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ORIGINAL RESEARCH ARTICLE

EARLY OUTCOME OF PERINATAL ASPHYXIA IN NEONATES ADMITTED IN SPECIAL NEWBORN CARE UNIT AT A TERTIARY CARE CENTER - A RETROSPECTIVE OBSERVATIONAL STUDY.

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ABSTRACT

Background:

Perinatal asphyxia is a leading cause of neonatal morbidity and mortality. Also, it is the fifth leading cause of death in children under 5 years of age. With the decline in neonatal mortality, the morbidity after birth asphyxia in the form of neurodevelopment sequelae is same or even increased due to survival of asphyxiated babies. The rate of decline of NMR lags behind Infant and under five child mortality rates. Hence, we endeavor to determine early outcome of perinatal asphyxia and the factors responsible for the outcome in neonates admitted in Special Newborn Care Unit at Bundelkhand Medical College, Sagar.

Methods; This retrospective study was conducted on newborns admitted with the diagnosis of perinatal asphyxia, at tertiary care centre, Bundelkhand Medical College,Sagar.190 asphyxiated neonates admitted in the special neonatal care unit, fulfilling the inclusion criteria were enrolled in the study. Clinical data was collected regarding maternal and neonatal details about the outcome characteristics from the Special Newborn Care Unit records.

Results: Perinatal asphyxia accounted for 11.10 % of the SNCU admissions and 22.91/1000 live births. Also, perinatal asphyxia accounted for 15.26% mortality rate among the asphyxiated newborns. The mortality rate due to perinatal asphyxia was 1.69% of all SNCU admissions and 3.49/1000 live births. Perinatal asphyxia accounted for 7.63 % of all SNCU deaths. Birth weight had a significant co-relation with mortality, 75% of <1.5 kg neonates, 17.2% of the >2.5 kg birth weight neonates expired, whereas among neonates with birth weight between 1.5-2.5 kg, 7.8% expired.

Conclusion: Birth asphyxia is still a major cause of morbidity and mortality in neonates as well as under five children. The risk factors associated with adverse outcome are postmaturity, birth weight <1.5 kg or >2.5kg and abnormal presentation at labour. These observations suggest that timely identification, timely referral and appropriate utilization of operative intervention for safe deliveries are necessary to prevent perinatal asphyxia.

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Keywords; Perinatal Asphyxia, Birth Asphyxia, Outcome, Neonatal asphyxia, Special Newborn Care Unit (SNCU)

1 . INTRODUCTION

Perinatal asphyxia is a leading cause of neonatal morbidity, mortality and adverse outcomes worldwide as well as in India. According to the latest National Neonatal Perinatal Database [1], in India, the incidence of birth asphyxia is about 8.4% of all live intramural births, and accounts for 28.8% of the neonatal deaths. Also, the commonest primary cause of neonatal death was perinatal asphyxia, to be followed by Septicemia/ meningitis (18.6%), extreme prematurity (26.3%) and congenital malformations (9.2%) among the intramural live births. Amongst the extramural live births, asphyxia accounted for18.5% deaths, although sepsis (37.6%) was the leading cause followed by prematurity and its related complications (18.5%). Asphyxia is the fifth leading cause of death in children under 5 years of age [2].

The term "asphyxia" is derived from the Greek language which means "stopping of the pulse" [3]. Asphyxia is defined as injury to the fetus or newborn due to lack of oxygen (hypoxia) or lack of perfusion (ischemia) to various organs, often associated with tissue lactic acidosis and hypercarbia. [4]. The guidelines of the American Academy of Paediatrics (AAP) and the American College of Obstetrics and Gynaecology (ACOG) consider all of the following criteria in diagnosing asphyxia: (i) profound metabolic or mixed acidemia (pH <7.00) in umbilical artery blood sample, if obtained, (ii) persistence of an Apgar score of 0–3 for longer than 5 min, (iii) neonatal neurologic sequelae (e.g., seizures, coma, hypotonia, or Hhypoxic ischemic encephalopathy), and (iv) multiple organ involvement (e.g., kidney, lungs, liver, heart, intestines)[5].

With the decline in neonatal mortality, the morbidity after birth asphyxia in the form of neurodevelopmental sequelae is same or even increased due to survival of asphyxiated babies [6]. The sequelae can be in the form of severe insults, often causing epilepsy, cerebral palsy, developmental delay and mental retardation, neurodegenerative diseases etc. or as mild insults causing ["minimal brain-damage disorders" such as attention deficits and hyperactivity disorder, schizophrenia and life-long functional psychotic syndromes etc[7].

2. METHODS

We conducted a hospital based retrospective cross-sectional observational study amongst the neonates admitted with the diagnosis of perinatal asphyxia (history of delayed cry or Apgar score of less than 7 in 5 minutes), during the study period from 1st May 22 to1st May 23 for one year. This study was performed at Special Newborn Care Unit (SNCU), at a tertiary care centre, Bundelkhand Medical College, Sagar, Madhya Pradesh, India. Those babies who were born with major congenital malformations or suspected inborn error of metabolism were excluded from the study.

A total of 190 neonates, both inborn and outborn, admitted with the clinical diagnosis of birth asphyxia (history of delayed cry or Apgar score of less than 7 in 5 minutes) , fulfilling the inclusion criteria, were included in the study. The data was collected in retrospect, regarding maternal and neonatal details, outcome and various factors concerning with the outcome from the SNCU records. The neonates were studied for the characteristics of gestational age, age at presentation, duration of stay in hospital, morbidity and mortality, determinants of outcome of perinatal asphyxia, maternal antenatal

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visits, type of delivery, presentation at labour, mode of transport etc

The statistical analysis was performed using SPSS 21.0 software. Proportion and percentage was calculated for qualitative data. Mean and median were calculated for quantitative data. The Institutional Ethical Committee approval and clearance was taken before performing the study.

3. RESULTS

During the study period, among the 8290 live births, 1711 neonates were admitted to SNCU. Among them 190 neonates were diagnosed with birth asphyxia. Of all SNCU admissions, 190 cases of perinatal asphyxia accounted for 11.10 % of the SNCU admissions and 22.91/1000 live births.

TABLE 1: CHARACTERISTICS OF THE NEONATES WITH PERINATAL ASPHYXIA

VARIABLES	MEAN	STD. DEVIATION
Gestational Age(wks)	37.1	2.3
Age of neonate(days)	0.3	1.7
Birth Weight(kg)	2.6	0.5
Head Circumference(cm)	33.3	1.7
Length(cm)	47.7	3.2
Maternal Hemoglobin(g/dl)	10.8	1.4
Duration of Stay(days)	4.8	3.5

The characteristics of the newborns admitted to SNCU were a mean gestational age of 37.1 ±2.3wks. The mean age at presentation was 0.3±1.7days. There were 78(41.1%) females and 112(58.9%) males. As regards to physical characteristics, the mean weight of the neonates was 2.6±0.5kgs, mean length was 47.7±3.2 cm and the mean head circumference was 33.3±1.7cm. The mean maternal hemoglobin was 10.8±1.4gm/dl. The mean duration of hospitalization in SNCU was 4.8±3.5 days.

TABLE 2: OUTCOME OF NEONATES WITH PERINATAL ASPHYXIA

OUTCOME	FREQUENCY	PERCENT
DISCHARGED	161	84.7%
EXPIRED	29	15.3%
Total	190	100

With regards to outcome, out of the total 190 neonates with birth asphyxia admitted during the study period, 29(15.3%) neonates having perinatal asphyxia expired, whereas 161(84.7%) neonates got discharged. Thus, perinatal asphyxia accounted for mortality rate of 15.3% among the asphyxiated newborns.

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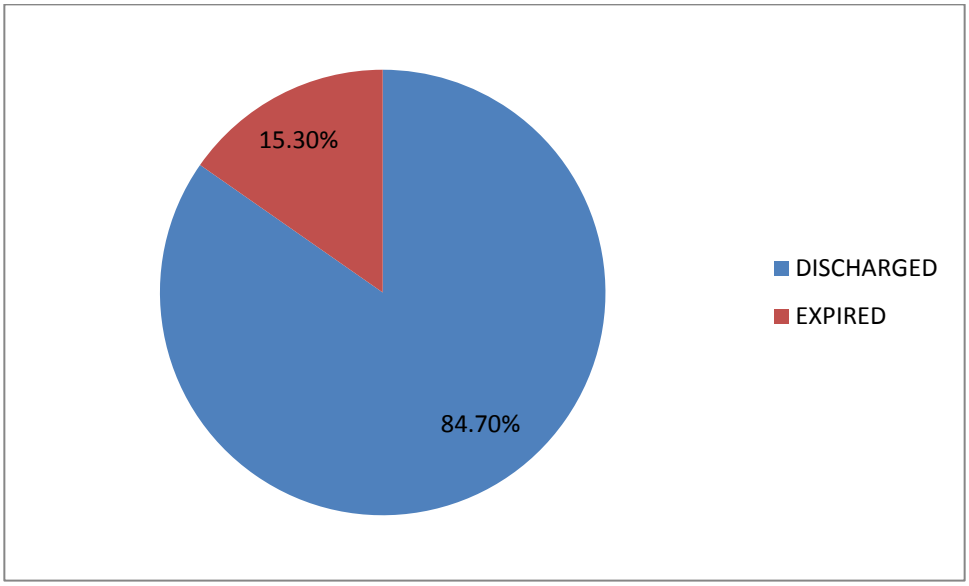
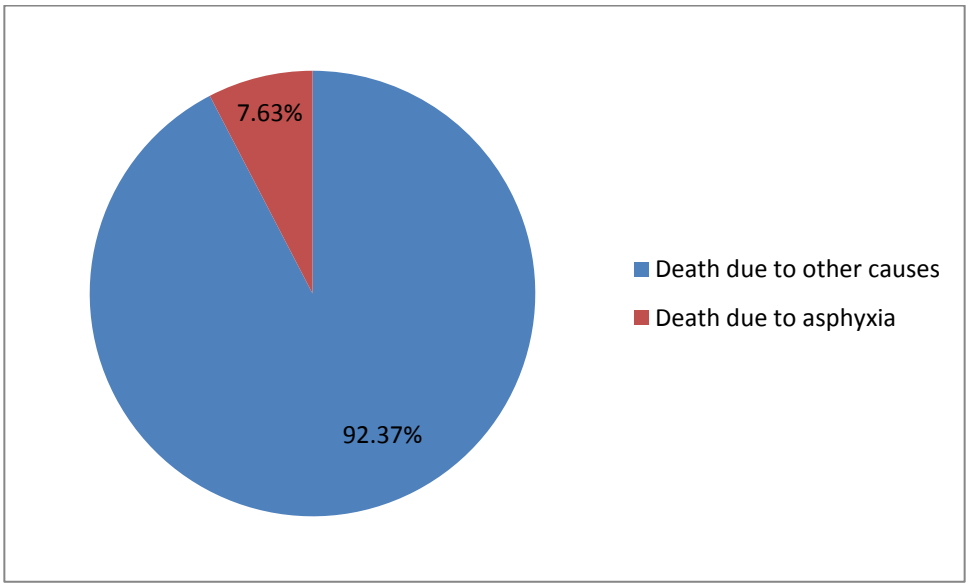
FIG 1: PIE CHART SHOWING OUTCOME OF NEONATES WITH PERINATAL ASPHYXIA



Of the total 1711 SNCU admissions during the study period, 380 neonates expired, 29 neonates could not survive due to perinatal asphyxia. The mortality rate was 22.20% of all SNCU admissions. The mortality rate due to perinatal asphyxia was 1.69% of all SNCU admissions.

Among the 8290 live births, during the study period, 29 neonates could not survive. The mortality rate due to perinatal asphyxia was 3.49/1000 live births. (The overall mortality rate was 4.58% of all live births)

FIG 2: PIE CHART SHOWING NEONATAL MORTALITY DUE TO PERINATAL ASPHYXIA AMONG ALL NEONATAL DEATHS



During the study period, among the various causes of mortality in NICU, perinatal asphyxia accounted for 7.63 % of all SNCU deaths (29 out of a total of 380 neonatal deaths).

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TABLE 3: CAUSE OF DEATH OF NEONATES WITH PERINATAL ASPHYXIA

CAUSE OF DEATH	FREQUENCY	PERCENT
HIE / Moderate-Severe BirthAsphyxia	22	**75.86%**
Sepsis	3	**10.34%**
Respiratory Distress Syndrome	2	**6.90%**
Pneumonia	1	**3.45%**
Any Other	1	**3.45%**
Total	29	**100.00%**

The various causes of deaths in neonates having birth asphyxia were moderate to severe asphyxia in 22(75.86%) neonates, sepsis and septic shock in 3(10.34%), respiratory distress syndrome in 2(6.90%) neonates and pneumonia in 1(3.45%)neonate.

FIGURE 3: BAR DIAGRAM SHOWING CAUSE OF DEATH OF NEONATES WITH PERINATAL ASPHYXIA

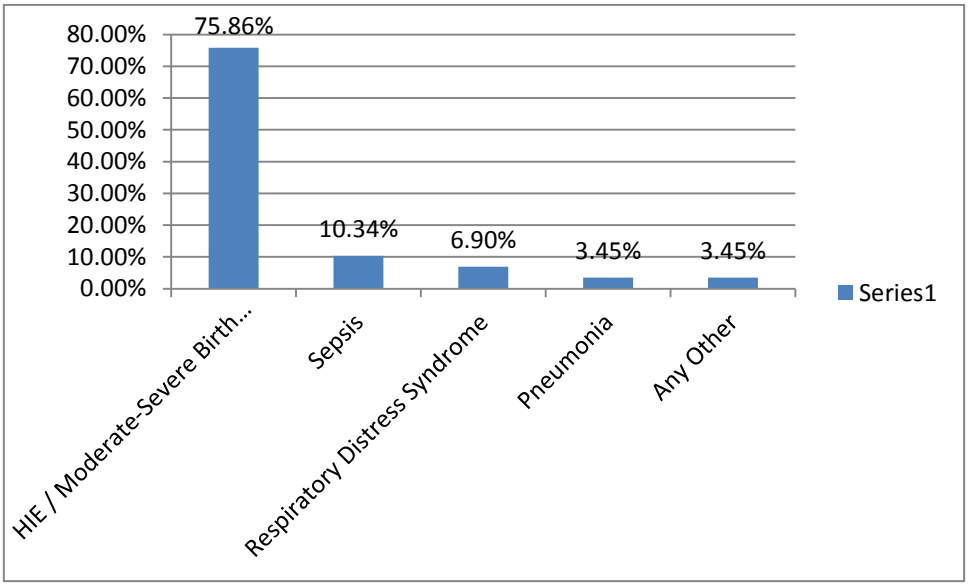

TABLE 4: DETERMINANTS AFFECTING THE OUTCOME OF PERINATAL ASPHYXIA

DETERMINANTS	**CATEGORY**	**OUTCOME**			**p-VALUE**
	Number	DISCHARGED	EXPIRED	Total	
ANC Visits	0	13	4	17	
	1	2	0	2	
	2	19	4	23	
	3	61	9	70	
	4	66	12	78	
	Total	161	29	190	0.755
Mode of Transport	Govt. Provided	109	21	130	0.615

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	Self Arranged	52	8	60	
	Total	161	29	190	
Source of Admission	Inborn	135	23	158	0.59
	Outborn	26	6	32	
	Total	161	29	190	
Presentation	Breech	10	1	11	0.3345
	Transverse	1	1	2	
	Vertex	150	27	166	
	Total	161	29	190	
Labour	Induced	53	6	59	0.1954
	Spontaneous	108	23	131	
	Total	161	29	190	
SEX	F	66	12	78	0.969
	M	95	17	112	
	Total	161	29	190	
Maturity	FULLTERM (37-<42 Weeks)	114	17	131	0.15
	POSTTERM (=>42 Weeks)	1	1	2	
	PRETERM (<37 Weeks)	46	11	57	
	Total	161	29	190	
Birth Weight	less than 1.5 kg	1 (25%)	3 (75%)	4	0.003
	1.5 to 2.5 kg	59 (92.2%)	5 (7.8%)	64	
	more than 2.5kg	101 (82.8%)	21 (17.2%)	122	
	Total	161	29	190	

The various determinants which tend to relate to the outcome of perinatal asphyxia have been studied. P-Value of <0.05 was taken as statistically significant. Most antenatal women had attended antenatal clinics (statistically insignificant with p-value 0.755). Mode of transport was “government provided” in most cases, whereas “self arranged” in a few cases (statistically insignificant with p-value 0.615).Among asphyxiated outborn babies, mortality rate was 23.07%, which was higher as compared to inborn babies 17.03% (statistically insignificant with p-value 0.59).Abnormal presentation as breech and transverse lie had higher risk of mortality, as compared to vertex presentation, although this co-relation was not statistically significant (p-value 0.33). Spontaneous labour cases had greater mortality (17.55%) as compared to induced labour or caesarean section (10.16%), although not statistically significant (p-value 0.19).

There was similar outcome with respect to gender (15.38% mortality in females as compared to 15.17% mortality in males). With regards to maturity, post-term neonates had highest mortality (50%), followed by premature neonates (19.29%) and term neonates

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(12.9%), although not statistically significant (p-value 0.15).
Birth weight was the only single criteria in the study which had statistically significant correlation of perinatal asphyxia with regards to mortality. 3/4(75%) of <1.5 kg neonate expired, 21/122(17.2%) of the >2.5 kg birth weight neonates expired, whereas 5/64(7.8%) neonates with birth weight between 1.5-2.5 kg expired.

4. DISCUSSION

This study focused on the immediate outcome of asphyxiated babies. In our study, perinatal asphyxia accounted for 11.10 % of the SNCU admissions and 22.91/1000 live births. The reported incidence varies from 2 to 16.2% in community based studies with the reported case fatality rates ranging from 38.5 to 74%. [8] About 2.8 and 5.6% of all live births had moderate and severe asphyxia, respectively, in a large hospital-based study; the case fatality rate was relatively low at ~ 8.7%.[1] The wide variation in the prevalence is probably a result of non-uniformity of the operational definitions of the entity of perinatal asphyxia as also including still births in few studies.

WHO has estimated that 4 million newborns die during the neonatal period every year, 99% of these occur in low and middle income countries. This further implies that perinatal asphyxia amounts to about a million (0.92) neonatal deaths [9,10] In the year 2013, in India, about 0.75 million neonates had died, the highest for any country in the world [2, 11]

In our study, perinatal asphyxia is a common cause of neonatal mortality and accounted for 15.26% mortality rate among the asphyxiated newborns. The mortality rate due to perinatal asphyxia was 1.69% of all SNCU admissions and 3.49/1000 live births. Perinatal asphyxia accounted for 7.63 % of all SNCU deaths. The overall mortality rate have been variously reported from 6.66% by Rasania et al[12], 7.6% by Muthuswamy et al[6], 8% by Siva Saranappa et al [13], 14.3% by Etak and Etak et al[15], 20.24% by Yelamali et al[16], 21% by Chikanna et al [17] to 24.57% by Rathi Y [3].

The neonatal mortality rate (NMR) declined from 52 per 1000 live births in 1990, to 44 per 1000 live births in 2000 to 28 per 1000 live births in 2013, but the rate of decline of NMR has been slow and lags behind that of infant and under-five child mortality rates [17]. With the early NMR of 22 per 1000 live births, deaths in the first week alone account for 45% of the total under 5 child deaths [18]. According to the National Family Health Survey, the neonatal mortality rate has dropped down from 29.5(in 2015-2016) as per NFHS-4, to 24.9(2019-2021) per 1000 live births in NFHS-5[19].

Of the total 1711 SNCU admissions during the study period, 29 neonates expired. The mortality rate due to perinatal asphyxia was 1.69% of all SNCU admissions. Among the 8290 live births, during the study period, 29 neonates expired. The mortality rate due to perinatal asphyxia was 3.49/1000 live births. During the study period, among the various causes of mortality in NICU, perinatal asphyxia accounted for 7.63% neonatal deaths (29 neonatal deaths, out of a total of 380).

In our study, among asphyxiated outborn babies, mortality rate was 23.07%, which was higher as compared to inborn babies 17.03%. Similarly, Yelamali et al reported overall 20.24% mortality, 29.48% outborn babies and 11.76% inborn babies expired [15]. Rathi Y reported mortality rate of 35.67% in asphyxiated outborn babies and 13.47% in asphyxiated inborn babies [3].

Spontaneous labour cases had greater mortality (17.55%) as compared to induced labour or caesarean section (10.16%), although not statistically significant (p-value 0.19). Abnormal

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presentation as of breech and transverse lie had higher risk of mortality, as compared to vertex presentation, although this co-relation was not statistically significant (p-value0.33). Yelamali et al also reported 68.71% spontaneous vaginal deliveries, 25.76% by caesarean section and 5.52% by instrumental delivery [15].

There was similar outcome with respect to gender (15.38% mortality in females as compared to 15.17% mortality in males).With regards to maturity, postterm neonates had highest mortality (50%), followed by premature neonates (19.29%) and term neonates (12.9%), although not statistically significant (p-value 0.15). Postmaturity has been noted as an important risk factor of birth asphyxia by Azam Multan et al.,[20], but not observed by few others as in a study by Muthuswamy[6]

The only single criteria in the study which had statistically significant correlation of perinatal asphyxia to mortality was Birth weight.3/4(75%) of <1.5 kg neonate expired, 21/122(17.2%) of the >2.5 kg birth weight neonates expired, whereas 5/64(7.8%) neonates with birth weight between 1.5-2.5 kgs expired. Unlike our results, Yelamali et al reported similar mortality rate in 1.5-2.5 kg weight as well as >2.5 kg weight [15].

The sample size, duration of the study and retrospective nature of the study were limiting factors in the study. As the aim of the study was to find the early outcome, so long term consequences could not be studied.

5. CONCLUSION

Birth asphyxia is still a major cause of morbidity and mortality in neonates as well as under five children. The risk factors associated with adverse outcome are postmaturity, birth weight <1.5 or more than>2.5kg and abnormal presentation at labour. These observations suggest that timely identification, timely referral and appropriate utilization of operative intervention for safe deliveries are necessary to prevent perinatal asphyxia.

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