Original Article

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Assessment of neonatal mortality major factors

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ABSTRACT

Background: Neonatal mortality accounts for nearly half of the deaths of children under the age of five, the main leading causes for which are respiratory distress, infection, and congenital anomalies. Action plans, which call for the elimination of preventable deaths of newborn babies, set specific targets to reduce neonatal mortality. This retrospective descriptive study was conducted in the Basra Teaching Hospital for maternity and childhood from January 2019 to February 2020, including all the neonates who were admitted in the first and second neonatal care units of the hospital.

Aim: This study aims to study the main causes of neonatal deaths in newborn babies in the neonatal care units at the main maternity and pediatric hospital of the Basra government.

Patients and methods: A total of 716 neonatal deaths were registered along with days of life before death and the cause of death; the cases were classified as early (1–6) days death and late (7–28) days death.

Results: In this study, we found that the main causes of early neonatal death were respiratory distress syndrome (68.4%), congenital anomalies (11.4%), infection (10.9%), birth asphyxia (7.2%), and other neonatal conditions (inborn error of metabolism, hemorrhagic disease of newborn, severe anemia, and unspecified causes) (2.1%), while for late neonatal death, respiratory distress (27.2%), congenital problems (17.7%), infection (45.6%), birth asphyxia (6.1%), and other conditions (3.4%) were cited.

Conclusions: It is important to direct the health resources towards preventable causes of neonatal deaths both before, during and after the delivery of a baby when the higher risk factors are preventable (prematurity, birth problems, and sepsis). Using all available resources to decrease preterm labors and mother education toward pregnancy and to improve the facilities and quality of neonatal care at the delivery room and neonatal care units.

Keywords: neonate, prematurity, congenital problems, birth asphyxia

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INTRODUCTION

The neonatal period (i.e., the first 28 days of life) represents the most delicate time for a child's survival. Roughly 46% of all deaths in children under the age of five occur during this period. This translates to 7000 newborn deaths every day. The majority of neonatal mortality is concentrated in the first day and week, with about 1 million dying on the first day and close to one million dying within the next six days.[1,2] Globally, the main causes of neonatal mortality are complications of preterm birth, intrapartum-related conditions, and infections.[3] The highest neonatal death rates are seen in sub-Saharan Africa. The neonatal deaths in Asia account for over 60% of the estimated global total of neonatal deaths; however, the average rates are lower, mainly because of the high fertility rate and large population.[4]

Respiratory distress syndrome (RDS), also known as hyaline membrane disease, is one of the most common respiratory disorders in preterm babies. The clinical diagnosis is made in preterm infants with respiratory difficulties such as tachypnea, retractions, grunting, nasal flaring, and need for oxygen. Signs of RDS appear immediately after birth or within four hours of birth. It is commonly characterized by tachypnea (>60 breaths/min), intercostal and subcostal retractions, nasal flaring, grunting, and cyanosis in room air.[5]

Neonatal infection is a clinical syndrome found in infants who are 28 days or younger and manifested by systemic signs of infection and isolation of a bacterial pathogen from the bloodstream.[6] It is somewhat difficult to clinically diagnose this condition due to nonspecific signs and symptoms, and laboratory diagnosis is time-consuming. That is why it is important to start prophylactic antibiotic therapy until any suspected sepsis is ruled out.[7]

Congenital anomalies, or birth defects, are structural, behavioral, metabolic, and functional disorders that occur during intrauterine life and can be identified prenatally, after birth or during infancy.[8,9] Worldwide, nearly 303,000 newborns die within the first four weeks of birth every year due to congenital problems. Heart defects are the most common severe congenital anomalies, followed by neural tube defects and Down syndrome. It is often difficult to identify the exact causes, although congenital defects may be the result of one or more genetic, infectious, nutritional, or environmental factors. [10]

It is important to initiate an action plan with specific targets to reduce neonatal and under-five mortality. These targets were reflected in the Sustainable Development Goals, which call for ending preventable deaths in newborn babies and children younger than 5 years by 2030. The goals show that all countries should aim to reduce their respective neonatal mortality rate to 12 deaths per 1000 live births or fewer and their respective under-five mortality rates to 25 deaths per 1000 live births or fewer by 2030. [11]

A recent assessment suggests that rapid policy change was driven by the recognition that an increasing proportion of deaths in children under the age of five were neonatal,

coupled with evidence that effective action was possible even in low resource settings.[12] Our study aims to categorize the main causes of neonatal mortality among newborn babies less than 28 days old who were admitted to the main neonatal care units of the Basra hospital.

PATIENTS AND METHODS

This is a retrospective descriptive study to calculate the percentage of each risk factor for neonatal death in all the neonates that were taken care of in the neonatal main care units at the main pediatric hospital in Basra in the period between January 2019 and February 2020.

The study includes patient information collected from the statistical department in the hospital and a review of the neonatal information registry when needed to collect the right information. All the information has been kept confidential since a large portion of the information was collected from the patient sheets. A total of 716 neonatal deaths were included in the study period, of which early neonatal deaths (1–6 days) were 596 and late neonatal deaths (7–28 days) were 147. The percentage was calculated using the equation

$$\text{Percentage} = \frac{no.\ of\ cases}{sample\ size} \times 100$$

This study is accepted by the responsible authorities.

RESULTS

The main causes of early neonatal death are shown in Table 1. The study included 569 cases of early neonatal death of which RDS was the leading cause of death with 68.4%, followed by congenital anomalies in 11.4%, infection found in 10.9%, complications of intrapartum (birth asphyxia) in 7.2%, and other neonatal conditions in 2.2%; some cases of death was within a short time after delivery where the specific cause was not specified.

Table 2 shows the main causes of death in the late neonatal period. A total of 147 cases were included. Infection contributed to 45.6% of deaths; this was the main cause of death in the late neonatal period. RDS in 27.2%, congenital anomalies in 17.7%, asphyxia in 6.1%, and other neonatal conditions in 3.4% of the cases were the other noted causes. Since in this part, life was longer, the cause of death was known and specified.

Table 3 shows the total distribution of causes of death in neonates (early and late) related to the 716 cases included. RDS in 60% and infection in 18% were the major causes of neonatal death, both of which can be lowered by improving pre, intra- and post-natal care. Congenital anomalies accounted for 12.7% of the deaths, birth asphyxia for 7%, and other conditions were at 2.3%.

Tables 4 and 5 show the distribution of causes within the main neonatal units in the hospital. The first unit receives newborn babies directly after birth from the same hospital, that is, from day one of life. Whereas, the second unit receives neonates from all the governorate of all ages less than 28 days.

Table 1: Causes of death in the early neonatal period

Cause of death	No. of cases	Percentage
RDS	389	68.4
Sepsis	62	10.9
Congenital Anomalies	65	11.4
Birth asphyxia	41	7.2
Other neonatal conditions	12	2.1
Total	**569**	**100**

Table 2: Causes of death in the late neonatal period

Cause of death	No. of cases	Percentage
RDS	40	27.2
Sepsis	67	45.6
Congenital anomalies	26	17.7
Birth asphyxia	9	6.1
Other neonatal conditions	5	3.4
Total	**147**	**100**

Table 3: Overall causes of death during the neonatal period

Cause of death	No. of cases	Percentage
RDS	429	60
Sepsis	129	18
Congenital anomalies	91	12.7
Birth asphyxia	50	7
Other neonatal conditions	17	2.3
Total	**716**	**100**

Table 4: Causes of death in first neonatal unit

Cause of death	No. of cases	Percentage
RDS	257	78.1
Sepsis	8	2.4
Congenital anomalies	41	12.5
Birth asphyxia	22	6.7
Other neonatal conditions	1	0.3
Total	**329**	**100**

Table 5: Causes of death in second neonatal unit

Cause of death	No. of cases	percentage
RDS	172	44.4
Sepsis	121	31.3
Congenital anomalies	50	13
Birth asphyxia	28	7.2
Other neonatal conditions	16	4.1
Total	**387**	**100**

DISCUSSION

In this study, it was shown that RDS was the main cause of death in 60% of cases, which is very high compared to the rates in other countries (18.5% in France, 4.24% in Pakistan, 20.5% in China,[13] and 20% in the USA)[5], but it was near to what was reported in a study in Saudi Arabia 54.7%.[14] It is clear that these results were high for both (68.4% in early neonatal and 27.2% in late neonatal). Studies show that countries with low resources reported high rates of neonatal deaths from RDS even in bigger, less-premature infants.[15] The more widespread usage of the basic interventions of oxygen, Continuous Positive Airway Pressure (CPAP), and surfactant would have better results in the reduction of neonatal deaths without overall improvements in general neonatal care.[16]

Infections were found to be a cause of death in 18% of the neonates (10.9% in early neonatal and 45.6% in late neonatal infants). It was reported in 26% of the neonatal deaths in sub-Saharan Africa.[17] In a global study, it was reported to range between 11% to 19%;[18] other studies conducted in Africa reported that it ranges from 37% in sub-Saharan Africa to 69% in North Africa, in Asia from 29% in South Asia to 66% in East Asia and the Pacific region. In South America and the Caribbean, it is about

83%.[19] In a similar study conducted in this hospital over 6 months (from November 2004 to the end of April 2005), it was reported that early-onset sepsis was detected in 62.9% of neonates, while late-onset sepsis was detected in 36.5% of neonates.[20] Nearly similar results were found for late neonatal sepsis; in that study, the wide range of differences in early neonatal sepsis was collected from only those patients who had a diagnosed infection and were not influenced by other risk factors, such as RDS and congenital problems, which would affect the outcome in this study (i.e., death takes place before diagnoses of sepsis are made).

Congenital anomalies were found in 12.7% (11.4% early neonatal, 17.7% late neonatal periods) of deaths. It was reported in 19.3% of deaths in a study in Colombia,[21] 10.4% in Nigeria,[22] 36.7% in Malta,[23] and 28.2% in Mexico.[24] Studies has shown that the varying pattern and prevalence of congenital problems over time or geographical location were because of the different methods of detection and recording or due to true differences in frequency; this reflects the complex interaction of known and unknown genetic and environmental factors, including socio-cultural, racial, and ethnic differences.[25]

Birth asphyxia was the cause of death in 7% (7.2% early neonatal, 6.1% late neonatal death) of deaths in this study, while it was reported to be the cause of death in 10–15% of neonates in developing countries.[26] Birth asphyxia was reported in Misurata, Libya (4% in early and 12% in late neonatal).[26] The results we found were within the global range or slightly lower, as other risk factors such as sepsis and congenital abnormalities caused a higher mortality.

Other neonatal conditions reported as a cause of death included hematological disorders, endocrine and metabolic disorders, digestive disorders, and unspecified causes. Their incidence levels were low in our study considering the duration of the study and sample size. The overall percentage was 2.3%, which was low in comparison to the major causes of neonatal mortality, thus further studies to specify the incidence of each can be studied in the future since their amelioration, if possible, will have an effect on the overall neonatal mortality, however low that may be.

CONCLUSIONS

It is important to have a basic line of the main causes of neonatal death in the community since many are preventable or can be managed to reduce the overall deaths in children under 5 years.

Since major risk factors of neonatal death are preventable before, during, and after delivery of the newborn, it is wise to direct the resources toward these factors.

Future studies on modifying major factors in comparison with such a study can influence the overall neonatal mortality.

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