ref		

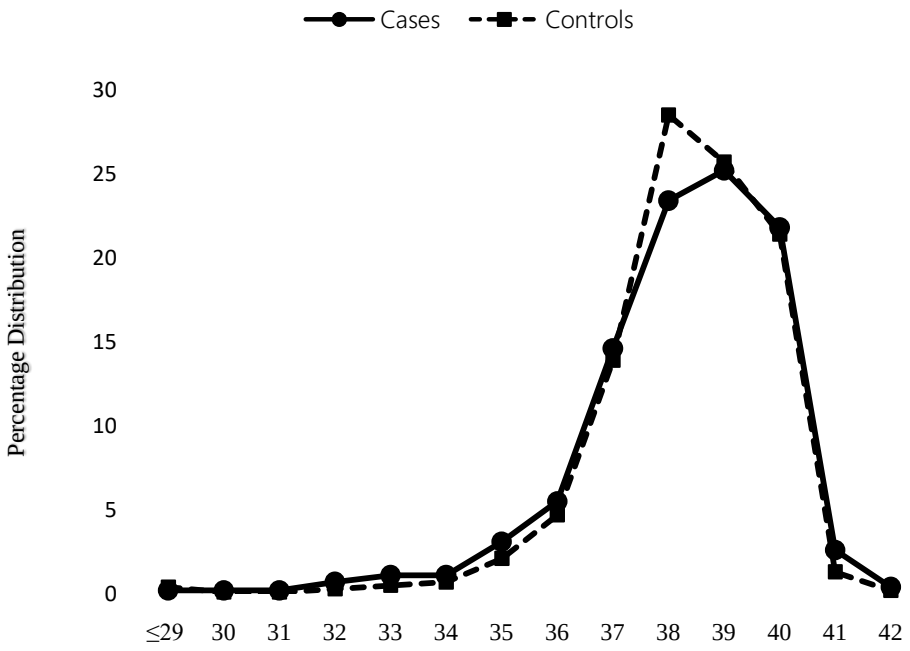

Figure 4. Peak births by week of gestation in cases and controls.

4.3.2 Birth weight

LBW newborns, <2,500g, were at higher risk, OR 1.51 [CI 95%] 1.21-1.98 compared to newborns with birth weight ≥ 2 ,500g, being highly statistically significant P=0.0001. However, infants with higher birth weight ≥3,500g had a higher percentage of asphyxiated babies as compared to controls, seen in Table 3 and Figure 5.

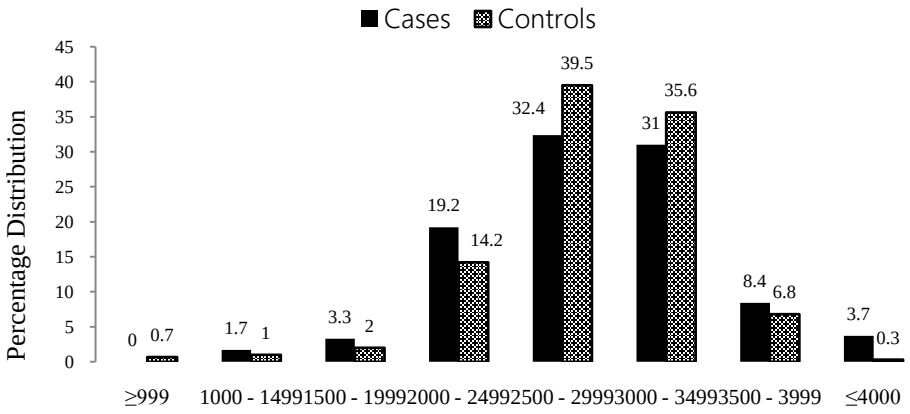

Figure 5. Percentage distribution of cases and controls according to birthweight.

4.3.3 Sex

The sex distribution between female and male newborns both in cases and in controls was almost equal, the ratio of F: M: 1.1:1 and 1.02:1 respectively, indicating increased susceptibility of male babies to birth asphyxia OR 1.51 [CI 95%] 1.21-1.98, though not statistically significant P=0.168. Thus, male babies were at greater risk of having birth asphyxia compared to female babies seen in Table 3 and Figure 6.

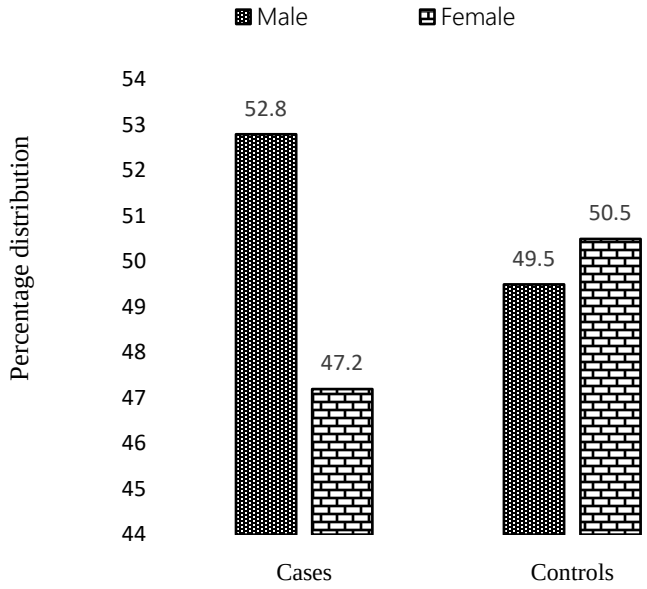

Figure 6. Percentage sex distribution of cases and controls.

5. Discussion

Anticipation is the key to preventing asphyxia neonatorum, hence the importance of identification of high risk pregnancy and fetuses that are likely to be at risk of asphyxia for active management of labor with quick judicious obstetric intervention to rescue endangered fetuses, will not only reduce birth asphyxia but also perinatal and under five mortality and morbidity improving neonatal outcome. Various risk factors include primigravida with high OR with 1.34 (0.92-2.04) times risk of birth asphyxia, comprising 45% of whom experienced birth asphyxia also reported in another study [10]. Obstetric complications of PIH has OR 2.98 (2.14-4.16) with significantly high risk, P=0.0001. Gestational diabetes and PROM of more than one hour prior to onset of labor had lower risk of birth asphyxia. Breech presentation obviously had high risk of birth asphyxia 8.42 (5.1-14) (P=0.0001) and meconium staining of liquor OR 29 (19.78-42.65, P=0.0001).

The incidence of LSCS was 41.6%, a majority two-thirds (64.7%) being emergency LSCS with indications of fetal distress OR 4.91(3.94-6.10), being highly statistically significant (P=0.0001), wherein 50.3% of these newborns suffered birth asphyxia as compared to one third (35%) elective or planned LSCS with low 9.1% incidence OR 1.67 (0.84-1.63). However vacuum extraction had high risk OR 8(5.58-11.69) (P=0.0001). Abnormalities of cord risk such as cord around the neck, prolapse etc., also had high risk of birth asphyxia with OR 2.9 [CI 95%] 2.18-3.88, being highly statistically significant P=0.0001. Among neonatal factors, prematurity <37 weeks had high risk of birth asphyxia 1.36 (1.03-1.79) (P=0.032), when compared to term newborns. Peak 23.7% cases asphyxiated births occurred later at 39 weeks contrasted to peak births 27% controls at 38 weeks (P<0.001). Low birth weight was associated with higher OR 1.5(1.21-1.88) times the risk of birth asphyxia, compared to birth weight ≥2 ,500g (P=0.0001), however more infants weighing above 3,500g were asphyxiated. Male babies had slightly higher OR 1.14 (0.95-1.37) times birth asphyxia as compared to female babies also reported in other studies [1, 5, 10].

Risk factors associated with birth asphyxia occur during antepartum, mainly intrapartum period also soon after birth despite vast advances in perinatal care and improved technology in fetal monitoring etc. Intrapartum events with maximum impact for fetal hypoxia is demonstrated in various studies that show placental insufficiency with decrease in oxygen supply to the fetus during contractions, recording greatest drop in fetal oxygen saturation 92 seconds after the peak of a contraction with recovery 1 minute 30 seconds later, being statistically significant (P=0.036) assessed by scalp electrode, intrauterine pressure catheter and a specially designed fetal pulse oximetry sensor as well as intravascular oxygen electrode measuring continuous fetal arterial PO_2 showed transient fetal hypoxemia following uterine contractions [11, 12]. Fetal infrared spectroscopy demonstrated a fall in cerebral oxygenated hemoglobin after a contraction as well as angiographic studies reveal blocked circulation through the intervillous space during uterine contractions decreases oxygen transfer to the fetus with lower oxygen levels and pH, noted more so, at the end of labor than at the beginning, being compounded by maternal pain, breath holding and maternal metabolic acidosis further reduces oxygen delivery to the fetus [11-13].

Fetal blood supply during the latter part of the second stage of labor is decreased by uterine contractions or termination by cord compression [12], causing hypoxia and hypercapnia, fetus gasps for a short period before becoming apneic with moderate asphyxia, termed as primary apnea, the heart rate and blood pressure being normal or slightly elevated. A second period of gasping commences within a few minutes, causing a fall in heart rate and blood pressure after the last gasp with terminal or secondary apnea. However, majority asphyxiated infants born with primary apnea will commence spontaneous respiration, if given air/oxygen to breathe but those with terminal apnea require active resuscitation to avoid death [9, 14].

Anoxia in the fetus is usually observed a few minutes to a few days before delivery with sudden increase in fetal activity followed by diminished activity and heart rate slows with weak and irregular beats. Fetal heart rate monitoring may reveal late decelerations begin at the peak of uterine contractions and recover after the contractions ends is indicative of uteroplacental insufficiency, causing fetal hypoxia and acidosis, classified as non-reassuring if it lasts between 2-3 minutes and abnormal more than 3 minutes. Scalp blood analysis may show acidosis with a pH of less than 7.20 or lactate > 4.8mmol/L (pH <7.1 is associated with neurological sequelae), comprises both respiratory and metabolic components. Consistent slowing of the fetal heart rate under 100 bpm for more than 3-5 minutes independent of uterine contractions indicates severe asphyxia of fetus mandates immediate delivery by LSCS to avoid or decrease damage to brain or alternatively by outlet forceps delivery if head is in perineum [11, 12, 15, 16].

Clinical studies have also demonstrated that delivery at 38 weeks by planned or elective LSCS in high risk groups have shown the lowest risk of perinatal deaths and extending pregnancy beyond 39-43 week resulted in increased perinatal risk index due to obstetric events more so in primigravidas with greater risk of antepartum stillbirth [17, 18]. Also non-laboring women delivered by cesarean section by 39 weeks, obviating intrapartum events noted a 83% reduction in moderate to severe encephalopathy, being one of the leading causes of HIE as well as late fetal death [19], signifying that early delivery preferably at 38 weeks by elective section in high risk cases will be associated not only with reduction in birth asphyxia cases but also fresh stillbirths due to anoxia, more effectively than any other strategy [18], still others advocate delivery by 37 weeks gestation [19, 20]. In fact, a substantial number of infants could have perinatal asphyxia attenuated or removed given timely obstetric intervention by elective section at 38-39 weeks that would remove the risk of intrapartum HIE as well as reduce in utero death, as any reduction in perinatal asphyxia may also reduce term stillbirth rates [19, 23, 24].

Thus, prolonging pregnancy beyond 38 week increases the risk of stillbirth, maternal and neonatal mortality and morbidity. It is of public health importance that a third of women in US who are pregnant beyond 39 weeks

anticipate a vaginal delivery increases neonatal risk as with increasing gestational age there is a higher risk of stillbirth and other outcomes such as PIH that rises with each additional week of gestation, as postdate induction is typically not recommended prior to 41st week. However, caesarean rates are not increased with labor induction compared with expectant management ≥ 37 weeks gestation according to a Cochrane review of clinical trials [23, 24]. Thus the increased risk with increasing gestation to neonatal outcome or maternal morbidity with later delivery at term questions management and duration of pregnancy beyond 39-40. The lowest risk of perinatal deaths was noted at 38 weeks and increased sharply among primigravida women beyond 39 weeks, because of greater risk of antepartum stillbirth with higher incidence of HIE [19-25].

I have earlier reported that the average duration of pregnancy in ethnic Asian-Indian population is 38.2 weeks [26, 27]. In the present study peak births of controls took place at 38 weeks gestation while asphyxiated cases occurred at 39 weeks. Also, despite vast technological and economic revolution which has influenced all sections of society in India, the intrauterine growth patterns and average birth weight in South Indian newborns over past three decades has remained the same with average birth weight of 2,873g in 2015-'17 to 2,881g in 1983 [26], clearly indicates an inherent genetic predisposition at play rather than environmental factors, indicating that ethnic Asian-Indian babies will continue to be small, majority being asymmetrically growth retarded infants with low energy reserves, who are less well equipped to cope with any physiological insults with increased susceptibility to asphyxia [27-29]. Many Asian countries have reported peak births at 38 weeks gestation [5, 10, 26, 27, 29]. In contrast, peak Caucasian births occurred later at 41 weeks with about 500g higher birth weight [30-31]. It is appropriate that ethnic Asian population redefine expected date of delivery or Asian Due Date (ADD) to 38 weeks [30, 33], to enable Asian Obstetricians to implement delivery at 38 weeks as opposed to Expected Date of Delivery (EDD) at 40 completed weeks gestation well adapted for Caucasian population with longer duration of gestation[26, 27, 29-33].

Even as we are poised to enter the twenty-first century in a world that has forever changed post Covid-19 pandemic. Simple clinical implementation of new ethnic Asian perinatal definition and guideline for Asian Obstetricians, pediatrician/neonatologists and extended perinatal team will not only improve maternal, fetal and neonatal outcome in reducing perinatal and neonatal morbidity and mortality, as well as infant and under five mortality rates, will go a long way in ensuring a better quality of life. Perinatal definitions and guidelines established by World Health Organization are eminently suitable for ethnic Caucasian population as it is time tested with low maternal, perinatal and neonatal mortality rates reported in the western world. It is over decades of research and clinical practice, I have outlined several perinatal redefinitions and guidelines including new ethnic Asian Due Date for delivery at 38 weeks, corresponding to average duration of gestation in ethnic Asian population will result in improved parturient and neonatal well-being but will also stem the colossal loss of still births due to birth asphyxia being a totally avoidable proportion of perinatal mortality rate.

6. Conclusions

Ethnic Asian-Indian population has high incidence 21.2% of birth asphyxia. Various risk factors include primigravida, abnormal presentation, meconium staining of liquor, oligohydramnios, cord abnormalities, prematurity and low birth weight requiring close supervision and judicious obstetric intervention. Peak asphyxiated births occurred at 39 weeks predominantly by emergency LSCS, while most controls were born normally at 38 weeks. Thus, effective preventive strategy of birth asphyxia in high risk cases is judicious intervention and delivery at 38 weeks gestation, preferably by elective or planned LSCS obviating intrapartum events, will reduce asphyxia perinatal and neonatal mortality and morbidity as well as term stillbirth. Thus, defining Asian Due Date at 38 weeks would prove to be the single most important strategy in reducing birth asphyxia to safe guard Asian fetuses and newborns, improving maternal, perinatal and neonatal outcome.

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