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Original Research Article

OUTCOME PREDICTORS IN NEONATES REQUIRING OXYGEN SUPPLEMENTATION

Sandhya Rani Tholety[1], Sandhya Dasari[2]

[1]Assistant Professor, Department of Pediatrics, NRI Medical College, Chinnakakani, Mangalgiri (Mandal), Guntur, Andhra Pradesh, India
[2]Associate Professor, Department of Pediatrics, Dr. Pinnamaneni Siddhartha Institute of Medical Sciences and Research Foundation, Chinnaoutapalli, Gannavaram (Mandal), Krishna, Andhra Pradesh, India

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Corresponding Author:
Dr. Sandhya Dasari,
Email: sandhyadasari@gmail.com

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Abstract

Background: To identify Antenatal, perinatal and postnatal factors in neonates requiring oxygen supplementation after birth. To observe outcome (survived or expired) predictors in babies requiring oxygen supplementation. **Materials and Methods:** Prospective cohort study of 300 consecutive babies requiring oxygen born in our hospital during their stay in hospital. Excluded out born babies. Study period is 2 years. Various Antenatal, perinatal and postnatal factors were collected and data was analyzed. **Result:** In the study the prematurity prevalence is 36%.The proportion of severely depressed babies needing invasive ventilation and resuscitation is 14% and who needed chest compressions is 5%. About 29% needed supportive oxygen supplementation and AMBU support. The frequent clinical problems observed are neonatal jaundice in 43%, pneumonia in 41%, birth asphyxia in 27%, neonatal sepsis in 20%, coagulopathy in 20% and bleeding diathesis in 15%. 7 to 27% babies needed noninvasive positive pressure ventilation and /or invasive mechanical ventilatory support. **Conclusion:** The factors associated with death are Babies requiring therapies like oxygen, bag and mask, endotracheal tube intubation, chest compressions, epinephrine. Those babies are having high mortality with odds ratio 8.2. Babies having shock have high risk for mortality (OR 9.7).Coagulopathy requiring intervention is associated with high mortality (OR17.2). Antenatal steroids are associated with high mortality (OR8.4). Babies who failed to tolerate breast feeds had high risk of death (OR 130).Mechanical ventilatory support is associated with high mortality (OR 37).

INTRODUCTION

Many neonates who get admitted in NICU receive oxygen therapy.[1] Frequent situations in which neonate needs oxygen,[2] are need for resuscitation, asphyxia, Respiratory distress, Hypoxemia (SpO2 <87% or paO2 <50 mm of Hg) in room air, Cyanosis, Hypothermia, Recurrent apnea. SpO2 alone is not always indicative of adequacy of oxygen therapy. The incidence of oxygen therapy is dependent on gestational age at birth with 97% of, 27 weekers receiving supplemental oxygen, whilst 79% of 28-31 weekers receive oxygen therapy during their initial hospitalization.[3-7]

If one could identify the preventable risk factors it would help to anticipate and intervene early for a better outcome. Outcome depends not only on optimum oxygen therapy [SpO2 88-92% with lower and upper limits 85-95%] but also on clinical condition and biological maturity.[8-10]

Aims and Objectives

To identify Antenatal, perinatal and postnatal factors in neonates requiring oxygen supplementation afterbirth. To observe outcome (survived or expired) predictors in babies requiring oxygen supplementation.

MATERIALS AND METHODS

The study was started after the protocol was approved by institutional ethics committee. Informed consent from the parent/legal authorized guardian is obtained. Prospective cohort study of 300 consecutive babies requiring oxygen born in our hospital during their stay in hospital. Excluded out born babies. Study period is 2 years. Various Antenatal, perinatal and postnatal factors were collected and data was analyzed.

Methodology

All neonates requiring oxygen therapy were included. The antenatal, perinatal, postnatal factors were recorded and babies followed during their

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hospital stay. General and systemic examination was done and any complications were noted. Case proforma were written and converted into electronic database and analysis was done.

RESULTS

Among mothers of babies requiring oxygen therapy 13% have preeclampsia, 12% have gestational hypertension, 6% have hypothyroidism, 3% have eclampsia and Gestational diabetes mellitus in 2%.

In mothers of these babies 36% required antenatal steroids with suspicion of preterm labour. Among the babies delivered and requiring oxygen 54 % were delivered through normal vaginal delivery and 46% through caesarean section. 6% of babies had fetal distress and 10% had PROM. PPROM was present in about 6%. 24% of babies born with MSAF. Among 4 babies who's APGAR at 15 minutes were recorded 2 babies had APGAR 9 & 10 and 2 babies who expired had 0 and 1 APGAR at 15 minutes. Among the babies requiring oxygen 30% required AMBU ventilation, 13% required intubation and 6% required chest compression. About 2% required epinephrine at delivery.

Significant number of term and normal weight babies needed oxygen with median age at 38 weeks and weight 2600gms. 20% babies had sepsis with 98% of it by bacterial sepsis. Most of them needed admission at 1st hour after birth.Clinical problems commonly seen among these babies are jaundice (43%), Pneumonia (41%), asphyxia (27%), and sepsis (20.4%). Babies also had coagulopathy prolonged APTT 917.3%), bleeding diathesis (16%), DIC (12%). Supportive therapies like CPAP, platelet transfusions, FFP transfusions, and mechanical ventilation were required among the study population

The median gestational age (GA) among survived was 38 weeks (95%CI 38 to 38 weeks) and among expired was 35 weeks (95%CI 32.1 to 37 weeks). The median birth weights among survived group were 2640 grams (95% CI 2560 to 2734 grams) and among expired group is 2055 grams (95%CI 1261.7 to 2533grams). Babies who did not need CPAP, mechanical ventilator support, phototherapy are having decreased mortality, when compared to those who required them with odds ratio 0.38 (95%CI 0.15 to 0.93), 0.02 (95%CI 0.004 to 0.11), 4.88 (95% CI 1.82 to 15.19) respectively. Babies in whom breast feeding was initiated had more survival rates when compared to those babies in whom it couldn't be started with odds ratio 48 (95% CI 15.3 to 162.1). The case fatality rate is 14.1% (95% CI 9.8% to 19.6%).

On multivariate logistic regression analysis the risk factors of death in these babies are Birth interventions (oxygen, AMBU, endotracheal tube intubation, chest compression, epinephrine, intravenous fluids) with odds ratio 8.24 (95%CI 1.77 to 38.36), shock with Odds ratio 9.75 (95% CI 0.79 to 119.38), prothrombin time prolongation with Odds ratio 17.24 (95% CI 2.38 to 124.83), antenatal steroids 2nd dose to mothers odds ratio 8.42 (95% CI 1.67 to 42.44), Breast feed not initiated had odds ratio130.06(95%CI20.01to845.28)and requiring mechanical ventilator support with odds ratio 37.33 (95% CI 2.25 to 617.77).

DISCUSSION

In this prospective cohort study of 225 neonates, who received oxygen therapy the following observations are made. Among mothers of babies requiring oxygen therapy 13% have preeclampsia, 12% have gestational hypertension, 6% have hypothyroidism, 3% have eclampsia and Gestational diabetes mellitus in 2%. In our study the proportion of gestational hypertension is similar to other studies.[11-17] The proportion of mothers receiving antenatal steroids is 37% indicating the proportion of premature labor suspected by obstetrician. This is corresponding to the proportion of preterm babies in our study which is 35%.

The prevalence of preterm babies in our study is 36% is similar to that of the other studies above.[14-16] Natal problems observed in our study are meconium stained amniotic fluid (24%), PROM (10%), fetal distress(6%) and PPROM(6%).Delivery room factors and clinical factors in neonates receiving oxygen therapy. The median Apgar score at 1 minute is 6, at 5 minute is 7 and at 10 minutes is 9. In our study the 1 minute APGAR is 6 which are below the observations suggested value in a normal new born baby (About 90% of normal term newborns have an APGAR between 8 and10 during their first breath in first 10 seconds) and it showed improvement by 10 minutes. Nevertheless, 30% of babies needed oxygen in delivery room, about 30.7% required bag and mask ventilation in delivery room and later all the 225 babies needed oxygen therapy in NICU. So in our population APGAR scores up to 10 minutes still may be of use for exercising caution despite normal pulse oximetry readings. The proportion of severely depressed babies in delivery room is 13.3% as indicated by the requirement for endotracheal tube intubation and 6% requiring chest compressions. Clinical problems commonly seen among these babies are jaundice (43%), Pneumonia (41%), asphyxia (27%), sepsis (20.4%). Babies also had coagulopathy prolonged APTT 917.3%), bleeding diathesis (16%), DIC (12%). Jaundice per se is not the primary disorder. It is most likely a part of sepsis because no hemolytic anemia or other reasons could be found in these babies. Among them 20.4% have culture proven sepsis and remaining 23% are most likely due to clinical sepsis. The proportion of very seriously ill to seriously ill neonates in our study is from 7% to 27% as indicated by the requirement of CPAP and ventilator respectively.

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Risk factors associated with mortality in neonates receiving oxygen therapy: Antenatal steroids need to the mother in our study is found to be a risk factor for neonatal mortality on multivariate analysis. The risk of baby dying is associated with mother receiving 2 doses of steroid. This can be explained by the higher degree of prematurity in those babies in our study by Kruskal-wallis test the median gestational age of babies of mothers who received first dose of steroid is 33 weeks, the median gestational age of babies of mothers who received 2nd dose of steroid is 35 weeks and median gestational age of babies of mothers who received no steroids is 38weeks. In post hoc analysis there is significant difference between gestational age of babies of no steroid mothers and other 2 groups (1st dose and 2nd dose) but not between gestational age of 1st dose and 2nd dose babies. But gestational age is not found to be a risk factor on multivariate analysis.

This shows that prematurity per se is not mainly responsible for mortality but the complications like DIC, prolonged prothrombin time, shock, encephalopathy associated with prematurity are responsible for mortality.

The lesser mortality in MSAF group compared to clear amniotic fluid group is likely to be due probably there are factors other than MSAF which are responsible for mortality. MAS babies who are more mature, when taken appropriate clinical care, are likely to survive compared to clear amniotic fluid group babies with prematurity and its associated complications like DIC, prolonged PT, sepsis, encephalopathy.

In the clear amniotic fluid group more preterm babies are found. Their gestational age ranges from 28 to 42 weeks where as in meconium stained amniotic group gestational age is ranging from 35 to 41 weeks. Babies who did not require delivery room care (oxygen, bag and mask, intubation, chest compression, epinephrine, intravenous fluid) are 0.3 times (95% CI 0.1 to 0.6; p value 0.002) less likely to die when compared to babies who needed these interventions. The babies who needed delivery room care is 8.2 times more likely to die when compared to those who did not require these interventions.

APGAR at 1 minute is significantly lower in expired group (score 3.5) compared to survived group (score 6). APGAR at 5 minute is also significantly lower in expired group (score 6.5) compared to survived group (score 7). APGAR at 10 minute is also significantly lower in expired group (score 8) compared to survived group (score9).

The SpO2 at 1 minute, 5 minutes and 10 minutes showed a significant difference between the survived and expired groups. The median SpO2 1 minute in survived group is 74% (95%CI 72% to 75%) where as in expired group is 65% (95% CI 60.4% to 67.8%). The median SpO2 at 5 minutes in survived and expired groups is 85% (95% CI 85% to 85.1%) and 77% (95% CI 72.7% to 80.0%) respectively. The median SpO2 at 10 minutes in survived group is 93% (95% CI 92% to 94%) and expired group is 88% (95%CI 82% to 90.4%).

The overall case fatality rate (Nonspecific /crude CFR) in the babies receiving oxygen therapy in our study is 14.15%. In swarnakar et al,[8] study in neonates with respiratory distress the case fatality rate is 22.86%.

On multivariate logistic regression analysis the risk factors of death in these babies are Birth interventions (oxygen, AMBU, endotracheal tube intubation, chest compression, epinephrine, intravenous fluids) with odds ratio 8.24 (95%CI 1.77 to 38.36), shock with Odds ratio 9.75 (95% CI 0.79 to 119.38), prothrombin time prolongation with Odds ratio 17.24 (95% CI 2.38 to 124.83), antenatal steroids 2nd dose to mothers odds ratio 8.42 (95% CI 1.67 to 42.44), Breast feed not initiated had odds ratio130.06(95%CI20.01to845.28)and requiring mechanical ventilator support with odds ratio 37.33 (95% CI 2.25 to 617.77).

Our observations suggest there are other factors apart from requiring oxygen, influencing the mortality which if were anticipated or identified, they can be helpful in giving better outcomes.

CONCLUSION

In this prospective cohort study of neonates admitted in NICU of rural teaching hospital requiring oxygen supplementation the following are the important observations: The risk factors for mortality among babies receiving oxygen therapy are: Babies needing delivery room interventions (oxygen, bag and mask, endotracheal tube intubation, chest compressions, epinephrine and intravenous fluids) are having higher risk of death (OR8.24) Neonates with shock have higher risk of death (OR9.75) Prolonged prothrombin time is associated with higher risk of death (OR17.24) Mothers requiring antenatal steroids is associated with higher risk of death of neonates (OR8.42) Breast feeding when could not be started due to the clinical condition is associated with higher risk of mortality (OR130.1) Needing mechanical ventilation support is associated with higher risk of death (OR37.3) Common maternal problems during pregnancy are preeclampsia (13%), gestational hypertension (13%). The proportion of mothers received antenatal steroids is36.6%. The prevalence of prematurity among these admitted babies is35%. The proportion of severely depressed babies who needed endotracheal tube intubation in delivery room is 13.3% and 6% of delivered babies needed chest compression in delivery room. About 30% of babies needed oxygen therapy and bag and mask ventilation in delivery room. The common clinical problems encountered are jaundice (a marker of sepsis) in 42.7%, pneumonia in 41.3%, perinatal asphyxia in 27.1%, sepsis in 20.4%, prolonged APTT in 17.3% and prolonged PT in 9.1% and bleeding diathesis in 16%. The properties of

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seriously ill to very seriously ill neonates during their stay in NICU is 7 to 27% who needed CPAP and or ventilator support. The identification of the risk factors associated with mortality in this population of babies will help in future reduction of mortality by focused and closely monitored care to such group of babies.

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