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RESEARCH ARTICLE

BIRTH ASPHYXIA IN FULLTERM NEONATES IN BASRA MATERNITY AND CHILDREN HOSPITAL

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ABSTRACT

**Objectives:** a case-control study has carried out on term neonates with birth asphyxia, whom were admitted to 1<sup>st</sup> neonatal care unit at Basra Maternity and Children Hospital, to assess the frequency of birth asphyxia, its clinical features and some related neonatal, maternal (labour and delivery) variable as well as its outcome.

**Method:** a total of (85) full term neonates, 50(58.82%) males and 35(41.17%) females, were recruited in the study from the first of December 2011 to 1<sup>st</sup> of December 2012. A total of (11486) full term neonates were delivered during the study period; (125) normal neonates delivered in the same period were regarded as control group. Detailed neonatal, maternal, perinatal, labor and delivery history were taken and compared in cases and control.

**Results:** frequency of birth asphyxia was (0.74%) of total births and represented (4.9%) of total admission to the 1<sup>st</sup> neonatal unit. All patients need resuscitation with suction and oxygen and 24.7% need intubation, while most control cried immediately after birth and only 16% of them needed simple resuscitation and responded to direct oxygen. No significant difference regarding neonatal history (gestational age, sex, weight) in cases and control (p- value >0.05). The main clinical features were related to the central nervous system and respiratory system. The neurological symptoms include irritability, convulsion, increase tone, lethargy, poor feeding, and decrease tone with the following percentages respectively (55.3%), (47.1%), (32.9%), (31.8%), (25.9%), (14.1%). Respiratory distress and cyanosis was reported in (50.5%) and (45.9%) of patients respectively. Maternal risk factors for asphyxia were; young mothers (< 18 years), primiparous mothers, mothers with no antenatal care, and history of maternal medical problems (P-value <0.05). Assisted vaginal deliveries, complications of labour (like prolonged rupture of membrane, prolonged labour, cord prolapse, and meconium) and breech presentation were found as risk factors of asphyxia (P-value <0.05). Regarding the mortality of asphyxiated neonate (22.3%) of cases died, mainly in stage(3) then stage(2), and more in males.

**Recommendations:** So regular antenatal care, close monitoring of fetus during labour, adequate resuscitation at birth can prevent asphyxia, and sharing in decreasing its frequency and morbidity.

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INTRODUCTION

Birth asphyxia is a serious problem which can cause 1 million deaths among newborn babies annually around the world and a similar number of patients with serious neurological sequelae, such as cerebral palsy, mental retardation and epilepsy. (Majeed *et al.*, 2007) Asphyxia results from combination of both hypoxia and ischemia, and the effect of asphyxia on the baby's central nervous system will result in a clinical syndrome called the hypoxic ischemic encephalopathy (HIE). (Waqar and Haque, 2012) The World Health Organization defines birth asphyxia as "failure to initiate and maintain spontaneous and effective breathing at birth", while the AAP (American academy of Pediatrics) and ACOG (American college of Obstetrics and Gynecology)

define four criteria to diagnose asphyxia. These criteria are: (a) Sever metabolic or mixed acidemia (pH < 7.00), (b) Depressed Apgar scores 0-3 for longer than 5 minutes, (c) Unexplained neurological manifestations (as seizures, coma, hypotonia), (d) Multi-organ system involvement (as kidney, lungs, liver, heart, and intestine). (Flavin and Perinatal Asphyxia, 2001) With the improvements in the health care provided to the pregnant women, the incidence of birth asphyxia has declined to levels less than 0.1% in the developed countries, while the developing countries are still having higher levels reaching to 26 per 1000 live births in Nigeria with 40% fatality rate or even more. (Haider and Bhutta, 2006) There are multiple risk factors for birth asphyxia including: antepartum risk factors (as primiparity, hypertension, anemia, and antepartum hemorrhage), intrapartum risk factors (as malpresentation, prolonged labor, preeclampsia, oxytocin use and umbilical cord

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prolapse), and infant risk factors (as prematurity, low birth weight and intrauterine growth retardation). (Lee *et al.*, 2008) The long-term sequelae of birth asphyxia depend really on the severity of HIE as 80% of asphyxiated infants who survive severe HIE, develop severe long-term neurological sequelae, while infants who experienced mild HIE may show no neurological sequelae (Agarwal *et al.*, 2007).

### Aims of the Study

The aims of this case-control study is to assess the frequency of birth asphyxia in full term newborn babies born in Basra Maternity and Children Hospital, evaluate clinical features and mortality of asphyxiated neonates, and to study some risk factors in relation to neonatal, maternal and labour variables.

## MATERIALS AND METHODS

A case-control study had been carried out on full term neonates (gestational age 37-42weeks) who were admitted to the 1<sup>st</sup> neonatal care unit (1<sup>st</sup> NCU) at Basra Maternity and Children Hospital for 12 months period from the 1<sup>st</sup> of December 2011 till the 1<sup>st</sup> of December 2012. Total cases (85) term newborns with birth asphyxia, 50(58.82%) of them were males and 35(41.17%) were females. Control cases (125) full term newborn were delivered in same period, matched for gestational age, sex, mode of delivery, included in the study, they were healthy and had no problem. Information were taken regarding name, age, sex, residence of the family, date of admission, date of discharge and days of hospitalization. Neonatal data included: body weight, gestational age, singleton or multiple births, Apgar score, need for resuscitation after birth, cried immediately, breath immediately and history of convulsion. Factors related to labor and delivery were assessed, these included: type of delivery (vaginal, assisted vaginal or caesarean section whether elective or emergency), presentation (cephalic, breech or others) complications as prolonged rupture of membranes > 18 hours, prolonged labor (Prolong labor of > 24 hrs duration, which may be due to a prolonged latent phase > 20 hrs in a primigravida or > 14 hrs in a multipara) (Carlo and Ambalavanan, 2011), meconium staining of liquor, eclampsia, cord prolapse and others. Maternal information were also recorded including: age (high risk group <18 yr or >35 yr and low risk group 18-35 yr) (TPitsawong, 2011), parity (which is divided into risk group if P<sub>1</sub> or more than P<sub>4</sub> and normal group= P<sub>2-4</sub>) (Üzel *et al.*, 2012), any medical disease (antepartum hemorrhage, diabetes, hypertension, sickle cell anemia, renal disease, heart disease and others), history of any drug ingestion during pregnancy, antenatal care attendance, history of any sign of infection before labor, maternal education and work also were inquired. Full examination was done for all neonates concentrating on assessment of gestational age, full term neonates were only included in the study (depending on the Ballard Scoring System) (Carlo and Ambalavanan, 2011) with last menstrual period and physical examination to assess level of consciousness, tone, reflex, feeding, fontanel, and colour, other system were assessed such as cardiovascular, respiratory, gastrointestinal, hematological system and Apgar scoring was done in all cases at 1min, 5min, and 10 min later on. Asphyxia was diagnosed according to

criteria of The World Health Organization. (Lincetto, 2007) Exclusion criteria as preterm and post term neonates, congenital abnormalities, cardiac, and respiratory problems and others like suspected metabolic problems. Total deliveries during the same period was recorded and percentage of asphyxia was calculated to total births and total admission to 1<sup>st</sup> NCU, clinical features were assessed and cases were divided according to Sarant classification. (Carlo and Ambalavanan, 2011), Statistical analysis was done using SPSS program (version17), data were expressed and comparisons of proportions were performed using the chi square, P-value of <0.05 was considered as statistically significant. Descriptive summarization of the data consisted of frequency counts and percentages. Fisher's Exact Test was used whenever applicable. Logistic regression analysis was also done for the analysis of some risk factors that were associated with significant birth asphyxia and for each variable the odd ratio (OR) was assessed (normal value of odd ratio <1.96).

## RESULTS

The frequency of cases of birth asphyxia was calculated in relation to total births and admission as shown in Table 1, which demonstrates that term neonates with birth asphyxia constitute 0.74% of total term infants, and 4.9% of total admission to the first neonatal care unit. The early clinical features that were selected for diagnosis of birth asphyxia were assessed in Table 2 which shows that most of neonates in the control group cried immediately after birth, and only 16% of them needed simple resuscitation and responds to direct oxygen. while 24.7% of cases needed intubation and other cases needed suction, oxygen or bag and mask. The severity of birth asphyxia is studied in relation to the sex.

**Table 1. The frequency of birth asphyxia in relation to total births and admission**

Variables	total	Birth asphyxia (%from total full term)
Total births(full term)	11486	85 (0.74)
1 <sup>st</sup> NCU admission	1783	85 (4.9)

**Table 2. Early clinical features and birth asphyxia**

Characteristic	Cases (n=85)		Controls (n=125)	
	NO.	%	NO.	%
Apgar at 1 minute:				
3	21	24.7	----	
4-7	56	65.8	22	17.6
>7	----		103	82.4
missing	8	9.4	----	
Apgar score at 5 minutes				
3	11	12.9	----	
4-7	69	81.2	2	1.6
>7	----		123	98.4
missing	5	5.9	----	
Apgar score at 10 minutes				
3	8	9.4	----	
4-7	77	90.6	----	
>7	----		125	100
Cried immediately	----		103	82.4
Resuscitation				
Suction, oxygen, or both	45	52.9	20	16
Bag & mask, oxygen	19	22.3	2	1.6
Intubation	21	24.7	----	

**Table 3. Stage of asphyxia in relation to sex**

Stages	Male		Female		p-value
	No.	%	No.	%	
Stage1	25	50.0	20	57.1	0.499
Stage2	17	34.0	10	28.6	0.529
Stage3	8	16.0	5	14.3	0.715
Total	50	58.8	35	41.2	0.072

Table 3 shows the Sarant classification of birth asphyxia in relation to the sex of the asphyxiated neonates, which demonstrates a higher frequency of male neonate with asphyxia, in stage 2 and stage 3 but statistically is not significant (P-value>0.05). Table 4 shows neonatal characteristics in cases and control which reveals that patients and control were similar in gestational age, sex, and weight (p-value>0.05). The clinical features of neonates with birth asphyxia were shown in Table 5. It shows that the main clinical features are related to central nervous system and respiratory system.

**Table 4. Neonatal characteristics of patients and control**

Variable	Patient (85)		Control (125)		P-value	
	NO.	%	NO.	%		
Mean age $\pm$ (SD)	37.71 $\pm$ 1.25		38.35 $\pm$ 1.48		0.064	
Gestational Age(wk)	37-38	14	16.5	17	13.6	0.565
	39-40	56	65.9	84	67.2	0.842
	41-42	15	17.6	2	19.2	0.776
Sex	male	50	58.8	72	57.6	0.926
	female	35	41.2	53	42.4	0.913
Mean weight $\pm$ (SD)	3.28 $\pm$ 0.62		3.12 $\pm$ 0.79		0.115	
Body weight (Kg)	<2.5	6	7.1	15	12.0	0.241
	2.5-4	63	74.1	90	72.0	0.735
	>4	16	18.8	20	16.0	0.594

**Table 5. The clinical features in neonate with birth asphyxia**

clinical features	No.	%
Irritability	47	55.3%
Convulsion	40	47.1%
Increased tone	28	32.9%
Lethargy	27	31.8%
Poor feeding	22	25.9%
Decrease tone	12	14.1%
Respiratory distress	43	50.5%
Cyanosis	39	45.9%

The CNS features include irritability, convulsion, increase tone, lethargy, poor feeding, and decrease tone with the following percentages respectively (55.3%), (47.1%), (32.9%), (31.8%), (25.9%), (14.1%). Respiratory system was also involved with respiratory distress and cyanosis in (50.5%) and (45.9%) of cases. Maternal characteristics were studied in both patients and control groups. Table 6 shows that birth asphyxia is found to be more in young mothers (< 18 years), primiparous mothers, mothers with no ANC, and mothers with medical problem and all are statistically significant (P-value <0.05). While Table 7 demonstrates the characteristics of labor and delivery in patients and control groups. It is shown that the number of vaginal delivery and c/s were similar in both patients and control, while assisted vaginal deliveries were more in patients (P-value < 0.05), complications of labour (like PROM, prolonged labour, cord prolapse, and meconium) and breech presentation were also more in patients (P-value < 0.05). Deaths in neonates with birth asphyxia were assessed according to the stage of asphyxia, sex, gestational age, body

weight and Apgar score at 1, 5, 10 minute. Table 8 shows that more deaths occurs among stage 3 (52.6%), male (68.4%) as compared with female (31.6%), increase with gestational age more than 40 weeks (73.7%) and more among weight more than 4kg (68.4%). According to Apgar score, low score at (5min) and (10 min) is associated with more deaths. All these results are statistically significant (P-value<0.05). The logistic regression analysis of risk factors in relation to birth asphyxia is shown in table 9, which demonstrates that the following factors; primigravida mothers, maternal age <18 years, medical problem, labour complication and lack of ANC were

**Table 6. Maternal characteristics of patients and control mothers**

Variable	Patient (85)		Control (125)		P-value	
	NO.	%	NO.	%		
Mean age $\pm$ (SD)	25.17 $\pm$ 7.67		25.98 $\pm$ 6.97		0.430	
Maternal age (years)	<18	21	24.7	10	8.0	0.001
	18-35	53	62.4	92	73.6	0.084
	>35	11	12.9	23	18.4	0.292
Mean parity $\pm$ (SD)	2.22 $\pm$ 1.34		2.17 $\pm$ 1.29		0.798	
Parity	primi	21	24.7	15	12.0	0.016
	2-4	50	58.8	86	68.8	0.137
	>4	14	16.5	24	19.2	0.614
ANC	+ve	38	44.7	80	64.0	0.069
	-ve	47	55.3	45	36.0	0.046
Education	10	50	58.8	68	54.4	0.526
	>10	17	20.0	26	20.8	0.888
	none	18	21.2	31	24.8	0.542
Medical problem	+ve	13	15.3	6	4.8	0.025
	-ve	72	84.7	119	95.2	0.456
Maternal work	yes	13	15.3	22	17.6	0.602
	no	72	84.7	103	82.4	0.816
Residence	urban	54	63.5	73	58.4	0.587
	rural	31	36.5	52	41.6	0.574

**Table 7. The characteristics of labor and delivery**

Variable		Patient (85)		Control (125)		P value
		NO.	%	NO.	%	
Mode of delivery	Normal vaginal	42	49.4	61	48.8	0.984
	Assisted vaginal	16	18.8	7	5.6	0.003
	Total vaginal	58	68.2	83	54.4	0.205
	Emergency c/s	22	25.9	44	35.2	0.249
	Elective c/s	5	5.9	13	10.4	0.317
Oxytocin drug used	Total C/S	27	31.8	57	45.6	0.113
	used	59	69.4	71	56.8	0.285
Complication of labour	Not used	26	30.6	54	43.2	0.163
	+ve	27	31.8	15	12.0	0.003
Presentation	-ve	58	68.2	110	88.0	0.109
	Cephalic	61	71.8	105	84.0	0.296
Others: Shoulder transverse	Breech	18	21.1	12	9.6	0.048
		6	7.1	8	6.4	0.782

**Table 8. Deaths in birth asphyxia in relation to stages of asphyxia, sex, age, body weight and Apgar score at 1, 5, 10 minute**

Variable		Death (19)		P-value
		No.	%	
		No.	%	
Stages	Stage 1	1	5.3	0.000
	Stage 2	8	42.1	
	Stage 3	10	52.6	
Sex	Male	13	68.4	0.000
	Female	6	31.6	
Age (weeks)	37-38	2	10.5	0.0001
	39-40	3	15.8	
	41-42	14	73.7	
Body weight (kg)	< 2.5	2	10.5	0.0001
	2.5-4	4	21.1	
Apgar (1min)	> 4	13	68.4	0.0001
	3	3	75.0	
Apgar (5min)	4-7	1	25.0	0.0001
	3	5	71.4	
Apgar (10min)	4-7	2	28.6	0.0001
	3	7	87.5	
	4-7	1	12.5	0.000

**Table 9. The logistic regression analysis of risk factors in relation to birth asphyxia**

Variable	P-value	Odd ratio (O R)	95% confidence interval	
			Lower bound	Upper bound
Primigravida	0.016	1.968	1.066	3.831
Maternal age(<18 yeas)	0.001	2.712	1.101	6.680
Medical problem	0.009	1.506	1.026	3.178
Labour complication	0.000	9.285	4.121	20.920
Assisted vaginal	0.130	4.098	0.956	17.558
Breech	0.190	1.095	0.158	7.569
ANC	0.002	0.444	0.236	0.836

more significant risk factor for birth asphyxia. The results are statistically significant (p-value <0.05).

## DISCUSSION

Birth asphyxia and hypoxic ischemic encephalopathy (HIE) are serious conditions that can cause significant mortality and life-long morbidity in the newborn baby. (Shireen *et al.*, 2009) Our study shows that the prevalence of birth asphyxia in term babies in relation to the total term deliveries and total admission of term babies to first neonatal care unit are 0.74% and 4.9% respectively. These figures are relatively higher as compared with those reported in studies done in Medina Munawarrha in Saudi Arabia (Itoo *et al.*, 2003), Jordan (Khreisat and Hababbeh, 2005), and Canada (Dzakpasu *et al.*, 2009).

Our higher figures could be attributed to prenatal factors as 55.3% of mothers do not have regular antenatal care with delay in seeking hospital care with midwife interference and signs of fetal distress were already present when they attend the hospital. The main presenting clinical features of birth asphyxia are related to the central nervous system such as (lethargy and poor feeding, irritability, convulsions, and increased tone), followed by respiratory system (respiratory distress and cyanosis). These findings are similar to studies done in India (Majeed *et al.*, 2007) and Australia (Badawi *et al.*, 1998) which show that the main clinical features are related to the central nervous system followed by respiratory system.

This study shows that the risk of birth asphyxia in maternal age less than 18 years is higher and it is statistically significant as

compared with control group; in contrast to studies carried out in Jordan in Prince Ali Hospital in 2005 (Dongol *et al.*, 2010) which shows no relation between maternal age and risk of asphyxia.

This can be explained by that the younger age mothers remain a high risk group due to factors which are more common among them such as biologic immaturity, inadequate prenatal care, and low pre pregnancy weight, all these factors may influence the outcome of pregnancy. (Groenendaal and Vanbel, 2012) Also this study shows that birth asphyxia is more among babies delivered to primigravida. This could be explained by that there is a higher chances of cephalo-pelvic disproportion and prolonged labour. (Levene 2011) However our study doesn't show an increased incidence of birth asphyxia with grand multipara which is different from a study done by in Multan Nepal 2010 which show increased incidence of asphyxia in grand multipara. (Butt *et al.*, 2008) The study shows that more than 55.3% of mothers of asphyxiated babies had no ANC, this is similar to a study done in Pakistan (Muhi *et al.*, 2011) This can be explained by that absence of ANC may lead to failure of detecting, treating and preventing many risk factors which may causing birth asphyxia, and there is a significant relationship between frequency of asphyxia and maternal disease during pregnancy, in which antepartum hemorrhage and pregnancy induced hypertension carried high risk for birth asphyxia as these problems can lead to placental insufficiency and asphyxia. (Khreisat and Hababbeh 2005)

In each delivery, there should be effective measures to detect and prevent fetal distress, so that early intervention may help in lowering the number of birth asphyxia. This study shows no relationship between birth asphyxia and whether the mothers had normal spontaneous vaginal delivery or induction of labour, this can be explained by the fact that oxytocin augmentation is done always by monitoring of fetal heart to detect fetal distress. (Milsom *et al.*, 2002) This is in contrast to a study done in Thailand, which shows that oxytocin used in induction can lead to asphyxia because oxytocin induces contraction. (TPitsawong, 2011) This study shows a statistically significant association between asphyxia and complication of labour (like prolonged rupture of membrane, prolonged labour, cord prolapse, and meconium), which is similar to a study done in Saudi Arabia (Ito *et al.*, 2003), and this is because labour complications are risk factors for interruption of umbilical blood flow during labour. (Nagdyman *et al.*, 2001) Malpresentation, especially breech presentation, is found to be associated with increased risk of birth asphyxia, however, whether the breech fetus is already compromised before delivery or the vaginal breech delivery is at increased risk for asphyxia is not well known yet. (Levene, 2011) Our study demonstrates that the frequency of death was 22.35% which is similar to a study done in Baghdad which shows the frequency was 23% (Ibrahim and Parkash, 2002) and more cases died were among stage III, which has poor prognosis. (Carlo and Ambalavanan, 2011), Males have a higher frequency of death (68.4% of deaths of birth asphyxia are males, and 31.6% are females). This difference is probably because of females resistance to diseases as a result of their XX chromosomes, X being the site of immunoglobulin production, giving them double protection (Ugwu *et al.*, 2012) , and also

male gender is a risk factors for neonatal morbidity and mortality (Carlo and Ambalavanan, 2011).

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