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Survival Rate in Preterm Baby Received Surfactant Replacement Therapy

A Study
Submitted to the Council of the College of Medicine, Diyala University, In Partial Fulfillment of Requirements for the Bachelor Degree in Medicine and General surgery

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بسم الله الرحمن الرحيم

وَقُلِ اعْمَلُوا فَسَيَرَى اللَّهُ عَمَلَكُمْ وَرَسُولُهُ

وَالْمُؤْمِنُونَ وَسَتُرَدُّونَ إِلَى عَالِمِ الْغَيْبِ

وَالشَّهَادَةِ فَيُنَبِّئُكُمْ بِمَا كُنْتُمْ تَعْمَلُونَ

صدق الله العظيم

التوبة–١٠٥

I certify that the article entitled (Survival rate in preterm baby received surfactant replacement therapy) is Done under my supervision by the student (ايلاف اسعد داود) In collage of medicine, pediatric department Al-batool teaching hospital.

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Abstract

Background: preterm delivery was frequently complicated by respiratory distress syndrome (RDS), surfactant was used to prevent the development of respiratory distress syndrome.

Objective: to determine Survival rate in preterm baby received surfactant replacement therapy.

Patients and methods: a cross-sectional observational study of preterm delivered neonates during the period from September 2022 to February 2023 done at Al-Batool Teaching Hospital. Self-prepared questionnaire was used for data collection, estimation of gestational age was done by LMP and/or ultrasound, Body weight was determined by using balanced infant scale. All preterm neonates weighting less than (2500g) were enrolled into the study. The surfactant preparation used was Survanta® (Beractant, U.S.A.), a natural bovine lung extract. The treatment was evaluated as markedly effective if the clinical symptoms of the neonate improved significantly (no dyspnea), no need for oxygen supply, normal spo2, improve chest x-ray and the neonate start feeding and the patient labeled as (survival) while the patient who deteriorated clinically and radiologically with decrease spo2 and then died labeled as (not survival) whatever the cause of deterioration and death. SPSS version ١٦ was used for the statistical analysis.

Results: 49 newly delivered preterm babies who take surfactant replacement therapy were included in the study, the survival rate was 32 (65.3), there is significant effect of birth weight neonate (p value 0.001) and gestational age (p value 0.000) and spo2 at birth (p value 0.000) on the survival rate in preterm babies who received surfactant replacement therapy, there is no significant effect of gender (p value 0.665) and mode of delivery (p value 0.801) on survival rate.

Conclusion: Surfactant therapy is effective to improve survival rate of preterm neonates.

Keywords: Respiratory distress syndrome; preterm; surfactant

Introduction

Preterm birth has been defined as any birth before 37 weeks completed weeks of gestation or fewer than 259 days since the first day of the woman's last menstrual period (LMP), this is further subdivided on the basis of gestational age (GA) in to: extremely preterm (<28 weeks), very preterm (28–<32 weeks) and moderate or late preterm (32–<37 completed weeks of gestation) (1).

Survival for extremely premature infants has increased significantly during the last two decades. Complications of prematurity are becoming more common as more survivors are spending time in newborn intensive care units (NICUs). Most premature infants born at Most premature infants born at <32 weeks gestation will remain in the NICU until close to term to allow for sufficient organ maturation so that the infant can be cared for independent of intensive care. Immaturity of multiple organ systems places them at high risk for a variety of complications during these prolonged hospital stays. Specific complications (CNS haemorrhage and/or ischaemia, necrotising entercolitis [NEC], chronic lung disease, and retinopathy of prematurity [ROP]), they have a significant impact on long-term development and outcome (2).

Neonatal respiratory distress syndrome (NRDS) refers to a kind of clinical syndrome in which symptoms such as dyspnea and respiratory failure occur within 4-12 h after birth. Due to the lack of pulmonary surfactant, alveolar collapse and reduced lung compliance happen, resulting in serious hypoxemia and lung injury.The epidemiological survey shows that NRDS is mostly found in premature infants, and its incidence is related to the gestational age and weight of children. The smaller the gestational age, the higher the incidence; the smaller the weight and the higher the mortality.The frequency of respiratory distress syndrome (RDS) can be decreased through prenatal treatment with the potent, halogenated corticosteroids, betamethasone and dexamethasone, but only by about 50%. Severe neonatal lung disease from surfactant deficiency, structural immaturity, and infection remains a frequent neonatal problem. Postnatal treatment of RDS with a variety of surfactant preparations reduces the frequency of barotrauma that may lead to pneumothorax and interstitial emphysema and improves lung function acutely in many, but not all, preterm newborns (3-8).

Exogenous surfactant is an undisputed treatment for neonatal respiratory distress syndrome (RDS) that optimizes gas exchange, reduces the risk of air leaks and, most importantly, reduces mortality. However, the efficacy of exogenous surfactant is highly dependent on the treatment strategy, including timing of administration, the surfactant preparation, and the dosage regimen. International guidelines have summarized the available evidence from randomized controlled trials on surfactant therapy and published recommendations on the optimal surfactant replacement strategy. Early selective surfactant administration given to infants with RDS requiring assisted ventilation leads to a decreased risk of acute pulmonary injury (decreased risk of pneumothorax and pulmonary interstitial emphysema) and a decreased risk of neonatal mortality and chronic lung disease compared to delaying treatment of such infants until they develop established RDS (9-17).

Aim of the study

The objective of the study is to determine Survival rate in preterm baby who taking surfactant replacement therapy.

Patients and methods

This is a cross-sectional observational study of all cases of RDS treated with or without surfactant during the period from September 2022 to February 2023 done at Al-Batool Teaching Hospital for Maternity and children. The collected data on surfactant treatment was practiced by self-prepared questionnaire, specific health and general health (including Gestational age, gender, weight, mode of delivery) were recorded from patients files. Evidence of sepsis was recorded, based on positive blood cultures, or elevated blood concentrations of C-reactive protein. Estimation of gestational age was done by LMP and/or ultrasound, Body weight was determined by using balanced infant scale and approximated to the nearest (0.1).

Inclusion criteria

All preterm infants weighing less than (2500g) and used surfactant replacement therapy were enrolled in the study.

Surfactant Policies

The surfactant preparations used was Survanta® (Beractant, U.S.A.), a natural bovine lung extract, containing phospholipids, neutrallipids, fatty acids, and surfactant associated proteins. The first dose of Survanta was given as soon as possible after the eligibility criteria had been met. The dosage of Survanta used was 4ml/kg/dose. The required dose of Survanta was drawn outfrom its ampoule into a sterile syringe and allowed to warm to room temperature. The infant is positioned supine on a flat surface with head turned to one side. 2ml/kg of Survanta is then instilled slowly over 10 to 15 minutes into the endotracheal tube via the sideport of an endotracheal tube adapter, Followed by continuous positive airway pressure. Surfactant replacement therapy was used either for preterm infant <1800g as a prophylactic therapy while rescue surfactant therapy was used for newborn >1800g and developed RDS (18).

Survival criteria

The treatment was evaluated as markedly effective if the clinical symptoms of the neonate improved significantly (no dyspnea), no need for oxygen supply, normal spo2, improve chest x-ray and the neonate start feeding and the patient labeled as (survival) while the patient who deteriorated clinically and radiologically with

decreased spo2 and then died labeled as (not survival) whatever the cause of deterioration and death. The treatment was evaluated as ineffective if the clinical symptoms did not improve or even aggravated.

Statistical analysis

The data were statistically analyzed depending on SPSS (Statistical Package for Social Science) Version 16. Chi-square was used to compare between the variable in this study. Statistical results were considered significant when p value being under (0.05).

Results

The preterm babies were included in the study, who used surfactant replacement therapy were 49, table (1) show infant and maternal criteria and surfactant use at delivery

Table ١: Infant and maternal criteria and surfactant use in preterm delivery

criteria	Surfactant used Number (%)
Gender	
Male	28 (28)
Female	21 (21)
Total	49 (49)
Birth weight (g)	
500 -< 1000	9 (9)
1000 -< 1500	18 (18)
1500 -< 2000	11 (11)
2000 -< 2500	11 (11)
Total	49 (49)
Gestational age (wk)	
<28	9 (9)
28 -< 30	6 (6)
30 -< 34	28 (28)
34 -< 37	6 (6)
Total	49 (49)
Mode of delivery	
NVD*	19 (19)
Cesarean section	30 (30)
Total	49 (49)
Oxygen saturation	
Normoxia	34 (34)
Hypoxia	15 (15)
Total	49 (49)

*Normal vaginal delivery

In surfactant treated infant 49 the survival rate was 32 (65.3).

The following tables 3,4,5 show the distribution of survival rate depend on gender, body weight, gestational age, mode of delivery, oxygen level respectively.

Table 2: Survival data based on gender

Gender	Survival Number (%)	Not survival Number (%)	Total Number (%)	P value
Male	19 (67.9)	9 (32.1)	28 (100)	0.665
Female	13 (61.9)	8 (38.1)	21 (100)	
Total	32 (65.3)	17 (34.7)	49 (100)	

Table 3: Survival data based on Body weight (g)

Birth weight (g)	Survival number (%)	Not survival number (%)	Total number (%)	P value
500 -< 1000	1 (11.1)	8 (88.9)	9 (100)	0.001
1000 -< 1500	12 (66.7)	6 (33.3)	18 (100)	
1500 -< 2000	9 (81.8)	2 (18.2)	11 (100)	
2000 -< 2500	10 (90.9)	1 (9.1)	11 (100)	

Table 4: Survival data based on gestational age (wk)

gestational age (wk)	Survival Number (%)	Not survival Number (%)	Total Number (%)	P value
<28	1 (11.1)	8 (88.9)	9 (100)	0.000
28 -< 30	2 (33.3)	4 (66.7)	6 (100)	
30 -< 34	24 (85.7)	4 (14.3)	28 (100)	
34 -< 37	5 (83.3)	1 (16.7)	6 (100)	

Table 5: Survival data based on mode of delivery

Mode of delivery	Survival number (%)	Not survival number (%)	Total number (%)	P value
NVD	12 (63.2)	7 (36.8)	19 (100)	0.801
Cesarean section	20 (66.7)	10 (33.3)	30 (100)	

*Normal vaginal delivery

Table 6: Survival data based on oxygen level

oxygen level	Survival number (%)	Not survival number (%)	Total number (%)	P value
Normoxia	29 (85.3)	5 (14.7)	34 (100)	0.000
hypoxia	3 (20)	12 (80)	15 (100)	

Discussion

The result of the study shows that the use of surfactant improve the survival rate in preterm, this is consistent with other studies (19-21).
The survival rate was more in male than female but this difference is not significant (p value 0.665), this is not comparable with other studies (22-23), this minor difference can be explained by unequal rate of involvement of both gender. There is no significant difference between genders regarding survival rate in preterm babies receiving surfactant (p value 0.665).

There is improvement in survival rate with increasing gestational maturity (p value 0.000), this is also consistent with other studies (24-25). With increasing gestational age, survival rate was improved by using surfactant replacement therapy. There is improvement in survival rate with increasing birth weight neonate (p value 0.001) and this is comparable with other studies (26-27).This is explained by increasing the lung maturity as increase the birth weight neonate and gestational age.

The survival rate was more in cesarean section delivery but is a statistically not significant (p value 0.801), there is no current study for comparison. The survival rate was more in neonate with normal oxygen level at birth (p value 0.000), there is no current study for comparison.

There are some limitations of this study. Firstly we did not include data on the severity of conditions and health behavior of the recipients. Some data on RDS may have been omitted or limited information about the diseases of the patients may have been available and there was a limit to clarify the clinical significance of RDS complications such as IVH or PDA. Secondly We didn't compare the survival rate between preterm received surfactant replacement therapy and other group of preterm not received the therapy because the criteria of inclusion is not available for the last one.

Conclusion

In conclusion, surfactant therapy is effective to improve survival rate of preterm neonates, survival rate was increase with increasing birth weight, gestational age and spo2 at birth.

Recommendation

We Recommend that:

1. Continuation of surfactant therapy in preterm infant according to the criteria.
2. More sophisticated study is needed about surfactant replacement to prevent complications of preterm such as pneumothorax, bronchopulmonary dysplasia and retinopathy.

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وزارة التعليم العالي والبحث العلمي
جامعة ديالى
كلية الطب

معدل البقاء على قيد الحياة في الأطفال الخدج الذين تلقوا علاج السرفاكتانت الصناعي

دراسة
مقدمة الى مجلس كلية الطب جامعة ديالى
كجزء من متطلبات نيل درجة البكالوريوس
في الطب والجراحة العامة

من قبل
ايلاف اسعد داود

مساعد مشرف
د .سرى قيس محمود

بأشراف
ا.د. نجدت محمود شكر

١٤٤٤/ه
٢٠٢٣/م

خلاصة

الخلفية: كانت الولادة المبكرة معقدة في كثير من الأحيان بسبب متلازمة الضائقة التنفسية (RDS)، وقد تم استخدام السرفاكتانت الصناعي لمنع تطور متلازمة الضائقة التنفسية.
الهدف: لتحديد معدل البقاء على قيد الحياة عند الطفل الخديج الذي تلقى العلاج بالسرفاكتانت الصناعي.
المرضى والطرق: تم اجراء دراسة مقطعية بالملاحظة للخدج الذين تم ولادتهم خلال الفترة من سبتمبر ٢٠٢٢ إلى فبراير ٢٠٢٣ في مستشفى البتول التعليمي. تم استخدام استبيان معد ذاتيًا لجمع البيانات، وتم تقدير عمر الحمل عن طريقLMP و / أو الموجات فوق الصوتية، وتم تحديد وزن الجسم باستخدام ميزان الكتروني لقياس الوزن للأطفال. تضمنت الدراسة جميع الخدج الذين يقل وزنهم عن (٢٥٠٠ جم) وتم علاجهم بالسرفاكتانت الصناعي. كان مستحضر السرفاكتانت المستخدم هو Survanta® (Beractant ، الولايات المتحدة الأمريكية) ، وهو مستخلص رئوي بقري طبيعي. تم تقييم العلاج على أنه فعال بشكل ملحوظ إذا تحسنت الأعراض السريرية لحديثي الولادة بشكل ملحوظ (لا يوجد ضيق في التنفس)، ولا حاجة لإمداد الأكسجين، وspo2 ضمن المعدل الطبيعي، وتحسن الأشعة السينية للصدر وبدء حديثي الولادة في الرضاعة وتم تصنيف المريض على أنه (البقاء على قيد الحياة)، في حين أن المريض الذي تدهور سريريًا وشعاعيًا مع انخفاض spo2 ثم توفي وتم تصنيفه على أنه (ليس على قيد الحياة) مهما كان سبب التدهور والوفاة. تم استخدام نسخة SPSS ١٦ للتحليل الإحصائي.
النتائج: تم تضمين ٤٩ طفلاً خدجًا حديثي الولادة ممن يتلقون العلاج ببدائل الفاعل بالسطح في الدراسة وكان معدل البقاء ٣٢ (٦٥,٣). هناك تأثير كبير لوزن الوليد عند الولادة (القيمة الاحتمالية ٠,٠٠١) وعمر الحمل (القيمة الاحتمالية ٠,٠٠٠) وspo2 عند الولادة (القيمة الاحتمالية ٠,٠٠٠) على معدل البقاء على قيد الحياة عند الخدج الذين تلقوا علاج السرفاكتانت الصناعي، لم يكن هناك تأثير معتد به للجنس (القيمة الاحتمالية 0.665) وطريقة الولادة (القيمة الاحتمالية 0.801) على معدل البقاء على قيد الحياة.
الخلاصة: المعالجة ببدائل الفاعل بالسطح فعالة في تحسين معدل بقاء الخدج على قيد الحياة.

الكلمات المفتاحية: متلازمة الضائقة التنفسية. الخدج. السرفاكتانت الصناعي