

Pattern of Admission and Outcome in a Neonatal Intensive Care Unit (NICU) of a Tertiary Care Hospital in Dhaka, Bangladesh

*G Tajkia¹, SK Amin², ME Rahman³, M Setu⁴, K Roy⁵, S Haldar⁶, MM Rahman⁷

ABSTRACT

Background: The neonatal period is a highly vulnerable time for an infant completing many of the physiologic adjustments required for life outside the uterus. As a result, there are high rates of morbidity and mortality. To reduce morbidity and mortality it is essential to know the neonatal disease pattern. Neonatal disease pattern changes from time to time and place. Analyzing the neonatal admission pattern helps the policy makers to make the better strategies and health care givers to serve better.

Objectives: This study aimed to determine the disease patterns and outcome of patients admitted to the Neonatal Intensive Care Unit (NICU) of Anwer Khan Modern Medical College Hospital, a tertiary care hospital in Dhaka, between January 2017 to December 2018.

Methods: Retrospective data from the medical records of all neonates admitted during the study period were reviewed and analyzed for age, weight, sex, reason for admission, duration of hospital stay, diagnosis and final outcome.

Results: The total number of neonates admitted during the study period was 262; 164 were male (62.6%), and 98 were female (37.4%). A total of 223 patients (85.12%) were born in the hospital while 39 (12.88%) were born at home. The majority were admitted during the first 48 hours of life (72.2%). A total of 5 patients (2%) weighed <1000 gm; 53(20.2%) weighed 1000-1500 gm, and 89 (34%) between 1600-2499 gm. Prematurity and infection were the main reasons for admission (52.7% and 20%, respectively), followed by birth asphyxia (12%) and neonatal jaundice (6.8%). A total of 206 patients (78.6%) were improved and discharged, 43 left against medical advice (16.4%), 3 were referred for urgent cardiac intervention (1.1%) and 10 (3.9%) died.

Conclusion: Prematurity, neonatal infection and birth asphyxia were the major causes of neonatal morbidity and mortality.

Key Words: Prematurity; Low Birth Weight; Neonatal infection; Neonatal Jaundice; Perinatal Asphyxia

Introduction

The first month of life is the most crucial period for child survival. Despite progress over the past two decades, in 2017 alone, an estimated 6.3 million children and young adolescents died and 2.5 million of those children died in the first month of life. The risk of dying is highest in the first month of life. An

estimated 2.5 million newborns died in the first month of life in 2017 - approximately 7,000 every day - about 36 percent died the same day they were born, and close to three-quarters of all newborn died in the first week of life.¹ In 2017, neonatal mortality - the probability of dying in the first 28 days of life

¹*Dr. Gule Tajkia, Assistant Professor, Department of Pediatrics, Anwer Khan Modern Medical College
e-mail: dr.guletajkia@gmail.com

²Prof. Syed Khairul Amin, Professor, Department of Pediatrics, Anwer Khan Modern Medical College

³Prof. M Ekhlashur Rahman, Professor and Head, Department of Pediatrics, Anwer Khan Modern Medical College

⁴Dr. Mumtahina Setu, Associate Professor, Department of Pediatrics, Anwer Khan Modern Medical College

⁵Dr. Kuntal Roy, Assistant Professor, Department of Pediatrics, Anwer Khan Modern Medical College

⁶Dr. Soma Halder, Assistant Professor, Department of Pediatrics, Anwer Khan Modern Medical College

⁷Dr. Mohammad Mahbubur Rahman, FCPS Part II Course, Bangabondhu Sheikh Mujib Medical University

*Corresponding Author

Date of submission: 27.04.2019 Date of acceptance: 03.05.2019

- was estimated at 18 deaths per 1,000 live births globally. In Bangladesh neonatal mortality rate fell gradually from 93.7 deaths per 1,000 live births in 1968 to 18.4 deaths per 1,000 live births in 2017.² Despite the considerable improvement in health outcomes in Bangladesh, the achievement remains vulnerable. The global community recognizes the crucial need to end preventable child deaths, making it an essential part of the Global Strategy for Women's, Children's, and Adolescent's Health (2016-2030)³ and the third Sustainable Development Goal (SDG)⁴ to ensure healthy lives and promote wellbeing for all people at all ages. It is a challenge for Bangladesh to maintain momentum and achieve the target of Sustainable Development Goal (SDG) 3 of reducing the neonatal mortality rate (NMR) to 12 per 1000 live births by 2030.⁵ To achieve the target of Sustainable Development Goal (SDG) 3 it is important to know the neonatal disease pattern. In the developed countries, the main cause of mortality and morbidity in the neonatal period are non-preventable causes such as congenital abnormalities, but in the developing countries the preventable causes such as Infections, Jaundice, Birth Asphyxia and Pneumonia predominat.^{6,7} Disease pattern in neonatal intensive care unit is a sensitive indicator of the availability, utilization and effectiveness of mother and child health services in the community. Disease pattern changes between different places and time to time even at the same place.⁸ Therefore, regular review of the disease pattern in any particular setting is important for providing better services to the patients. We conducted this study to document the disease pattern and outcome of patients admitted to our neonatal intensive care unit. Knowing the disease pattern in the neonatal intensive care unit (NICU) and disease-wise mortality rate we can use our available resources best and can make requisite efforts to reduce morbidity and mortality.

Materials and Methods

This descriptive study was conducted in the Neonatal Intensive Care Unit (NICU), Department of Pediatrics, Anwer Khan Modern Medical College Hospital, Dhaka, Bangladesh between January 2017 to December 2018. A total of 262 neonates admitted

to the NICU at Anwer Khan Modern Medical College Hospital, both inborn and out born with in this period were included in this study. Neonates, who were kept under observation, including those referred from other facilities with suspected disease but labeled healthy after evaluation in NICU were excluded from the study.

Data of all neonates admitted into the neonatal unit were collected from the admission, discharge and death registers using a pretested structured questionnaire prepared in English. Data extracted included: The age of neonate on admission, sex, weight on admission and at birth, Gestational age, mode of delivery, place of delivery, history of birth asphyxia, main final diagnosis, and date of discharge, and outcomes (discharge, death or left against medical advice) and cause of death. The data were subjected to statistical analysis according to standard procedure. SPSS version 20 for Windows (SPSS Inc, Chicago, IL, USA) software was used for data recording and analysis. Since it was a descriptive study, percentage and frequencies were determined. Approval for the study was obtained from the hospital ethical committee.

Operational Definition

In this setting, disease diagnosis was based on clinical presentation and supportive laboratory results. Prematurity was described as live born neonates delivered before 37 completed weeks. For mothers who did not know dates of their last menstrual period, the new Ballard score was used to estimate the gestational age.⁹ Birth weight was classified using WHO weight classification.¹⁰ Sepsis and meningitis were diagnosed after isolating the pathogenic organism from the blood or cerebral spinal fluid whenever possible; otherwise, most of the other diagnoses depended on history, physical examination, and other supportive investigations. Birth asphyxia was diagnosed whenever a neonate had an Apgar score <6 in the fifth minute and/or was unresponsive to stimuli or convulsion not explained by other causes.¹¹ For babies born outside health facilities with unknown Apgar scores, details were obtained from the mother about the neonate: if he/she did not cry immediately after birth; had

respiratory distress, floppiness, loss of consciousness, presence of convulsion, and loss of neonatal reflexes. In the present study, radiologic examination including X-ray was performed inconsistently; however, for the diagnosis of RDS, clinical criteria were used and risk factors like premature infant with signs and symptoms of rapid labored, grunting type of breathing manifesting immediately or within a few hours after delivery and with subcostal retraction, cyanosis, and decreased air entry in bilateral lung field or those who had chest X-ray examination with characteristic findings for RDS were also included. Both early onset neonatal sepsis (EONS) and late onset neonatal sepsis (LONS) were defined after assessing the risk factors for infection including prematurity, maternal infection during labor, and clinical signs and symptoms suggestive of infection. Neonates who presented to the NICU with a diagnosis of sepsis within 72 hours of birth are labeled as EONS, while those who came after 72 hours of birth are labeled LONS. Anthropometric assessment was carried out using Lubchenco curve.¹² All other assessments were based on physician judgment as written in the patient card.

Results

The total number of neonates admitted during the study period was 262. There were 164 males (62.6%) while 98 (37.4%) were females, male babies outnumbered their female counterpart with a ratio of 1.7:1. Both inborn and outborn neonates were admitted. Of the 262, 223 (85.12%) were born in the hospital while 39 (12.88%) were born at home. The mode of delivery was mostly lower uterine caesarean section (LUCS) 206(78.6%), normal vaginal delivery (NVD) was 52(20%) and instrumental delivery 4(1.4%). The majority of the newborns (72.2%) were admitted during the first 48 hours of life [Figure 1]. Among the 262 neonates more than half 138(52.7%) were premature. Regarding the birth weight of these babies, 147 (56.2%) babies were low birth weight (<2500 gm), among them 5 patient were categorized as ELBW (2%), 53 as VLBW (20.2%) and 89 as LBW (34%) and rest 115(43.8%) had normal birth weight [Table 1]. Among the preterm neonates most common complication were respiratory distress

syndrome 43(30.3%), neonatal jaundice 34(24%), sepsis 32(22.5%), apnea of prematurity 13(9.15%) [Figure 2]. Next to prematurity neonatal infections and perinatal asphyxia were the common causes of admission to the neonatal unit, at 20% and 12%, respectively among the term neonates. The major causes of infections were sepsis (65.4%), pneumonia (19.2%) and meningitis (15.4%) [Table 2]. Other causes of admission were Neonatal jaundice 18(6.8%), congenital heart disease 7(2.7%), Transient Tachypnea of Newborn 6(2.32%), Surgical problems 6(2.32%), Meconium Aspiration syndrome 2(0.76%) and Multiple congenital malformation (0.38%) [Figure 3].

Analysis of outcome showed that out of 262 neonates, 206 cases (78.6%) were improved and discharged to home, 43 cases (16.4%) left the hospital against medical advice (LAMA), 10 expired (3.9%) and 3 patient of complex congenital heart disease (1.1%) were referred for urgent cardiac intervention [Figure 4]. The leading cause of death were prematurity (60%), followed by birth asphyxia (30%) and sepsis (10%) [Table 3]. The case fatality rate was highest in Perinatal asphyxia (9.4%) [Figure 5].

Table 1: Demographic Characteristics of the admitted neonates

Variables	Attributes	Frequency (number)	Relative frequency (%)
Gender	Male	162	62.6
	Female	98	37.4
Place of delivery	Hospital	223	85.12
	Home	39	12.88
Mode of delivery	LUCS	206	78.6
	NVD	52	20
	Instrumental delivery	4	1.4
Number of gestation	Singleton	235	90
	Singleton	24	9.16
	Twins	3	1.14
	Triplets	53	20.2
Gestational age	< 34 weeks	113	43.2
	34-36 weeks	96	36.6
	37-42 weeks		
Birth Weight	<1000 gm	P5	2
	1000-1500 gm	53	20.2
	1600- 2499 gm	89	34
	> 2500 gm	115	43.8

Table 2: Disease pattern of the neonatal admissions

Diagnosis	n (N=262)	%
1. Prematurity	138	52.7
With sepsis	32	22.5
With Respiratory distress Syndrome	43	30.3
With asphyxia	12	8.45
With jaundice	34	24
With apnea of prematurity	13	9.15
With necrotizing enterocolitis	8	5.6
2. Neonatal infections	52	20
Sepsis		
Early onset	21	40.4
Late onset	13	25
Pneumonia	10	19.2
Meningitis	8	15.4
3. Perinatal asphyxia	32	12.02
Hypoxic ischemic encephalopathy		
Stage I	7	21.9
Stage II	16	50
Stage III	9	28.1
4. Neonatal Jaundice	18	6.8
5. Transient Tachypnea of Newborn	6	2.32
6. Meconium aspiration syndrome	2	0.76
7. Congenital Heart disease	7	2.7
8. Surgical problems	6	2.32
9. Multiple congenital malformation	1	0.38

Table 3: Major causes of neonatal deaths (n = 10)

Cause	Deaths n (%)	Case fatality rate (%)
Prematurity with it's complication (n=138)	6(60)	4.3
Perinatal asphyxia(n=32)	3(30)	9.4
Neonatal infection (n=52)	1(10)	2

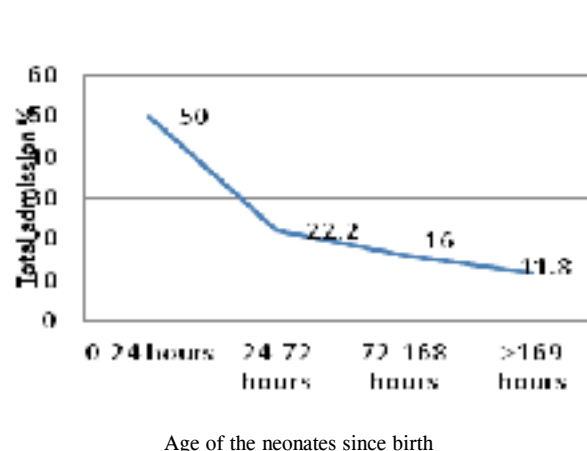


Figure 1: Percentage of neonates according to their age at admission; indicating 72.2% admission occur within first 48 hours of birth.

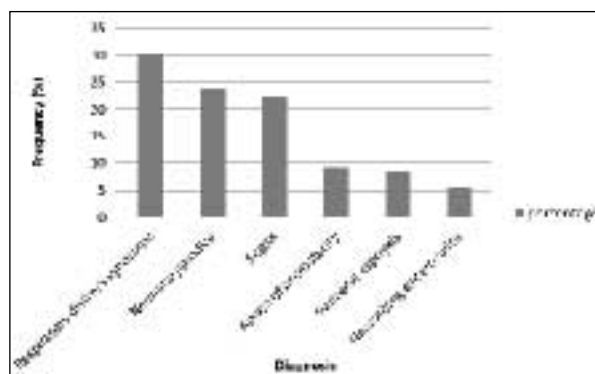


Figure 2: Causes of Preterm Admissions; Respiratory distress syndrome(RDS) (30.3%), neonatal jaundice 34(24%), sepsis 32(22.5%), apnea of prematurity 13(9.15%), perinatal asphyxia 12(8.45%) and necrotizing enterocolitis 8(5.6%).

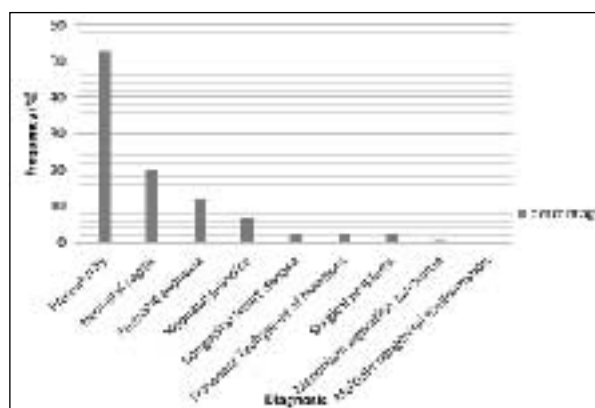


Figure 3: Causes of neonatal admissions; showing prematurity is the most common cause of admission (52.7%), followed by Neonatal sepsis (20%), Perinatal asphyxia (12%)

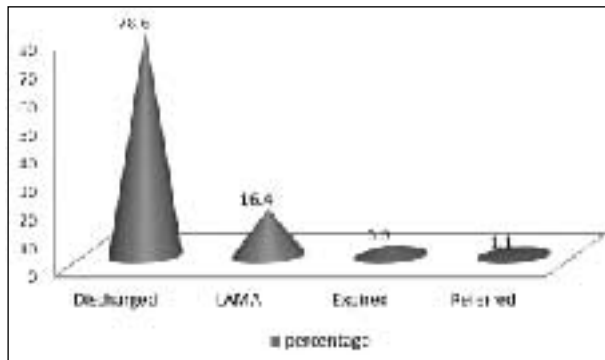


Figure 4: Outcome of neonatal admissions showing 78.6% neonates were discharged, 16.4% left the hospital against medical advice (LAMA), 3.9% expired and 3 patient (1.1%) were referred

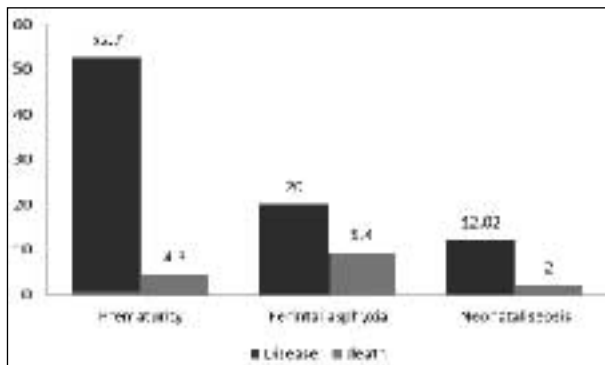


Figure 5: Case fatality rate of Major disease burden. Higher case fatality rate (9.4%) is observed in Perinatal asphyxia.

Discussion

Achieving the ambitious neonatal survival goals requires ensuring universal access to safe, effective, high quality and affordable care for neonates. It also requires an understanding of the levels and trends in neonatal mortality as well as the underlying causes of neonatal deaths. This study assessed the causes and outcomes of neonatal admissions in the Anwer Khan Modern Medical college Hospital. The study revealed that more male neonates 62.6% were admitted compared to female neonates 37.4%, representing male to female ratio of 1.7:1. Some studies have reported similar observation.^{13,14} While others archived the contrary.¹⁵ The preponderance of male neonates to suffer various conditions which usually result in admission cannot be explained by this study. However, this has been partly attributed to relatively well developed lungs

in female neonates at the time of birth compared to males, as surfactant markers such as lecithin, phosphatidylglycerol, and phosphatidylinositol appear much early in females than males.¹⁶ In addition, a recent study has established the genetic influence in neonatal infection, revealing that x chromosome linked diseases are predominant in males than females.¹⁷ Additionally, cultural and social factors could contribute to male babies getting more attention by parents than females. Although the sex of a baby is nonmodifiable, this factor is significant from a program planning perspective, in that male infants may require greater attention.

The present study revealed that more than half of the newborns (72.2%) were admitted within the first two days of life; an observation which has been reported by similar studies conducted elsewhere.¹⁸⁻²⁰ Among the 262 neonates more than half 138(52.7%) were premature and rest 124(47.3%) were term. Prematurity was the leading cause of admission in our NICU. This data is similar to study conducted by Elizabeth U and Modupe O. Oyetunde²¹ at Ibadan, Nigeria (54.9%) and Rahim F *et al.* (53%).²² Some other studies the contribution of preterm admission is comparatively less like MS Hoque, S Alam (28%)²³, Raghvendra Narayan (13%)²⁴, Veena Prasad and Nutan singh (20%).²⁵ Although there are numerous factors associated with prematurity and low birth weight, the major contributors are low socioeconomic status, maternal infection, maternal under nutrition, and anemia.²⁶

For more than 25 years, LBW has been observed to be one of the major risk factors for neonatal admissions in multiple studies conducted in many developing countries.²⁷ In this study, LBW was found in 56.15% of patients; this can be compared to 55.4% in Karachi²⁸ and 41.2% in Peshawar.²⁹ Percentage of ELBW was 2.7%, VLBW 21.5%, LBW 32%, findings are very similar from the study conducted by Veena Prasad, Nutan singh²⁵ and Bhagat Baghel, Anurup Sahu.³⁰ Among the preterm LBW neonates most common complication were respiratory distress syndrome 43(30.3%), neonatal jaundice 34(24%), sepsis 32(22.5%), apnea of prematurity 13(9.15%), perinatal asphyxia 12(8.45%) and necrotizing enterocolitis 8(5.6%) similar to Quddusi *et al.*³¹ Prematures are not only

the principal contributors to neonatal morbidity and mortality but they are the ones who experience more health problems and consumed more health resources.³²

Next to prematurity neonatal infections and perinatal asphyxia were the common causes of admission to the neonatal unit, at 20% and 12.02%, respectively among the term neonates similar to Preety Raikwar *et al.*³³ and Sridhar PV.³⁴ The major causes of infections were sepsis (65.4%), pneumonia (19.2%) and meningitis (15.4%). Neonatal sepsis is a global problem and has no boundaries. The variation in neonatal sepsis between developed and developing countries would be the degree of prevalence, as higher prevalence rates are recorded in developing countries.³⁵

In this study, birth asphyxia was 12%, as compared to 13% of neonates in the study conducted in Pakistan³⁶, 16.52% in Peshawar²⁸ and 38% in a study in DSH.²³ The important risk factors for birth asphyxia reported from a study conducted in Hyderabad, India include the lack of antenatal care, poor nutritional status, antepartum haemorrhage, maternal toxemia and having a home delivery.³⁷ Other causes of admission were Neonatal jaundice 18(6.8%), congenital heart disease 7(2.7%), Transient Tachypnea of Newborn 6(2.32%), Surgical problems 6(2.6%), Meconium aspiration syndrome 2(0.76%) and Multiple congenital malformation (0.38%). Higher incidences of jaundice in neonates have been reported from other studies in Bangladesh and Nigeria (30.71% and 17.25%, respectively).^{38,39} But in our center the percentage is low because in our center there is facility of Phototherapy in ward and cabin for the neonates who have normal vital parameters. Overall, the most prevalent indications of admission to our NICU were prematurity, infection, perinatal asphyxia. Studies conducted in other developing countries have reported similar findings.^{40,41}

Analysis of outcome showed that out of 262 neonates, 206 cases (78.6%) were improved and discharged to home, 43 cases (16.4%) left the hospital against medical advice (LAMA), 10 expired (3.9%) and 3 patient of complex congenital heart disease (1.1%) were referred for urgent cardiac intervention (Figure

4). Neonates who did not survive, the leading causes of death were prematurity and LBW (60%), followed by birth asphyxia (30%) and neonatal infections (10%) similar to Syed R A and Tekleab AM.^{36,42} Prematurity was the leading cause of neonatal deaths in the study conducted in other developing countries.^{36,43} In this study case fatality rate was highest in perinatal asphyxia (9.4%). Higher incidences have been reported in developing countries partly due to the level of quality of prenatal, perinatal, and obstetrics and gynaecological care in general.^{44,45} The burden of perinatal asphyxia is huge, as it is responsible for over 42 million disabilities adjusted lives.²⁰ Approximately 23% and 8% of birth asphyxia associated deaths occur in neonates and children under the age five years old respectively.⁴⁶ Looking critically at these studies, it is obvious that prematurity, birth asphyxia and sepsis are among the leading cause of neonatal admission, which are largely consistent with the global pattern of neonatal mortality.⁴⁷ These highlight the fact that many causes of neonatal deaths may be preventable. Obviously, the causes of these conditions are multifactorial and will need a multifaceted approach to curbing their contributions to neonatal deaths.

Limitation of Study

This is a hospital based study may not represent community as whole and outcome of newborn who left against medical advice was unknown.

Conclusion

Prematurity, Neonatal infection, birth asphyxia and neonatal jaundice were the major causes of neonatal admissions in our study and prematurity and perinatal asphyxia with hypoxic ischemic encephalopathy Stage III were the major causes of death. Variations in mortality rates are important because they permit inferences about quality of care and can yield important insights into how to improve efficacy and efficiency of care.

Recommendation

In the light of the findings of this study, the following recommendations are made:

1. Creating awareness among all the population for antenatal monitoring, prompt and timely transfer of

"at risk fetus" (i.e. baby in mother's uterus) to enable the mother to deliver close to Special Care Baby Unit where prompt action will be readily available. 2. Identification of women who are likely to deliver between 24 and 34 weeks of pregnancy and treatment with corticosteroids speed up maturation of fetal lungs and further reduce complication related to prematurity.³ Every delivery should be encouraged to be attendant by trained personnel for prompt and timely resuscitation of babies at birth to reduce high case fatality and morbidity related to birth asphyxia.

Conflict of Interest: None

References

1. UNICEF, WHO, World Bank, UN-DESA Population Division. The United Nations Inter-agency Group for Child Mortality Estimation (UN IGME). Levels & Trends in Child Mortality, Report 2018 [Cited 2018 Sep]. Available From: https://www.unicef.org/index_103264
2. World Data Atlas. Bangladesh Neonatal mortality rate, 1960-2018-kneoma.com <https://knoema.com/atlas/Bangladesh/Neonatal-mortality-rate>
3. Every Woman Every Child. Global Strategy for Women's, Children's and Adolescents Health 2016-2030. <http://www.who.int/life-course/partners/global-strategy/global-strategy-2016-2030/en/>
4. <https://sustainabledevelopment.un.org/>
5. United Nations. Sustainable Development Goals: 17 goals to transform our world (<http://www.un.org/sustainabledevelopment/sustainable-development-goals/>, accessed 23 January 2018).
6. Jehan I, Harris H, Salat S, Zeb A, Moben N, Pasha O, *et al.* Neonatal mortality: risk factors and causes: a prospective population based cohort study in Pakistan. Bulletin of the World Health Organization. 2009; **87**: 130-8.
7. Khinchi YR, Kumar A, Yadav S. Profile of neonatal sepsis. J Coll Med Sci Nepal. 2010; **6(2)**: 1-6.
8. Parkash J, Das N. Pattern of admissions to neonatal unit. J Coll Physicians Surg. Pak 2005; **15**: 341-44.
9. Ballard JL, Khoury JC, Wedig K, *et al.* New Ballard score, expanded to include extremely premature infants. J Pediatr. 1991; **119**: 417-423.
10. World Health Organization. Promoting Optimal Fetal Development: Report of a Technical Consultation. Geneva: World Health Organization; 2006. p. 3.
11. World Health Organization. Basic Newborn Resuscitation: A Practical Guide. Geneva: World Health Organization; 1997.
12. Lubchenco L, Hansman C, Dressler M, *et al.* Intrauterine growth as estimated from live born birth weight data at 24 to 42 weeks of gestation. Pediatrics. 1963; **32**: 793-800.
13. Clifton V. Review: sex and the human placenta: mediating differential strategies of fetal growth and survival. Placenta. 2010; **31**: S33-S39.
14. Toma BO, Ige OO, Abok II, *et al.* Pattern of neonatal admissions and outcome in a tertiary institution in north central Nigeria. J Med Trop. 2013; **15**: 121.
15. Baba S, Wikström AK, Stephansson O, *et al.* Influence of snuff and smoking habits in early pregnancy on risks for stillbirth and early neonatal mortality. Nicotine Tob Res. 2014; **16**: 78-83.
16. Bourbon JR, Frasion C. Developmental Aspects of the Alveolar Epithelium and the Pulmonary Surfactant System. Pulmonary surfactant: biochemical, functional, regulatory, and clinical concepts. 1991; 257.
17. Libert C, Dejager L, Pinheiro I. The X chromosome in immune functions: when a chromosome makes the difference. Nat Rev Immunol. 2010; **10**: 594-604.
18. Wang X, Buhimschi CS, Temoin S, *et al.* Comparative microbial analysis of paired amniotic fluid and cord blood from pregnancies complicated by preterm birth and early-onset neonatal sepsis. PLoS One. 2013; **8**: e56131.

19. Ali Z. Neonatal bacterial septicaemia at the mount hopes Women's Hospital, Trinidad. *Ann Trop Paediatr: International Child Health*. 2013; **24**: 41-44.
20. Lawn JE, Lee AC, Kinney M, *et al*. Two million intrapartum-related stillbirths and neonatal deaths: where, why, and what can be done? *Int J Gynecol Obstet*. 2009; **107**: S5-S19.
21. Ike Elizabeth U, Modupe O. Oyetunde. Pattern of Diseases and Care Outcomes of Neonates Admitted in Special Care Baby Unit of University College Hospital, Ibadan, Nigeria From 2007 To 2011, *IOSR J Nursing Health Science*. 2015; **4(3)**: 62-71.
22. Rahim F, Jan A, Mohummad J, Iqbal H. Pattern and outcome of admissions to neonatal unit of Khyber Teaching Hospital, Peshawar. *Pak J Med Sci*. 2007; **23**: 249.
23. MS Hoque, S Alam *et al*. Pattern of Neonatal Admissions and Outcome in an Intensive Care Unit of a Tertiary Care Paediatric Hospital in Bangladesh - A One-Year Analysis. *Journal of Bangladesh College of Physicians and Surgeons*. 2013; **31(3)**.
24. Raghvendra Narayan. A study of the pattern of admissions and outcome in a neonatal intensive care unit at high altitude; *Sri Lanka J Child Health*. 2012; **41(2)**: 79-81.
25. Veena prasad and Nutan singh. Causes of morbidity and mortality admitted in Government Medical college Haldwani in Kumoun Region Uttarakhand India. *JPBMS (Journal of Pharmaceuticals and Biomedical Scinces)*. 2011; **9(23)**.
26. Mathews TJ, MacDorman MF. Infant mortality statistics from the 2004 period linked birth/infant death data set. *Natl Vital StatRep*. 2007; **55**: 1-32.
27. Lawn JE, Cousens SN, Darmstadt GL, *et al*. 1 year after The Lancet Neonatal Survival Series: Was the call for action heard? *Lancet*. 2006; **367**: 1541-7.
28. Fazlur R, Amin J, Jan M, Hamid I. Pattern and outcome of admissions to neonatal unit of Khyber Teaching Hospital Peshawar. *Pak J Med Sci*. 2007; **23**: 249-53.
29. Alam AY. Health equity, quality of care and community based approaches are key to maternal and child survival in Pakistan. *J Pak Med Assoc*. 2011; **61**: 1-2.
30. Bhagat Baghel, Anurup Sahu, K. Vishwanadham. Pattern of Admission and Outcome of Neonates in a NICU of Tribal Region Bastar, India *Int J Med Res Prof*. 2016; **2(6)**: 147-50.
31. Ahmed Iqbal Quddusi, Athar Razzaq, Sajjad Hussain, *et al*. Pattern of neonatal admission at The Children's Hospital and The Institute of Child Health, Multan. *J Ayub Med Coll Abbottabad*. 2012; **24(2)**: 108-110
32. Eichevald EC. Care of the extremely low birth weight infant. In: Tausch HW, Ballard RA, Gleason CA, (Eds). *Avery's Diseases of the Newborns*. 8th ed. Haryana (India): WB Saunders; 2010.p. 410-26.
33. Preeti Raikwar, Dhiraj Parihar, Manoj Rawal, *et al*. A Study of Neonatal Admission Pattern and Outcome from Rural Haryana. *GJRA - Global Journal for Research Analysis*. 2018; **7(8)**: 73-75
34. Sridhar PV, Thammanna PS, Sandeep M. Morbidity Pattern and Hospital Outcome of Neonates Admitted in a Tertiary Care Teaching Hospital, Mandya. *Int J Sci Stud*. 2015; **3(6)**: 126-129V 24
35. Ayaz A, Saleem S. Neonatal mortality and prevalence of practices for newborn care in a squatter settlement of Karachi, Pakistan: a crosssectional study. *PLoS One*. 2010; **5**: e13783. S
36. Syed R. Ali, Shakeel Ahmed *et al*. Disease Patterns and Outcomes of Neonatal Admissions at a Secondary Care Hospital in Pakistan Sultan. *Qaboos Univ Med J*. 2013; **13(3)**: 424-428
37. Azra Haider B, Bhutta ZA. Birth asphyxia in developing countries: current status and public health implications. *Curr Probl Pediatr Adolesc Health Care*. 2006; **36**: 178-88.
38. Choi Y, El Arifeen S, Mannan I, *et al*. Can mothers recognize neonatal illness correctly? Comparison of maternal report and assessment by community health workers in rural Bangladesh. *Trop Med Int Health*. 2010; **15**: 743-53.

19. Ali Z. Neonatal bacterial septicaemia at the mount hopes Women's Hospital, Trinidad. *Ann Trop Paediatr: International Child Health*. 2013; **24**: 41-44.
20. Lawn JE, Lee AC, Kinney M, *et al*. Two million intrapartum-related stillbirths and neonatal deaths: where, why, and what can be done? *Int J Gynecol Obstet*. 2009; **107**: S5-S19.
21. Ike Elizabeth U, Modupe O. Oyetunde. Pattern of Diseases and Care Outcomes of Neonates Admitted in Special Care Baby Unit of University College Hospital, Ibadan, Nigeria From 2007 To 2011, *IOSR J Nursing Health Science*. 2015; **4(3)**: 62-71.
22. Rahim F, Jan A, Mohummad J, Iqbal H. Pattern and outcome of admissions to neonatal unit of Khyber Teaching Hospital, Peshawar. *Pak J Med Sci*. 2007; **23**: 249.
23. MS Hoque, S Alam *et al*. Pattern of Neonatal Admissions and Outcome in an Intensive Care Unit of a Tertiary Care Paediatric Hospital in Bangladesh - A One-Year Analysis. *Journal of Bangladesh College of Physicians and Surgeons*. 2013; **31(3)**.
24. Raghvendra Narayan. A study of the pattern of admissions and outcome in a neonatal intensive care unit at high altitude; *Sri Lanka J Child Health*. 2012; **41(2)**: 79-81.
25. Veena prasad and Nutan singh. Causes of morbidity and mortality admitted in Government Medical college Haldwani in Kumoun Region Uttarakhand India. *JPBMS (Journal of Pharmaceuticals and Biomedical Scinces)*. 2011; **9(23)**.
26. Mathews TJ, MacDorman MF. Infant mortality statistics from the 2004 period linked birth/infant death data set. *Natl Vital StatRep*. 2007; **55**: 1-32.
27. Lawn JE, Cousens SN, Darmstadt GL, *et al*. 1 year after The Lancet Neonatal Survival Series: Was the call for action heard? *Lancet*. 2006; **367**: 1541-7.
28. Fazlur R, Amin J, Jan M, Hamid I. Pattern and outcome of admissions to neonatal unit of Khyber Teaching Hospital Peshawar. *Pak J Med Sci*. 2007; **23**: 249-53.
29. Alam AY. Health equity, quality of care and community based approaches are key to maternal and child survival in Pakistan. *J Pak Med Assoc*. 2011; **61**: 1-2.
30. Bhagat Baghel, Anurup Sahu, K. Vishwanadham. Pattern of Admission and Outcome of Neonates in a NICU of Tribal Region Bastar, India *Int J Med Res Prof*. 2016; **2(6)**: 147-50.
31. Ahmed Iqbal Quddusi, Athar Razzaq, Sajjad Hussain, *et al*. Pattern of neonatal admission at The Children's Hospital and The Institute of Child Health, Multan. *J Ayub Med Coll Abbottabad*. 2012; **24(2)**: 108-110
32. Eichewald EC. Care of the extremely low birth weight infant. In: Tausch HW, Ballard RA, Gleason CA, (Eds). *Avery's Diseases of the Newborns*. 8th ed. Haryana (India): WB Saunders; 2010.p. 410-26.
33. Preeti Raikwar, Dhiraj Parihar, Manoj Rawal, *et al*. A Study of Neonatal Admission Pattern and Outcome from Rural Haryana. *GJRA - Global Journal for Research Analysis*. 2018; **7(8)**: 73-75
34. Sridhar PV, Thammanna PS, Sandeep M. Morbidity Pattern and Hospital Outcome of Neonates Admitted in a Tertiary Care Teaching Hospital, Mandya. *Int J Sci Stud*. 2015; **3(6)**: 126-129V 24
35. Ayaz A, Saleem S. Neonatal mortality and prevalence of practices for newborn care in a squatter settlement of Karachi, Pakistan: a crosssectional study. *PLoS One*. 2010; **5**: e13783. S
36. Syed R. Ali, Shakeel Ahmed *et al*. Disease Patterns and Outcomes of Neonatal Admissions at a Secondary Care Hospital in Pakistan Sultan. *Qaboos Univ Med J*. 2013; **13(3)**: 424-428
37. Azra Haider B, Bhutta ZA. Birth asphyxia in developing countries: current status and public health implications. *Curr Probl Pediatr Adolesc Health Care*. 2006; **36**: 178-88.
38. Choi Y, El Arifeen S, Mannan I, *et al*. Can mothers recognize neonatal illness correctly? Comparison of maternal report and assessment by community health workers in rural Bangladesh. *Trop Med Int Health*. 2010; **15**: 743-53.