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Research Article

Death Rate and Causes of Death in the Neonatal Intensive Care Unit in the Children Welfare Teaching Hospital (2018-2021)

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Abstract

Background: The first month of life is the most vulnerable period and mortality during this period is an important component of under-5 mortalities. Causes of death in this period are preventable like sepsis, RDS, and asphyxia, while others are not like multiple congenital abnormalities.

Objectives: To study the death rate and main causes of death in the neonatal intensive care unit (NICU) of the Children Welfare Teaching Hospital (CWTH) through the period (2018-2021).

Methods: The death per year for the four years of the study and causes of death were collected retrospectively and analyzed for total death rate and rate for each year, sex distribution, male-to-female ratio, early and late death rate, and main causes of death.

Results: it was found that the total death rate is 17.3%, male: female ratio 1.6: 1. The early neonatal death was 54.3% and the late neonatal death was 45.6%. The main causes are congenital anomalies (39%), sepsis (17.4%), prematurity (16.9%), RDS (10.8%), postoperative complications (7.5%), and birth asphyxia (1.9%).

Conclusions: The death rate in the NICU / CWTH is still high despite improvement in respiratory care and the use of invasive and noninvasive respiratory support. The death rate because of congenital abnormalities was the main cause of death.

Keywords: Death Rate; Causes of Death; Neonatal Death; Neonatal intensive care unit.

Introduction:

The neonatal mortality rate (NMR) is on the decline globally, falling from 40 deaths per 1,000 live births in 1990 to 18 per 1,000 live births in 2020, that is a drop in neonatal deaths worldwide from 5.0 million in 1990 to 2.4 million in 2020. However, this decline of 52% is slower than the rate of decline among children under five years of age (60%) (1). Sub-Saharan Africa had the highest NMR in 2020 at 27 (25–32) deaths per 1000 live births, followed by central and southern Asia with 23 (21–25) deaths per 1000 live births (2). Reducing NMRs in developing countries remains a key global health goal. The United Nations Sustainable Development Goal (SDG) 3.2 aims to 'end preventable deaths of newborns and children under five years of age' by 2030, 'with all countries aiming to reduce their NMR to at least as low as 12 per 1,000 live births' (3).

Most neonatal deaths (75%) occur during the first week of life, with about one million newborn deaths occurring within the first 24 hours in 2019. Preterm birth, childbirth-related complications (birth asphyxia and infections), and birth defects cause most neonatal deaths in 2019 (2).

In Iraq, estimates developed by the UN Inter-agency Group for Child Mortality Estimation (UNICEF, WHO, World Bank, UN DESA Population Division) indicate that neonatal mortality (per 1000 live births) was 14 in 2020 which is declining from 15 in 2019 (4).

This study aimed to show the neonatal death rates and causes of death through the years 2018 – 2021 among admitted neonates to the neonatal intensive care unit (NICU) in the Children Welfare Teaching Hospital (CWTH).

Patients and methods

This hospital-based record review study was conducted in the NICU / CWTH which is a main tertiary center that receives neonates born in different hospitals in Iraq. The study included all neonates who were admitted and died in NICU / CWTH throughout the period from 1st of January 2018 to 31st of December 2021). Institutional and ethical approvals were taken from the hospital administration. The data was collected from the patients' files the registration data in the NICU and the death certificates. The information included the death rates for each of the study years, age at admission and death, sex, gestational age, and cause of death. The data were analyzed using the chi-square test. The number and percent of deaths for each year and the total of the four years, early and late death rates, sex and male to female ratio, number and percent of the main causes of neonatal

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deaths. A P value of < 0.05 was considered statistically significant.

Results

Throughout the four years covered by the study, the total number of admissions to NICU was 6900 and the total number of deaths was 1199 with a mortality rate of 17.3%, p = 0.00. The number and the rate of admission and death is shown in table 1. The death percent distribution according to the months and years is shown in Figure 1.

Year	Total NICU admission	Neonates discharged alive	Neonatal death	
	No.	No.	No.	%
2018	2276	1922	354	15.6
2019	2049	1739	310	15.1
2020	1094	829	265	24.2
2021	1481	1211	270	18.2
Total	6900	5701	1199	17.3
	χ^2 = 48.9, d.f. = 3, p = 0.00			

Table 1: Neonatal death in CWTH (2018 – 2021)

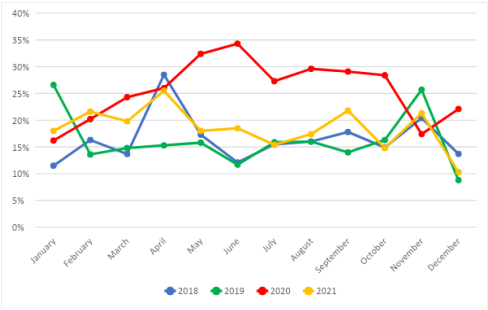

Figure 1: The death percent distribution according to the months and years

The distribution of the neonates who died by sex and year is shown in table 2, with male deaths of 722 (60.2%), female deaths of 477 (39.8%), and a male to female ratio of 1.5:1. The association is non-significant (p = 0.2). The different death rates in different years are shown in Table 2.

Table 2: Distribution of neonatal death by sex 2018 – 2021

Year	Neonatal death				Total deaths	
	Male		Female			
	No.	%	No.	%	No.	%
2018	206	58.2	148	41.8	354	15.6
2019	184	59.3	126	40.7	310	15.1
2020	154	58.1	111	41.9	265	24.2
2021	178	65.9	92	34.1	270	18.2
Total (100%)	722	60.2	477	39.8	1199	17.3
χ^2 = 4.86, d.f. = 3, p = 0.2						

The distribution by the time of death whether it was early (1-7 days old neonates) or late (from 8-28 days) is shown in Table 3 with the total early deaths being 54.3% and the late death being 45.6%. out of the total neonatal death throughout the study period, with a non-significant association (P = 0.45).

Table (3): Distribution of early and late neonatal death rate by year in CWTH 2018 – 2021

Year	Neonatal deaths				Total deaths	
	Early		Late			
	No.	No.	%	%	No.	%
2018	181	354	15.6	40.9	354	15.6
2019	169	310	15.1	45.5	310	15.1
2020	147	265	24.2	44.5	265	24.2
2021	155	270	18.2	42.6	270	18.2
total	652	1199	17.3	45.6	1199	17.3
χ^2 = 2.63, d.f. = 3, p = 0.45						

The main causes of neonatal deaths identified throughout the four years of the study are shown in figure 2 with congenital anomalies being the most common cause (39%) followed by infections (17.4%), prematurity (16.9%), acute RDS (10.8%), and post-operative complications (7.5%).

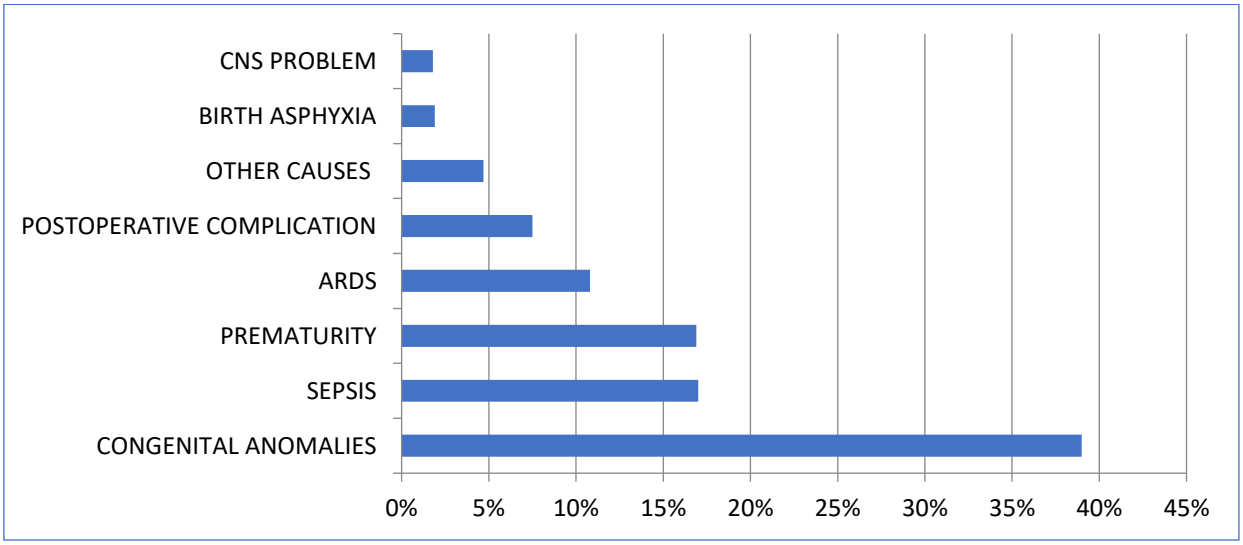

Figure 2: The main causes of neonatal deaths identified through the four years of the study

Discussion

The total NMR of 17.3% found in the current study is higher than that reported by Hameed et al (5) from (2000-2004) with a total death rate of 10.7%. This may be due to the CWTH became the advanced specialist referral center that receives more complex cases referred from other Iraqi governorates. This rate is nearly the same as that reported by Noudamadjo (6) in Parakou/Benin, with a death rate of 16.8%. Due to the circumstances of the COVID-19 pandemic lockdown and delay in seeking medical care, a higher mortality rate was found in 2020 compared to the mortality in the other years, mainly due to the lower number of admission than the other three years. The higher percentage of deaths among males than females was also reported by Hameed et al (7) for the years (2005-2009) where the death rate was 60.8% for males and 39.2% for females and the male to female ratio was 1.6: 1. The time of death found by the current study was different from that reported in Jordan (8), with (76%for early and 24% for late). These differences may be due to the fact that the data in Jordan is based on all deaths and not only deaths in one hospital. The cases included in the Jordanian study were those born in the same hospital studies and not referred from other hospitals. The percentage of deaths from congenital anomalies in the current study is higher than that reported in Eritrea (9) with a death rate of 10.1% and in China (10) with a death rate of 20.2% for congenital abnormality. This may be due to the high number of referred cases from other hospitals in Iraq to CWTH. The traditional pattern of consanguineous marriage in Iraq increases neonatal mortality and morbidity caused by congenital abnormalities. The percentage of neonates dying from sepsis in the current study was higher than that reported by Hameed et al (7) (14%), and lower than that reported by a study from Ethiopia (11) with a sepsis death rate of (31.1%%). A similar result was reported from Tanta / Egypt (12) with a sepsis death rate of 18.2%. This may be due to poor follow-up during pregnancy, and overcrowding in the CWTH NICU due to high admissions which affects the infection control strategies as the unit receives neonates from different sectors.

The death rate due to RDS in the current study is the same as that reported from Tanta / Egypt (12) but lower than that reported by Hameed et al (7) (20%). This is probably due to improvements and the use of more advanced invasive and non-invasive respiratory support in NICU / CWTH. The death due to postoperative complications is near to the 6.4% reported by Dora (13) and lower than the 11.3% reported by Hameed et al (7). This could be attributed to improving respiratory care and postoperative care in our NICU. Deaths caused by birth asphyxia were similar to the 2% reported from Jordan (8) and 3% reported from Tanta / Egypt (12) but lower than the 7.9**%** reported by Hameed et al (5)**.** This could be due to increasing elective cesarean section deliveries in the last years.

Conclusions

The neonatal mortality rate in the Children Welfare Teaching Hospital was found to be high throughout the four years of the study. Multiple congenital anomalies were the main cause of death followed by other causes like sepsis, RDS, and postoperative complication. Improving neonatal care and training the staff on respiratory care and infection control strategies as well as establishing more advanced NICUs around Iraq can improve the general care given in NICU and reduce neonatal mortality.

Authors' declaration

Conflicts of Interest: None.

We hereby confirm that all the Figures and Tables in the manuscript are ours.

Authors sign on ethical consideration's approval-Ethical Clearance: The project was approved by the local ethical committee in NICU of Children Welfare Teaching Hospital according to the code number (4089on 19/5/2022).

Authors' contributions:

Sura Abd Alwahab & Noor Abd Alwahab as a researcher and data collector

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نسب الوفاة وأسبابها في ردهة العناية المركزة لحديثي الولادة في مستشفى حماية الأطفال التعليمي (2018-2021)

د. سرى عبد الوهاب مهدي / م. حماية الاطفال التعليمي

د. نور عبد الوهاب مهدي / م. الزهراء / بغداد

خلفية البحث: الشهر الاول من الحياة أكثر فترة هشة والوفاة خلال هذه الفترة جزء مهم من الوفاة للأقل من خمسة سنوات. اسباب الوفاة بهذه الفترة ممكن تفاديها مثل تسمم الدم ومتلازمة عسر التنفس والاختناق الولادي، ولكن بعضها لا يمكن تفاديها مثل التشوهات الخلقية المتعددة.

هدف الدراسة: لمعرفة نسب الوفاة واسبابها الرئيسية في وحدة العناية المركزة لحديثي الولادة في مستشفى حماية الاطفال التعليمي للفترة من 2018 الى 2021.

المرضى وطريقة البحث: الوفيات خلال السنة ولمدة اربعة سنوات التي حصلت بها الدراسة مع اسبابها جمعت وحللت لإيجاد نسبة الوفاة الكلية للسنوات الاربع وكذلك نسبة الوفاة لكل سنة، الوفاة حسب الجنس ونسبة الوفيات بين الذكور والاناث، الوفيات المبكرة والوفيات المتأخرة وكذلك اهم اسباب الوفاة.

النتائج: وجد ان نسبة الوفيات الكلية 17.3%, نسبة وفيات الذكور الى الاناث 1.6:1,الوفيات المبكرة 54.3% والوفيات المتأخرة45.6%. اهم أسباب الوفيات التشوهات الخلقية 39%,تسمم الدم الجرثومي 17.4%,الخداجة 16.9%,عسر التنفس الولادي10.8%، مضاعفات ما بعد العمليات الجراحية 7.5%والاختناق الولادي1.9%.

الاستنتاج: نسبة الوفيات في ردهة الخدج وحديثي الولادة في مستشفى حماية الأطفال التعليمي لا تزال عالية بالرغم من استخدام أجهزة الدعم التنفسي الباضعة والغير باضعة. نسبة الوفاة بسبب التشوهات الخلقية كانت اهم أسباب الوفيات.

مفتاح الكلمات: وفيات، حديثي الولادة، ردهة الخدج وحديثي الولادة، م. حماية الاطفال