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Research Article

Why newborns die? A self-audit

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ABSTRACT

Background: A birth weight specific reduction in neonatal mortality has been noted in babies above 1000 gm. This has been attributed to intensive care management of high-risk pregnancies and new borns. A further decline in mortality can be accomplished by evidence based evaluation of high-risk therapies. This prospective study was conducted to evaluate the postnatal factors correlating with new born mortality. Apgar scores at birth have been correlated with deaths in low birth weight babies. In the present study we tried to correlate the presence of apnea, hyaline membrane disease, necrotizing enterocolitis and sepsis with neonatal mortality. Lethal Congenital malformations were also studied. It is a prospective consecutive enumerative study of all new borns weighing less than 2000 grams.
Methods: The post natal course in the hospital including the presence of apnea, seizures, patent ductus arteriosus, intra ventricular hemorrhage, hyaline membrane disease, hyper bilirubinemia, necrotizing enterocollitis, duration of oxygen therapy and ventilator support were noted. Statistical analysis was done using Fisher Exact test.
Results: There was a significant increase in mortality if the new born had low Apgar score, necrotizing enterocollitis, hyaline membrane disease, apnoea, sepsis or congenital malformations. Nursery biological risk score is a sensitive tool to predict new born mortality.
Conclusions: Nursery biological risk factors can be used to predict the outcome. However the clinical picture is compound with various coexisting pathologies.

Keywords: Neonate, Mortality, Low birth weight, Resuscitation

INTRODUCTION

The number of new borns with low birth weight has increased considerably in recent years. This is due to the use of assisted reproductive techniques, multiple gestations and increased use of ultrasound for confirmation of gestational age.[1] Babies weighing less than 2500 grams irrespective of the period of gestation are classified as low birth weight babies. A low birth weight baby includes both preterm and term small for gestational age.[2] The mean birth weight of an Indian baby is about 500 gms. less than an American New born Baby. It was assessed by Indian scientists that in view of maturity, respiratory distress and feeding problems 2000gms or less should be taken as the criterion of low birth weight of Indian babies.[3] It was also shown that babies with birth weight <2000 gms or less had a significantly altered immune profile as compared with those above 2000 gms.[3,4] Low birth weight baby can be the result of either preterm delivery or retarded fetal growth.[5] The two present problems of varying etiology. The preterm birth complications are caused by anatomic and physiologic immaturity. There is respiratory distress due to delayed alveolar clearance of alveolar fluid and surfactant deficiency. Postnatal delayed closure of ductus

venosus, ductus arteriosus and foramen ovale leads to systemic hypotension and pulmonary hypertension.[6] In liver, the synthesis of coagulation factors and conjugation is not adequate. Retinopathy and intraventricular hemorrhage occurs due to immature vessels. Underdeveloped cellular and humoral immunity put the new borns at risk of necrotizing enterocollitis and neonatal sepsis. Besides, there is an inappropriate colonization of new born skin, respiratory, gastrointestinal and urogenital tracts.[7]

The growth-retarded babies on the other hand are as a result of inadequate substrata transfer and uteroplacental insufficiency. Sometimes the problems of inadequate reserves and prematurity coexist in a growth retarded preterm baby.

Aims and objectives

The neonatal period is defined as the first 28 days after birth. Neonatal mortality (4.04/1000 in 2011) accounts for about two-thirds of all infant deaths (death before 1 year of age). A birth weight specific reduction in neonatal mortality has been noted in babies above 1000 gms. This has been attributed to intensive care management of high-risk pregnancies and new borns. A further decline in mortality can be accomplished by evidence based evaluation of high-risk therapies. This prospective study was conducted to evaluate the postnatal factors correlating with new born mortality. Early preterm babies (28-34 weeks) have adverse neurodevelopmental outcomes like intra ventricular hemorrhage, periventricular leukomalacia, necrotizing enterocollitis requiring extensive bowel resections, neonatal infections and bronchopulmonary dysplasia. Late preterm babies (34-36 weeks) are at a risk of hypothermia, hypoglycemia, respiratory distress, apnea, jaundice, feeding difficulties and suspected sepsis. Apgar scores at birth have been correlated with deaths in low birth weight babies. Similarly in the present study we tried to correlate the presence of apnea, hyaline membrane disease, necrotizing enterocolitis and sepsis with neonatal mortality. Lethal congenital malformations were also studied.

METHODS

The study population consists of 100 new borns weighing less than 2000gms. The period of study was between June 2013 and May 2015 at Saveetha Medical College and Hospital. During this period there were about 150 deliveries per month and an average of 33 new borns were admitted per month to neonatal intensive care unit.

All new borns of birth weight less than 2000gms were studied prospectively. Detailed account of intra partum events like duration of labour, fetal presentations, fetal distress, fever, Apgar score, Birth asphyxia and resuscitation after delivery were recorded. Gestational age was determined according to the Ballard's modification of Dubowitz et al. The post natal course in the hospital including the presence of apnea, seizures, patent ductus arteriosus, intra ventricular hemorrhage, hyaline membrane disease, hyper bilirubinemia, necrotizing enterocollitis, duration of oxygen therapy and ventilator support were noted. Statistical analysis was done using Fisher Exact test.

RESULTS

During the study period, 100 (5.55%) pregnancies resulted in low birth weight neonates (<2000 gms) out of total 1800 pregnancies. There were 7 neonatal deaths. A preterm delivery was associated with significant risk for low birth weight mortality (p<0.5) as shown in (Table 1). While no term baby or a preterm baby above 2000gms had neonatal death. There were 4 deaths in babies below 28 weeks, 2 deaths in babies 29-32 weeks and 1 death in babies 33-36 weeks. (Table 2) tells us that the preterm AGA has a significant incidence of mortality as compared to preterm SGA and IUGR. Birth asphyxia was one of the most significant factors affecting low birth weight survival. Abnormal Apgar score increased the risk of mortality (Table 3). It was found that necrotizing enterocolitis was a significant contributor of low birth weight mortality (Table 4). Interestingly, both the babies who developed necrotizing enterocolitis were intrauterine growth retarded babies with an antenatal reversed flow in ductus arteriosus.

Table 1: Low birth weight and neonatal death.

Outcome	<1000 gms	1000-1500 gms	1500-2000 gms	Total
Death	2 (28.57)	4 (14.81)	1 (1.52)	7
Survival	5 (71.43)	23 (85.19)	65 (98.48)	93
Total	7 (7.00)	27 (27.00)	66 (66.00)	100

(p<0.05 significant)

Table 2: Gestational age and neonatal death.

Out-come	<28 weeks	29-32 new weeks	33-36 weeks	Term	Total
Death	4 (50)	2 (7.69)	1 (2.17)	0	7
Survival	4 (50)	24 (92.31)	45 (97.83)	20 (100)	93
Total	8 (8)	26 (26.00)	46 (46.00)	20 (20)	100

(p< 0.05 significant)

Table 3: Apgar score and neonatal death.

S. No.	Apgar status	Mortality percentage
A	1 minute score <4	6 (24.00%)
	1 minute score >4	1 (1.49%)
B	5 minutes score <4	5 (50.00%)
	5 minutes score >4	2 (2.44%)

(p< 0.05 significant)

Table 4: Necrotizing enterocollitis and neonatal death.

Outcome	Not present	Present	Total
Death	6 (6.12)	1 (50)	7
Survival	92 (93.87)	1 (50)	93
Total	98 (98.00)	2 (2)	100

(p< 0.05 significant)

There was a significant association of respiratory distress syndrome with an increase in the incidence of neonatal death (Table 5). Apnea is a significant risk factor for low birth weight neonatal mortality, as observed (Table 4). Sepsis was clinically documented in 21 babies out of whom 4 succumbed (Table 5). There were five congenitally malformed babies and out of which 2 died. Seventeen neonates were born as twins, out of which 2 died.

Table 5: Hyaline membrane disease and neonatal death.

Outcome	Not present	Present	Total
Death	5 (5.15)	2 (75)	7
Survival	92 (94.85)	1 (25)	93
Total	97 (97.00)	3 (3)	100

(p< 0.05 significant)

Table 6: Apnoea and neonatal death.

Outcome	Not present	Present	Total
Death	4 (4.25)	3 (50)	7
Survival	90 (95.75)	3 (50)	93
Total	94 (94.00)	6 (6)	100

(p< 0.05 significant)

Table 7: Sepsis and neonatal death.

Outcome	Not present	Present	Total
Death	3 (3.80)	4 (19.04)	7
Survival	76 (96.20)	7 (80.96)	93
Total	79 (79.00)	21 (21.00)	100

(p< 0.05 significant)

Table 8: Congenital malformations and neonatal death.

Outcome	Not present	Present	Total
Death	5 (5.26)	2 (40)	7
Survival	90 (94.74)	3 (60)	93
Total	95 (95.00)	5 (5)	100

(p< 0.05 significant)

DISCUSSION

Low birth weight babies have an altogether altered developmental, metabolic and nutritional status. The ill effect of perinatal asphyxia is more pronounced in low birth weight babies as noted.[8,9] Low Apgar score has been correlated widely with neonatal mortality.[10,11] An Apgar score of 0-3 at 5 min is uncommon but is a better predictor of neonatal death than an umbilical artery pH ≤7. The presence of both parameters though increases the relative risk of mortality. Other studies have correlated Apgar score with cerebral palsies and it was found that the score was mostly normal in neonates who developed cerebral palsy later. The Apgar score correlates better with mortality than cerebral palsy. An addition of umbilical cord pH can improve the prediction value.

Low birth weight baby's intestine tends to be colonized by coliforms, *enterococci* and bacteroids. *Bifidobacterium* and *Lactobacillus* are found in the stool of <5% of low birth weight infants in the first month of life.[12] The pathogenesis of necrotizing enterocolitis is multi factorial. Reversed ductus arteriosus flow; prematurity, formula feeding, intestinal ischemia and bacterial colonization activate an inflammatory cascade accumulating in bowel necrosis.[13] Extensive data and meta-analysis recommend probiotic preparations decrease the incidence and mortality in stage 2 and above necrotizing enterocolitis but an FDA approved preparation is not available.

The incidence of Hyaline membrane disease is inversely proportional to birth weight and gestational age. It occurs in 60-80% of infants <28 week of gestational age, in 15-32% of those between 32 and 36 weeks of gestational age, and rarely in those above 37 weeks. It is a direct predictor of new born death.[14] Additive associated factors which increase mortality are interstitial emphysema, male sex, low PaCO2 during the treatment of respiratory distress syndrome, PDA, high peak inspiratory pressure, increased airway resistance in the first week of life, increased pulmonary artery pressure and a family history of atopy.[15]

Neonatal apnea if present directly influences the survival rates in our study. However, some studies have quoted that apnea of prematurity does not alter an infant's prognosis unless it is severe, recurrent and refractory to therapy.[16]

New born sepsis as in our study has been shown to direct predictor of mortality.[17] Mortality rates are according to the definition of sepsis. Reported mortality rates in some studies are as low as 10% because all infections are included in the definition. Risk factors which increase mortality from sepsis are seizure duration >72 hours, coma, need for inotropic support and leukopenia.

Congenital malformations are also directly related to neonatal death as in other studies.[18] Birth defects account for 1 in 5 infant deaths in developed countries, with a rate of 137.6 deaths per 100,000 live births, which is higher than other causes, such as preterm and low birth weight (109.5/100,000), sudden infant death syndrome (55.5/100,000), maternal complications of pregnancy

(37.3/100,000) and respiratory distress syndrome (25.3/1,00,000).[15]

Many studies have also documented the impact of adverse family and socioeconomic risk factors.

CONCLUSION

Nursery biological scoring systems based on risks may help to predict neonatal mortality. However, we are still far from giving answers to why new borns die. The clinical picture is usually compounded by multiple coexisting problems and neonatal emergencies arise unexpectedly. Effective perinatal care requires referral centers with equipment and facilities and transportation services for pregnant women and new borns. A reduction in neonatal mortality can be achieved by prevention of preterm births and development of intrauterine fetal therapy. It is vital to realize that prediction and management low reserves and congenital anomalies in utero can significantly reduce the incidence mortality in low birth weight. If anything can go wrong it will and we need to be prepared for all unforeseen complications of low birth weight.

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REFERENCES

1. Victoria CG, Wagstaff A, Schellenberg JA, Gwakin D, Claeson M, Habicht JP. Applying an equity Lens to child wealth and mortality: more of same is not enough. The Lancet. 2003;362:233-41.
2. Battaglia FC, Lula O. A practical classification of new born infants by weight and gestational age. J Pediatrics. 1967;71:2.
3. Chatrrath R, Saili A. Immune status of full term SGA neonates in India. J Trop Pediatr. 1997;43:345-8.
4. Sagayaraj BM, Sharma N, Lal DV. New born care: our perspective. Indian J Neonat Med Res. 2014;2,2:13-7.
5. United Nations Children's Fund and World Health Organization. Low birth weight: country regional and global estimates. UNICEF. 2004:92-806-3832-37.
6. Kinsella JP, Abman SH. Recent developments in the pathophysiology and treatment of persistent pulmonary hypertension of new born. Pediatr. 1995;126:853-64.
7. Sagayaraj BM, Lal DV, Kumar R, Sharma N. Magnifying glass on why new borns die. Indian J Neona Med Res. 2014;2(1):7-10.
8. Lindner W, Vobbeck S, Hummler H, Pontantandt F. Delivery room management of extremely low birth weight infants: spontaneous breathing or intubation? Paediatrics. 2005;103(5):961-67.
9. Brazy JE, Eckerman CO, Jerri M, Ridei O, Goldstein I, O'Raand AM. Nursery neurobiological risk score: important factors in predicting outcome in very low birth weight infants. J Paediatr. 1991;118(5):783-92.
10. Apgar V. A proposal for a new method of evaluation of the new born infant. Curr Res Anesth Anal. 1953;32:260-7.
11. Casey BM, McIntire DD, Leveno KJ. The continuing value of the Apgar score for the assessment of new born infants. N Engl J Med. 2001;344:467-71.
12. Gewolb IH, Schwalbe RS, Taciak VL, Harrison TS, Panigrani P. Stool micro flora in extremely low birth weight infants. Arch Dis Child Fetal Neonatal. 1999;80:167-73.
13. Saavedra JM, Bauman NA, Oung I, Perman JA, Yolken RH. Feeding of *Bifidobacterium bifidum* and streptococcus thermophiles to infants in hospital for prevention of diarrhoea and shedding of rotavirus. Lancet. 1994;344:1046-49.
14. Neonatal Resuscitation: International Consensus on Cardiopulmonary Resuscitation and Emergency Cardiovascular Care Science with Treatment recommendations. Circulation. 2010;122(2):S516-38.
15. Carlo WA. In Kliegman RM, Stanton BF, Schor NF, Joseph W. St Geme III. Nelson textbook of Pediatrics. First south Asian Edition. Haryana, India: Reed Elsevier India Pvt Ltd;2011:850.
16. Shane AL, Stoll BJ. Recent developments and current issues in the epidemiology, diagnosis and management of bacterial and fungal neonatal sepsis. Am J Perinatol. 2013;30(2):131-41.
17. Walden RV, Taylor SC, Hansen NI, Poole WK, Stoll BJ, Abuelo D. Major congenital anomalies place extremely low birth weight infants at higher risk for poor growth and developmental outcomes. 2007;120(6):e1512-9.
18. Slavotinek A. In Kliegman RM, Stanton BF, Schor NF, Joseph W. St Geme III. Nelson textbook of Pediatrics. First south Asian Edition. Haryana, India: Reed Elsevier India Pvt Ltd. 1:899.

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