

Risk factors of perinatal asphyxia: a study at Al-Diwaniya maternity and children teaching hospital

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Abstract

Perinatal asphyxia is a common neonatal problem that contribute significantly to neonatal morbidity and mortality. Total number of patient enrolled in our study was one-hundred seventy-one. Data collected from October 01, 2013 to the September 30, 2014. Many variables are included such as GA, BWT, gender, mode of delivery, maternal age, parity and their ANC. In addition, a number of risk factor were encountered; maternal anemia, maternal hypertension, maternal DM, PROM, prolong labor, meconium- stained amniotic fluid, maternal fever, fetal distress, multiple gestation and APH. As a result, there is no gender difference between patient and control. Among patients group, the predominant mode of delivery was induced vaginal delivery (38.02 %), most of the mothers were primipara (61.16%) with irregular ANC seen in 55.37% of them. While among control group, the predominant mode of delivery was elective CS (40%), most of the mothers were multipara (60%) with regular ANC seen in 70% of them. (88.43 % of patients had risk factor versus only 44% of control had history of risk factor). We found that higher rate of induced vaginal delivery, primiparity and irregular ANC was reported among patients with perinatal asphyxia. Risk factors was more reported in patient group than control one. The less the no. of risk factors, the more possibility of good outcome.

Keywords: Risk factor, Perinatal asphyxia, Al-Diwaniya maternity and children teaching hospital

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Introduction

Perinatal asphyxia is a common health problem that contribute significantly to neonatal morbidity and mortality [1]. although the exact definition is imprecise, it's a condition that occur when there is an impairment in blood gas exchange that

result in hypoxemia and hypercapnia [2]. The combination of hypoxia and ischemia will result in a cascade of biochemical changes in the body leading to brain neuronal death and brain damage [3].

Neonatal encephalopathy (HIE) is a brain insult that result from failure to breathe adequately at birth [4]. Asphyxia may be caused by many maternal and fetal causes [5]. Patient who survive may have a chance of permanent neurological sequel such as epilepsy and cerebral palsy [6]. The incidence of perinatal asphyxia shows a higher association with complicated pregnancies especially if the placental blood flow is impaired [7].

Risk factor has been divided into ante partum, intra partum and fetal causes [8], it includes increasing or decreasing maternal age, multiple birth, PROM, APH, meconium-stained amniotic fluid, prolong labor, poor attendance to antenatal care, maternal hypertension or DM, maternal anemia [9]. The outcome of patient with asphyxia depend on the risk factors and proper management of the patient [10]. The clinical neurological dysfunction has been regarded as the best predictor of long term outcome [11].

Majority of the risk factor are avoidable by good ANC, hence asphyxia is considered a preventable condition, whatever the etiology, it is important to highlighting its risk factors [12]. The aim of this study is to evaluate risk factors of perinatal asphyxia and to determine its correlation with outcome.

Patients and methods

Total number of patient enrolled in this study were 171, the study was conducted at the NICU of Al-Diwaniya Maternity and children Teaching Hospital over a period of 12 months (from the 1st of October 2013 to the 30th of September 2014). Subjects were divided into cases and control, neonate who were (near term, term and post term) delivered with significant history of

asphyxia and clinical manifestation of neonatal encephalopathy were considered as cases while neonates with negative history and normal physical and neurological examination were involved as control.

All newborns delivered at hospital with a low Apgar score (< 7 at 1 minute) with clinical manifestation of HIE were recruited consecutively over the study period. For newborns who were delivered at home with no Apgar score recording we depend on significant history of delay cry with cyanosis and irregular respiration with clinical manifestation of HIE.

Neonates with GA less than 35 weeks, gross congenital anomalies, lethal anomalies were excluded from the study. Data were recorded according to a predesigned forma and parental verbal permission for inclusion in to the study were allowed with full explanation of the role of these studies to improve long term prognosis.

Many variables were obtained like gender, G. A, B. WT, mode of delivery, maternal age, parity and their ANC. In addition, a number of risk factor were also studied including PROM > 18 hours, prolong labor > 12 hours in primipara and 8 hours in multipara, fetal distress (abnormality on fetal heart monitoring), meconium stained A.F., maternal anemia with Hb <10 g/dl, maternal diseases like hypertension and DM. Follow up to those patient until discharge were done with a classification of outcome as planned.

Statistical analysis

Data obtained in the present study were summarized, presented and analyzed using two software programs; these were statistical package for the social sciences (SPSS) version 16 and Microsoft Office Excel 2010. For purpose of presentation numeric variables were expressed in the

form of mean+SD (standard deviation), while categorical variables were expressed in the form of number and percentage. Mean values were compared using independent samples t-test. Chi-square and Fischer Exact tests were used to study association between any two categorical variables. P-value was considered significant when it was equal to or less than 0.05.

Results

During the study period of 12 months, a total of 171 neonates were involved in the study, 121 of them fulfill the criteria for inclusion as cases while 50 neonates were involved as control.

Table 1 show the general characteristic of the study population for both cases and control. The general characteristic of the study population is shown in table 1.

Among patient group, male: female ratio was 2.3:1. The main mode of delivery was induced vaginal delivery (38.02%), the rate of CS delivery was 49 (40.76%), 29 of them (23.1% of total) was delivered by EM.CS. Most of the mothers of patient group were primipara (61.16%), 17-35 years' age (65.29%), having irregular ANC (55.37%). Among control group male: female ratio was 2.8:1, the main mode of delivery was elective CS delivery (40%) and the rate of CS delivery was (44%), of them only 2(4%) of total was delivered by EM.CS. Most of the mothers of patient group were multipara (60%), 17-35 years' age (80%), having regular ANC (70%). G.A. and BWT of both cases and control shown in table 2.

Characteristic		No. patient	%	No. control	%
Gender	Male	85	70.25	37	74
	Female	36	29.75	13	26
Mode of delivery	Spontaneous vaginal delivery	26	21.49	15	30
	Induced vaginal delivery	46	38.02	13	26
	Elective CS	21	17.36	20	40
	Emergency CS	28	23.14	2	4
Maternal age	<16 years	19	15.70	7	14
	17-35 years	79	65.29	40	80
	>35 years	23	19.01	3	6
Parity	Primipara	74	61.16	20	40
	Multipara	47	38.84	30	60
ANC	Regular	54	44.63	35	70
	Irregular	67	55.37	15	30
Total		121	100.00	50	100.00

Table 1.

General characteristics of the study sample

Characteristic		Mean	SD
Birth weight	Cases	3.31	0.85
	Control	3.45	0.81
Gestational age	Cases	38.19	2.53
	Control	38.06	2.44

Table 2.

Mean birth weight and gestational age

Risk factors that may be associated with an outcome of birth asphyxia in study population are shown in table 3. These included anemia, hypertension, DM, premature rupture of membrane (PROM), prolonged labor, fetal distress, multiple gestation, maternal fever and anti-partum hemorrhage (APH).

Risk factor	No. patient	%	No. control	%
anemic mother	14	11.57	4	8
Hyt. Mother	17	14.05	1	2
DM of mother	13	10.74	2	4
PROM	10	8.26	3	6
Mconium stain	17	14.05	2	4
Prolonged labor	13	10.74	2	4
Fetal distress	5	4.13	0	0
Multiple gestation	10	8.26	1	2
Maternal fever	11	9.09	3	6
APH	6	4.96	4	8

Table 3.
Risk factors encountered by study population

Number of risk factor	No.	%	No.	%
0	19	15.70	28	56
1	88	72.73	22	44
2	14	11.57	0	0
Total	121	100.00	50	100.00

Table 4.
Number of risk factors

Table 4 showed the classification of patients according to number of risk factors; accordingly, among cases: 19 patients (15.7%) had no risk factors, 88 patients (72.73%) had single risk factor and 14 patients (11.57%) had multiple risk factors. While among control 28 neonates (56%) had no risk factor, 22 of them (44%) had only one risk factor, no one had more than one risk factor. According to outcome, subjects were classified into 4 categories, as shown in table 5. Outcome A: good outcome (normal on examination with no need to AED) Outcome B: variable outcome (abnormal neurological examination with need to AED).

Outcome C: death

Outcome D: unknown (discharge against medical advice). Then we highlight the correlation between risk factor and patient's outcome, patients with outcome D were excluded from the study, they were 13

(10.74%) of total. There was no significant association between fate A and any of risk factors taken individually, nevertheless there was a significant association (P=0.010) between fate A and number of risk factors in such a way the less are the risk factors the more is the probability of fate A, as shown in table 6.

Cases			Control	
Fate	No.	%	No	%
A	58	47.93	41	82%
B	30	24.79	0	0
C	20	16.53	0	0
D	13	10.74	9	18%
Total	121	100.00	50	100.00

Table 5.
Outcome of subjects

Risk factors		Others	Fate A	Total	P-value
Anemic mother	Yes	5	8	13	0.546
	No	45	50	95	
Hypertensive Moth	Yes	8	8	16	0.748
	No	42	50	92	
DM mother	Yes	7	4	11	0.224
	No	43	54	97	
PROM	Yes	5	3	8	0.467
	No	45	55	100	
Meconium stained A.F.	Yes	8	8	16	0.748
	No	42	50	92	
Prolonged labor	Yes	7	4	11	0.224
	No	43	54	97	
Fetal distress	Yes	4	1	5	0.180
	No	46	57	103	
Multiple gestation	Yes	4	5	9	1.000
	No	46	53	99	
Maternal fever	Yes	5	5	10	1.000
	No	45	53	98	
APH	Yes	4	2	6	0.412
	No	46	56	102	
Parity	Primipara	33	36	69	0.671
	Multipara	17	22	39	
ANC	Regular	23	25	48	0.763
	Irregular	27	33	60	
Number of risk factor	0	3	14	17	0.010
	1	37	40	77	
	2	10	4	14	

Table 6.
Association between fate A and risk factors.

None of the risk factors could predict fate B ($P>0.05$), as shown in table 7, as it was obvious that there is no significant association between fate B and any of the risk factors neither singly nor in combination.

Characteristic	Yes	No	Total	P-value
Anemic mother	11	2	13	0.509
	67	28	95	
Hypertensive Mother	10	6	16	0.372
	68	24	92	
DM	6	5	11	0.175
	72	25	97	
PROM	6	2	8	1.000
	72	28	100	
Meconium stain	12	4	16	1.000
	66	26	92	
Prolonged labor	7	4	11	0.494
	71	26	97	
Fetal distress	3	2	5	0.616
	75	28	103	
Multiple gestation	6	3	9	0.706
	72	27	99	
Maternal fever	8	2	10	0.723
	70	28	98	
APH	3	3	6	0.345
	75	27	102	
Number of risk factor	0	15	2	0.249
	1	54	23	
	2	9	5	

Table 7.
Association between fate B and risk factors.

Similarly, there was no significant association between any of the risk factors and fate C, whether taken singly or in combination, ($P>0.05$) as shown in table 8. In other words, fate C cannot be predicted by any of the risk factors.

Discussion

This study was planned to analyze risk factors of perinatal asphyxia and to evaluate their relations to outcome in a group of neonates admitted to NICU of Al-Diwaniya maternity and children teaching hospital. Male: Female ratio was approximately the

same between patient and control, it was (2.3:1) and (2.8:1) respectively with predominant male gender.

Characteristic	Others	Fate C	Total	P-value
Anemic mother	10	3	13	0.705
	78	17	95	
Hypertensive mother	14	2	16	0.731
	74	18	92	
DM of mother	9	2	11	1.000
	79	18	97	
PROM	5	3	8	0.164
	83	17	100	
Meconium stain A.F.	12	4	16	0.491
	76	16	92	
Prolonged labor	8	3	11	0.424
	80	17	97	
Fetal distress	3	2	5	0.230
	85	18	103	
Multiple gestation	8	1	9	1.000
	80	19	99	
Maternal fever	7	3	10	0.390
	81	17	98	
APH	5	1	6	1.000
	83	19	102	
Number of risk factor	1	63	14	0.103
	0	16	1	
	2	9	5	
Total	88	20	18	

Table 8.
Association between fate C and risk factors.

The same result was also seen by S. Ibrahim et al [12], Ekta A Dalal et al, [13] and Fatemeh Nayeri M.D et al, [14] but no significant gender difference was noted by Ronald S. Bloom [15]. Although many studies showed increasing rate of asphyxia among young mothers (<20 years) and older one (>35 years) [16].

Our study show that the majority of mothers were (17-35) years old, it was 65.29% among patient and 80% among control. This result may be explained by the high birth rate in this age group. Regarding mode of delivery, the rate of NVD was higher than CS in both patient and control, this was also seen in many studies 2, 5, 17, 18. The predominant mode of delivery among patient was induced vaginal delivery

(38.02%), while most of the control were delivered by elective CS (40%). The rate of EM.CS was significantly higher among patients than control (23.14%) versus (4%). this result was consistent to many other previous studies [15], [19-23].

Few studies showed a higher rate of CS among patient [12]. The higher rate of EM.CS among patient may be explained by the fact that either most of the mothers came with complication or the decision of CS was done late. Regarding parity, most of the mothers of patient groups were primipara, while the majority of control were of multipara mothers, which was also seen by many previous studies [2, 12, 14, 24, 25] clarifying the importance of primiparity as a risk factor.

The irregular attendance to ANC was also seem to have a role as 55.37% of patient had that while only 30% of control had history of irregular ANC. This result was consistent to that reported in a number of previous studies [2, 8, 12, 14, 15, 25]. On evaluation of risk factor majority of patients (85.3%) had risk factor, while most of control had no risk factor (56%).

Meconium stained amniotic fluid and maternal hypertension were the most common risk factor, the first one was seen in 14.05% of patients which was about the same of that seen by Igberase GO et al [21], Onyearugha CN et al, [24] and Ilah BG [26]. while the latter (14.05%) of patient, which was also reported by NILUFAR et al, (16%) [12], (11.4%) [2] and Fatemeh Nayeri et al, (21%) [15]. HAVIZ M. et al. Other risk factor reported were maternal anemia (11.57%), maternal DM (10.74%), prolong labor (10.74%), maternal fever (9.09%), PROM (8.26%), multiple gestation (8.26%), APH (4.96%), fetal distress (4.13%). In comparison to other studies, PROM was

seen in 33% in Bangladesh [12] and Iran [15], 42.5% in Nigeria [25]. while about maternal anemia it was seen in (66%) in Abottabad study [8] and (48%) by Hafiz M. et al [2], both are higher than result of our study.

The other risk factor was consistent with other studies [2, 12, 24]. On determination of outcome of cases: The death rate was (16.53%) among cases versus none in control, this result was consistent with Bangladesh [12] and Nigeria study [27] but less than reported by khatoon 1989 - (25.4%) [28], Bhuyara 1996 (44%) [29] and in Karachi (26%) [13]. This declining death rate may be a reflective of the improvement in the perinatal care. 47.93% of cases were normal with no neurological sequelae (in Bangladesh it was 40% only) [13], there was no other studies to compare, while 24.79% of cases were discharged with neurological sequelae (28% was seen by Nilufar Shireen et al, [12]. In comparison to control, none of them was discharged with neurological sequelae, the majority of them were normal on neurological examination (82%) and (18%) were left against medical consent. In comparison with Bangladesh study [12], 70% of control were normal on examination and 30% were left against medical consent, there was no reported death or neurological abnormalities seen among them. (this was about the same of our results).

By highlighting the risk factor and evaluation of their relation to outcome, we found that the less the number of risk factor, the better the chance of good outcome (outcome A).

There was no significant association between any of risk factors and neurological sequelae or death. (There was no other studies to compare).

Conclusion

Higher rate of induced vaginal Delivery, primiparity and irregular ANC was reported among patients with perinatal asphyxia. Risk factors was more reported in patient group than control one. Maternal hypertension and meconium -stained A.F. are the two most common risk factors reported. The less the no. of risk factors, the more possibility of good outcome.

Recommendations

Perinatal asphyxia is a preventable condition as most of its risk factors are preventable, hence increasing maternal education, improving maternal ANC, early detection of high risk pregnancy and proper management of neonates who are suffering from asphyxia is crucial to decrease the rate and its complications.

Competing interests

The authors declare that there is no conflict of interest.

Author Contributions

All authors wrote, read and approved the final manuscript.

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