Evaluating the Outcomes of Neonatal deaths in Iraq and Identifying the Leading Causes in Pediatric Hospitals

Dr. Hasan Hadi Hasan Al-Musawi[1], Dr. Mohammed Ridha Hussein[2], and Dr. Suadad Mustafa Abdulameer[3]

[1]M.B.Ch.B., D.C.H. \ (Paediatrics), Iraqi Ministry of Health, Babylon Health Directorate, Al-Imam Al-Sadiq Teaching Hospital in Hilla, Babylon, Iraq

[2]M.B.Ch.B., F.I.B.M.S. \ (Paediatrics), Iraqi Ministry of Health, Al-Najaf Health Directorate, Al-Zahraa Teaching Hospital for Maternity and Children, Al-Najaf, Iraq

[3]M.B.Ch.B., M.P. \ (Paediatrics), Iraqi Ministry of Health, Diyala Health Directorate, Al-Khalis General Hospital, Diyala, Iraq

Abstract: Background: The World Health Organization (WHO) defined neonatal mortality as death between birth and 28 days of life. In the United States, newborn mortality corresponds to 47% of the total deaths of children under five years of age. **Aim:** This study analyzed and assessed clinical outcomes related to neonatal deaths in pediatric Iraqi hospitals. **Patients and methods:** We conducted a survey of newborn patients for a period from March 6, 2022, to October 27, 2023, in different hospitals in Iraq. 108 newborns who had died were recruited, with ages ranging from (< 48 to > 96). We evaluated all negative patient outcomes, determined mortality rates, and assessed the newborns' quality of life in the long term after birth. **Results:** Males had highest rate with 76 cases than females were 32 cases, as well as gestational age of neonatal include < 36 weeks had 62 cases, neonatal with ages (36 – 40) weeks was 28 cases, neonatal with > 40 weeks were 18 cases, mode of delivery which include vaginal delivery was 78 cases and Cesarean section was 30 cases, APGAR 1st minute of < 6 include 45 while >6 include 63, mortality rate of neonates was 30.56%, Our findings were shown adverse outcomes which determine common causes of neonates which are shortness of breath included 8, sepsis included 7 cases, and perinatal asphyxia included 11 cases, and mortality rate of neonates was 30.56%. **Conclusion:** The current study indicated that the high rate of complications and lack of prenatal health care cause high and dangerous complications, which results in deterioration of health quality and high neonatal death rate.

Keywords: Neonatal mortality, Neonatal intensive care unit, Pregnant women; and Survival life.

INTRODUCTION

Infant mortality is considered a faithful indicator of the social development of a nation, and its decrease constitutes one of the most important goals not only of the Ministry of Health of the Germany Nation [Cunningham, G. *et al*., 2014; Bala Ghafari, A . *et al*., 2009]. In the United States, although the trend is decreasing, the inequality between the provinces is notable in such a way that infant mortality (IM) (22.9‰ year 2007).

Among the components of infant mortality is neonatal mortality. [Chaman, R. *et al*., 2009]

Approximately 6 out of 10 deaths in children under one year old occur before 28 days of life. In our country, 60% of newborn deaths (NR) are considered preventable with measures that improve the quality of care, such as adequate control of pregnancy and childbirth and timely and efficient NR care [Chaman, R. *et al*., 2009 – Javanmardi, Z. *et al*., 2008]. Within the evaluation of the quality of care, the analysis of neonatal deaths allows for a review of the circumstances surrounding the death of that RN and the establishment of factors related to it. Some of these factors may be linked to suboptimal care processes, and their identification will allow the definition of strategies aimed at developing improvement processes. [Golestan, M. *et al*., 2008; Sareshtedari, M. *et al*., 2012; Mirzarahimi, M. *et al*., 2009; Mohamed, E. M. *et al*., 2011]

However, sometimes these records turn out to be incomplete or deficient and do not reflect the actual circumstances surrounding the adverse development [Ghaffari Saravi, V. *et al*., 2009]. Medical records are usually incomplete and particularly deficient in centers with high mortality rates, as they reflect structural management and organizational problems [Mohsen Zade, A. *et al*., 2002]. Therefore, approximating the distances between death and its analysis by searching in a directed, dynamic, and participatory way for its causes will contribute to identifying more precisely those factors that, being avoidable, allow for the planning of specific strategies that reduce neonatal mortality. [Khani, S. *et al*., 2008 – Sankaran, K. *et al*., 2002]

Currently, obstetric complications are defined as setbacks that put the life of a woman or her child at risk during pregnancy, childbirth, puerperium, or that cause serious sequelae, including death [Lee, A. C. *et al*., 2011; Madar, J. *et al*., 2021]. In Netherland, perinatal conditions, which include the period from 28 weeks of gestation (SDG) to the first day of extrauterine life (EVD), represent the

seventh cause of general mortality and the first infantile. [WHO, 2012]

The frequency of perinatal death, in which many social, economic, and educational factors intervene, is increasing because all these factors converge so that pregnant patients present to health services with pregnancy complications and are still in a state of obstetric emergency, a situation that alarms the patient and the doctor when they are not prepared to face the emergency. [WHO, 2017; Wall, S. N. *et al.*, 2009]

PATIENTS AND METHODS

We conducted a survey of newborn patients for a period from March 6, 2022, to October 27, 2023, in different hospitals in Iraq. 108 newborn children who had died were recruited, with ages ranging from < 48 to > 96. This study collected demographic and clinical data for newborns and mothers, which included age, gender, maternal age, gestational age, smoking status, education level, income, and employment of the mothers.

In addition, this study collected clinical data on the mothers of newborn patients. These data included secondary outcomes such as the type of delivery (vaginal or cesarean), the number of babies born, the number of pregnancies, the primary or multiple births, and the position of delivery. And the

mothers' medical problems, which included high blood pressure, HIV, diabetes, and others.

Furthermore, this study also recorded secondary outcomes of neonatal characteristics, which included birth weight in grams (< 2500 - > 3500), agar (1st minute), agar (5th minute), length of hospital stays, neonatal mortality rate, and neonatal care experience. Birth within criteria (poor, average, and excellent). Also, this study identified negative clinical outcomes for neonates admitted to the neonatal intensive care unit of children's hospitals.

This study determined the inclusion and exclusion criteria for newborn patients and their mothers, as the exclusion criteria included all newborn patients who suffer from serious diseases or have been exposed to congenital malformations, or mothers who are exposed to alcohol consumption, have been exposed to previous surgeries, or have chronic infectious or dangerous diseases. While the inclusion criteria specified data for newborn patients who died or were not in the hospital and were admitted to the intensive care unit, SBS, version 22.0, designed and defined clinical outcomes for neonatal patients.

RESULTS

Table 1: Clinical and demographic parameters outcomes of neonatal patients

Characteristics	Number of patients [108]	Percentage [%]
Age, hours		
< 48	65	60.19%
24 – 96	24	22.22%
> 96	19	17.59%
Sex		
Male	76	70.37%
Female	32	29.63%
Mother age, years		
25 – 30	12	11.11%
31 – 35	90	83.33%
> 35	6	5.56%
Gestational age, weeks		
< 36	62	57.41%
36 – 40	28	25.93%
> 40	18	16.67%
Smoking status		
Yes	21	19.44%
No	87	80.56%
Education status of mothers		
Primary	8	7.41%
Secondary	10	9.26%
College / University	90	83.33%

Employment status		
Employed	67	62.04%
Unemployed	41	37.96%
Income status, $		
< 800	60	55.56%
≥ 800	48	44.44%

Our study was determined demographic results of infants where patients with ages < 48 hours were most prevalence with 65 cases, followed by patients with (24 – 96) hours were 24 cases, males had highest rate with 76 cases than females were 32 cases, as well as gestational age of neonatal include < 36 weeks had 62 cases, neonatal with ages (36 – 40) weeks was 28 cases, neonatal with > 40 weeks were 18 cases

Table 2: Determining secondary outcomes of features for mothers of neonatal patients

Variables	Number of patients [108]	Percentage [%]
Mode of delivery		
Vaginal delivery	78	72.22%
Cesarean section	30	27.78%
Antenatal care of mothers during follow-up		
Yes	71	65.74%
No	37	34.26%
Types of pregnancy		
Single	77	71.3%
Multiple	31	28.7%
Parity		
Primiparous	48	44.44%
Multiparous	60	55.56%
Setting of delivery		
Hospital	76	70.37%
Health center	14	12.96%
Private health facility	10	9.26%
Homes	8	7.41%
Medical problems of mothers		
Yes	38	35.19%
No	70	64.81%
Hypertension		
Yes	4	10.53%
No	34	89.47%
HIV		
Yes	2	5.26%
No	36	94.74%
Diabetes mellitus		
Yes	5	13.16%
No	33	86.84%
Others		
Yes	4	10.53%
No	34	89.47%

Secondary findings were determined mode of delivery which include vaginal delivery was 78 cases and Cesarean section was 30 cases, antenatal care of mothers during follow-up was 71, single pregnancy was 77 cases and multiple pregnancy 31 cases, rate of mother had hypertension was 10.53%, HIV was 5.26%, diabetes mellitus was 13.16%, others were 10.53%.

Table 3: Determining secondary outcomes of features for neonatal patients

Parameters	Number of patients [108]	Percentage [%]
Birth weight in grams		
< 2500	20	18.52%
> 2500 – 3500	78	72.22%
> 3500	10	9.26%
APGAR 1st minute		
< 6	82	75.93%
> 6	26	24.07%
APGAR 5th minute		
< 6	45	41.67%
> 6	63	58.33%
Length of hospital stay, days		
< 6	54	50.0%
7 – 10	31	28.7%
> 10	23	21.3%
Mortality rate of neonates		
Yes	33	30.56%
No	75	69.44%
Neonatal care experience		
Poor	9	8.33%
Middle	15	13.89%
Excellent	84	77.78%

Birth weight of neonatal patients with < 2500 grams was 20 cases, neonatal patients with grams (2500 – 3500) were 78 case, neonatal patients with > 3500 grams were 10 cases, APGAR 1st minute of < 6 include 45 while >6 include 63, mortality rate of neonates was 30.56%, duration of neonatal patients stayed in hospital less than 6 days were 54 cases, and neonatal care experience who are excellent were 77.78%.

Table 4: Identifying adverse outcomes of neonates admitted to the NICU in the pediatric hospitals

Adverse findings	Number of patients [108]	Percentage [%]
Shortness of breath	8	7.41%
Low birth weight	5	4.63%
Infection	3	2.78%
Sepsis	7	6.48%
Premature delivery	2	1.85%
Perinatal asphyxia	11	10.19%

Our findings were shown adverse outcomes which determine common causes of neonates which are shortness of breath included 8, sepsis included 7 cases, and perinatal asphyxia included 11 cases
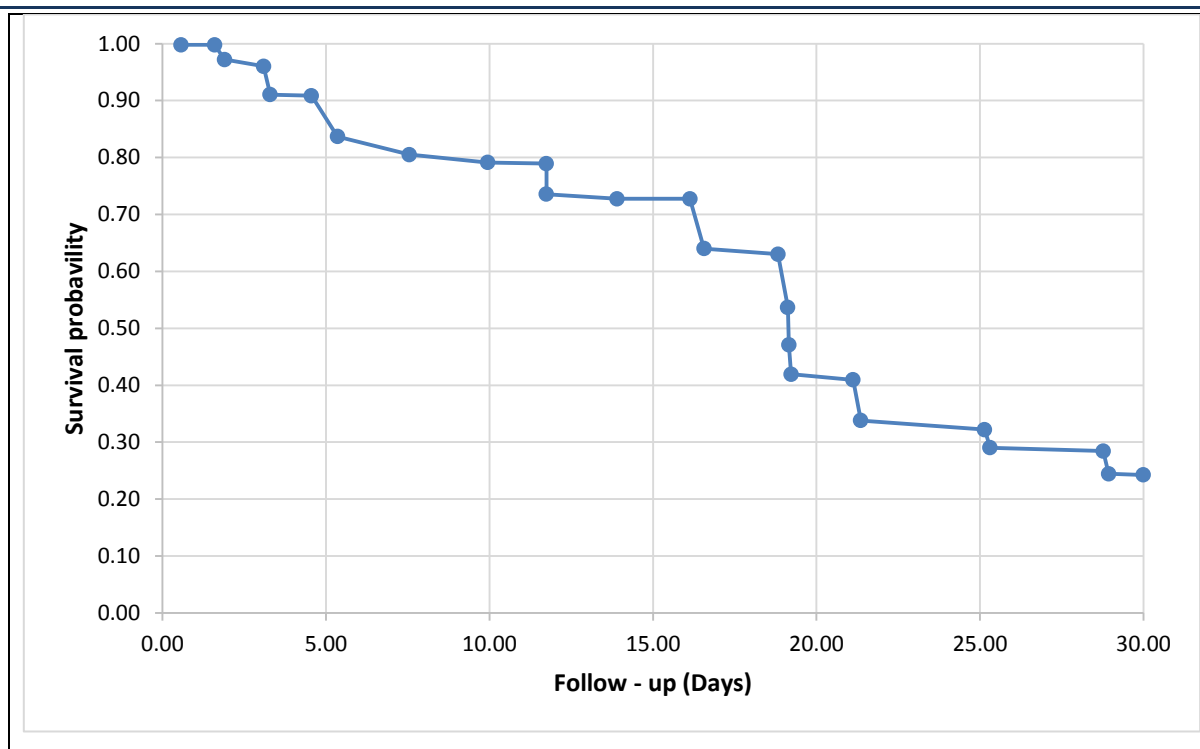
Figure 1: Enrolling overall Kaplan-Meier survival curve for neonates admitted to the Neonatal Intensive Care Unit

Table 5: Predicting quality of life of neonates who admitted to the Neonatal Intensive Care Unit in the long term

Physical function	72.83 ± 6.22
Psychological function	64.24 ± 11.86
Emotional function	69.51 ± 2.94
Daily pain	65.34 ± 9.40

Table 6: Analysis of bivariate and multivariate Cox regression for neonates admitted to the NICU

Parameters	CHR (95%CI)	AHR (95%)
Age of mother who > 35	2.6 [1.1 – 4.2]	1.10 [1.03 – 1.17]
Sex of neonatal [Males]	1.5 [0.6 – 2.8]	1.3 [1.07 – 2.17]
Cesarean section	4.1 [2.6 – 7.5]	1.3 [1.05 – 1.68]
Pregnancy [Multiple]	2.89 [1.62 – 5.28]	2.26 [1.14 – 4.6]
Perinatal asphyxia	2.2 [1.46 – 3.81]	2.94 [1.82 – 4.73]

DISCUSSION

Last studies have shown findings of this investigation, revealed a mortality rate of 6.44 per 1,000 live births over the course of seven years where most majority of fatalities had found all respiratory distress, inadequate fetal growth, early delivery, as well as blood infection. The strong connection between death in neonatal critical care units which determined low birth weight, as well as preterm delivery underscores the imperative need for prenatal treatment focused on the prevention of preterm labor [Lindback, C. *et al.*, 2014]. The findings of some studies had indicated advisable for creating NMR committees with the purpose of designing extensive initiatives to provide prenatal care for both the fetus and the mother where initiatives ought into including screening for the likelihood in newborn mortality and implementing preventative measures. [Ehret, D. E. Y. *et al.*, 2020 - Niermeyer, S. *et al.*, 2018]

Furthermore, a study conducted in the United States shown that the prevalence of newborn mortality was 24.7 every 1,000 live births, with more 92% of these fatalities occurred during the first 24 hours following delivery [Wrammert, J. *et al.*, 2017]. Some studies demonstrated video documentation of newborn resuscitation within district hospitals of the secondary level which situated in a low-resource environment as well as exposed notable deviations in the established

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criteria for neonatal resuscitation [Carbine, D. N. *et al*., 2000]. This occurred despite the fact that almost 92% of healthcare professionals had received training in neonatal resuscitation where video recordings provided conclusive proof of deficiencies of the quality of healthcare and also got in pinpointing areas that need more education, particularly in improvement the effectiveness of bag as well as mask ventilation. [Gaertner, V. D. *et al*., 2018]

Previous study has shown that newborn fatalities occurring of children's hospitals constitute a sorrowful and catastrophic occurrence where it may lead into substantial therapeutic ramifications [Hellden, D. *et al*., 2021]. These fatalities can be averted through the provision of appropriate medical care along with intervention which neonatal death can be attributed into clinical symptoms in terms of respiratory distress syndrome, infections, and congenital abnormalities, as well as perinatal asphyxia. [Maya-Enero, S. *et al*., 2018]

British study has determined that almost discoveries resulted in enduring health complications for infants that survive, as well as psychological anguish into their families and healthcare professionals which it was considered as a crucial identifying and tackling of the underlying reasons for newborn fatalities, in term of insufficient prenatal care, shortage of competent healthcare professionals, and restricted availability of medical treatments which found as an essential for enhancing clinical results and decreasing mortality rates. [Pietravalle, A. *et al*., 2018; Schilleman, K. *et al*., 2012]

CONCLUSION

The current study showed that there is a strong association between a high neonatal mortality rate and poor health care provided to newborns in the prenatal period. Moreover, most neonatal deaths were associated with shortness of breath, sepsis, and perinatal asphyxia, which negatively affect the quality of life of patients from newborn to long-term.

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