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Evaluating the Mortality Outcomes of Premature Infants in the Intensive Care Unit

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ABSTRACT

Background: Currently, premature birth is the predominant and crucial factor contributing to birth complications, leading to both perinatal mortality and morbidity, with an impact on as many as five to twelve percent of all births. Our study conducted a statistical analysis to evaluate mortality outcomes for preterm infants in the intensive care unit.

Patients and methods: From 12th March 2022 to 8th April 2023, a cross-sectional study was conducted to evaluate preterm neonatal patients in the neonatal intensive care unit at different hospitals in Iraq. We enrolled 105 participants and included preoperative demographic data in our investigation. The data were obtained from patients with premature infants delivered between 20- and 36 weeks

gestation and birth weight in term [1/2 - 1], [1 - 1 ½], [1 ½ - 2], and > 2. Demographic data on smoking, steroid use, gestational age, types of obstetric interventions, and age of pregnant women (under 30 years and over 30 years) were analysed in our investigation.

Results: The research found that 62.86% of the sample population comprised women over the age of 30, while women aged less than 30 accounted for 37.14%. Our study comprised women who attended an entire hospital where clinical data were collected, and 29.52% of deliveries were vaginal, while Caesarean section accounted for 70.48%. The study analysed women in gestational weeks ranging from 20 to 24, and the incidence was 14.29%. The study analysed the postoperative mortality of premature infants, with a rate of 53.33% for women in gestational weeks between 31 to 36. The duration of hospital stay was (37.22 ± 25.441) days, and the discharge weight was (2110 ± 780.4) grams. There were 15 cases of premature infant patients weighing over 2 grams.

Conclusion: Prematurity is one risk factor that increases the likelihood of a newborn dying from respiratory distress syndrome. Low birth weight is the other risk factor for respiratory distress syndrome-related death.

INTRODUCTION

Preterm birth represents the primary obstetric concern of our time, with the diagnosis and timely treatment of prematurity being crucial in managing the condition. [1]

According to the World Health Organization, with the backing of various European centres, premature birth is classified as the delivery of an infant before gestational age reaches 37 completed weeks (259 days) with a birth weight of less than 2,500 g. Around 13 million such births happen worldwide each year, with the majority occurring in developing nations. Prematurity is estimated to affect between 5 and 10% of births globally. In the United States, the incidence rate ranges from 8 to 11%, whereas in Europe, it remains between 5 and 7%. The impact of the problem is more significant in underdeveloped nations, with 17% of the births in Bangladesh reported as premature, and the figure reaches 38.4% in Cuba. [2-7]

In Spain, prematurity has an incidence of 19.7%, contributing to 38.4% of neonatal deaths, thereby emerging as the primary cause of perinatal mortality. The Spanish Social Security Institute reports a frequency of prematurity at 8%, with the Sinaloa figures at 2.8% and Hidalgo figures at 16.6%. Also, at General Hospital Mexico, a study conducted from 1995 to 2001 reported a prematurity incidence of 4.1%, including 2.8% of NICU admissions. Meanwhile, Maternal and Child Hospital León recorded a 22.4% incidence of premature NICU admissions in 2005. Premature patients are associated with high morbidity rates, typically diagnosed with hyaline membrane disease, sepsis, pneumonia, or asthma. [8-13]

Prematurity is linked to an increased incidence of preterm births, which account for three-quarters of neonatal deaths not associated with malformations. The neonatal mortality rate is a crucial health indicator for countries, enabling the development of policies and strategies to improve outcomes. Neonatal mortality rates vary across countries. In Bolivia, the reported rate is 30 per 1000 live births, whereas, in Brazil and Mexico, it is 15; in Chile, it is 6; in the United States, it is 5; in Canada, it is 4; and in Spain, it is 3. According to the UNICEF report, mortality due to prematurity and its complications is 28%, due to asphyxia, 23%; and due to sepsis, 36%. [14-18]

PATIENTS AND METHODS

We conducted a cross-sectional study to evaluate premature infant patients in the neonatal intensive care unit in different hospitals in Iraq from March 12th, 2022, to April 8th, 2023. Our study included basic preoperative demographic characteristics, and 105 patients were recruited. Data were obtained from premature infant patients who were born between 20 and 36 weeks of gestation. Our study analysed demographic data related to the age of pregnant women (younger than 30 years, older than 30 years), gestational age, smoking, steroids, and types of obstetric procedures. Our study analysed and evaluated all data and results using the program SPSS, version 22.0. This study examined all key parameters regarding the mother's condition before surgery, which included preeclampsia, diabetes, urinary tract infection, chorioamnionitis, and others.

Our study analyzed all data related to intraoperative and postoperative patient management, which included vaginal delivery, caesarean section, gestational age, birth weight, duration of operation, length of hospital stays as well as postoperative discharge weight.

In addition, our study also determined the impact of respiratory distress syndrome on premature patients. Also, this study expanded secondary outcomes, which included postoperative complications, which included intraventricular hemorrhage, retinopathy of prematurity, pulmonary hemorrhage, pneumothorax, and pulmonary artery hypertension. Moreover, data evaluating outcomes showed postoperative mortality in premature infant patients.

RESULTS

Our study included 62.86% women over 30 years old and 37.14% women under 30 years old. Regarding smoking status, our data showed that 17.14% of women were smokers. The participants were recruited from the entire hospital where clinical data was collected. Vaginal delivery occurred in 29.52% of cases, while 70.48% of cases involved a caesarean section, where these outcomes can be expressed in ***Table 1.***

Table 1: *Baseline demographic characteristics of patients.*

Parameters	***Number of patients, [105]***	***Percentage (%)***
Age (years)		
<30	39	37.14%
>30	66	62.86%
Gravidity (Pregnancies)		
< 2	29	27.62%

≥ 2	76	72.38%
Smoking status		
Yes	18	17.14%
No	87	82.86%
Mode of delivery		
Vaginal delivery	31	29.52%
Caesarean section	74	70.48%
Antenatal steroid		
Yes	29	27.62%
No	76	72.38%

Additionally, we identified a set of standard criteria to assess maternal health prior to surgery. Of the sample population, 50 women (47.62%) had no underlying health conditions, while 14 (13.33%) had eclampsia, and 20 others (19.05%) had a variety of conditions. Eight women (7.62%) had diabetes mellitus, where it can be shown in ***Figure 1.***

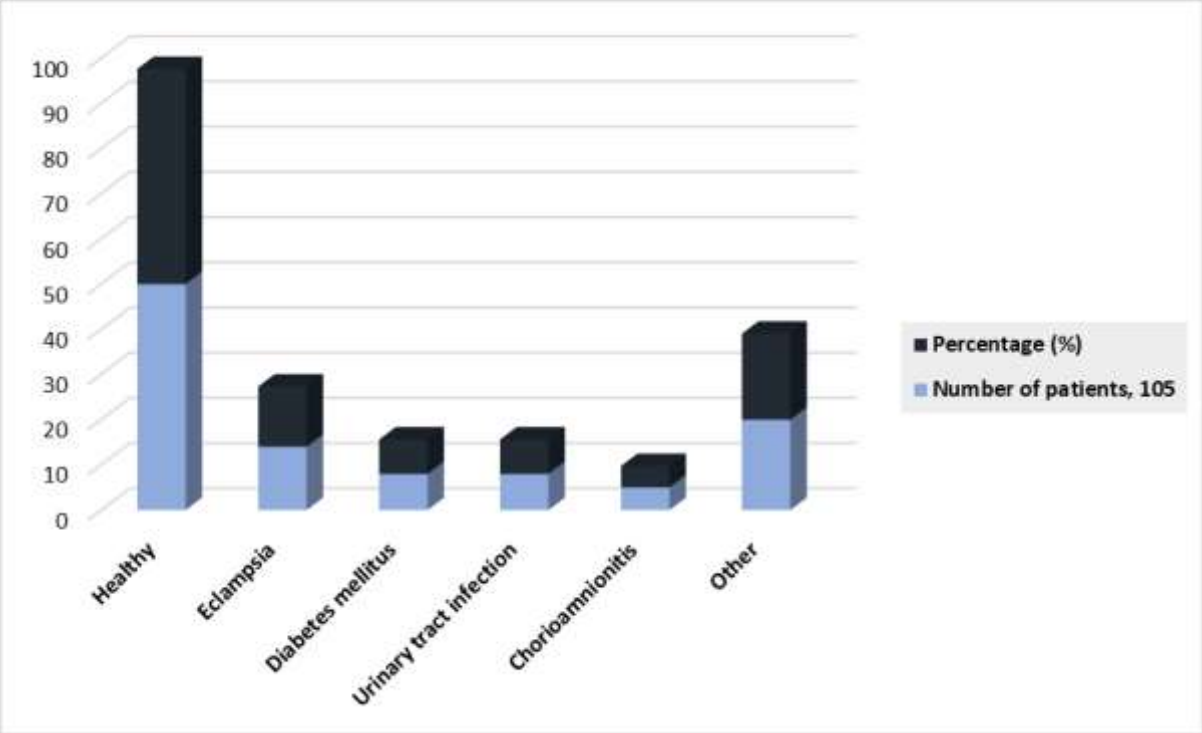

Figure 1: *Establish basic criteria regarding maternal status before surgery.*

Our clinical findings revealed primary outcomes related to preterm infants. Among women examined in the gestational weeks of (20-24), the rate was 14.29%, while for those examined in (31-36) weeks, it was 53.33%. The highest rates of cases were recorded among birth weight infants weighing between 1 ½ to 2 grams, accounting for 35.24%, while those weighing > 2 grams had a rate of 29.52%. Our data pertained to the examination of women with respiratory distress syndrome, with a total of 45 patients (42.86%), which all these details were determined in ***Table 2***.

Table 2: *Identification of primary outcomes in relation to preterm infants.*

Variables	***Number of patients, [105]***	***Percentage [%]***
Gestational week		
[20-24]	15	14.29%
[25-30]	34	32.38%
[31-36]	56	53.33%
Birth weight (Kg)		
[1/2 - 1]	12	11.43%
[1 - 1 ½]	25	23.81%
[1 ½ - 2]	37	35.24%
> 2	31	29.52%
Respiratory distress syndrome [RDS]		
Yes	45	42.86%
No	60	57.14%

Table 3: *Complication outcomes for premature infant patients.*

Variables	***Number of patients, [105]***	***Percentage [%]***
Intraventricular hemorrhage	4	3.81%
Retinopathy of prematurity	9	8.57%
Pulmonary hemorrhage	15	14.29%
Pneumothorax	5	4.76%
Pulmonary hypertension	7	6.67%

These results recorded clinical data related to hospitalized patients where the Duration of operative of vaginal delivery of premature infants' patients was (11.6 ± 2.4) hours, but (51 ± 6.3) hours during Caesarean section, as well as Length of stay in hospital was (37.22 ± 25.441) days, Discharge weight was (2110 ± 780.4) grams, and these findings can be seen in **Table 4**.

Table 4: *Secondary outcomes of premature infant patients.*

Variables	***Premature patients, [mean ± SD]***
Duration of operative [hours]	
Vaginal delivery	*11.6 ± 2.4*
Caesarean section	*51 ± 6.3*
Length of stay in hospital [Days]	*37.22 ± 25.441*
Discharge weight (Grams)	*2110 ± 780.4*

This study assessed the postoperative mortality of premature infants. The patient group with a birth weight greater than 2 grams consisted of 15 cases, while the groups with weights ranging from [1 - 1 ½] grams, [1/2 - 1] grams, and [1 ½ - 2] grams had 11 cases, 6 cases, and 8 cases respectively where our outcomes can be defined in ***Figure 2.***

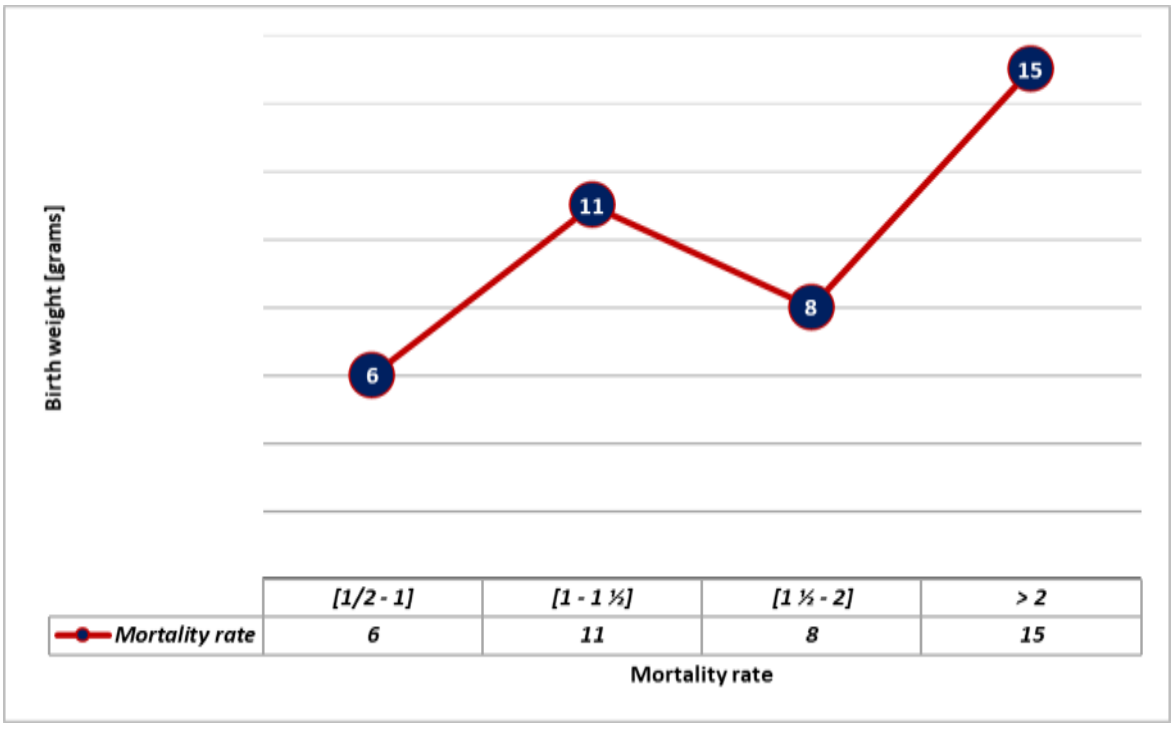

Figure 2*: Premature infants' postoperative mortality.*

DISCUSSION

Our study analysed the clinical and demographic outcomes linked to mortality rates of premature infants. The study found that women above the age of 30 accounted for 62.86% of the sample population, while women below 30 years accounted for 37.14%. The study also found that the gravida rate was categorized as below two and above or equal to 2 pregnancies, with 72.38% having above or equal to 2 pregnancies and 27.62% having below two pregnancies. To smoke status, 17.14% of the female participants in our data were smokers. According to the mode of delivery, our study included women who attended a whole hospital where clinical data were collected. Vaginal delivery accounted for 29.52%, and Caesarean section accounted for 70.48% of all deliveries. Additionally, clinical outcomes were observed in relation to antenatal steroid use, where 27.62% of pregnancies used steroids and 72.38% did not.

Additionally, we identified basic maternal health criteria pre-surgery. The sample included 50 healthy women (47.62%), 14 diagnosed with Eclampsia (13.33%), 20 with other health conditions (19.05%), and 8 with Diabetes Mellitus (7.62%).

Furthermore, our clinical findings have determined the primary outcomes concerning preterm infants. The study examined women in gestational weeks ranging from 20 to 24, where the incidence was 14.29%. For women in gestational weeks ranging from 31 to 36, the rate was 53.33%. The highest rate of cases, at 35.24%, was found amongst infants with a birth weight of 1 ½ to 2 grams, while infants weighing over 2 grams accounted for 29.52%. Our study focused on women who were diagnosed with respiratory distress syndrome, of which there were 45 patients (42.86%).

Besides to that, the study collected clinical data pertaining to hospitalized patients. It was found that the duration of operative vaginal delivery of premature infants was (11.6 ± 2.4) hours, while Caesarean section procedures lasted (51 ± 6.3) hours. Furthermore, the length of hospital stay was (37.22 ± 25.441) days, and the discharge weight was (2110 ± 780.4) grams. The study evaluated the postoperative mortality of premature infants. There were 15 cases of premature infant patients weighing over 2 grams and 11 cases for those weighing between 1 and 1 ½ grams.

Previous studies indicated that respiratory distress syndrome is a risk factor that contributes to increased mortality rates in premature infants. These studies have observed a rising trend in the rates of respiratory distress syndrome among premature infants, which may be due to a decrease in the number of gestational weeks [19]. Studies conducted in Britain have verified that 50% of premature infants experience respiratory distress syndrome. These studies have observed a rising trend in the rates of respiratory distress syndrome among premature infants, which may be due to a decrease in the number of gestational weeks. This study conducted in the United Kingdom demonstrated the potential of steroids in reducing the likelihood of developing respiratory distress syndrome. The research suggests that a decrease in steroid intake could lead to an increased incidence of patients with respiratory distress syndrome. [20]

The French study indicated that 53.2% of premature infants delivered before the 32nd week of gestation required surfactant therapy [21]. Similarly, a study showed that 42% of 560 premature infants with respiratory distress syndrome (RDS) who were born before the 30th week of gestation necessitated surfactant therapy, representing roughly 55.4% of such cases. Nevertheless, the reduced use of surfactant treatment could be associated with the fact that only 8.83% of our patients were born before 27 weeks. Additionally, [22] a Spanish study demonstrated the long-term complications following surgery on patients. The study identified pulmonary hemorrhage, pulmonary hypertension, and pneumothorax as frequent factors causing

death in premature infants. The study also noted that pregnancies at high risk were associated with higher mortality rates among premature infants. [23]

CONCLUSION

This study presents the adverse consequences linked with preterm patients, particularly their positive correlation with respiratory distress syndrome regarding their chances of survival. The outcomes display that the low birth weight of preterm babies suffering from respiratory distress syndrome is responsible for a rise in infant mortality rates, which can be linked to 38.10% of all pregnancies. This study found that pulmonary hemorrhage is one of the risk factors that leads to an increase in mortality rates.

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