


To study the clinical profile and early outcome of term asphyxiated newborns intramurally and extramurally in SNCU, Dr. Bram Hospital, Raipur, Chhattisgarh, India

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Introduction: Perinatal asphyxia is an important contributor of neonatal morbidity, mortality and adverse outcome in India. **Aim and Objective:** To study the clinical profile and early outcome of term asphyxiated newborns intramurally and extramurally. **Material and Methods:** Cross-sectional observational hospital-based study was conducted over a period of one year from January 2018 to December 2018 in Special Newborn Care Unit (SNCU) of Dr BRAM Hospital, Raipur, Chhattisgarh. Sarnat and Sarnat staging was used to classify HIE. Statistical analysis was performed by using SPSS21.0 software. Chi-square test, P-value and likelihood ratio were calculated using appropriate tests. **Result:** Total 2035 newborns were admitted in SNCU during the study period. 415 newborns were admitted with HIE. 66.03% newborns were extramural and 33.97% were intramural. 71% of extramural babies admitted to neonatal ward after 6 hours. This is showing delayed or inaccurate identification of the gravity of the situation, inaccurate diagnosis and in many cases delayed referral and transport to an appropriate referral centre. 242(58.3%) were HIE II followed by 121(29.1%) were HIE-III and rest 52 (12.5%) were HIE-I cases. The mortality rate in extramural babies was 35.67% and intramural babies were 13.47%. **Conclusion:** The study has shown the significant differences that account in the antenatal and perinatal profile, perinatal management and resuscitation, postnatal management, morbidity, mortality and neurodevelopment outcome of extramurally delivered neonates in comparison to institutional deliveries.

Keywords: Meconium stained liquor (MSAF), Hypoxic Ischemic Encephalopathy (HIE), Special Newborn Care Unit (SNCU)

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Introduction

Perinatal asphyxia is the leading cause of neonatal morbidity and mortality. In institutional delivery incidence is 5% and accounts for 24.3% of neonatal deaths [1]. It is the greatest burden and fifth leading cause of death in under 5 years of age [2]. Cerebral palsy is one of the most costly neurologic disabilities occurred due to hypoxic-ischemic event because of its frequency (2/1000 births) and lifelong disability, huge burden to society [3,4].

The term "asphyxia" is derived from the Greek language which means "stopping of the pulse". According to World Health Organization, birth asphyxia is "inability to start and manage breathing during childbirth" and depends on Apgar score, an Apgar score of <7 at one moment of life is suggestive of birth asphyxia [5]. Apgar scores are a valuable tool for future events in babies with perinatal asphyxia [6,7].

According to ACOG and AAP Criteria for diagnosis for asphyxia before birth are [8,9]:

- Delayed metabolic or blended acidemia (pH <7.0 on line blood vessel blood test).
- Determination of an Apgar score of <3 for 5 min or more.
- Clinical neurologic appearance as seizures, hypotonia, trance state or HIE in the prompt neonatal period.
- Proof of multi-organ framework brokenness in the quick neonatal period.

According to the World Health Organization (WHO) report, four million develop birth asphyxia, and newborn asphyxia condition depends on the severity and its consequences, such as epilepsy, cerebral palsy and developmental delay [4,5]. This is the reason, mortality and morbidity both are very significant and worrisome. Birth asphyxia related to events that are either the antepartum, the intrapartum, or the postpartum periods or combination thereof [10].

The current study was therefore planned to evaluate related factors and short term outcome of asphyxiated neonates born intramurally where standard management protocol was started immediately after birth and extramurally at home or another hospital from where the asphyxiated neonate was referred and transported to a facility equipped with NICU causing a delay in the start of standard management protocol

Material and Methods

Study design: Cross-sectional observational study

Setting: Hospital-based study at Special Newborn Care Unit (SNCU) of Dr. BRAM Hospital, Raipur, Chhattisgarh, India

Inclusion criteria: All babies with gestational age >or = 36 weeks with Apgar score <7 at 5 min or no breathing at 1 minute of age and babies who were managed as per the NNF protocol of asphyxia were included in our the study. Gestational age of babies was assessed from maternal last menstrual period and/or early antenatal ultrasound. Based on the place of birth newborns were divided into two groups intramural (born in the hospital of Dr. B.R.A.M. hospital Raipur, Medical College) and extramural (born outside and were referred to these hospitals).

Exclusion criteria: Preterm babies with gestational age <36 weeks

02. Babies with major congenital malformation/anomalies, suspected to be having an inborn error of metabolism were excluded from the study.

Variables: Gestational age, birth weight, sex, HIE

Data Source: A predesigned and pretested proforma was used to collect data

Bias: Reporting bias, observation bias

Study size: 415 term newborns with HIE out of 2035 newborns admitted in SNCU

Statistical methods: Statistical analyses were performed by using SPSS21.0 software. Chi-square test, P-value and likelihood ratio were calculated using appropriate tests.

Ethical approval: The study was conducted after taking ethical approval from the Institute's Ethical Committee.

Results

The cross-sectional observational hospital-based study was done to study the clinical profile and early outcome of term asphyxiated newborns intramurally and extramurally. A total of 2035 neonates were admitted in SNCU for various problems, among them 415 (20%) term neonates were admitted for perinatal asphyxia. 66.03% newborns were extramural and 33.97% were intramural.

In the present study, 71% of extramural babies admitted to the neonatal ward after 6 hours (Table 1). This is showing delayed or inaccurate identification of the gravity of the situation, inaccurate diagnosis and in many cases delayed referral and transport to an appropriate referral centre.

All term neonates 242(58.3%) were HIE II followed by 121(29.1%) were HIE-III and rest 52 (12.5%) were HIE-I cases.HIE III was found in 81(66.6%) extramural neonates f/b 40(33.4%) intramural neonates with a statistical significance (P=0.001).Male babies were marginally higher than female (58.1% males versus 41.9% female.with a statistically insignificant (P=0.510535). The number of caesarean deliveries was higher in the intramural group (47.5%) as compared to extramural group (26.2%)(Table 1).

Table-1: Clinical profile of newborns with birth asphyxia.

	Intramural	Extramural	Total
Total	141(33.97%)	274(66.03%)	415
Male	127	114	241(Pvalue =.433)
Female	86	88	174
HIE I	20	32	52
HIE II	81	161	242
HIE III	40	81	121
NVD	63(44.7%)	179(65.3%)	242 (P value=.0001)
Instrumental delivery	11(7%)	23(8.4%)	34
LSCS	67(47.5%)	72(26.2%)	139

The number of normal vaginal deliveries were higher in the extramural group(65.3%) as compared to intramural group(44.7%)remaining 7% of intramural and 8.4% of extramural delivered instrumentally with statistical significant(p=.0001) (Table 1).

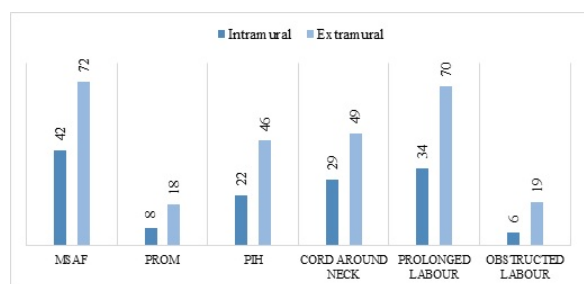


Fig-1: Comparison of risk factors and perinatal events between the intramural and extramural group.

In the present study, various factors and event are associated with birth asphyxia.

Meconium stained liquor and prolonged labour are one of the most common factors or event associated with asphyxia in both groups. Other factors like PIH, Cord around the neck, PROM, obstructed labour/w birth asphyxia in both group,showing no statistical significance (p>.056)(Figure 1).

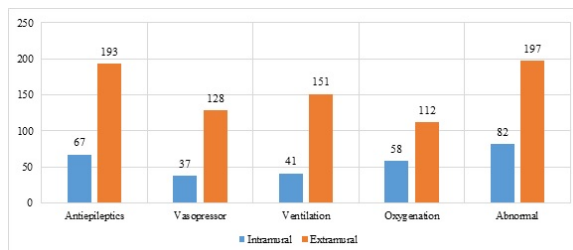


Fig-2: Early outcome of term neonates with birth asphyxia comparison in both group.

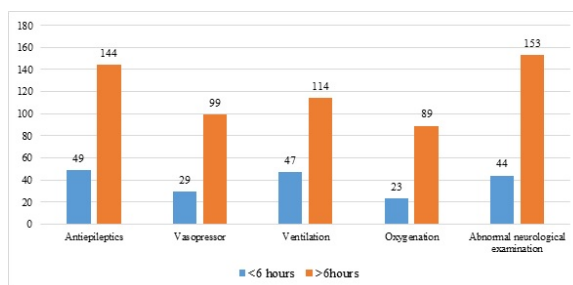


Fig-3: Early outcome of Extramural newborns in terms of time taken to reach our hospital.

In the present study requirement of anticonvulsant is more in 70.43% of outborn newborn as compared to 47.51% inborn (Figure 2).The extramural group who admitted after 6 hours required more anticonvulsant as the compared group who admitted before 6 hours of birth(Figure 3).

In the present study Need for vasopressor is twice in extramural neonates as compared to intramural (Figure 2).Particularly in more in extramural neonates who admitted after 6 hours of birth (Figure 3). Study shows that Ventilatory support required twice for outborn babies in comparisonwith inborn babies(Figure 2).In Extramural group who admitted after 6 hours of birth required more ventilator support (Figure 3). Oxygenation requirement is approximately 40% which is same in intramural and extramural group (Figure 2). The requirement is approximately double in babies who admitted after 6 hours (Figure 3).

Study shows that at time of discharge 71.89% extramural and 58.15% intramural newborn had an abnormal neurological examination which is statistically significant (P .004732)(Figure 2).

75% extramural newborn who admitted after 6 hours and 60% who admitted within 6 hours of birth had neurological disability on discharge and statistically significant (P .0047)(Figure 3).

Table-2: Outcome in terms of survival of term neonates with birth asphyxia.

	Intramural	Extramural	Total
Survived	122	179	301
Expired	19(13.47%)	95(34.67%)	114
Total	141	274	415

Table-3: Outcome in terms of survival of asphyxiated extramural neonates.

Extramural neonates	Before 6 hours of birth	After 6 hours of birth	Total	P-value
Survived	59	120	179	3.5613
Expired	21(26%)	74(38.14%)	95	.0591

In the present study mortality rate in extramural babies were 35.67% and intramural babies were 13.47%(Table 2). 38.14% of babies who admitted after 6 hours of birth were died as compared to before 6 hours of birth 26% of babies died which is not statistically significant(0.0591)(Table 3).

Asphyxiated Extramural neonates delivered in Tertiary hospital (25%) and PHC (25%) followed by FRU (18%), Private hospital (10%) and home delivery (12.8%). Most of them arrived after 6 hours of birth (Figure 4).

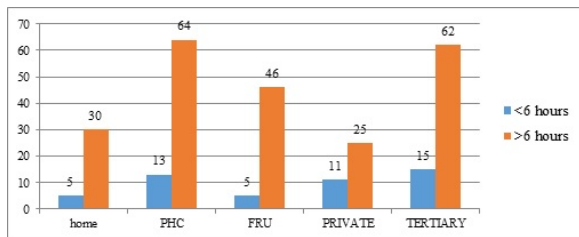


Fig-4: Place of delivery of asphyxiated extramural neonates.

Asphyxiated extramural newborn mostly transported through ambulance (93%).but when they brought to our hospital condition of newborn deteriorated due to improper method of transportation, untrained staff for neonatal transportation (Table 4).

Table-4: Transportation of extramural term newborn with asphyxia.

Mode of transportation	No. of neonates
Ambulance	254(93%)
Bus	4
Car	6
Jeep	2

Bike	8
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In the present study, 50%of extramural neonates were delivered by the physician. In extramural neonates, 15% of babies delivered at home unattended by any trained/skilled birth attendant and asphyxia was the second leading cause of referral next to prematurity. Antenatal and perinatal events were not managed properly by an untrained person (Figure 5).

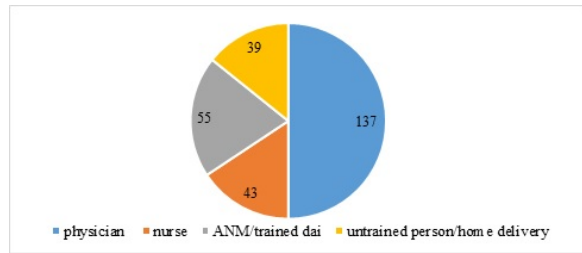


Fig-5: Attendance of trained/untrained personnel during delivery of extramural neonates.

The percentage of HIE stage III was statistically higher in the Extramural group who admitted after 6 hours when compared to the extramural group who admitted within 6 hours showing statistical significance(p<0.05) (Table 5)

Table-5: Comparison of outcome of neonates based on time-lapse in admission after birth in the extramural group.

	<6 hours	>6 hours	Total extramural newborns	P value
HIE I	19	13	32	17.459
HIE II	37	124	161	.0001
HIE III	22	59	81	
Total newborn	80(29%)	194(71%)		

Discussion

Birth asphyxia is a major cause of morbidity and mortality. It is the commonest cause of hospital admission of a newborn [1].In the present study 2035 admitted newborns, 415 term newborns were asphyxiated.66.03% were extramural and 33.975 were intramural. Similarly in Rana et al 90.5% of babies were intramural [11] 58.1% males versus 41.9% femalewith a statistically insignificant (P=0.510535).Similarly, in Yelamali et al 65% male vs 35% female and 52% intramural and 48 % extramural [12] and other studies have also shown similar ratio [13,14,15].

242(58.3%) babies were HIE II followed by121(29.1%) babies were HIE-III and only 52 (12.5%) babies were HIE-I cases.

2/3 of HIE III were extramural and 1/3 were intramural with a statistical significance ($P=0.001$). the percentage of HIE stage III was statistically higher in the Extramural group who admitted after 6 hours when compared to the extramural group who admitted within 6 hours ($p<0.05$).

Neonates with the feature of HIE III showing the severity of birth asphyxia, poor management, delay in diagnosis, delay in referral, a grave prognosis which was more seen in extramural neonates. Similar findings are seen in Kriti Mohan et al [7] in term neonates the maximum number of neonates had features of stage II (54%) while 31% and 14% had stage I and III features respectively [16].

In the present study number of caesarean deliveries were higher in the intramural group. The number of normal vaginal deliveries were higher in the extramural group (65.3%) with statistical significance ($p=.0001$) This is similar to study done by Memon et al [14] while other studies have shown 75% and 51% [deliveries by caesarian section [17,18].

Since our centre is a tertiary referral centre and caters to a large percentage of complicated obstetrical cases, the number of modes of delivery other than vaginal delivery was much higher in the intramural group as compared to the extramural group. In general, the percentage of caesarean deliveries was higher in babies who were born asphyxiated.

This implies that much more early intervention was required in these cases. If the extramural neonates who were born asphyxiated by vaginal delivery, had a chance of an early intervention/termination of labour the prognosis will be good.

In the present study, various factors and event are associated with birth asphyxia. Meconium stained liquor and prolonged labour are one of the most common factors or event associated with asphyxia in both groups. showing no statistical significance ($p>.056$). In Saranappa et al 40% had a history of meconium-stained liquor, 11.66% had PROM, 13.33% had PIH and 5% has cord prolapsed [18].

Extramural neonates especially who admitted after 6 hours of birth also have a higher requirement anticonvulsant, vasopressor, oxygenation, ventilator support in terms of both number and duration.

The neurological examination was abnormal in most of the neonates who survived at discharge in the group who were admitted after the first 6 hours of life ($n=19$ out of 37 discharged neonates) in both

Intramural and extramural neonates showing statistical significance ($P .004732$). Similar finding seen in Memon et al, showed the probability of neurological disability due to HIE after birth asphyxia was 4.615 times more in out-born babies. This might be due to the fact that inborn babies were admitted earlier (within 6 hours) as compared to out-born babies [14]

In the present study, the perinatal mortality rate is 35.67% of asphyxiated outborn babies and 13.47% in inborn babies. In the present study mortality rate is 38.14% babies who admitted after 6 hours of birth have died as compared to before 6 hours of birth is 26% of babies with statistical insignificance ($P\text{-value} =0.0591$). Similarly, Velamali et al 29.48% outborn babies and 11.76% inborn babies expired [12].

The present study is showing that earlier admission either it inborn or outborn is directly related to the outcome of the newborn. Early diagnosis, adequate management, the early referral can minimize morbidity and mortality of asphyxiated newborn.

In the present study, extramural babies with birth asphyxia delivered in Tertiary hospital (25%) and PHC (25%) which is followed by FRU (18%), Private hospital (10%) and home delivery (12.8%). In the current study, 71% of extramural babies admitted to the neonatal ward after 6 hours. Majeed et al [19] showed that only 12% were delivered at a tertiary care hospital.

Asphyxiated extramural term newborn mostly transported through ambulance (93%). but when they brought to our hospital condition of newborn deteriorated due to improper method of transportation, untrained staff for neonatal transportation. The highest delay in the admission to our centre from the place of birth was seen in neonates who were delivered at a Primary Health Centre and neonates delivered at a Private Hospital were the earliest to reach our centre.

In extramural neonates, 50% of extramural neonates were delivered by a physician, the percentage of babies delivered at home unattended by any trained/skilled birth attendant was 15% and asphyxia was the second leading cause of referral next to prematurity. Antenatal and perinatal events were not managed. Shah et al, the percentage of asphyxiated neonates delivered by health personnel was 33.8%, the trained birth attendants 29.5% and most of the others were not attended [20].

Conclusion

The study has shown the significant differences that account in the antenatal and perinatal profile, perinatal management and resuscitation, postnatal management, morbidity, mortality and neurodevelopment outcome of extramurally delivered neonates in a peripheral health centre or at home as compared to intramurally delivered neonates in a tertiary level institute. For improvement of their outcome infrastructure, skilled manpower, early referral with well-equipped transport unit, well equipped NICU appropriate guidelines is required. Still, there is large no. of home delivery in our state although the health care system through Janani Surakshayojana providing lots of facilities and incentives to institutional deliveries.

What does this study add to existing knowledge?

This study helps make Strict guidelines for early detection of risk factors, early referral of these high-risk pregnancies in-utero, the timely intervention of these high-risk pregnancies and advanced NICU care can help in reducing the occurrence of birth asphyxia and hence mortality and morbidity in neonates.

Author's Contributions

Dr. Yogita Rathi wrote the protocol, conceptualized, analysed data, prepared and finalized the manuscript.

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