

What is the main cause of neonatal death in intensive care units? A Review

Fraidon Frahmand¹, Cui Huixia², Zaker Hussain pour³

Jinzhou medical university

Abstract: The person who open the eyes to the world until 28 days after the birth is called a newborn. Newborn children in need of critical medical care are normally disclosed to the neonatal intensive care unit (NICU). The arrangement of progressive technology and an expert medical team in the NICU well provides specialized carefulness for patients. Neonatal survival differs with the quality of medical care. The death cause of neonates can be different because of diagnostic, caring and treatment. Also, scientific capacities, skill, quality diagnostic devices will have important roll to the cause, increase or decrease rate death of neonates. The death causes of neonates are in the different countries and neonatal intensive care can be different, but the results show that some of the death causes of newborns in many countries are similar. These similarities or differences can also be caused by the status of mothers during pregnancy, nutrition status, environment, and gestational age and hereditary. So the result of study shown, that all common death causes of neonates in the ICU included respectively; asphyxia (8 times), Jaundice, sepsis(5 times), congenital abnormalities (Ventricular septal defect, coarctation of aorta, transposition of great arteries, hypo plastic left ventricle, patent ductus arteriosus, pulmonary atresia),hemorrhage disease(4 times), Prematurity(3 times), low birth weight, Birth trauma, tetanus, diarrhea, respiratory distress syndrome, meconium aspiration syndrome(2 times) and hospital infection acquired, improper motherly healthiness, inappropriate social situations, insufficient care throughout gestation and delivery, hypertensive disorders, perinatal difficulties, respiratory distress Syndrome, hypoglycemia, hypoglycemia , Cytomegalovirus, herpes simplex virus, enter virus, meningitis, pneumonia, syphilis, intracranial hemorrhagic, bilirubin encephalopathy, persistent pulmonary hypertension of newborn, necrotizing enter colitis, amino acid disorders, urea cycle disorders, organic acidemias, fatty acid oxidation, chromosomal diseases, IVH, acute respiratory illnesses, hyaline membrane disease and Unknown (1 times).

Keyword: cause death, neonate and ICU.

Introduction

A live birth is definite as the complete dismissal from the mom of a produce of human conception, regardless of the period of gestation, which, after such dismissal, respire or displays any extra indication of life, such as heartbeat, pulse of the umbilical cord, or certain movement of controlled muscles, irrespective of whether the umbilical cord has been cut. Or an animate birth that outcomes in death within the 1-28 days is definite as a neonatal death (D, 2016, pp. 1-4) ^[1].

Newborn children in need of critical medical care are normally disclosed to the neonatal intensive care unit (NICU). The arrangement of progressive technology and an expert medical team (including neonatologists, nurses, respiratory therapists, work-related therapists, dieticians, and lactation advisors) in the NICU well provides specialized carefulness for patients. Neonatal survival differs with the quality of medical care. Prematurity, congenital abnormalities, and perinatal asphyxia are the main causes of death in children (Chow, 2015) ^[2] Also the hospital infections acquired thru cure of neonates in NICU are common happen in patients of all ages and are likely to result in 90 000 deaths ((Richard A. Polin, 2012, p. 1) ^[3].

Above nine million kids in the world die each year throughout the neonatal periods and perinatal and almost all (98%) of these deaths happen in evolving republics. Nearly 50% of these death are associated to severe infection, tetanus and diarrhea in republics with greater newborn mortality rates and on the other side, these reasons are less common in countries with low newborn death rates. Newborn deaths in evolving countries are recognized to happen primarily because of improper motherly healthiness, inappropriate social situations, and insufficient care throughout gestation, delivery, and the speedy post-delivery period. The most public causes of deaths were neonatal asphyxia 32.9%, prematurity 43% and neonatal infection 9.8 % (Neonatal infection is an important cause of hospitalization, the recognized predisposing factors for neonatal infections are deprived obstetric care and un-sterile delivery performs in source poor settings where maximum of deliveries are conducted at family and outdoor health services), Congenital abnormality 9.2 Birth trauma 0 %, Jaundice 0.9 Unknown 1.9%, Other conditions has role to increase the death of neonates in ICU including: tetanus and diarrhea, improper motherly healthiness, inappropriate social situations, insufficient care throughout gestation and delivery, hypertensive disorders and antipartum hemorrhage. The main causes for referrals from other health centers were pre-maturity, infections, and birth asphyxia (M Hoque, 2011) ^[4].

Outside of 3093 neonates accepted 412 died. In other words, there were 30 deaths per 1,000 live childbirths at the JUMC for the period in the study nearly 1, 488 (48.1%) of admittances were due to birth asphyxia & additional perinatal difficulties. Of these 138 dead, for 4.5% of over-all neonatal death. Against low birth weight newborns, it has been counted for 1108 (35.8%) of acceptance and participated to 249(8.1%) of neonatal deaths. Also, neonatal sepsis and infections were the third reasons of a revision to the NICU, accounting for 919(29.7%) and 129(4.2%) neonatal admissions and deaths. Neonates in general with sepsis 884 and 129 (31.3%) Died. 169 (41%) Of 809 (28.6%) newborns admitted with hyperthermia have died. Furthermore, Respiratory Distress Syndrome, 169(41.0%) was the fourth graded cause dead neonates; while hypoglycemia, 49 (11.9%), congenital defects 33(8%), and pathologic jaundice, 31(7.5%) were the least graded three status one-to-one. In the Ethiopian at 2016, the common cause of neonates dead in the NICU including Low birth weight 249(60.4%), Prematurity 230(55.8%), RDS 169(41.0%), Neonatal sepsis 129(31.3%), Hypothermia 120(29.1%), PNA and birth trauma 108(26.2%), MAS 53(12.9%), Hypoglycemia 49(11.9%), Congenital malformation 33(8.0%) and Pathologic Jaundice 31 (7.5%) (Seid, 2019, pp. 4-6) ^[5].

Also a study shown the Cause of neonatal death at the eight categories. The base of these classifications is according to record, clinical symptoms and sign, laboratory findings, Apgar score and convulsions, cranial ultrasound, chest radiograph founded.

- ✓ First, Infection: virus infection (cytomegalovirus, herpes simplex virus, enter virus, Sepsis, meningitis, diarrhea, pneumonia, tetanus, syphilis.
- ✓ Second Neurologic diseases: Birth asphyxia, ICH (Intracranial hemorrhage), bilirubin encephalopathy.
- ✓ Third, pulmonary disease (noninfection): NRDS (Neonatal respiratory distress syndrome), MAS (Meconium aspiration syndrome), PPHN (Persistent pulmonary hypertension of newborn), pulmonary hemorrhage.
- ✓ Fourth CHD (Congenital heart disease): Ventricular septal defect, coarctation of aorta, transposition of great arteries, hypo plastic left ventricle, patent ductus arteriosus, pulmonary atresia.
- ✓ Fifth GI diseases: GI (Gastrointestinal) abnormalities, necrotizing enter-colitis.
- ✓ Sixth IEM (Inborn errors of metabolism): Amino acid disorders, urea cycle disorders, organic acidemias, fatty acid oxidation, etc.
- ✓ Seventh other congenital abnormalities: Chromosomal diseases.
- ✓ Eighth Other Specific cause of neonatal death not included in the above causes, including neonatal jaundice, hemolytic disease, hemorrhagic disease, term baby dying due to in utero growth restriction (Wang1, 2016) ^[6].

From 261 neonates admitted during the period review. The communal causes were perinatal asphyxia, low birth weight, neonatal sepsis, and neonatal jaundice. Therefore from 37 (14.2%) deaths were noted during the study. The main causes of deaths were severe form of very low birth weight (two, 0.06%), neonatal sepsis (10, 29.4%), and perinatal asphyxia (18, 52.9%). 55 percent of all the deaths occurred in 24 hour of acceptiosns (U Ekwochi, 2014)^[7].

The common cause of death were major HIV 22 per 1000 neonates, acute respiratory illnesses 21 per 1000 neonates, sepsis 12 per 1000 neonates and perinatal asphyxia, that all includes 345(7,7%) death from 4454 neonates (Schindler, 2017)^[8]. A study by Ayenew Engida Yismaw conducted that identified the cause of neonatal die included PNA(perinatal asphyxia) 13% , HMD (hyaline membrane disease) 26%, jaundice 7%,clinical sepsis 9%,cardiorespiratory arrest due to apnea 17%, other 10% (Yismaw, 2019)^[9].

The aim of this study was to determine the most common cause of death of newborns in the neonatal intensive care unit. Because the diagnostic, caring, treatments facilities, human resources and capacity are different from a hospital to another hospital and from a country than other countries. This information could assistance to reduce or increase knowledge about cause of neonate death in ICU.

Methods and materials

PubMed was used as the main search machine for our literature review to identify relevant studies for full-text selection on the neonate cause death in the neonatal intensive care unit. Search terms included cause of death of neonate, neonatal mortality and neonatal intensive care unit.

All creative investigation articles published in English, between January 2015 and January 2020 with their main objective to study the neonate cause death in the neonatal intensive care unit were selected. An overall of 216 studies were recognized, of which 10 studies encountered the inclusion criteria and were used in this review. Studies were included cause death of neonate and neonatal death in NICU. Articles that did not have cause deaths about neonate in NICU statistics were excluded.

Conclusion

Table Summary Results Review study

Author(year)	Cause	Design	Place of study
Selina chow (2015)2	Prematurity, congenital abnormalities and perinatal asphyxia.	literature review	Ovid Medline, Old Medline, Embaseclassic, Embase
Richard A (2012)3	hospital infection acquired	Report	American Academy
MHoque (2015)4	neonatal asphyxia, prematurity, neonatal infection, Congenital abnormality , Birth trauma , Jaundice , Unknown, Other conditions has role including: tetanus and diarrhea, improper motherly healthiness, inappropriate social situations, insufficient care throughout gestation and delivery, hypertensive disorders and antipartum hemorrhage.	Retrospective descriptive study	South Africa
Sheka Shemsi Seid (2018)5	Perinatal asphyxia,perinatal difficulties, ,respiratory distress Syndrome, hypoglycemia, congenital defects, PNA , birth trauma , MAS, low birth weight, Prematurity ,RDS ,sepsis , hypoglycemia ,congenital malformation , Pathologic Jaundice.	cross-sectional study	Jimma Medical Center.
Wang CH (2016)6	Cytomegalovirus, herpes simplex virus, enter virus, Sepsis, meningitis, diarrhea, pneumonia, tetanus, syphilis, birth asphyxia, ICH, bilirubin encephalopathy, pulmonary disease NRDS, MAS, PPHN, pulmonary hemorrhage, Ventricular septal defect, coarctation of aorta, transposition of great arteries, hypo plastic left ventricle, patent ductus arteriosus, pulmonary atresia, abnormalities, necrotizing enterocolitis, amino acid disorders, urea cycle disorders, organic acidemias, fatty acid oxidation, chromosomal diseases, jaundice, hemolytic disease, hemorrhagic disease.	A collaborative study gruop	China
U Ekwochi (2014)7	Perinatal asphyxia, low birth weight, neonatal sepsis and jaundice.	Comparative and descriptive longitudinal study	sick and SCBU of the ESUTH
Tim Schindler (2017)8	IVH, acute respiratory illnesses, sepsis, perinatal asphyxia.	Retrospective analysis	New South Wales
Ayenew EngidaYismw (2019)9	PNA, HMD, jaundice, clinical sepsis, apnea.	retrospective follow-up study	University of Gondar

Four publications (2, 5, 4) shown the similar result of death cause of neonate's in the ICU, that is Prematurity. The studies (2, 4, 5, 6) identified the congenital abnormality is a death cause of neonates in the ICU. Also perinatal asphyxia came as a result in the studies (2, 5, 9, 8, 7), but in one study (4) neonatal asphyxia is death cause of neonate. Neonatal infection (is an important cause of hospitalization, the recognized predisposing factors for neonatal infections are deprived obstetric care and un-sterile delivery performs in source poor settings where maximum of deliveries are conducted at family and outdoor health services), was the death cause of neonate in the studies (4, 10). Birth trauma found to the two studies as a death cause of neonate (4, 5) and jaundice is also same cause in the five studies (4, 5, 6, 7, 9).

Tetanus as a result in the two studies 4, 6, and diarrhea is also at two studies (4, 6) diarrhea. Improper motherly healthiness, inappropriate social situations, insufficient care throughout gestation and delivery, hypertensive disorders and antipartum hemorrhage are only in one study as a result (4). The studies (5, 6) identified the Respiratory distress Syndrome, pneumonia, pulmonary disease, pulmonary hemorrhage as an outcome of death cause for neonates but acute respiratory illnesses is included in the study (8).

The Sepsis lead to death of neonate is very common (5, 6, 7, 8, 9), also the apnea and HMD is result of the (9) study.

Low birth Wight came as result in two studies (5, 7). HIV determined only in one study (8). The study (6) shown the death cause of neonates conatin; ICH(Intracranial hemorrhage), bilirubin encephalopathy, MAS(Meconium aspiration syndrome), PPHN(Persistent pulmonary hypertension of newborn), Ventricular septal defect, coarctation of aorta, transposition of great arteries, hypo plastic left ventricle, patent ductus arteriosus, pulmonary atresia, abnormalities, necrotizing enterocolitis, amino acid disorders, urea cycle disorders, organic acidemias, fatty acid oxidation, chromosomal diseases, hemolytic disease, hemorrhagic disease. Hospital infection acquired is only in the study (3).

The most public causes of neonatal death are labor asphyxia, prematurity, neonate infection, congenital anomaly, but the high quantity of neonate deaths due to prematurity in the M Hoque, study perhaps draws attention to the extraordinary effort load in neonatal unit which, beside with fewer educated nursing staff, refutes chances for the best likely care required for these premature babes. Caesarean type of delivery is for the advantage of mothers (maternal condition) or fetal conditions and was related with a lower death. Congenital anomalies were the cause of higher rate in neonate death. Birth asphyxia, neonatal infections and Prematurity were the main causes of neonatal deaths ^[4].

The major causes of neonatal death were RDS, congenital malformations, birth asphyxia, low birth weight and respiratory distress syndrome were known as prophets of neonatal death. These specified that greatest of the neonatal deaths are due to preventable causes of dead that could be addressed by expecting risky pregnancies and the providing of good and on time involvements. Also the outcome specified that neonatal death was also associated to the length of clinic stay, gestational age and labor weights of the newborn ^[5] and similar result included about prematurity in the four studies ^[5, 2, 4, 10]. So the general cause of neonatal death determined such as Cytomegalovirus, herpes simplex virus, enter virus, Sepsis, meningitis, diarrhea, tetanus, syphilis, birth asphyxia, ICH, bilirubin encephalopathy, NRDS, MAS, PPHN, Ventricular septal defect, coarctation of aorta, transposition of great arteries, hypo plastic left ventricle, patent ductus arteriosus, pulmonary atresia, abnormalities, necrotizing enterocolitis, amino acid disorders, urea cycle disorders, organic acidemias, fatty acid oxidation, chromosomal diseases, jaundice, hemolytic disease, hemorrhagic disease ^[6]

The prematurity complications, pulmonary diseases, severe infection, and neurologic diseases also remain the most frequent causes of neonatal death. Pulmonary diseases, severe infection, and neurologic diseases were the left main causes, which were different to some previous studies. Birth asphyxia was the most frequent cause. The relatively lower proportion of birth asphyxia in all causes may be due to the progress of neonatal resuscitation training and improved perinatal care all over the country. Preterm birth complications and congenital disorders are the leading causes of neonatal death. Congenital disorders including CHD, GI abnormalities, IEM, and other

congenital abnormalities are other important reasons of all the neonate deaths. Congenital disorder is becoming an increasing burden on the health-care resources in the developing countries. The cause-of-death distribution varied with several factors, including the age of death, GA, regions, and hospitals. In early neonate period, pulmonary diseases occupied the largest proportion of preterm deaths while infection and neurologic diseases were the two main causes of term deaths. In late neonate period, infection was the leading cause of both preterm and term neonate death ^[6].

The four important causes involved; perinatal asphyxia, neonatal sepsis, neonatal jaundice and low birth weight were reliable by the primary causes of neonate's death. Severe formula of perinatal asphyxia accounts for totally the deaths from perinatal asphyxia understood in this study. This is cooperated by related findings in AKTH where greatest of the deaths from perinatal asphyxia were due to severe form. The asphyxiated inborn neonates had a greater odd of living compared to out born newborn. In future, they suggestion tiny or no practice of fast resuscitation to the asphyxiated newborns. In extra cases recognition of the hazard marks of asphyxiation comes hour later delivery. For persons who diagnose these sign and choose to refer, the main means of transport particularly for those coming from far-off regions are bikes and the tricycles which not one delays production to the hospital, but too depiction these sick babies to even extra opposing situation that could outcome in hypothermia. Additional so the delivery of inborn by danger of asphyxiation is managed by doctors and nurses who are expert in newborn resuscitation. Also study showed a greater probability of death for inborn newborn admitted for neonate sepsis compared to the out born newborn. This might be due to variance in bacterial bases in both neonatal classes. Whereas the inborn are at greater hazard of hospital acquired stresses of poisoning organism which are ordinarily further hard to treat due to medicine resistance, the communal acquired infections in out born newborn are ordinarily fewer resistant, and replies well to antibiotics ^[7].

The major population created study telling CMR for an excessive to actual preterm population. Death due to acute respiratory infection was expectedly the important cause of death in the great preterm population but newborn in elder gestational age clusters were extra likely to die from other causes such as asphyxia and IVH. It is not amazing that perinatal asphyxia converts the greatest public cause of death with growing gestation as the newborns in these collections are fewer probable to die from difficulties that are extra predominant in the great preterm population such as respiratory problems. Further perinatal factors that were related with a greater death were male sexual category, low Apgar score at five minutes and low birth weight, minor for gestational age. Hypertensive disease throughout gestation was linked with a reduced amount of deaths due to main IVH. Chorioamnionitis was found additional generally in newborn who died of sepsis, which was too reliable with further studies that show a relationship between neonatal sepsis and maternal chorioamnionitis. It was not astonishing to find that newborns who die due to respiratory complications, asphyxia and IVH are fewer likely to have received steroids antenatally. Additional predictable findings involved relations among being out born and death due to IVH and having no antenatal care and dead due to perinatal asphyxia. Moms of newborns who died due to necrotizing enter colitis had a minor average age. Newborns who die from IVH and ARI generally die in the first 2 to 3 weeks of lifetime, which is a predictable outcome. The common of deaths linking to sepsis died primary reflecting early beginning sepsis. Actual premature newborns continue to be vulnerable to necrotizing enter colitis and thus deaths due to necrotizing enter colitis acted very differently to the additional communal causes of death. There are very insufficient early deaths attributable to necrotizing enter colitis followed thru a stable reduction in the existence curve due to the start of necrotizing enter colitis later 2 to 3 weeks of age.. It is clear that newborns who die of IVH and ARI spent the smallest resources throughout their hospital stay. Newborns who died from sepsis spent extra resources than newborns who died in the speedy postnatal period however fewer than those who died from necrotizing enter colitis ^[8].

The causes of dead weren't one problem fairly mixture of difficulties lead to dead and the main once were jaundice, PNA, clinical sepsis, HMD and cardiorespiratory arrest due to apnea. Room of delivery, kind of pregnancy, gestational age at birth, maternal illness/diseases, neonate cry immediately at birth, weight for gestational age at birth, PNA, HMD, Jaundice, kangaroo mother, hypoglycemia care were found to be forecasters of death. 11.4% of newborn deaths were in the first 24 h and 85.23% were within the first seven days identified

as primary newborn death. The clinical sign that as gestational age rises fetal maturity will be increased and risk of evolving dissimilar life-threatening problems related with prematurity could reduction and risk of dead will be reduced. This result presented that a newborn who was minor for gestational age at birth was 1.7 times at greater risk of dead compared to those who were suitable for gestational age. The possible causes might be due to that if minor for gestational age the event of life-threatening problems similar hypothermia and hypoglycemia which lead to dead is great compared to suitable for gestational age newborns. The HMD is illness of prematurity moving breathing task which is vital for existence and prime reason of death in preterm newborn.

PNA rises the risk of dead by 52%. The probable causes might be that PNA is one of the important causes of neonate death wherever the value and admission of emergency obstetric neonatal and complete emergency obstetric facilities are insufficient in each clinical set of the republic. Preterm newborn identified with jaundice had 1.65 times greater risk of dead than their counter parts. This might be due to that preterm newborn are at risk of evolving jaundice due to digestive immaturity, liver enzyme deficit leading to extra manufacture of bilirubin to outcome in brain poisonousness and death. Hypoglycemia was meaningfully linked with the risk of dead for preterm newborns. And likewise decrease the risk of hypoglycemia by simply retrieving breastfeed as request night and day. Totally accountable bodies should effort on excellence maintenance at ANC to maximize maternal health situations, admission neonatal intensive care unit with substructures and skilled manpower at health institutes and give unusual carefulness for preterm to evade difficulties due to preterm ^[9].

Final the all death cause of neonates in the intensive care units are included; respectively; asphyxia, Jaundice, sepsis, congenital abnormalities (Ventricular septal defect, coarctation of aorta, transposition of great arteries, hypo plastic left ventricle, patent ductus arteriosus, pulmonary atresia), hemorrhage disease, Prematurity, low birth weight, Birth trauma, tetanus, diarrhea, respiratory distress syndrome, meconium aspiration syndrome and hospital infection acquired, improper motherly healthiness, inappropriate social situations, insufficient care throughout gestation and delivery, hypertensive disorders, perinatal difficulties, respiratory distress Syndrome, hypoglycemia, hypoglycemia, Cytomegalovirus, herpes simplex virus, enter virus, meningitis, pneumonia, syphilis, intracranial hemorrhagic, bilirubin encephalopathy, persistent pulmonary hypertension of newborn, necrotizing enter colitis, amino acid disorders, urea cycle disorders, organic acidemias, fatty acid oxidation, chromosomal diseases, IVH, acute respiratory illnesses, hyaline membrane disease and Unknown.

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