Sarcouncil Journal of Medicine and Surgery

ISSN(Online): 2945-3534

Volume- 03| Issue- 05| 2024

Research Article **Received:** 15-04-2024 | **Accepted:** 02-05-2024 | **Published:** 29-05-2024

Outcome of the Premature Newborn Receiving Surfactant for Treatment of Respiratory Distress Syndrome from 2020 to 2022

Dr. Ahmed AbdulRazaaq Salim[1], Dr. Ali Sadi Salih[2], Dr. Marwah Amer Abed[3] and Dr. Ali Qais Abdulkafi[4]

[1]M.B.Ch.B., D.C.H., MRCPCH \ (Paediatrics) Iraqi Ministry of Health, Salah-Alden Health Department, Ballad Hospital, Salah-Alden, Iraq.

[2]M.B.Ch.B., F.I.C.M.S. (Pediatric) Ministry of Higher Education and Scientific Research, Uruk University, Baghdad, Iraq.

[3]M.B.Ch.B., F.I.C.M.S. (Pediatric) Iraqi Ministry of Health, Al-Rusafa Health Department, Al-Elwiya Maternity Teaching Hospital, Baghdad, Iraq.

[4]M.B.Ch.B., D.C.H. (Pediatrics) Iraqi Ministry of Health, Kirkuk Health Department, Kirkuk Teaching Hospital, Kirkuk, Iraq

Abstract: The paper investigates the outcome of premature newborns with respiratory distress syndrome (RDS) who received surfactant treatment from 2020 to 2022. RDS is a respiratory condition that affects neonates, particularly those born prematurely, due to surfactant deficiency. The lagging growth of the lungs and the collapse of the air sacs contribute to the condition. An exploratory study was designed in different hospitals in Thi-Qar, where 90 cases were collected and distributed into two groups: patients, 50 cases, and control, 50 cases of newborn babies. Between the two groups the results found in this study are the condition results in reduced blood oxygen saturation and respiratory insufficiency. Length of (PICU) stay after acute respiratory distress syndrome (PARDS) of Group patients 14.62±2.17, Group control 13.28±0.74 and mechanical ventilation (conventional/high frequency) of group patients 52.313 ± 3.61, control 31.82 ± 4.735 and about Local Complications we found in Group patients at 26 (65%), control group at 9 (18%). We conclude from this study that PS contributed to reducing the death rate of patients' Iraqi children through ameliorate pulmonary oxygenation in the acute phase of moderate or severe PARDS.

Keywords: PARDS, Complications, mechanical ventilation, lungs, associated, treatment.

INTRODUCTION

Respiratory distress syndrome (RDS), also referred to as hyaline membrane disease, is a respiratory condition that affects neonates, particularly those born prematurely (Doni, D., Paterlini, G. *et al.,* 2020).

The condition results from the lagging growth of the lungs and deficiency of surfactant, which assists in the expansion of the lungs and prevents air sacs from collapsing (Alvarado Socarras, J. *et al.,* 2018; Pan, J. *et al.,* 2017).

RDS symptoms include breathing difficulties, rapid breathing, grunting, flaring nostrils, and cyanosis. The infant may show signs of reduced blood oxygen saturation and respiratory insufficiency (Bertini, G. *et al.,* 2017; Nin, N., 2017).

RDS is primarily caused by lung immaturity, especially in babies born before 37 weeks of gestation. Other risk factors include maternal diabetes, delivery via caesarean section, male sex, and multiple births (Fierro, Michael A. *et al.,* 2017).

Where surfactant treatment is effective for premature newborns with respiratory distress syndrome so found that 66% of infants treated with bovine surfactant had a lasting response, (Xie, H. *et al.,* 2018; Pan, C., Liu, L. *et al.,* 2018) where found that a single postventilatory dose of reconstituted bovine surfactant reduced the severity of respiratory distress and decreased major pulmonary morbidity and intracranial hemorrhage (Kim, H. J. et al ., 2017).

In a previous study as, Long 1991 found that synthetic surfactant treatment improved survival and reduced perinatal morbidity in infants weighing at least 1250 g at birth. Merritt 1986 found that prophylactic treatment with human surfactant reduced the incidence of bronchopulmonary dysplasia and neonatal death (Gong, M. N., & Ferguson, N. D., 2015; Zhang, Y. *et al.,* 2017).

A previous study found that surfactant treatment for premature newborns with respiratory distress syndrome may reduce mortality and morbidity, but the evidence is mixed (Wu, J. Z. *et al.,* 2018).

In 1990 and, Maniscalco 1989 report that surfactant treatment reduces mortality and hospital charges, respectively, and in other studies found that surfactant use may be associated with a decreased risk of mortality and short-term respiratory morbidities, but further trials are needed. Premnath 2016 found that early surfactant administration is associated with a shorter duration of ventilation but does not appear to be significantly protective against chronic lung disease or mortality among premature infants (Jo, Y. S. *et al.,* 2017; Y. Zhang, L. *et al.,* 2018).

PATIENTS AND METHODS

This is a prospective study which collected 90 cases of acute respiratory distress syndrome (RDS) treatment in neonates from various hospitals in Thi-Qar. The study was conducted between 15th July 2020 and 7th October 2022.

***Corresponding Author:** Dr. Ahmed AbdulRazaaq Salim

DOI- https://doi.org/10.5281/zenodo.11378524

Pulmonary surfactant was administered to neonates with RDS, with a treatment group of 40 cases compared to a control group of 50 cases. The methodology for the database was constructed and advanced in line with patient groups. The treatment group encompassed patients who did not receive PS treatment, while the control group involved patients who did undergo PS treatment. The SPSS software was utilised to scrutinise the database results. To apply the methodology, we have provided Table 1, which displays the demographic features of patients diagnosed with acute respiratory distress syndrome. This includes the neonatal gestational age, body weight, pediatric critical illness score (PCIS), oxygenation index (OI), birth weight ranges (<1100 g, 1150-1550 g, and 1600-2300 g), and respiratory distress syndrome (RDS).

RESULTS

Table 1: Features characteristic of demographic acute respiratory distress syndrome patients**.**

Parameters	***Patients (40)***	***Control (50)***	***P-value***
Neonatal			
Age	*1.06 ± 0.66*	*1.02±0.55*	*0.07763*
Body weight	*0.92-2.22 Kg*	*1.108-2.28 Kg*	*0.0468*
Pediatric critical illness score (PCIS)	*77 (70-80)*	*73 (70-80)*	*0.04677*
Oxygenation index (OI)	*15.57 (11.56-21.74)*	*17.36 (12.64-22.75)*	*0.0486*
Birth weight			
<1100 g	*5 (12.5%)*	*8 (16%)*	*0.0317*
1150-1550 g	*24 (60%)*	*26 (52%)*	*0.0376*
1600-2300 g	*11(27.5%)*	*16 (32%)*	*0.0422*
Respiratory distress syndrome (RDS)			
Level III	*26 (65%)*	*30 (60%)*	*0.0488*
Level IV	*14 (35%)*	*20 (40%)*	*0.0488*

Our clinical outcomes of acute respiratory distress syndrome patients were found that the Oxygenation index (OI) was an M value of 17.36 (12.64-22.75), which higher than the control group with an M value of 15.57 (11.56-21.74)

These papers indicate that the oxygenation index (OI) may be a valuable prognostic marker for mortality in patients with respiratory distress syndrome. Rsovac (2020) discovered that OI on day 3 of mechanical ventilation was strongly predictive of short-term mortality in children with ARDS. Hsieh (1990) observed that patients with septic shock and ARDS who had a severely depressed OI during the early period were more likely to have a poor outcome.

Dechert (2014) conducted an assessment of the discriminatory power of a modified OI for the prediction of 28-day mortality in adults with respiratory failure. Results showed that age-adjusted OI correlated positively with mortality. Hammond (2017) subsequently established OI cut-points for mortality, revealing that mortality rates nearly tripled when the maximum OI exceeded 17. These findings highlight the significance of OI as a risk factor linked with respiratory distress syndrome and mortality.

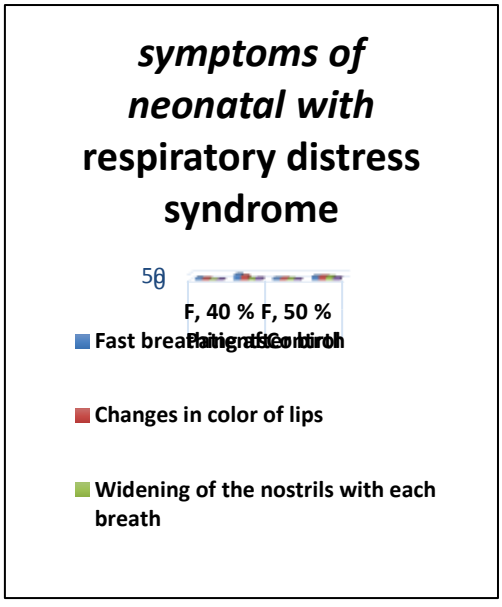

Figure 1: Identify the symptoms of neonatal with respiratory distress syndrome (RDS).

Publisher: SARC Publisher

Table 2: Comparison between patients and control in terms of Pregnancy and obstetric conditions for mothers during pregnancy.

Pregnancy and obstetric conditions	***Patients (40)***	***Control (50)***
Gestational hypertension	*3 (6.67%)*	*2 (4.44%)*
Gestational diabetes mellitus	*5 (11.11%)*	*3 (6.67%)*
Chorioamnionitis	*2 (4.44%)*	*2 (15.56%)*
Antenatal infection	*8 (17.78%)*	*7 (15.56%)*
Intrauterine distress	*2 (4.44%)*	*1 (2.22%)*
Total	***20 (44.44%) cases***	***15 (33.33%) cases***

Table 3: Etiology of Pediatric Acute Respiratory Distress

Parameters	*Patients (40)*	*Control (50)*	*P-value*
Pulmonary disease	*13 (32.5%)*	*21 (42%)*	*0.031106*
Extra-pulmonary disease	*15 (37.5%)*	*14 (28%)*	*0.0428*
Septic shock	*7 (17.5%)*	*8 (16%)*	*0.04879*
Hematological tumor	*5 (12.5%)*	*7 (14%)*	*0.048537*

The paper suggests that the causes of pediatric acute respiratory distress are varied and can be difficult to diagnose, where notes that the cause of respiratory distress can vary depending on the predominant symptoms and signs and can include croup and acute severe asthma.

Our study refers to pulmonary embolism is a possible cause of pediatric respiratory distress, where we found in 13 (32.5%) from patients, Septic shock in 7 (17.5%), Hematological tumor in 5 (12.5%), and in another study emphasizes the importance of reading the clues to pinpoint the cause of respiratory distress, which can include status asthmaticus, croup, epiglottitis, or pneumonia.

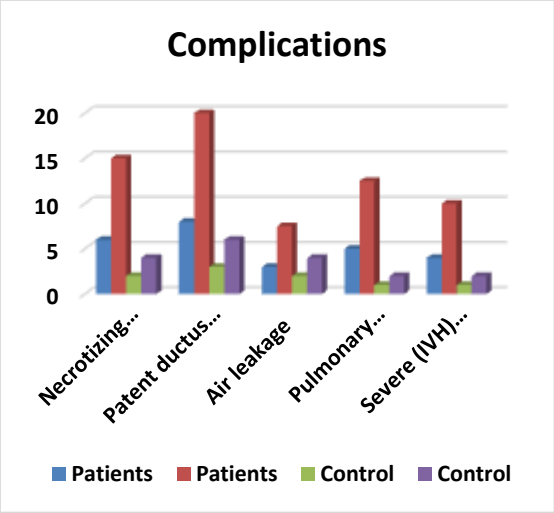

Figure 2: Assessment of outcomes studies according to surfactant therapy

Table 4: Clinical outcomes of acute respiratory distress syndrome patients.

Parameters	**Patients (40)**	**Control (50)**	**P-value**
Length of (PICU) stay after acute respiratory distress syndrome (PARDS)	14.62±2.17	13.28±0.74	0.0481
Length of hospital stay after pediatric acute respiratory distress syndrome (PARDS)	19.68±2.54	17.181±2.47	0.0491
Mechanical ventilation (conventional/high frequency)	52.313±3.61	31.82±4.735	0.0362
Mechanical ventilation (MV) time (h)	296.45±14.6	363.74±13.582	0.03512
Daily liquid accumulation within 72 hours (ml/kg. d)	10.457±11.482	11.68±14.553	0.03781
Local Complications	26 (65%)	9 (18%)	0.0362
pneumothorax	7 (17.5%)	5 (10%)	0.02146
Mediastinal emphysema	4 (10%)	3 (6%)	0.0352
Pulmonary hemorrhage	3 (7.5%)	2 (4%)	0.0424
Mortality	47.82%	8.63%	0.0042

Publisher: SARC Publisher

Pediatric critical illness score: (PICU); pediatric acute respiratory distress syndrome: (PARDS); MV: Mechanical ventilation; PICU: acute respiratory distress syndrome.

Our results showed the impact of PS on the improvement of OI where, thereby to decrease of mortality. Due to that, out outcomes enrolled 8.63% of mortality in the control group in comparison with the patients' group with 47.82%.

DISCUSSION

Our current study discusses Outcome of the premature newborns receiving surfactant for treatment of respiratory distress syndrome from 2020 to 2022.

Whereas in this study, the administration of surfactant to premature newborns with respiratory distress syndrome (RDS) has been shown to have significant positive outcomes. Here are some key discussion points regarding the outcomes of premature newborns receiving surfactant treatment for RDS were: Improved Respiratory Function and the primary outcome of surfactant therapy in premature newborns with RDS is the improvement in their respiratory function. Surfactant, a natural substance that helps keep the air sacs in the lungs open, is deficient in premature infants, leading to collapsed lungs and difficulty breathing (Kaya, G. *et al.,* 2017; Kashif, M. *et al.,* 2017).

Surfactant therapy has been shown to decrease the demand for mechanical ventilation in preterm newborns with RDS, and in our study, we can know to Mechanical ventilation can cause lung injury and lead to complications such as bronchopulmonary dysplasia and the results also showed an improvement in the function of the respiratory system, which in turn contributes to reducing mortality rates (de Ayala Fernandez, J. A., & Tamayo, L., 2020; Kunutsor, S. K. *et al.,* 2017).

the previous study shows that surfactant administration reduces the need for mechanical ventilation in chlidren with respiratory distress syndrome. Where found that a single dose of surfactant reduced the need for subsequent mechanical ventilation in infants with moderate-to-severe respiratory distress syndrome treated with nasal continuous positive airway pressure and surfactant administration followed by extubation to nasal constant positive airway pressure reduced the need for later mechanical ventilation in premature infants with mild-to-moderate respiratory distress syndrome.

Pulmonary surfactant (PS) effectively reduces the surface tension of the alveoli, preventing respiratory atelectasis (Kashif, M. *et al.,* 2017). However, some studies do not recommend it as a drug for the treatment of respiratory distress syndrome (RDS) due to its potential impact on infant mortality and the duration of mechanical ventilation. In contrast, our study provides evidence of the significant benefits of pulmonary surfactants for treating respiratory distress syndrome and enhancing lung oxygenation (Dadbakhsh, M. *et al.,* 2017).

We grouped the databases of infant patients to divide the 90 participants into two groups, one including 40 cases and the other acting as a control group with 50 participants. The main objective was to accelerate the improvement of the oxygenation index. To follow that, the improvement of the oxygenation index in the treatment of respiratory distress syndrome (RDS) generally relies on the active role of pulmonary surfactant, while there are several causes of respiratory distress syndrome (Luo, J. e al., 2017). Reduced pulmonary surfactant causes lung volume reduction, leading to alveolar collapse and intrapulmonary shunt, resulting in hypoxaemia and pulmonary hypertension. As a result, the clinical outcomes of RDS patients yielded an Oxygenation Index (OI) of 15.57 (11.56-21.74) for the patient group and 17.36 (12.64-22.75) for the control group. Nevertheless, the results indicated a high score of respiratory distress syndrome (RDS) patients at Level III, with 26 (65%) patients in the patient group and 30 (60%) in the control group.

Our study found that mortality was significantly lower in the control group (8.63%) than in the patient group (47.82%). Our mortality results confirm that pulmonary surfactant can significantly decrease mortality by rates in infants with respiratory distress syndrome during the severe period by enhancing the oxygenation index (OI) (Wang, T. 2018).

Furthermore, our study found that the incidence of complications in the control group was 9 (18%) lower than that in the patient group, where both groups had a high percentage of infants with cases of NEC and PDA. In addition, mechanical ventilation is necessary for managing the deterioration of oxygenation in RDS patients with an average oxygenation level of (52.313±3.61) as compared to the control group with (31.82±4.735). According to recent studies, PS has been found effective within 12-24 hours of the initial dose, with enhanced pulmonary oxygenation. However, some patients experienced oxygenation deterioration after initial improvement.

CONCLUSION

We determine from this analysis that there exists a statistical connection between the pulmonary surfactant and its efficacy in improving oxygen supply in infants with moderate and severe cases of ARDS.

In conclusion, surfactant therapy has shown encouraging results in the treatment of respiratory distress syndrome in premature infants and has been shown to be effective in improving lung function, reducing the need for invasive ventilatory support, and reducing the risk of complications associated with respiratory distress syndrome.

Publisher: SARC Publisher

REFERENCES

1. Doni, D., Paterlini, G., Locatelli, A., Arnoldi, S., Magri, M. C., Bernasconi, D.,... & Tagliabue, P. E. "Effects of antenatal indomethacin on ductus arteriosus early closure and on adverse outcomes in preterm neonates." *The Journal of Maternal-Fetal & Neonatal Medicine* 33.4 (2020): 645-650.
2. Alvarado Socarras, J. L., Monsalve, J. C., & Diaz Quijano, F. A. "Inhaled nitric oxide in preterm neonates with refractory hypoxemia associated to oligohydramnios." *Current Drug Discovery Technologies* 15.2 (2018): 156-160.
3. Pan, J., Chen, M. W., Ni, W. Q., Fang, T., Zhang, H., Chen, Y., & Pan, J. H. "Clinical efficacy of pulmonary surfactant combined with budesonide for preventing bronchopulmonary dysplasia in very low birth weight infants." *Zhongguo Dang dai er ke za zhi= Chinese Journal of Contemporary Pediatrics* 19.2 (2017): 137-141.
4. Bertini, G., Coviello, C., Gozzini, E., Bianconi, T., Bresci, C., Leonardi, V., & Dani, C "Change of cerebral oxygenation during surfactant treatment in preterm infants:"LISA" versus "InSurE" procedures." *Neuropediatrics* 48.02 (2017): 098-103.
5. Nin, N., Muriel, A., Peñuelas, O., Brochard, L., Lorente, J. A., Ferguson, N. D., ... & VENTILA Group "Severe hypercapnia and outcome of mechanically ventilated patients with moderate or severe acute respiratory distress syndrome." *Intensive care medicine* 43 (2017): 200-208.
6. Fierro, Michael A., and Raquel R. Bartz. "Reducing the shock of acute respiratory distress syndrome: Is veno-venous ECMO a viable therapy in the hemodynamically unstable patient?." *Anesthesia & Analgesia* 124.3 (2017): 716-718.
7. Xie, H., Zhou, Z. G., Jin, W., Yuan, C. B., Du, J., Lu, J., & Wang, R. L., "Ventilator management for acute respiratory distress syndrome associated with avian influenza A (H7N9) virus infection: A case series." *World Journal of Emergency Medicine* 9.2 (2018): 118.
8. Pan, C., Liu, L., Xie, J. F., & Qiu, H. B. "Acute respiratory distress syndrome: challenge for diagnosis and therapy." *Chinese Medical Journal* 131.10 (2018): 1220-1224.
9. Kim, H. J., Choi, M. G., Park, M. K., & Seo, Y. R. "Predictive and prognostic biomarkers of respiratory diseases due to particulate matter exposure." *Journal of cancer prevention* 22.1 (2017): 6.
10. Gong, M. N., & Ferguson, N. D. "Lung-protective ventilation in acute respiratory distress syndrome. How soon is now?." *American journal of respiratory and critical care medicine* 191.2 (2015): 125-126.
11. Zhang, Y., Ding, S., Li, C., Wang, Y., Chen, Z., & Wang, Z. "Effects of N-acetylcysteine treatment in acute respiratory distress syndrome: A meta-analysis." *Experimental and therapeutic medicine* 14.4 (2017): 2863-2868.
12. Wu, J. Z., Ge, D. D., Zhou, L. F., Hou, L. Y., Zhou, Y., & Li, Q. Y. "Effects of particulate matter on allergic respiratory diseases." *Chronic diseases and translational medicine* 4.2 (2018): 95-102.
13. Jo, Y. S., Choi, S. M., Lee, J., Park, Y. S., Lee, C. H., Yim, J. J., ... & Lee, S. M. "Effect of preadmission metformin use on clinical outcome of acute respiratory distress syndrome among critically ill patients with diabetes." *Tuberculosis and Respiratory Diseases* 80.3 (2017): 296.
14. Zhang, Y., Song, L., Zang, B., Pan, R. and Jin, M. "Hydroxysafflor Yellow an Alleviates Lipopolysaccharide-Induced Acute Respiratory Distress Syndrome in Miceellow A alleviates lipopolysaccharide-induced acute respiratory distress syndrome in mice," *Biological & pharmaceutical bulletin*, 40.2, (2017) 135–144.
15. Kaya, G., Sivasli, E., Oztuzcu, S., Melekoglu, N. A., Ozkara, E., Sarikabadayi, U., & Demiryürek, A. T. "Association of Rho-kinase gene polymorphisms with respiratory distress syndrome in preterm neonates." *Pediatrics & Neonatology* 58.1 (2017): 36-42.
16. Kashif, M., Patel, R., Bajantri, B. and Diaz-Fuentes, G. "Legionella pneumonia associated with severe acute respiratory distress syndrome and diffuse alveolar hemorrhage-A rare association." *Respiratory medicine case reports* 21 (2017): 7-11.
17. de Ayala Fernandez, J. A., & Tamayo, L. "Acute respiratory distress syndrome due to severe community-acquired pneumonia caused by Rothia mucilaginosa in an immunocompetent patient." *Medicina Clínica* 156.4 (2020): 198-199.
18. Kunutsor, S. K., Laukkanen, T., & Laukkanen, J. A. "Sauna bathing reduces the risk of respiratory diseases: a long-term prospective cohort study." *European journal of epidemiology* 32 (2017): 1107-1111.
19. Dadbakhsh, M., Khanjani, N., Bahrampour, A., & Haghighi, P. S. "Death from respiratory diseases and temperature in Shiraz, Iran (2006–2011)." *International journal of biometeorology* 61 (2017): 239-246.
20. Luo, J., Yu, H., Hu, Y. H., Liu, D., Wang, Y. W., Wang, M. Y., ... & Liang, Z. A. "Early identification of patients at risk for acute respiratory distress syndrome among severe pneumonia: a retrospective cohort study." *Journal of thoracic disease* 9.10 (2017): 3979.
21. Wang, Tong. "Basic and clinical research progress in acute lung injury/acute respiratory distress syndrome." *Infection International* 7.2 (2018): 38-43.

Publisher: SARC Publisher

Source of support: Nil; **Conflict of interest:** Nil.

Cite this article as:
Salim, A.A., Salih, A.S., Abed, M.A. and Abdulkafi, A.Q. "Outcome of the Premature Newborn Receiving Surfactant for Treatment of Respiratory Distress Syndrome from 2020 to 2022." *Sarcouncil Journal of Medicine and Surgery* 3.5 (2024): pp 33-38.

Publisher: SARC Publisher