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Prevalence, Associated Factors and Outcomes of Neonatal Asphyxia amongst Term Neonates in Ngaoundere

Prévalence, facteurs associés et devenir de l'asphyxie néonatale chez les nouveau-nés à terme à Ngaoundere

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ABSTRACT

Background. Neonatal asphyxia continues to be a substantial cause of mortality and disability worldwide, especially in Africa. Data for Cameroon indicate high rates of mortality (21.3%) in Douala, but information remains disproportionately fragmentary for different regions of the country. Our study assessed the prevalence, associated factors, and outcomes of neonatal asphyxia amongst term neonates. **Materials and methods.** A hospital-based cross sectional study was conducted in two hospitals in Ngaoundere over a 2-month period. Data was collected using a structured questionnaire which documented socio-demographics, associated peripartum factors, and short-term outcomes. The data were analyzed with Statistical Package for Social Sciences (SPSS version 25). Prevalence was calculated and association sociodemographic and peripartum factors and outcomes were derived from logistic regression. **Results.** A total of 330 neonates were approached, with 114 neonates asphyxiated. Prevalence of neonatal asphyxia obtained was 35%. Factors that significantly constrained neonatal asphyxia included the following: young maternal age (<19) (adjusted OR=2.23; 95%CI:1.07-4.64; p=0.032); anemia (adjusted OR=4.35; 95% CI:1.49-11.96; p=0.005); acute fetal distress (adjusted OR=33.19; 95% CI:0.01-0.05; p<0.001); gestational age (>42 weeks) (adjusted OR=5.270; 95% CI:1.22-22.68; p=0.026). The most common short-term outcome was hypoxic-ischemic encephalopathy. A majority of neonates were discharged with stable neurological status. Mortality was 15.8%. **Conclusion.** Young maternal age (<19), anemia, acute fetal distress, gestational age (>42 weeks) were the major associated factors identified in our study. Proper antenatal consultations and monitoring during labor may help to reduce the burden of neonatal asphyxia.

RÉSUMÉ

Introduction. L'asphyxie néonatale reste une cause importante de mortalité et d'invalidité dans le monde en Afrique particulièrement. Les données du Cameroun révèlent des taux de mortalité élevée (21,3 %) à Douala, mais les informations restent disproportionnées pour les autres régions du pays. Notre étude a évalué la prévalence, les facteurs associés et le devenir des nourrissons nés à terme ayant eu l'asphyxie néonatale. **Matériels et méthodes**. Une étude transversale a été menée dans deux hôpitaux de Ngaoundéré sur une période de 2 mois. Les données ont été recueillies à l'aide d'un questionnaire établi à cet effet et renseignant sur les données sociodémographiques, les facteurs péripartum associés et le devenir à court terme. Les données ont été analysées avec le logiciel statistique pour les sciences sociales (SPSS version 25). La prévalence a été calculée, et les associations entre les facteurs sociodémographiques, périnataux et les résultats ont été générés en utilisant la régression logistique. **Résultats.** Au total, 330 nouveau-nés ont été abordés, dont 114 asphyxiés. La prévalence de l'asphyxie néonatale obtenue était de 35 %. Les facteurs significativement associés à l'asphyxie néonatale comprenaient: le jeune âge maternel (<19) (OR ajusté = 2,23 ; IC à 95 % : 1,07-4,64 ;; p=0.032), l'anémie (OR ajusté=4.45; 95% CI. 49-11.96), la souffrance fœtale aiguë (OR ajusté = 33.19;95% IC:0.01-22.68; p=0.026). La complication à court terme la plus fréquente était l'encéphalopathie ischémique hypoxique. La majorité des nourrissons avaient un bon état neurologique à la sortie. Le taux de mortalité était de 15.8%. **Conclusion.** Le jeune âge maternel, l'anémie, la souffrance fœtale aiguë, l'âge gestationnel (>42 semaines) étaient les principaux facteurs associés à l'asphyxie néonatale dans notre étude. Le bon suivi de la grossesse et du travail peuvent aider à réduire le fardeau de l'asphyxie néonatale.

INTRODUCTION

Neonatal asphyxia or birth asphyxia or perinatal asphyxia defined as "failure to establish breathing at birth" by World Health Organization is estimated to cause 900,000 fatalities per year and is one of the leading causes of early neonatal mortality[1]. It is a serious public health concern that has a significant influence on morbidity and mortality of neonates worldwide, particularly in low and middle income countries due to limited access to medical care[2].Globally, four million babies are born with asphyxia each year, according to the WHO, 3.6 million babies suffer from

neonatal asphyxia, of whom 23% (840,000) die which equates to nearly one million neonatal deaths per year[3]. Earlier studies reported that the prevalence of neonatal asphyxia was 46% in Spain, 10.7% in India, and 5.3 % in Sweden, in each country respectively[4–6]. In Sub-Saharan Africa, two studies conducted in Nigeria found the prevalence of neonatal asphyxia to be 11.1% and 13% respectively[7,8].The National Institute of Statistics conveyed a prevalence of 31 per 1000 live term births for neonatal asphyxia in Cameroon[9]. Prevalence rates of 8.5% (with mortality of 6.7%), 9.13%, 9.7%, 22.9% (with a mortality of 21.3%) and 31% were obtained from studies in Yaoundé, Douala, and Bamenda, Cameroon[10–13].

Numerous factors such as: maternal age, single status, gravidity, incomplete/lack of antenatal consultations, maternal medical conditions (anaemia, infections, hypertensive disorders in pregnancy, antepartum haemorrhage, and premature rupture of membranes) were associated with neonatal asphyxia[10,14–18]. A prolonged second stage of labour, nuchal cord, meconium stained amniotic fluid, acute foetal distress, delivery through caesarean section, and prolonged rupture of membranes were major intrapartum factors[10,16,17,19]. Substantial foetal factors were gestational age, low birth weight, foetal presentation, and resuscitation at birth [10,19,20]. Neonatal asphyxia is associated with death, seizures, multiple organ dysfunction, and prolonged hospital stay in the short-term[10,17]. Mental retardation, epilepsy, and cerebral palsy are the most common long-term neurological sequelae of neonatal asphyxia [21,22]. Despite the high rates of mortality due to NNA, there is a scarcity of data on NNA in Ngaoundere. Also, conducting this study may provide data and hence strategies on how to reduce the burden of NNA in Adamaoua region, Ngaoundere.

MATERIALS AND METHODS

Study design and period

This hospital-based cross-sectional study was conducted from the 20th of February to the 20th of April 2022 in the Maternity and Paediatric departments of the Ngaoundere Regional hospital and Ngaoundere Protestant hospital.

Sampling procedure

Patients were recruited successively, through a non-probabilistic consecutive convenient sampling method. The sample size was obtained by using the Lorentz's formula:

$n = \frac{(Z)2\ p(1-p)}{d2}$ where; n = sample size ,p = expected proportion in population ,d = margin of error (0.05) , Z = standard normal variant at a confidence interval of 95% (standard value 1.96),p= in a study done in Douala 2021, Cameroon reported a prevalence of 9.3%[12]. We obtained a total of 130 patients, which became 150 after adjustments. Finally, a total of 360 neonates were approached during the study period.

Inclusion criteria

- All live new-borns delivered at ≥ 37 weeks of gestation at the Ngaoundere Regional hospital and Ngaoundere Protestant hospital.
- Neonates who had an Apgar score < 7 at the 5th minute
- Women who have consented.

Exclusion criteria

- Neonates with an Apgar score <7 at the 5th min with deadly anomalies; hydrops, cyanotic congenital heart problems, congenital or chromosomal deformities, or congenital infection.
- Mothers who were severely ill or in a coma.

Procedure and data collection

All neonates delivered at the maternity and admitted at the neonatology ward during the study period were involved in the study. Data was collected with a prestructured questionnaire. At birth, the Apgar score was used to assess the neonate's condition. The score on obtained at the 5th minute was recorded in each babies' files. Mothers were approached on their day of delivery and day of discharge (of the neonate), on the 7th day of admission whichever was later on.

Ethical consideration

Ethical clearance was obtained from the Institutional Review Board of the Faculty of Health Sciences University of Buea. Administrative authorizations from the Regional Delegate of health in the Adamaoua region and Directors of the Ngaoundere Regional hospital and Ngaoundere Protestant hospital were obtained. An informed written consent was obtained from all mothers of the new-borns that were included in our study.

Data collection

Some information about the antenatal and medical history of the mother was obtained from the medical file and antenatal book respectively; the same procedure was done to obtain information about the neonate from its case notes. The most common language spoken by the participants was the Fulfulde language, where questions had to be translated into for the women to understand. For those who spoke languages not understood by the student investigator, another translator was solicited. For mothers who gave birth to twins, all the factors except the neonatal ones were obtained from the mother on a single form. A complete physical examination was done. The Sarnat and Sarnat score was used to assess neurologic function and only the clinical elements were used. EEG was not done in all the cases of neonatal asphyxia.

Data processing and analysis

Data collected was reviewed, checked for normality and completeness, cleaned and categorized daily. The folder containing the data was safely protected with a password and placed in a confidential location known only to the researcher. Data were entered into Epi info version 7.1 and analysed using SPPS software (version 25.0). Continuous variables were represented as means and standard deviation. Categorical variables were represented as frequencies, and percentages, using tables and graphs. A binary logistic regression was carried out to study the predictors of neonatal asphyxia. After adjusting for confounders, the Adjusted odds ratio (AOR) with a 95% confidence interval was calculated and predictors with a p-value<0.05 were considered statistically significant for the observed differences and associations. Univariate analysis and cross-tabulations were used to look for association

between short-term neonatal outcomes and neonatal asphyxia.

Study variables

The dependent variable in this study was neonatal asphyxia, and independent variables were categorized into:

- Maternal socio-demographic: maternal age, marital status, religion, level of education, occupation, parity.
- Medical and obstetric characteristic: smoking, alcohol, HIV, hepatitis, stillbirth, miscarriage, previous baby with a history of NNA, intrauterine foetal death.
- Antepartum factors: number of antenatal consultations, malaria, urinary tract infection, chronic hypertension, diabetes mellitus, eclampsia/preeclampsia, bleeding in pregnancy, number of ultrasounds, history of hospitalization during pregnancy, anaemia in pregnancy.
- Intrapartum factors: prolonged labour, PROM, non-vertex presentation, mode of delivery, meconium-stained amniotic fluid, place of delivery, conductor of delivery, foetal distress, place of delivery, mode of delivery, type of labour.
- Neonatal factors: gestational age, gender, weight, Apgar score at the 5th minute, history of resuscitation, duration and method.
- Short term outcome: HIE, seizures, acute renal failure, necrotizing enterocolitis, acute heart failure, disseminated intravascular coagulation, hypoglycaemia, discharge with stable neurological status, and death.

RESULTS

Out of our sample size of 150 patients, 360 participants were approached in the maternity and paediatric departments of the Regional and Protestant hospital of Ngaoundere during the study period. 330 patients met our inclusion criteria as shown in figure 1.

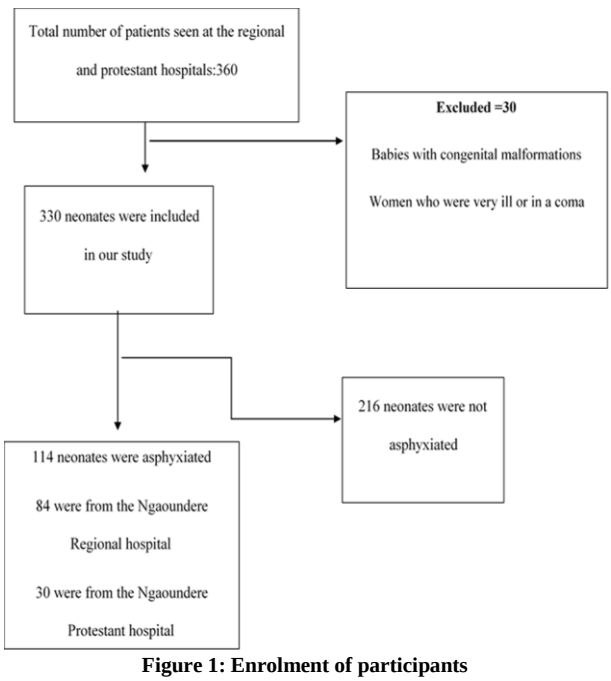

Figure 1: Enrolment of participants

Sociodemographic characteristics

Most of the participants(mothers) 260 (78.8%) had an age range of 20-35, with a mean age of 26.76(±6.211). A majority had attended secondary school 120(36.4%). Three hundred and thirteen women were married (94.8%). Two hundred and thirty-one (70%) women were housewives. Two hundred and thirty-two (70.3%) were multigravida.

Table 1: Sociodemographic data

Variables	Category	Frequency	Percentage(%)
Age	≤19	39	11.8
	20-35	260	78.8
	>35	31	9.4
Occupation	Farmer	6	1.8
	Housewife	231	70
	Student	42	12.7
	Other	51	15.5
Level of education	Primary	75	22.7
	Secondary	120	36.4
	University	54	16.4
	None	81	24.5
Parity	Multipara	232	70.3
	Primipara	98	29.7
Marital status	Married	313	94.8
	Cohabitation	3	0.9
	Single	13	3.9
	Widow	1	0.3

Maternal comorbidities

A majority of the women developed malaria in pregnancy 54.4%, 14.2% had urinary tract infections, 7.6% suffered from hypertensive disorders during pregnancy, 6.7% were anaemic and 3.6% developed bleeding during the second and/or third trimester.

Obstetric characteristics

Of most of the mothers, 97.9% delivered in the hospital, whereas 72.1% of the deliveries were done by midwives. Also, 1.8% gave birth at home. 19.7% underwent emergency caesarean sections while 6.4% were delivered through a planned caesarean section. Labour started spontaneously in a majority of the women (77.9%). In addition, 73% of the mothers gave birth through normal vaginal delivery.

Neonatal characteristics

A great number of the women, two hundred and seventy-two (82.4%) were at 38-40 weeks of gestation, whereas thirteen women (3.6%) were at >42 weeks of gestation. Out of the 330 patients, one hundred and seventy-one (51.9%) women who participated delivered male neonates, and one hundred and fifty-nine (48.2) delivered female neonates, giving a ratio of 1.1:1. One hundred and eight neonates were resuscitated (32.7%).

Prevalence

A total of 330 neonates were delivered during our study. One hundred and fourteen neonates were asphyxiated (with an Apgar score <7 at the 5th minute) giving a prevalence of 35% as shown below. In addition, 216 babies had an Apgar score ≥7. Five neonates (5.7%) developed severe asphyxia with an Apgar score of (0-3) at the 5th minute, meanwhile, one hundred and nine neonates (33.4%) had moderate asphyxia with an Apgar score of 4-6 at the 5th min.

Table 2: Obstetric characteristics

Variable	Category	Frequency (N=330)	Percent (%)
Place of delivery	Hospital	323	97.9
	House	6	1.8
	Others	1	0.3
Type of labour	Spontaneous	257	77.9
	Induced	44	13.3
	Augmented	7	2.1
	Did not go into labour	22	6.7
PROM >12 hours	Yes	33	90
	No	297	10
Foetal presentation	Vertex	303	91.9
	Breech	24	7.3
	Face	1	0.3
	others	2	0.6
Colour of amniotic fluid	Bloody	9	2.7
	Clear	221	67
	Meconium-stained	100	30.3
Mode of delivery	Normal vaginal	241	73
	Instrumental	3	0.9
	Emergency CS	65	19.7
	Planned CS	21	6.4
Delivery done by	Midwives	238	72.1
	Obstetrician	85	25.8
	Others	7	2.1

AOR= Adjusted Odds ratio, CI= Confidence interval

Factors associated with neonatal asphyxia

Antepartum factors

Women aged ≤19 years were 2.23 times more likely to give birth to asphyxiated babies compared to older women in this study, (AOR=2.231 95% CI 1.073-4.640) with a p-value of 0.032. Amongst the maternal comorbidities, malaria in pregnancy, urinary tract infections, and anaemia in pregnancy had a major statistical impact on the occurrence of NNA with the p-value being 0.001, 0.004 and 0.005 respectively. Neonates whose mothers suffered from anaemia during pregnancy were 4.2 times more likely to suffer from NNA compared to mothers who were not anaemic during pregnancy (adjusted OR=4.223, 95%CI: 1.49-11.965). Also, neonates with mothers who had malaria were 2.4 times more likely to develop NNA compared to the mothers who did not suffer from malaria in pregnancy (adjusted OR=2.44, 95%CI: 1.409-4.227). In addition, neonates whose mothers had urinary tract infections were 2.9 times more likely to have NNA compared to mothers who did not have urinary tract infections (adjusted OR=2.961, 95%CI: 1.463-5.993) as shown in table 5 below.

Intrapartum factors

Acute foetal distress (adjusted OR=33.198 95% CI 0.015-0.053), meconium-stained amniotic fluid (adjusted OR=7.595 95% CI 1.628-35.427) and prolonged labour (adjusted OR=5.791 95%CI 2.013-16.665) were found to be significantly associated with NNA, with a p-value of **0.000**, **0.04** and **0.001** respectively. Neonates whose liquor was stained with meconium were 7.59 times more likely to be asphyxiated compared to those whose liquor was bloody. Also, neonates whose mothers' labour was prolonged were 5.7 times more likely to develop NNA compared to mothers whose labour duration was normal. In contrast, NNA was reduced by 0.188 times in mothers with a normal duration of labour compared to those with prolonged labour. Neonates who developed acute foetal distress during labour were 33 times more likely to suffer from neonatal asphyxia compared to neonates who did not suffer from neonatal asphyxia (PROM, mode of delivery and conductor of delivery) were shown to have no association with neonatal asphyxia.

Neonatal factors

Multivariate analysis showed that low birth weight(<2.5kg) (AOR=2.421 95%CI 1.093-5.36 p-value=**0.029**) was significantly associated with neonatal asphyxia. Additionally, NNA was increased by 2.42 in babies with low birth weight compared to babies with normal birth weight. Also, female neonates were 0.37 (AOR=0.372 95%CI 0.2-0.692 p-value=**0.002**) times less likely to develop NNA compared to male neonates. Sixty-six male neonates and 48 female neonates were affected, giving a ratio of 1.4:1. In addition, postdate (>42 weeks) (AOR=5.270 95%CI 1.224-22.683 p-value=**0.026**) babies were 5.27 times more likely to develop NNA compared to term and full term neonates.

Table 3: Antepartum and sociodemographic factors associated with neonatal asphyxia

Variable	Category	No NNA(N=216)(%)	NNA(N=114)(%)	AOR 95%CI	p-value
Past history of NNA	Yes	4(1.9)	3(2.6)	0.965(0.144, 4.018	0.968
	No	212(98.1)	111(97.4)	1	
Hypertension	Yes	1(0.5)	3(2.6)	2.228(0.027, 3.884)	0.563
	No	215(99.5)	111(97.4)	1	
HIV	Yes	2(0.9)	3(2.6)	4.817(0.028, 1.223)	0.101
	No	214(99.1)	111(97.4)	1	
Malaria	Yes	98(45.4)	83(72.8)	2.409(1.409, 4.227	**0.001**
	No	118(54.6)	31(27.2)	1	
Urinary tract infections	Yes	18(8.3)	29(25.4)	2.758(1.463, 5.993)	**0.004**
	No	198(91.7)	85(74.6)	1	
Anaemia	Yes	6(2.8)	16(14.0)	4.358(1.49,11.6)	**0.005**
	No	210(97.2)	98(86.0)	1	
Bleeding during the 2nd and/or 3rd trimester	Yes	4(1.9)	8(7.0)	3.533(1.392,44.8)	0.069
	No	212(98.1)	106(93.0)	1	
Preeclampsia/ Eclampsia	Yes	11(5.1)	14(12.3)	1.810(0.22,1.50)	0.211
	No	205(94.9)	100(87.7)	1	

AOR= Adjusted odds ratio, CI= Confidence interval

Table 4: Intrapartum factors associated with neonatal asphyxia

			Neonatal asphyxia (N=114) (%)	AOR95%CI	p-value
PROM >18 hours	Yes	13(6.0)	20(17.5)	1.795(0.24,4.436)	0.202
	No	203(94.0)	94(82.5)	1	
Colour of amniotic fluid	Bloody	6(2.8)	3(2.6)	1	
	Clear	186(86.1)	35(30.7)	0.371(0.83,1.66)	0.196
	Meconium-stained	24(11.1)	76(66.7)	7.595(1.62,35.42)	**0.01**
Acute foetal distress	Yes	28(13.0)	96(84.2)	33.198(0.015,0.05)	**0.000**
	No	188(87.0)	18(15.8)	1	
Duration of labour	Normal	152(70.4)	33(28.9)	0.188(0.07,0.49)	**0.001**
	Prolonged	6(21.3)	74(64.9)	5.791(2.01,16.65)	**0.001**
	Precipitate	0(0.0)	2(1.8)	58(10.2,20.5)	0.999
	Did not go into labour	18(8.3)	5(4.4)	1	
Mode of delivery	Emergency cs	34(15.7)	31(27.2)	2.371(0.02,240.56)	0.714
	Instrumental	2(0.9)	1(0.9)	18.876(0.017,210.9	0.412
	Normal vaginal	163(75.5)	78(68.4)	23.779(0.14,4019.18)	0.226
	Planned	17(7.9)	4(3.5)	1	
Delivery was done by?	Midwives	165(76.4)	73(64.0)	0.38(0.04,3.36)	0.384
	Obstetrician	49(22.7)	36(31.6)	1	
	Others	2(0.9)	5(4.4)		

AOR= Adjusted Odds ratio, CI=Confidence interval

Table 5: Neonatal factors associated with neonatal asphyxia

Variable	Category	No NNA(N=216)(%)	NNA(N=114) (%)	AOR95%CI	p-value
Gestational age	>42 weeks	7(3.2)	6(5.3)	5.270(1.22,22.68)	**0.026**
	37 weeks	17(7.9)	3(2.6)	0.462(0.09,2.207)	0.333
	38-40weeks	167(77.3)	105(92.1)	1.861(0.71,4.88)	0.206
	41-42weeks	15(6.9)	10(8.7)	1	
Birth weight	Low birth weight	24(11.1)	24(21.1)	2.421(1.09,5.36)	**0.029**
	Macrosomia	5(2.3)	1(0.9)	0.387(0.02,5.944)	0.496
	Normal	187(86.6)	89(78.1)	1	
Baby's gender	Female	111(51.4)	48(42.1)	0.372(0.2,0.692)	**0.002**
	Male	105(48.6)	66(57.9)	1	

AOR= Adjusted Odds ratio, CI= Confidence interval

Short term outcomes of neonatal asphyxia

Complications such as: feeding difficulties (49.1%), seizures (22.8%), acute kidney injury (11.4%), sepsis (81.6%), acute heart failure (6.1%), necrotizing enterocolitis (6.1%), and death (15.8%), were common in neonates with NNA?

Table 6: Short term outcomes of neonatal asphyxia

Short-term outcome	Neonatal asphyxia (N=114)(%)
IE	112(96.5%)
Feeding difficulties	56(49.1%)
Seizure	26(22.8%)
Acute kidney injury	13(11.4%)
Hypoglycemia	60(52.6%)
Respiratory distress	108(94.7%)
Necrotizing enterocolitis	7(6.1%)
Disseminated intravascular coagulation	0(0.0%)
Sepsis	93(81.6%)
Acute heart failure	7(6.1%)
Discharge without neurological sequelae	85(74.6%)
Death	18(15.8%)

Sarnat classification of hypoxic ischemic encephalopathy

In our study, 112 developed HIE (33.9%) and among those patients, (71) 21.5% had mild encephalopathy, (25) (7.6%) had moderate encephalopathy while (10) 3.0% developed severe encephalopathy.

DISCUSSION

In our study, the prevalence of neonatal asphyxia was found to be 35%. Similar results were obtained in Dilla Ethiopia 32.8%, and Kigali Rwanda 39.7%[15,17]. In contrast, our finding was lower than that obtained in Pakistan 51.25% and Bangladesh 56.9%[14,23]. This variation could be explained by the fact that a majority of the women were attended to by untrained traditional midwives compared to our study where medically trained midwives were the major conductors of delivery. In addition, this was higher than that obtained in Yaounde 8.5% in 2013, and 9.13% in 2020, Douala [10,12]. The discrepancies between our findings and those of the studies above could be explained by the fact that they used different methodologies, study population, area and time. The high prevalence of NNA in our study could be explained by the fact that the Ngaoundere Regional hospital and Ngaoundere Protestant hospital are secondary-level hospitals and many complicated maternal and foetal cases are sent towards them.

Young maternal age (<19yrs) was associated with NNA. Similar results were obtained in Karachi Pakistan and Tehran Iran[14,24]. This could be explained by the fact that teenage marriages and pregnancies are rampant in our study area, and these young women have no formal education and hence tend to be ignorant of how to handle pregnancy up till delivery.

As maternal pathologies; malaria, urinary tract infection, and anaemia were found to be significantly associated with neonatal asphyxia. Similar results were obtained in studies done in Cameroon and Senegal[11,16,25]. Malaria may cause developmental abnormalities in the baby, which may make it difficult to store sufficient energy during labour or in the immediate postpartum period, leading to asphyxia[26]. Anaemia in pregnancy causes a decrease in the level of oxygen and nutrients carried to the foetus through the placenta which may lead to intrapartum hypoxia[10].

Prolonged labour, meconium-stained amniotic fluid and acute foetal distress were significantly associated with NNA in our study. These findings were in line with studies done in Togo, India, and Pakistan[14,27,28]. Poor uterine contractions commonly lead to the use of oxytocin or misoprostol, and these uterotonics cause powerful uterine contractions that cause reduced blood flow to the placenta and consequently to the foetus leading to foetal distress, hypoxia and asphyxia[11]. Additionally, a normal duration of labour was found to be a protective factor against NNA. This was different compared to what was found in Rwanda where a normal duration of labour was found to be associated with NNA[29]. This divergence could be explained by the fact that we had more multiparas than primiparas in our study and the majority of them had a normal duration of labour. The presence of meconium in the amniotic fluid is linked with the development of FHR abnormalities, or more accurately foetal distress[30]. A possible explanation is that meconium-stained amniotic fluid causes peripartum inhalation of meconium-stained amniotic fluid, resulting in chemical pneumonitis with inflammation of the pulmonary tissue, mechanical narrowing of the airways, and pulmonary air leakage, ultimately leading to anoxia or hypoxia[31]. Low birth weight was found to be associated with neonatal asphyxia. A similar result was obtained in Pakistan[14]. Low birth weight infants may have a higher risk of perinatal complications due to placental insufficiency; also, low-birth-weight neonates are characterized by pulmonary immaturity and a lack of sufficient respiratory muscle strength. We found that being female was a protective factor against NNA. This could be due to the secretion of sex hormones such as oestrogens, as they provide protection against anoxic ischemic lesions in the brain[32]. Postdate pregnancies were found to be associated with NNA in our study. This was similar to what was found in Surabaya[33]. The longer a pregnancy continues above term, the greater the risk of developing placental insufficiency, foetal development retardation, and hypoxia-anoxia[34].

The commonest complication of neonatal asphyxia was HIE (96.5%) with seizures (22.8%) with 21% having mild encephalopathy, 7.6% with moderate encephalopathy and 3% with severe encephalopathy. A similar result was found in Brazzaville Congo where 100% had HIE with 16% at Sarnat I, 62% at Sarnat II and 22% at Sarnat III[35]. Uganda reported 3% of patients with 43.5% with mild HIE, followed by 34.8%, and 21.7% that had moderate and severe HIE respectively[36]. This was lower compared to the results found in our study. Differences could be due to the higher sample size used in each study. Other significant complications were respiratory distress (94.1%), sepsis (81.6%), hypoglycaemia (52.6%), feeding difficulties (49.1%) which were similar to what was found in Allahabad[37]. Mortality in our study was 15.8%. This was similar to what was obtained by Nepal 17.8% [13,38]. However, mortality was 31.1% in Irrua Nigeria[8]. These differences could be because this study utilized a different definition for neonatal asphyxia compared to our study.

Limitations and strengths

Our main limitation was the use of the Apgar score, which is a tool used to evaluate the physiological state of a neonate at a specific point in time. Confirmatory tests such as umbilical artery cord blood ph. <7.00 and base deficit <12mEq/l was not done. Neonates were not followed up after discharge to assess for progress on their neurological status. Our strength was the use of a standard score such as Sarnat and Sarnat were used to classify the severity of neonatal asphyxia.

CONCLUSION

We conclude that, the prevalence of neonatal asphyxia was high at 35%. Young maternal age (<19), anaemia, acute foetal distress, gestational age (>42 weeks) were the major factors identified in our study, with most being preventable. HIE (Sarnat I) was the commonest outcome identified. A majority of the neonates were discharged with a stable neurological status (74.6%), while 15.8% of them died. Organization of training sessions on the proper steps of neonatal resuscitation and proper guidance on attending antenatal consultations may help reduce the burden of NNA.

Abbreviations

AHF: Acute heart failure
HIE: Hypoxic ischemic encephalopathy
NEC: Necrotising enterocolitis
NNA: Neonatal asphyxia
PROM: Premature rupture of membranes

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