

Frequency of moderate to severe birth asphyxia in newborns and its risk factors at two major hospitals of Kohat (Pakistan)

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Abstract

Birth asphyxia means that a fetus suffers from lack of oxygen during the birth process. If too severe this may affect the brain as well as other organs and in severe cases may lead to brain injury or even death. Birth asphyxia is a serious clinical problem worldwide. Each year approximately 4 million babies are born asphyxiated, which results in 1 million deaths and an equal number of serious neurological sequels, such as cerebral palsy, mental retardation, and epilepsy.

The objective of the study was to assess the incidence and risk factors associated with moderate to severe birth asphyxia in newborns in two major hospitals of Kohat, Pakistan. The study was cross sectional. It was conducted for the duration of 6 months from from 1st Dec 2013 to 30th May 2014. A questionnaire having both open and close ended questions was designed to collect data from the mothers of newborns having birth asphyxia. A sample size of 400 newborns was taken ($N_0 = z^2 pq/d^2$ (prevalence of disease in KPK 18.3%). Pretesting was conducted in 10% of the sample. Non probability convenient sampling technique was used to take samples. The study was conducted at the neonatal care unit of two major hospitals of Kohat i-e Liaqat Memorial Hospital and CMH (Combined military hospital).

Results: Frequency of birth asphyxia was 39% and 61% were non-diseased in total of 400 newborns. In birth asphyxiated babies 13% newborns were found with severe Apgar scoring that is 0-3 and 26% were found with moderate scoring that is 4-6. 16% newborns were found with less than 2.5kg weight and 12% were found between 2.5kg to 3kg and 11% were more than 3kg. The demographic characteristics of mother included age, area, and education. The highest number of birth asphyxiated newborns were observed in age of mothers between 18 to 24 that was 12%, 10% mothers were between 25 to 30, and 6%

were under 17, 6% mothers were between 31to35 and 5% mothers were above 35. Mothers from rural areas were 24% and 15% were from urban areas. 22% mothers were uneducated and 17% were educated. 17% mothers didn't go for any antenatal visit and 22 % attended. The gestational age of 10% mothers was less than 37 weeks, 22% mothers gestational age was between 37 to 42 and 7% mothers gestational age was above 42 weeks. Other maternal risk factors included hypertensive disorders were found in 12% mothers and in them 4% went to preeclampsia. 11.5% mothers were anemic. Abruptio placenta, placenta previa and cord prolapsed mothers were 5%, 4% and 6% respectively. 6% mothers had complications of abnormal presentation of baby. 5% newborns having birth asphyxia didn't recover.

Conclusions: The study showed that birth asphyxia is more prevalent at the two major hospitals of Kohat with 5% mortality rate. The common risk factors resulted were low birth weight of neonate, maternal risk factors, Education status and area of residence of mothers.

On the basis of results we recommended that the timely and accurate diagnosis and proper management of birth asphyxia can reduce the severity and mortality rate. Awareness programs should be launched in communities to provide maternal health education and importance of antenatal checkups.

Keywords: Birth asphyxia, Newborns, Incidence, Risk factors, Neonatal health, Maternal health, Perinatal care, Neonatal Mortality, Birth complications, Obstetric interventions, Fetal distress, Birth outcomes.

1. Introduction

1.1 Background

Asphyxia is defined as lack of oxygen (hypoxia) due to failure of initiation of breathing. A condition during the perinatal period that severely reduces oxygen delivery and leads to acidosis. A lack of oxygen or an excess of carbon dioxide caused by the interruption in breathing, is the result of the failure of the gas exchange organ. Asphyxia continues to be a major cause of morbidity and mortality in the neonatal period (WHO) ¹.

Newborns are the backbone of every community and nation. Healthy newborns will lead to healthy nation. Over 8 million newborns die before their birthday each year, and nearly all of the 5.1 million deaths in the neonatal period occur in developing countries. Although the causes of neonatal deaths are not always easy to assess, the World Health

Organization estimates that 85 percent of deaths are caused by birth asphyxia, infections, birth injury, and problems related to preterm birth ².

Birth asphyxia is a significant contributor to newborn morbidity and mortality as well as long term neurological deficits. It is a common problem in the developing world where there are lack of facilities and awareness. It has been recognized that of the 130 million newborn newborns born each year globally, about 4 million die in the first 4 weeks of life, the neonatal period. It is estimated that about 23% of all newborn deaths are due to birth asphyxia ².

According to the Pakistan demographic and health survey 2006 the major causes of death among children under five are birth asphyxia (22 percent), sepsis (14 percent), pneumonia (13 percent), diarrhea (11 percent), and prematurity (9 percent). Causes of death are highly correlated with age at death. Deaths during the neonatal period (first month of life) are almost entirely due to birth asphyxia, sepsis, or prematurity. In all four provinces, birth asphyxia is the main cause of death (22.1%). In Khyber Pakhtoonkhwa the percentage of birth asphyxia is (18.3) ².

Province	Birth Asphyxia
KPK	18.3
Punjab	24%
Sindh	21.5%
Baluchistan	16%

Percent distribution of birth asphyxia according to province, Pakistan 2006-2007

WHO estimates that approximately 3% of about 120 million newborns born each year in developing countries develop asphyxia and need resuscitation. Approximately 900,000 of these newborns die as the result of asphyxia. Asphyxia accounts for 23% of neonatal deaths globally, and 8% of all deaths in children under five years of age. Reducing neonatal mortality is a critical component of achieving the fourth millennium development goal 4 (MDG 4) target of two-third reduction in deaths among children under 5 years of age. The incidence of birth asphyxia is much higher in developing countries ³.

A Retrospective study was conducted in neonatal Unit of National Institute of Child Health, Karachi (Pakistan) from 1st January, 2001 to 31st August, 2001. They analyzed Variables included antenatal care, period of gestation, place of delivery, mode of delivery, birth weight and age at arrival in the hospital. The objective was to look for risk factors leading to birth asphyxia in newborns admitted in a tertiary care unit. The study recommended that trained personnel and neonatal resuscitation equipment should be made mandatory in all maternity homes/hospitals ⁴. Many perinatal deaths follow birth asphyxia that occurs in newborn babies of women who are referred on developing life-threatening obstetric complications ⁵.

A study was conducted in delivery room of King Edward Medical College, hospital during 1985. Apgar score was carried out with special emphasis on the 5 minute score using stopwatch and pre-printed Apgar score cards. Total cases were 807, of these 27 (33%) had Apgar scores of 3 or less at 5 minutes and were thus termed severely asphyxiated. Of these 47% cases died, 26% had neurological deficit and only 26% were apparently normal ⁶.

Most studies consider an umbilical arterial PH less than 7.1 to indicate severe asphyxia and PH less than 7.2 to indicate some degree of asphyxia although there is a variation. Combining Apgar score and arterial PH suggest that severe depression of Apgar score of less than or equal to 3 at 5 minutes and PH less than or equal to 7.0 is needed before significant asphyxia can be confidently diagnosed⁷.

The current NRP guidelines state that "if there is no heart rate after 10 minutes of complete and adequate resuscitation efforts, and there is no evidence of other causes of newborn compromise, discontinuation of resuscitation efforts may be appropriate. Current data indicate that, after 10 minutes of asystole, newborns are very unlikely to survive, or the rare survivor is likely to survive with severe disability⁸.

This study helped us to recommend preventive measures and for different risk factors of newborn birth asphyxia and to create awareness in community regarding proper antenatal care and to prevent morbidity and mortality among the newborns.

1.2 Public health significance

Asphyxia continues to be a major cause of morbidity and mortality in the neonatal period (WHO). Newborns are the backbone of every community and nation. Healthy newborns will lead to healthy nation. Over 8 million newborns die before their birthday each year, and nearly all of the 5.1 million deaths in the neonatal period occur in developing

countries. Although the causes of neonatal deaths are not always easy to assess, the World Health Organization estimates that 85 percent of deaths are caused by birth asphyxia, infections, birth injury, and problems related to preterm birth. Birth asphyxia is a significant contributor to newborn morbidity and mortality as well as long term neurological deficits. It is a common problem in the developing world where there are lack of facilities and awareness. It has been recognized that of the 130 million newborn newborns born each year globally, about 4 million die in the first 4 weeks of life, the neonatal period.

1.5. Tools used to assess Asphyxia

Apgar score: There are three types of asphyxia mild, moderate and severe. In 1952, Dr. Virginia Apgar devised a scoring system that was a rapid method of assessing the clinical status of the newborn infant at 1 minute of age and the need for prompt intervention to establish breathing. The Apgar score provides convenient shorthand for reporting the status of the newborn infant. This scoring system provided a standardized assessment for newborns after delivery. The Apgar score comprises 5 components heart rate, respiratory effort, muscle tone, reflex irritability, and color, each of which is given a score of 0, 1, or 2. The score is now reported at 1 and 5 minutes after birth. An Apgar score of 3 or less at 5 minutes was considered an essential requirement for the diagnosis of perinatal asphyxia

Apgar core

PARAMETER	SCORING		
	0	1	2
color	blue, pale	body pink, extremities blue	all pink
heart rate	absent	< 100	>= 100)
Respiration	absent	irregular, slow	good, crying
reflex response to nose catheter	none	grimace	sneeze, cough
muscle tone	Limp	some flexion of extremities	active

2. Objectives

2.1. General objectives:

To assess the incidence and risk factors associated with moderate to severe birth asphyxia in newborns in two major hospitals of Kohat, Pakistan.

2.2. Specific objectives:

1. To determine the incidence of moderate to severe birth asphyxia in newborns.
2. To determine the demographic characteristics of mothers whose babies are asphyxiated at birth.
3. To determine the frequencies of different maternal risk factors leading to birth asphyxia.
4. To determine the mortality rate of birth asphyxiated babies with follow-ups.

3. Methodology

3.1. Ethical consideration

Approval from research ethical committee of Gandhara University was taken. Written and verbal consent from mothers of patients was also taken.

3.2. Study design

Study Design was Cross sectional (descriptive).

3.3. Data collection

The Duration of Study was 6 months (1st Dec 2013 to 30th May 2014). Target Population were all male and female newborns admitted at the nurseries at Liaqat Memorial Hospital and CMH Kohat (Pakistan). Study population included all newborns. Inclusion Criteria was all alive newborns and exclusion Criteria was newborns with lethal anomalies (e.g. cyanotic congenital heart defects), still births. Study Area was Liaqat Memorial Hospital and C.M.H Kohat. Study Frame was newborns admitted at the nursery of Liaqat memorial hospital and CMH. Sample Size was $400 \left(\frac{za/2=2}{2} \right)$ (prevalence of disease in KPK 18.3%). Sampling Method was non probability convenient sampling. Patients who were present at the nurseries at the time of sample collection were included. Data collection tools included well designed semi-structured questionnaire having both open ended and closed ended questions. Questions were asked from mothers of patients. Data was presented in form of tables and graphs. Data statistical analysis was done by computer software SPSS version. In order to check the feasibility and applicability of

questionnaire and to make necessary changes where ever required the analysis was conducted on 10% of sample at first.

3.4. Variables:

Dependable variable

Birth asphyxia

Independable variables

Demographic characteristics of mother (Age, area, education status), Antenatal visits, Abnormal Presentation, Low birth weight, Gestational age of mother, Cord prolapsed, Placenta previa, Abruptio placenta, Hypertension in Pregnancy, Maternal Anemia, Meconium staining.

4. Results

Out of the 400 (sample size) newborns during the three months of study period, 155 (39%) were birth asphyxiated and 245 (61%) newborns were non-diseased. Of those who had neonatal asphyxia 80 (20%) were males 75 (19%) and were females. (Table#1and2) Newborns assessment and evaluation was done by the apgar score at 5 min was recorded. The distribution of newborns by their apgar score defined as moderate (4-6) and severe (0-3). In this study 155 newborns were asphyxia patients and in them 53(13%) newborns were in severe condition having apgar score (0-3) at 5 min and 102(26%) newborns have apgar score (4-6) at 5 min that is moderate. (Table#3)

One of the important factor is the weight of the newborns, the low birth weight newborns are more likely to have birth asphyxia as compared to normal birth weight. In this study among the 155 asphyxiated newborns 64 (16%) were low birth weight less than 2.5kg and 47 (12 %) were between 2.5 to 3 kg and 44 (11%) were above 3kg. (Table#4).

In this study the age was caterized in five parts <17, 18-24, 25-30, 31-35, and >35. According to this study 26(6%) mothers were under 17, 50 (12%) mothers were 18-24, 38 (10%) mothers were 25-30, 22(6%) were between 31-35 and 19 (5%) mothers were above 35. In this study the highest range of mothers were between 18 to 24. The mothers above 35 were very low in number. (Table#5.1).

The location was divided in two catagories urban and rural. In this study 58 (15%) mothers were from urban areas and 97 (24%) mothers were belonged to the rural areas. (Table#5.2).

Mother education has a significant effect on the health of the neonate. Upto primary level mother was considered uneducated and more than it, mother was considered educated. In

this study mothers of 155 asphyxiated newborns, 67(17%) were educated and 88 (22%) were uneducated. (Table#5.3).

The role of antenatal care in reducing perinatal mortality and morbidity is well known. In this study the mothers of asphyxiated babies had a high attendance rate with 89(22%) and 66 (17%) of the mothers did not have any antenatal visits. (Table#6)

The gestational age of 41(10%) mothers was less than or equal to 37 weeks, 88(22%) mothers gestational age was between 37 to 42 and 26(7%) mothers gestational age was above 42 weeks. (Table#7). Vaginal delivery was the commonest mode at 119(24%) followed by c/s 36(15%). (Table#8)

Some of the pregnancies were complicated by an intrapartum maternal risk factors. These intrapartum accidents leads to the birth asphyxia in most cases like hypertensive disorders, maternal anaemia, abruptio placenta, placenta previa and cord prolapse. Hypertensive disorders of pregnancy were high among mothers of asphyxiated. In this study 49 (12%) mothers have hypertensive disorder and 17 (4%) mothers developed preeclampsia. 46 (11.5%) mothers of asphyxiated babies were anaemic. (Table#9).

Placenta previa was observed in 16 (4%) mothers, 21(5%) have abruptio placenta, 24(6%) mothers have cord prolapse. Meconium staining of liquor was recorded in 26(6.5%) cases. 23(6%) have abnormal presentation of fetus. (Table#9)

Out of 155 newborns with low apgar score (0-6), 18(5%) didn't survive and 132(34%) were alive or discharged. (Table#10)

5. Discussion

Pakistan is a low income country with a population of 160 million and an infant mortality rate estimated to be 95/1000 live births in 1994. Birth asphyxia is a leading factor contributing in perinatal and neonatal mortality which reflects social, educational and economical standards of a community. Its incidence is very high in developing countries like Pakistan where health facilities are restricted to urban areas and only small population (21%) is getting benefits. In Khyber Pakhtoonkhwa the percentage of birth asphyxia is (18.3). It is very important to accurately diagnose perinatal asphyxia as early as possible and to predict the prognosis of the newborn. Given an early diagnosis, it may be possible to minimize unfavorable consequences through prompt application of appropriate treatment and rehabilitation exercises. Despite lot of improvement in the public health over the past many years, it is still a major contributing factor in neonatal mortality 2.

A cross sectional study including 150 newborns was conducted in the labour room of Nishtar hospital Multan. Full term newborn babies (and their mothers) with 1, 5 and 10 minutes Apgar score 4 or less (birth asphyxia) were included. Out of 150 newborns, 57 (38%) presented with birth asphyxia at the age of 1 minute, 62 (41.3%) at the age of 5 minutes and 31 (20.1%) at the age of 10 minutes. 45 (30%) cases were related to maternal cause. 71 (47.3%) cases were related to placental cause and 34 (22.7%) cases were related to fatal cause 9.

A descriptive cross-sectional study was conducted in the Paediatric Department, Neonatal Ward of Liaquat University Hospital (LUH) Hyderabad from January to December 2009. All babies were received at onursery or delivered in LUH with birth asphyxia were included. The objective of study was to determine the frequency of birth asphyxia and short-term (early) outcome in relation to age at admission and place of delivery. 90 (15%) were normal while clinical signs of HIE were present in 85%, with 180(30%) in stage I, 210 (35%) in Stage II and 120 (20%) in stage III of HIE. There was a statistically improved outcome for babies received within 6 hours than those after 6 hours of birth (Chi-square test P-value < 0.0255). In this study it was concluded that early recognition of birth asphyxia and timely referral to tertiary center can reduce morbidity and mortality¹⁰.

On the basis of the results we concluded that the frequency of the birth asphyxia was (39%). This was higher than previously reported findings of birth asphyxia (10.4%) reported by Kawo Urassa, Killeo and Massawe (1995). The reason for this difference could be attributed to inadequate resuscitative facilities, lack of skilled personnel and increased numbers of admitted asphyxiated newborns ¹¹.

Newborn assessment and evaluation was done by the apgar score at 5 min was recorded. The distribution of newborns by their apgar score defined as moderate (4-6) and severe (0-3). In this study 13% newborns were in severe condition having apgar score (0-3) and 26% babies have apgar score (4-6) which is moderate. Similarly a cross-sectional study was conducted in Nigeria in which antepartum and intrapartum factors associated with "very low" (0-3) or "intermediate"(4-6) five-minute Apgar scores were compared with correlates of low five-minute Apgar scores(0-6) based on multinomial and binary logistic regression analyses. The objective was to determine the potential impact of two classification methods of five-minute Apgar score as predictor for birth asphyxia. Of the

4281 mother-infant pairs enrolled, 3377 (78.9%) were full-term and 904 (21.1%) preterm. Apgar scores were very low in 99 (2.3%) and intermediate in 1115 (26.0%)¹².

In another retrospective study performed by analysis of medical charts (n = 7,094) of all live newborns during the period of 2005 to 2009. In 7,094 births, there were 139 deaths, 58.3% during the first week, and 3.6% of them with Apgar < 4 in the 1st minute. A positive association was found between mortality and the apgar score¹³.

Low birth weight newborns are more likely to have birth asphyxia as compared to normal birth weight. In this study 16% were low birth weight less than 2.5kg and 12 % were between 2.5 to 3 kg and 11% were above 3kg. This result is consistent with the earlier findings of Boonamnuaykij (2002) he also concluded that babies with weight below 2.5 kg were at risk of having birth asphyxia¹⁴.

Demographic features of mothers included age of mother, education and the location of mother. Age is an important factor according to other studies it was shown that below 17 years and over 35 years mothers were more likely to give birth to asphyxiated children. In this study the age was categorized in five parts <17, 18-24, 25-30, 31-35, >35. According to this study 33(6%) mothers 25-30 and 32 (6%) were between 31-35, 5% mothers were above 35. In this study the highest range of mothers were between 18 to 24. The mothers above 35 were very low in number. So we can say that there is no significant association of age of mothers with the birth asphyxia. Most of the mothers were from rural areas i.e 24% and 15% mothers were from urban areas. It means that the rural areas mothers have more chances to give birth to asphyxiated babies as compared to urban. Same results were shown in National Health Family Survey: 2005–2006, that in rural or slum areas proportion of pregnant woman receiving adequate antenatal care is low¹⁵.

Education has a very important role. An educated mother is aware about the healthy practices that are important during pregnancy and how to avoid intrapartum accidents and how to adopt healthy life styles to avoid any type of complications. Women without formal education might find it difficult to benefit from reproductive health education. In our study 67(17%) were educated and 88 (22%) were uneducated. Diallo et al in Guinea also observed that a large proportion of asphyxiated newborns were born from uneducated mothers. Also in another study 80% respondents argued that education could play a vital role in, health care, less education, lack of knowledge and awareness about maternal health protection and care during pregnancy could cause the neonatal death. It was revealed from the study who have better education is more responsible and go for care during pregnancy and less child mortality also observed on those groups¹⁶.

The role of antenatal care in reducing perinatal mortality and morbidity is well known. In this study the mothers of asphyxiated babies had a high attendance rate with 22% and 17% of the mothers did not have any antenatal visits. This low figure is rather surprising because lack of antenatal care is considered to be associated with poor pregnancy outcome. Therefore a higher number would have been expected. Same results were shown in a study in Zimbabwe found that absence of antenatal care was not a significant risk for low Apgar score ¹⁷.

A cross-sectional survey of mothers of newborns attending the Immunization clinic in a Nigerian Teaching Hospital was done between July and October 2010. The objective of this study was to assess the knowledge of mothers, who received health facility-based antenatal care. Lower socioeconomic status, lack of counseling, and nonattendance of teaching hospital antenatal clinic were associated with poor knowledge about risk factors and sequel of birth asphyxia. According to gestational age of mothers the preterm babies were 10%, 22% were term babies and 7% mothers gestational age was above 42 weeks and babies were postdates. The intrapartum riskfactors leads to the birth asphyxia in most cases like abruptio placenta, placenta previa and cord prolapse. They carry a high risk for an unfavorable fetal outcome. They are unpredictable and can only be addressed if there is access to trained birth attendants, good referral system and availability of facilities to enable immediate surgical intervention. A rapid response to such an emergency may help to mitigate the consequences. In this study 5% mothers have abruptio placenta, 6% mothers have cord prolapse and 4% mothers have placenta previa and 6.5% have meconium staining. 6% have abnormal presentation of fetus ¹⁸.

Hypertensive disorders of pregnancy have been identified as obstetric risk factors for birth asphyxia 12% mothers have hypertensive disorder and 4% mothers developed preclampsia. The study shows that hypertension is an important risk factor of birth asphyxia. Similarly 11.5% mothers were anaemic. In this study hypertension and anaemia were the most common maternal risk factors associated with neonatal birth asphyxia. A Retrospective Case control study, conducted at Neonatal Intensive Care Unit of pediatric ward (I, II, III) and in Gynecology wards (I, II, III) of Civil Hospital Karachi, Dow University of Health Sciences. Study was conducted from January 2011-November 2012. Neonates diagnosed with birth asphyxia were considered as “cases” while neonates born either with normal vaginal delivery or by cesarean section having no abnormality were considered as “control”. Out of total 240 neonates, 123 were “cases” and 117 were

“control”. Pre-eclampsia was associated significantly with increased risk of birth asphyxia (OR 0.943, CI 95% 0.90-0.98, $p = <0.01$)¹⁹.

A prospective cohort study was conducted in Sindh Government Lyari general hospital, Karachi from 1 May 2006 to 30 April 2008. A total of 1103 deliveries were conducted during this period with 119 perinatal deaths. Stillbirths constituted 68.9% while there were early neonatal deaths in 31.1% cases. Booking status, gestational age, weight of fetus and the presence of obstetric risk factors were found to have significant (P -value < 0.05) association with perinatal deaths. Among the obstetric risk factors, abruptio placentae was the commonest (13.4%) and the commonest cause of death was identified as birth asphyxia (44.5%). There was a strong association between birth weight and perinatal death²⁰.

Another case and control study was conducted in Matiari District Pakistan with 246 cases and 492 controls. Newborn deaths with birth asphyxia diagnosed through verbal autopsy accreditation during 2005 and 2006 were taken as cases. Controls were the live births during the same period, matched on area of residence, gender and age. The factors found to be associated with birth asphyxia mortality in Matiari District of Sindh Province, Pakistan were maternal education, history of stillbirths, pregnancy complications (including smelly or excessive vaginal discharge and anemia), intrapartum complications (including fever, prolong or difficult labour, breech delivery, cord around child’s neck, premature delivery, large baby size) and failure to establish spontaneous respiration after birth²¹. A much higher case fatality rate of 74% was found in India²². In 2007, Doba conducted a study in which he concluded from a total of 356 cases with asphyxia had 4.2% deaths²³.

Nelson et al in a prospective study in the USA found that apgar score of 0-3 at 5min was ominous findings with 44% of the newborns were died and 5% of the survivors showed evidence of disability²⁴.

6. Conclusions

1. The study showed that the majority of early newborns complications were related to Birth Asphyxia (39%) with 13% severe Birth asphyxia and 26% moderate birth asphyxia.
2. Most birth asphyxiated newborn mothers had low level of education with 22% illiteracy rate and 17% were educated. 12% having age in range of 18 to 24 and 24% of mothers were from rural areas.

3. The mothers with hypertensive disorder were high (12%) as compared to other maternal risk factors i-e maternal anemia, cord prolapsed etc.
4. 5% newborns having birth asphyxia were died and 34% were recovered and discharged.

7. Recommendations

1. Timely and accurate diagnosis, along with proper management, can reduce severe birth asphyxia by addressing preventable risk factors.
2. Targeted education and awareness programs are essential for mothers with low education levels to promote maternal health, prenatal care, and the importance of seeking medical assistance during pregnancy and childbirth.
3. Improved monitoring and management of maternal health, particularly for hypertensive disorders, are crucial during pregnancy to prevent complications for both mothers and newborns.
4. Strengthening neonatal care services is vital, given that 5% of newborns with birth asphyxia do not survive. This entails ensuring access to skilled health professionals, adequate facilities for neonatal resuscitation, and specialized care for newborns with complications.
5. Implementing targeted community outreach programs in rural areas is necessary to provide essential maternal and neonatal health services, education, and support. Governments should organize free antenatal checkup camps and awareness campaigns to reduce the incidence of birth asphyxia in rural communities.

Author's contribution

The author conceptualized, drafted and critically edited the manuscript.

Competing interest

The author declares that they have no known competing interest.

Funding

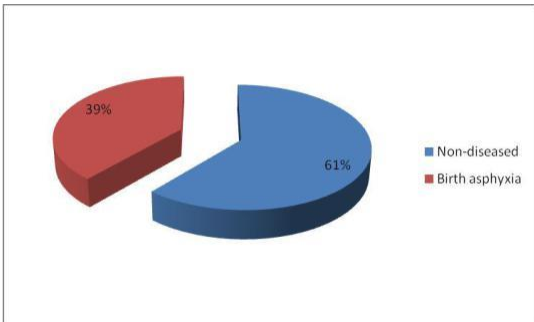
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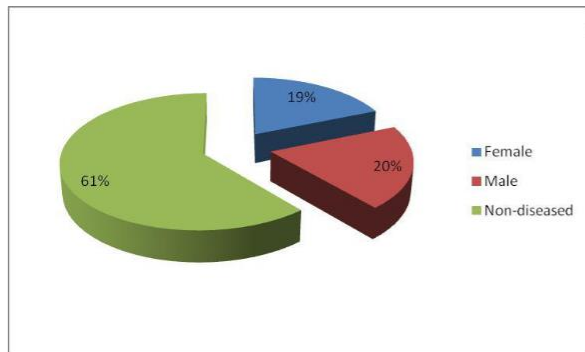
Table and graphs

Table and graph#1: Frequency of moderate to severe asphyxia in newborns



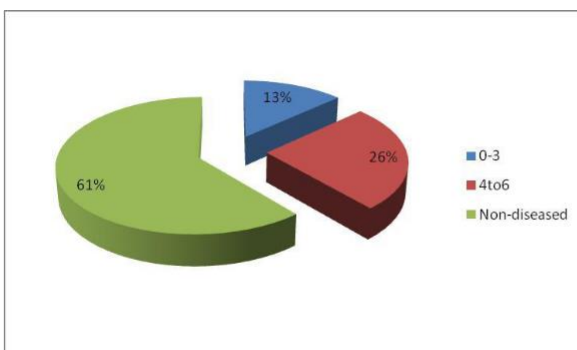
Diagnosis	Frequency	Percent
Non-diseased	245	61
Birth asphyxia	155	39
Total	400	100

Table and graph #2: Gender distribution regarding birth asphyxia in newborns



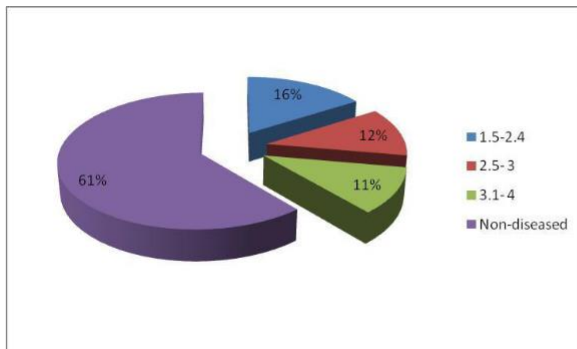
Sex	Frequency	Percent
Female	75	19
Male	80	20
Non-diseased	245	61
Total	400	100

Table and graph #3: Apgar score of asphyxiated newborns at 5 minute



Apgar score	Frequency	Percent
0-3	53	13
4-6	102	26
Non-diseased	245	61
Total	400	100

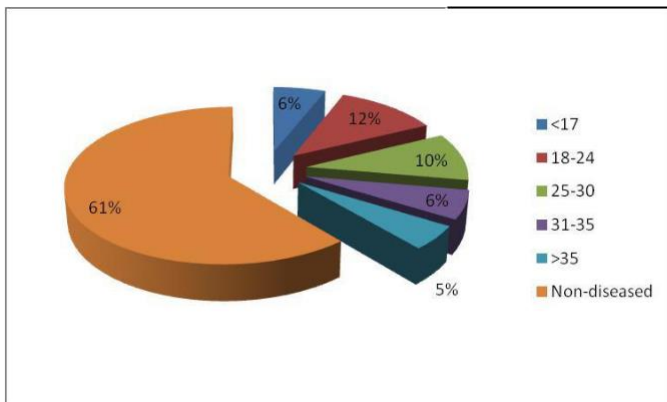
Table and graph #4: Weight of asphyxiated newborns



Weight	Frequency	Percent
1.5-2.4	64	16
2.5-3	47	12
3.1-4	44	11
Non-diseased	245	61
Total	400	100

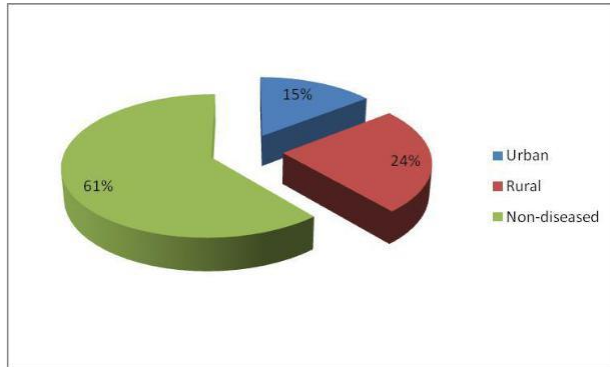
Demographic characteristics of mother

Table and graph #5.1: Age distribution of mothers of asphyxiated newborns



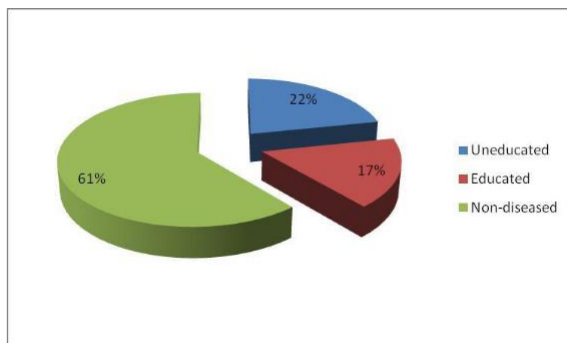
Age	Frequency	Percent
<17	26	6
18-24	50	12
25-30	38	10
31-35	22	6
>35	19	5
Non-diseased	245	61
Total	400	100

Table and graph #5.2: Area of residence of mothers



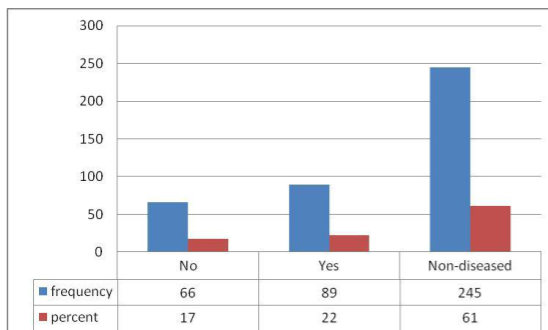
Area	Frequency	Percent
Urban	58	15
Rural	97	24
Non-diseased	245	61
Total	400	100

Table and graph #5.3: Education status of mothers



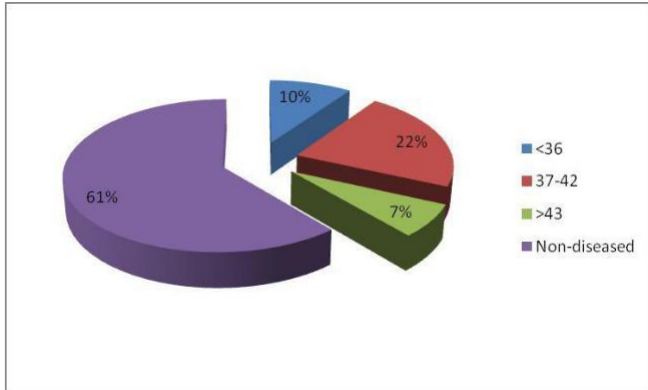
Education	Frequency	Percent
Uneducated	88	22
Educated	67	17
Non-diseased	245	61
Total	400	100

Table and graph #6: Antenatal visits



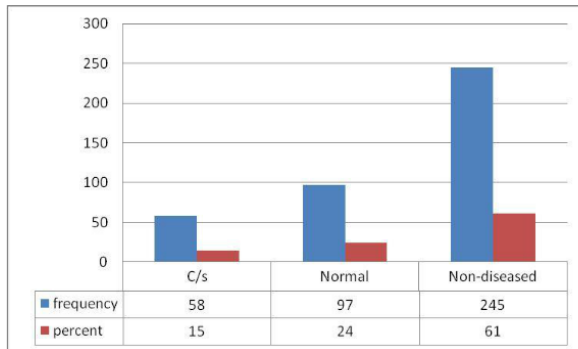
Antenatal visits	Frequency	Percent
No	66	17
Yes	89	22
Non-diseased	245	61
Total	400	100

Table and graph #7: Gestational age of mothers



G.Age	Frequency	Percent
<36	41	10
37- 42	88	22
>43	26	7
Non-diseased	245	61
Total	400	100

Table and graph #8: Mode of delivery



Mode of delivery	Frequency	Percent
C/s	58	15
Normal	97	24
Non-diseased	245	61
Total	400	100

Table 9: Other maternal risk factors leading to birth asphyxia

Factors	Number	Percentage
Hypertension	49	12%
Preeclampcia	17	4%
Anemia	46	11.5%
Meconium staining	26	6.5%
Abruptioplaceta	21	5%
Cord prolapsed	24	6%
Abnormal presentation	23	6%

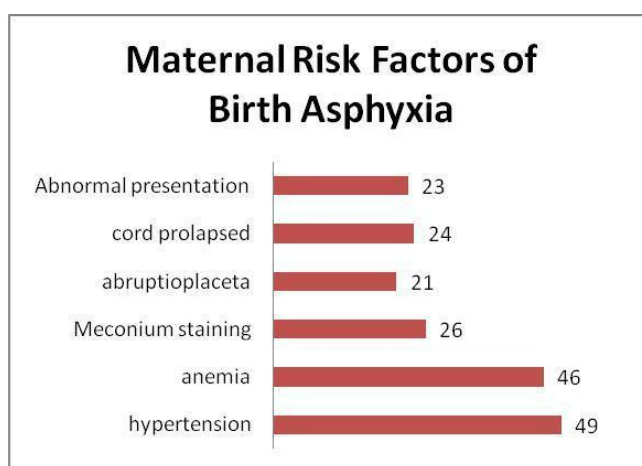
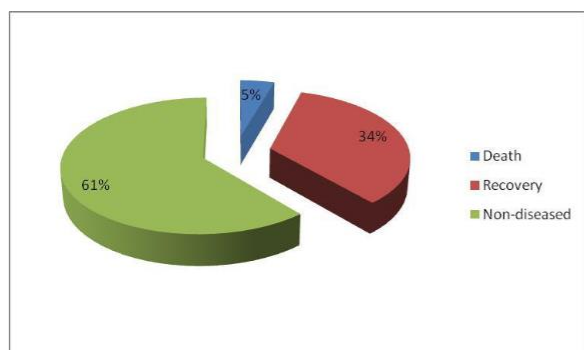


Table and graph #10: Outcome of birth asphyxiated newborns



Outcome	Frequency	Percent
Death	18	5
Recovery	137	34
Non-diseased	245	61
Total	400	100

8. References

1. Pervaiz, A. K. (2008). Basis of Pediatrics (7th ed., pp. 138-142).
2. Pakistan Demographic and Health Survey 2006-07. National Institute of Population Studies, Islamabad, and Macro International Inc., Calverton, Maryland, USA. (June 2008).
3. United Nations. (2010). The Millennium Development Goals Report 2010. New York.
4. Ibrahim, S., and Parkash, J. (2002). Birth asphyxia--analysis of 235 cases. *Journal of the Pakistan Medical Association*, 52(12), 553-556.
5. Kaye, D. (2003). Antenatal and intrapartum risk factors for birth asphyxia among emergency obstetric referrals in Mulago Hospital, Kampala, Uganda. *East African Medical Journal*, 80(3), 140-143.
6. Saeed, M., and Shaukat, R. K. (2012). Birth asphyxia (pp. 217-219). Department of Paediatrics, King Edward Medical College, Lahore.
7. Henry, G. P. (2012). A study on the incidence and factors associated with birth asphyxia at the university teaching hospital in Lusaka, Zambia. University of Zambia.
8. Chishty, A. L., Iqbal, M. A., Anjum, A., and Maqbool, S. (2002). Risk factor analysis of birth asphyxia at the Children's Hospital, Lahore. *Pakistan Paediatric Journal*, 26(2), 47-53.
9. Merani I. Risk factors of birth asphyxia at Nishtar hospital Multan, Pakistan.
10. Shazia M, Salma S and Seema B. To compare the outcome (early) of newborns with birth asphyxia in-relation to place of delivery and age at time of admission. *JPMA* 62: 1277; 2012.
11. Kawo, N. G., Urassa, E. N. J., Killeo, C., and Massawe, A. J. (1995). Asphyxia neonatorum in Muhimbili National Hospital Management Centre: management of associated factors. *Tanzanian Journal of Paediatrics*, 3(2), 50-53.
12. Olusanya BO, Solanke OA. Correlates of birth asphyxia using two Apgar score classification methods. *Nig Q J Hosp Med*. 2010 Oct-Dec; 20(4):153-61.
13. de Oliveira TG, Freire PV, Moreira FT, de Moraes Jda S, Arrelaro RC, Ricardi SR, Juliano Y, Novo NF, Bertagnon JR. Apgar score and neonatal mortality in a hospital

- located in the southern area of São Paulo City, Brazil. *Einstein (Sao Paulo)*. 2012 Jan-Mar; 10(1):22-8.
14. Boonamnuaykij, B. (2002). Low Apgar score newborns in Maternal and Child Hospital Yala. *Thai Pediatric Journal*, 9, 7-13.
 15. International Institute for Population Sciences and Macro International. (2010). National Family Health Survey: 2005–2006: India. Accessed August 15, 2010.
 16. Diallo, S., Kourouma, S. T., and Camara, Y. B. (1998). Mortalité néonatale à l'institute de nutrition et de santé de l'enfant (INSE), Conakry-Republique de Guinée. *Medicine Africaine Noire*, 45(5), 326–329.
 17. Kaiyo-Utete M, Langhaug L, Chingono A, Dambi JM, Magwali T, Henderson C, Chirenje ZM. Antenatal depression: Associations with birth and neonatal outcomes among women attending maternity care in Harare, Zimbabwe. *PLoS One*. 2023 Jul 7; 18(7):e0270873.
 18. Ogunlesi, T. A., Fetuga, M. B., and Adekanmbi, A. F. (2013). Mother's knowledge about birth asphyxia: the need to do more. *Nigerian Journal of Clinical Practice*, 16(1), 31-36.
 19. Aslam HM, Saleem S, Afzal R, Iqbal U, Saleem SM, Shaikh MW, Shahid N. "Risk factors of birth asphyxia". *Ital J Pediatr*. 2014 Dec 20; 40:94.
 20. Perveen, F., Tayyab, S., and Zuberi, B. F. (2011). Risk factors for perinatal deaths in Pakistan. *Journal of Obstetrics and Gynaecology Research*, 37(10), 1359-1364.
 21. Tabassum, F., Rizvi, A., Ariff, S., Soofi, S., Bhutta, Z. A. (2014). Risk factors associated with birth asphyxia in rural district Matiari, Pakistan: A case control study. *International Journal of Clinical Medicine*, 5(21), 1430-1441.
 22. Kumar, R. (1995). Birth asphyxia in a rural community in India. *Journal of Tropical Pediatrics*, 41(1), 5–7.
 23. Nacho, K. J., Chamber, T. H. K., and Mutimavale, L. A. R. (1990). Mortality and immediate morbidity in term babies with low Apgar scores. *Annals of Tropical Paediatrics*, 10, 239-244.
 24. Nelson, K. B., and Ellenberg, J. H. (1985). Antecedents of cerebral palsy: univariate analysis of risk. *American Journal of Diseases of Children*, 139(10), 1031-1038.