Original Article

Maternal Risk Factors for Birth Asphyxia in Low-Resource Communities

Rubeena Parveen Dhiloo[1], Ambreen Amna Siddique[2], Kanwal Zaman[3], Kousar Fatima[4], Sharmeen Baloch[5], Tasneem Kousar[6],

[1]MS, Resident, Department of Obstetrics & Gynaecology PUMHS/Nawabshah, [2]Associate Professor of gynae and Obs Isra University Hospital Hyderabad
[3]FCPS, Obstetrics & Gynaecology (WMO) Sindh Govt. hospital Qasimabad,
[4]Assistant Professor Obs and gynae, Suleman Roshan Medical College Tando Adam
[5]Registrar, Department of Obstetrics & Gynaecology LUMHS/Jamshoro, [6]Assistant Professor of Paeds, Suleman Roshan Medical College Tando Adam

Correspondence: *Dr Rubeena Parveen Dhiloo*
Resident, Department of Obstetrics & Gynaecology
PUMHS/Nawabshah
rubyali819@gmail.com

Abstract

Objective: To scientifically determine the maternal risk factors for birth asphyxia in low resource communities.
Methodology: The cross-sectional study was conducted in the Department of Gynecology & Obstetrics, Peoples University of Medical & Health Sciences for Women Hospital, Nawabshah through a non-probability consecutive sampling technique for a period of six months from October 2021 to April 2022. All the pregnant women admitted in labor room for delivery of a baby via normal vaginal delivery (NVD) or caesarean section of either age, belongs to lower socioeconomic stratum, gestational age between 37 weeks to 42 weeks, and those who consent to participate were selected for final analysis. Baseline and clinical data were collected and analyzed using SPSS v. 26.0
Results: A total of 118 patients were selected for final analysis. The overall maternal mean age was 33.91±5.87 years. The overall observed prevalence of birth asphyxia was 28.81% (n = 34). Significant predictors of birth asphyxia in our region was increased maternal age (33.91±5.87 – years), unbooked pregnancies (52.94%, n = 18/34), use of cigarettes (8.82%, n = 3/34), previous history of birth asphyxia (47.05%, n = 16/34), presence of anemia (55.88%, n = 19/34), breech presentation (29.41%, n = 10/34), cesarean section (32.35%, n = 11/35), and increased duration of labor (359.18±60.42 – minutes), p <0.05.
Conclusion: Birth asphyxia was found to be highly prevalent in this study. Multiple preventable factors that can be controlled reduces the risk of birth asphyxia in the women of our area.
Keywords**:** Birth asphyxia, low-socioeconomic status.

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Introduction

Low resource countries where healthcare facilities are comprised are much prevalent regions of neonatal deaths. Most of these countries are belongs to Sub-Saharan part of Africa and some parts of Southeast Asia including Pakistan. That is why the prevalence of neonatal deaths is higher in developing countries (~ 4 million neonatal deaths / annum) as compared to developed nations (2.3 million neonatal deaths / annum).[1;2] Risk factors leading to neonatal death vary in developing and developed countries such as lack of perinatal checkups, malnutrition of mother during pregnancy, delivery at non-hygienic healthcare facilities leading to infection are the leading risk factors in developing countries while use of tobacco & alcohol during pregnancy, low birth weight, prematurity, and congenital defects are the leading risk factors in developed countries.[3]

Birth asphyxia (BA) poses a significant burden in developing countries as a cause of neonatal death following a complicated infection during pregnancy or at the time of delivery.[4] Simply, when newborn unable to maintain breathing or failure to initiate breathing is termed as BA.[5] Among such neonates, multi-organ failure leading to death and intrapartum stillbirths is seen approximately 2/3rd of the population annually.[6]

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Hospitals equipped with advanced health facilities have comparatively low prevalence of poor neonatal outcome but such patients may experience long-term complications associated with neuro-developmental disorders including cerebral palsy, epilepsy, and delayed achieving in milestones. Low-resource countries such as Pakistan, Nigeria, parts of Sub-Saharan Africa where healthcare facilities are compromised bears burden associated with BA by the parents and government.[7;8] In a previously conducted study by Sterpu I and colleagues [9] in 2020 have identified maternal risk factors (i.e. low socio-economic status, lack of peri-natal visits, malnourished mother, infection during pregnancy, maternal diabetes mellitus or hypertension, and use of drugs during pregnancy are linked with BA. Early and timely recognition of BA is crucial in reducing its burden and associated complications. Healthcare facilities should be equipped with well trained staff and instruments to reduce the morbidity and mortality associated with BA. In Pakistan due to lack of scientific data in this regard urges us to conduct this study so that this scientific gap would be filled with evidence.

Methodology

The cross-sectional study was conducted in the Department of Gynecology & Obstetrics, Peoples University of Medical & Health Sciences for Women Hospital, Nawabshah through a non-probability consecutive sampling technique for a period of six months from October 2021 to April 2022. All the pregnant women admitted in labor room for delivery of a baby via normal vaginal delivery (NVD) or caesarean section of either age**,** belongs to lower socioeconomic stratum, gestational age between 37 weeks to 42 weeks, and those who consent to participate were selected for final analysis. Patients with pre-mature baby, all those babies who born with severe form of congenital anomalies such as cyanotic congenital heart disease, chromosomal defects, and hydrops, those who do not consent to participate were excluded from this study.

Data were collected in 2 sections by using structured questionnaire in which questions were asked to determine the maternal risk factors associated with birth asphyxia; (1) Demographic and baseline data of mother (age of mother, area of residence, education status, booked or unbooked labor, history of drug or smoke usage during pregnancy, parity, fetus number, history of anemia, diabetes, preeclampsia, eclampsia, any previous history of birth asphyxia, and any other associated morbidities in mother during pregnancy). (2) Second section of questionnaire consist history of current pregnancy in which current maternal and fetal clinical parameters were included such as presence or absence of birth asphyxia, type of anesthesia received, mode of fetal delivery, APGAR score, gender, and birth weight of fetus. The APGAR score was recorded at minute 1, then minute 5, and lastly at minutes 20. APGAR score was assessed using certain parameters such as physical signs, skin color, fetal heart rate, fetal respiratory rate, reflex irritability, and muscle tone.

If labor duration exceeds more than 8 hours in multiparous women and more than 12 hours in primigravida women then the labor was considered as prolonged. Fetal distress was labelled when fetal heart rate was greater than 160 beats per minute of heart rate were too fast and irregular. Fetal body's temperature when rises more than 99^0F was considered febrile. Mother was labelled anemic when her hemoglobin levels less than 11gm/dL before admission in hospital.

After collection of relevant data, statistical package for social sciences (SPSS) version 26.0 was used for data entry and same software was used for final analysis. Quantitative variables were analyzed as mean and standard deviation such as age, APGAR score in minutes, gestational age, and fetal heart rate. Categorical variables such as gender, mode of delivery, type of anesthesia received during c-section, and presence or absence of birth asphyxia. Independent t-test and chi-square test were used where appropriate and a p value of <0.05 was considered as statistically significant.

Results

A total of 118 patients were selected for final analysis who met the inclusion and exclusion criteria. The overall maternal mean age was 33.91±5.87 years. The minimum age was 18 years and maximum age was 39 years. Most of the mothers did not have education and were illiterate (n = 38, 32.2%), while only 10.16% (n = 12) had education level of ≥graduation. Most of our study subjects belongs from rural area as compare to urban, 61.01% (n = 72) vs. 38.98% (n = 46), respectively.

In my study, we have observed that most of the pregnant mothers had unbooked pregnancy 31.35% (n = 37). In this study, pregnant women who had previous history of birth asphyxia were 20.0% (n = 24) and 79.66% (n = 94) did not had previous history of birth asphyxia. The findings of this study shows most common comorbid condition was presence of anemia in 22.88% (n = 27) of

Table I: Maternal Predictors of Birth Asphyxia in Low-Resource Communities. (n = 118)					
Maternal Predictors		**Overall**	**Birth Asphyxia**		**p value**
		(N = 118)	**Yes (N = 34)**	**No (N = 84)**	
Age – mean ± SD		33.91±5.87	33.91±5.87	29.81±6.24	**0.003**
BMI - kg/m2		25.85±5.08	24.35±4.19	25.05±3.83	0.15
Education Status	Illiterate	38	15	23	0.07
	Primary	27	8	19	
	Secondary	22	4	18	
	Intermediate	19	4	15	
	≥Graduate	12	3	9	
Area of Residence	Rural	72	26	46	0.04
	Urban	46	8	38	
Booked Pregnancy	Yes	37	16	21	0.02
	No	81	18	63	
Type of Addiction (n = 12)	Betel Nuts	7	2	5	0.001
	Cigarette	3	3	0	
	Hukka	2	0	2	
	Chewable Tobacco	1	1	0	
Previous History of BA	Yes	24	16	8	0.03
	No	94	18	76	
Parity	Primiparous	72	10	62	0.27
	Multiparity	37	19	18	
	Grand Multiparity	9	5	4	
Comorbid	None	71	5	66	0.001
	Anemia	27	19	8	
	CVD Related	14	6	8	
	Diabetes Mellitus	6	4	2	
Cardiovascular Related (n = 14)	Preeclampsia	9	4	3	0.03
	Eclampsia	3	3	0	
	PIH	2	1	1	
	X^2 and fisher's exact tests were applied where appropriate, P value <0.05 considered to be significant				

pregnant women. Cardiovascular related and presence of diabetes mellitus were less frequent, 11.86% (n = 14) vs. 5.08% (n = 06), respectively.

Mean duration of labor was 247.77±90.78 minutes. The most common fetal presentation was vertex 88.98% (n = 105). Normal vaginal delivery 71. 18 % (n = 84) was the most common technique used for fetal delivery, cesarean section was observed in 22.03% (n = 26) of the cases, while delivery assisted with instruments were observed in 6.77% (n = 08) of the cases.

Significant predictors of birth asphyxia in our region were increased maternal age (33.91±5.87 – years), unbooked pregnancies (52.94%, n = 18/34), use of cigarettes (8.82%, n = 3/34), previous history of birth asphyxia (47.05%, n = 16/34), presence of anemia in pregnant women (55.88%, n = 19/34), breech presentation (29.41%, n = 10/34), cesarean section (32.35%, n = 11/35), and increased duration of labor (359.18±60.42 – minutes), p <0.05. Table I

The overall observed prevalence of birth asphyxia in this study was 28.81% (n = 34). Figure 1

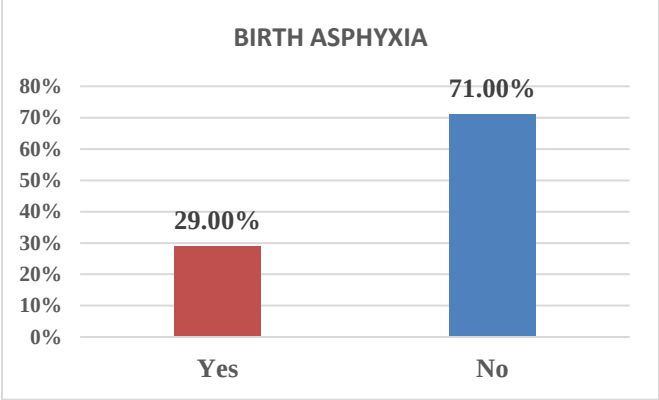

Figure 1. Overall prevalence of birth asphyxia in low resource communities. (n = 118)

Discussion

Larger scale epidemiological studies observed that roughly 130 million newborn infants born and among them around 4 million die during the first month. Also, more than 98% of these neonatal deaths occur in low and middle-income countries including Pakistan, India, Nigeria, and Africa. The rate of mortality among children of less than five years of age has greatly improved during the past couple of decades and on the other hands, there is no or little improvement in terms of mortality of

neonates. It is also estimated that one third of mortality among children occur in before reaching the age of 5 years. According to millennium development goal 4 (MDG 4), focus should be made on reducing children mortality due to preventable causes including birth asphyxia and complicated infections. By following the MDG 4 guidelines, most of the developed countries has an incidence of birth asphyxia to less than 0.1%. On the other hands, the incidence of birth asphyxia in developing countries can reach up to 23% and Nigeria has the highest rate of birth asphyxia as 40%. The main reason behind this huge difference is the implementation of MDG 4 recommendations in their health care facilities.

In our study, we have observed that overall prevalence of birth asphyxia was 28.81%. In an international study conducted by Workineh Y and colleagues [10] has shown almost similar prevalence of birth asphyxia (24.0%). This is because of their study was also comprises of low resource communities and among them lack of antenatal care is the predominant cause leading to birth asphyxia. Another larger scale national study conducted in Pakistan and patients were recruited from major cities like Karachi, Lahore, and Khyber Pakhtunkhwa has shown prevalence of birth asphyxia as 35%, 14%, and 11%, respectively.[11] This vast difference in different cities of Pakistan is not clearly mentioned anywhere in their studies but one of the underlying reasons is the inclusion of the number of patients in their studies such as more number of pregnant women were enrolled in Karachi, then Lahore, and least numbers were included in Khyber Pakhtunkhwa. While recent data from UNICEF has shown prevalence of birth asphyxia in Pakistan as 20.9%.[12]

Maternal age is also a big risk factor in causing birth asphyxia. Higher frequency of birth asphyxia observed in older women having age more than 30 years. This statement can be proved through this study as the increasing mean age of 33.91±5.87 years in pregnant women was associated with higher prevalence of birth asphyxia. On the contrary, a study conducted in Pakistan has shown Mean maternal age in asphyxia group was 24.22 ± 3.38 year.[13] One of the possible reasons could be the inclusion of younger age group population in their study, unfortunately they did not have mentioned age limits in their study. While, some of the previously conducted studies also shows no-relation of maternal age with birth asphyxia.[14]

In the analysis of associated factors, previously conducted studies have shown variable findings related to birth asphyxia. Findings from an international study has shown that fetal presentation at the time of delivery is an important predictor of birth asphyxia. Fetus born with vertex presentation were more than four folds lower chance of having birth asphyxia as compared to neonates born with mal-presentation.[15] The same findings were observed in a previously conducted studies[16,17] but they observed higher odds of having birth asphyxia (7 times higher) in mal-presented fetuses as compared with normal fetal presentation at the time of delivery. Cameroonian study's findings are in concordant with the previously conducted studies in this regard.[18] One of the scientific reason behind this cause is that mal-presentation of the fetus is most of the times associated with premature rupture of the membrane and this may lead to umbilical cord compression and ultimately lead to birth asphyxia.[19] Another risk factor of the birth asphyxia is the presence of prolong labor which is also caused by the mal-presentation of the fetus. That is why, ante-natal visits and care are the utmost important factors to reduce maternal and fetal complications. Significant predictors of birth asphyxia in our region was increased maternal age (33.91±5.87 – years), unbooked pregnancies (52.94%, n = 18/34), use of cigarettes (8.82%, n = 3/34), previous history of birth asphyxia (47.05%, n = 16/34), presence of anemia in pregnant women (55.88%, n = 19/34), breech presentation (29.41%, n = 10/34), cesarean section (32.35%, n = 11/35), and increased duration of labor (359.18±60.42 – minutes), $p < 0.05$. An infant may also experience asphyxia if their blood cannot carry sufficient oxygen to their cells, typically due to iron deficiency or other hemoglobin-related issues in the baby's red blood cells. If the mother is anemic, this form of asphyxia can occur before the delivery and during the delivery.

Previously published several international studies [20-22] have identified that anemia is the leading risk factor associated with BA and hence should be identified & rectified by periodic peri-natal visits. The same findings are observed in our study.

Some national and international studies differ from the findings of our study. primigravida’s frequently leave out on essential aspects of pregnancy care, such as early registration and regular antenatal visits, leaving them unaware of their responsibilities towards themselves and their unborn babies.[23] This lack of awareness can result in complications, including birth asphyxia.

Conclusion

Birth asphyxia overserved to be the highly prevalent in this study. Multiple preventable factors that can be controlled reduces the risk of birth asphyxia the women of our area. Awareness and proper ante-natal care should be done in all pregnant women to reduce the risk of maternal and fetal complications.

References

1. Garces A, Perez W, Harrison MS, Hwang KS, Nolen TL, Goldenberg RL, et al. Association of parity with birthweight and neonatal death in five sites: The Global Network's Maternal Newborn Health Registry study. Reprod Health 2020 Dec 17;17(Suppl 3):182.
2. Goudar SS, Goco N, Somannavar MS, Kavi A, Vernekar SS, Tshefu A, et al. Institutional deliveries and stillbirth and neonatal mortality in the Global Network's Maternal and Newborn Health Registry. Reprod Health 2020 Dec 17;17(Suppl 3):179.
3. Bauserman M, Nowak K, Nolen TL, Patterson J, Lokangaka A, Tshefu A, et al. The relationship between birth intervals and adverse maternal and neonatal outcomes in six low and lower-middle income countries. Reprod Health 2020 Nov 30;17(Suppl 2):157.
4. Opondo C, Jayaweera H, Hollowell J, Li Y, Kurinczuk JJ, Quigley MA. Variations in neonatal mortality, infant mortality, preterm birth and birth weight in England and Wales according to ethnicity and maternal country or region of birth: an analysis of linked national data from 2006 to 2012. J Epidemiol Community Health 2020 Apr;74(4):336-45.
5. Abdo RA, Halil HM, Kebede BA, Anshebo AA, Gejo NG. Prevalence and contributing factors of birth asphyxia among the neonates delivered at Nigist Eleni Mohammed memorial teaching hospital, Southern Ethiopia: a cross-sectional study. BMC Pregnancy Childbirth 2019 Dec 30;19(1):536.
6. The World Health Organization ACTION-I (Antenatal CorTicosteroids for Improving Outcomes in preterm Newborns) Trial: a multi-country, multi-centre, two-arm, parallel, double-blind, placebo-controlled, individually randomized trial of antenatal corticosteroids for women at risk of imminent birth in the early preterm period in hospitals in low-resource countries. Trials. 2019 Aug 16;20(1):507.
7. Samad N, Farooq S, Hafeez K, Maryam M, Rafi MA. Analysis of Consequences of Birth Asphyxia in Infants: A Regional Study in Southern Punjab, Pakistan. J Coll Physicians Surg Pak 2016 Dec;26(12):950-3.
8. McClure EM, Saleem S, Goudar SS, Dhaded S, Guruprasad G, Kumar Y, et al. The project to understand and research preterm pregnancy outcomes and stillbirths in South Asia (PURPOSe): a protocol of a prospective, cohort study of causes of mortality among preterm births and stillbirths. Reprod Health. 2018 Jun 22;15(Suppl 1):89.
9. Sterpu I, Pilo C, Koistinen IS, Lindqvist PG, Gemzell-Danielsson K, Itzel EW. Risk factors for poor neonatal outcome in pregnancies with decreased fetal movements. Acta Obstet Gynecol Scand. 2020;99(8):1014-21.
10. Workineh Y, Semachew A, Ayalew E, Animaw W, Tirfie M, Birhanu M. Prevalence of perinatal asphyxia in East and Central Africa: systematic review and meta-analysis. Heliyon. 2020;6(4):e03793.
11. Nauman Kiyani A, Khushdil A, Ehsan A. Perinatal Factors Leading to Birth Asphyxia among Term Newborns in a Tertiary Care Hospital. Iran J Pediatr. 2014;24(5):637-42.
12. Pradhan NA, Ali SA, Roujani S, Ali A, Hussain SS, Rizwan S, et al. Quality of care assessment for small and sick newborns and young infants in Pakistan: findings from a cross-sectional study. BMC Pediatr. 2022;22(1):68.
13. Aslam HM, Saleem S, Afzal R, Iqbal U, Saleem SM, Shaikh MW, et al. "Risk factors of birth asphyxia". Ital J Pediatr. 2014;40:94.
14. Bayih WA, Tezera TG, Alemu AY, Belay DM, Hailemeskel HS, Ayalew MY. Prevalence and determinants of asphyxia neonatorum among live births at Debre Tabor General Hospital, North Central Ethiopia: a cross-sectional study. Afr Health Sci. 2021;21(1):385-96.
15. Wayessa z, Belachew T, Joseph J. Birth Asphyxia and Associated Factors among Newborns Delivered in Jimma Zone Public Hospitals, Southwest Ethiopia: A Cross-sectional Study. Journal of Midwifery and Reproductive Health. 2018;6(2):1289-95.
16. Gudayu TW. Proportion and factors associated with low fifth minute Apgar score among singleton newborn babies in Gondar University referral hospital; North West Ethiopia. Afr Health Sci. 2017;17(1):1-6.
17. Chiabi A, Nguefack S, Mah E, Nodem S, Mbuagbaw L, Mbonda E, et al. Risk factors for birth asphyxia in an urban health facility in cameroon. Iran J Child Neurol. 2013;7(3):46-54.
18. Cunningham FG, Leveno KJ, Bloom SL, Spong CY, Dashe JS. Williams obstetrics, 24e: Mcgraw-hill New York, NY, USA; 2014.
19. Adeoye S, Ogbonnaya LU, Umeorah OU, Asiegbu O. Concurrent use of multiple antenatal care providers by women utilising free antenatal care at Ebonyi State University Teaching Hospital, Abakaliki. Afr J Reprod Health. 2005;9(2):101-6.
20. Risk factors of perinatal asphyxia: a study at Al-Diwaniya maternity and children teaching hospital. Sahib HS. https://www.iasj.net/iasj/download/b34bc3089124cef1 Muthanna Med J. 2015;2:50–57.
21. Abdo RA, Halil HM, Kebede BA, Anshebo AA, Gejo NG. Prevalence and contributing factors of birth asphyxia among the neonates delivered at Nigist Eleni Mohammed memorial teaching hospital, Southern Ethiopia: a cross-sectional study. BMC pregnancy and childbirth. 2019 Dec;19(1):1-7.
22. Ana´lia Luana Sena de Souza NLdS, de Franc¸a De´bora Feitosa, de Oliveira Samara Isabela Maia, Arau´jo Anne Karoline Candido, Dantas Da^ndara Nayara Azevedo. Risk Factors for Perinatal Asphyxia in Newborns Delivered at Term. Open Journal of Nursing. 2016, 6:558–564.
23. Tasew H, Zemicheal M, Teklay G, Mariye T, Ayele E. Risk factors of birth asphyxia among newborns in public hospitals of Central Zone, Tigray, Ethiopia. BMC Res Notes 2018, 11(1):496