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THE EFFECT OF EARLY ENTERAL FEEDING ON HOSPITALIZATION TIME IN NEONATES WITH NEONATAL RESPIRATORY DISTRESS

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ABSTRACT

Background: Neonatal respiratory distress is considered a frequent etiology of admission for neonatal intensive care in both preterm and term neonates globally and whether outcome is modulated by time to initiation of enteral feeding, which have been shown to increase time of hospitalization and worsen outcome in delay nutrition. **Objective:** The aim of this study was investigate the effect of enteral feeding time on prognosis of neonates with a respiratory distress. **Materials and Methods:** An analytical cross-sectional study was conducted for the period one year (2021-2022) at Tishreen University Hospital in Lattakia-Syria. The study included two groups of full term neonates with a diagnosis of respiratory distress were compared: group I consisted of 82 neonates (group I) who received feeding during the first 48 hours of birth, whereas group II consisted of 88 neonates (group II) who fed enterally after 48 hours of birth. **Results:** The population of 170 neonates was predominantly male (67.1%), with a mean gestational age of 37.49±0.6 weeks and a mean birth weight of 2788.70±321.8 g. Cesarean section represented the most frequent method of delivery (95.30%), and the etiology of respiratory distress was neonatal sepsis in 55.9%. There were no significant differences between two groups regarding demographic variables and features of respiratory distress (p>0.05). Neonatal sepsis was significantly more frequent in group II (75% versus 35.4%, p:0.0001), whereas transient tachypnea was observed more frequently in group I (62.2% versus 20.5%, p:0.0001). The duration of oxygen-based treatment, hospitalization, and transition of respiratory distress were significantly longer in group II compared to I (3.6±3.19 versus 1.2±0.7, p:0.001), (9.55±6.7 versus 4.53±3.2, p:0.0001) and (6.40±3.1 versus 2.65±1.41, p:0.0001) respectively. In addition to, feeding intolerance was observed more frequently in group II (9.1 versus 2.4%, p:0.04). Time of initiating feeding didn't affect the course of respiratory distress (p:0.3). **Conclusion:** The current study demonstrated presence of favorable associations of early initiation of feeding with duration of hospitalization, oxygen therapy, and resolution for distress without deterioration of respiratory status.

KEYWORDS: Respiratory distress, enteral feeding, full term, neonates.

INTRODUCTION

Neonatal respiratory distress represents a common reason for neonatal intensive care unit (NICU) admission with longer duration of hospital stay.[1] It occurs approximately in 5-7% of term infants, and most cases are mild and transient.[2] In postnatal period, fetal nutrient delivery changes from a continuous supply form by placenta to intermittent gastrointestinal feeding.[3] Term healthy infant's nutrition is not affected, in which the functional integrity and capacity of gastrointestinal tract are intact and nutrient transfer in the third trimester especially amino acids, fats, and minerals take place in contrast to preterm neonates.[4] In acute pulmonary disease, there is a status of increased respiratory work that characterized by higher consumption of energy, oxygen, and protein to maintain a positive nitrogen balance, and early initiation of feeding is considered an essential step to improve survival, enhancing growth, and to prevent development of complications.[5,6]

Proper nutritional management aims to support normal growth and development of pulmonary tissues, accommodating different needs of infants, protect pulmonary tissues from oxidative damage, and prevent complications related to nutrition.[7] Early enteral feeding stimulates maturation of gastrointestinal system, prevents

gut atrophy, enhances immune functions, associates with better endocrine adaptation, and is considered essential for optimizing growth. In addition to, it is associated with earlier discharge of hospitalized newborns.[8] One challenging milestone for neonates with respiratory distress is timing for enteral feeding introduction due to the fear among neonatologists that feeding might worsen respiratory status with the risk of inhalation. Therefore, the aims of this study were to: 1- investigate the optimal timing for the initiation of enteral feeding on outcome in neonates with respiratory distress, 2- compare the effects of early versus late nutrition regarding: respiratory distress transition, duration of oxygen therapy, hospitalization, and rate of complications.

PATIENTS AND METHODS

Study Population

After approval by local research ethics committee, an analytical cross-sectional study was conducted in full term neonates admitted at neonate intensive care unit (NICU), Tishreen University Hospital over a period of one year from August 2021 to August 2022.

Inclusion Criteria were as follows: Full term neonates of both sexes with a diagnosis of respiratory distress. **Exclusion Criteria:** neonates with presence of one of the following: perinatal asphyxia, respiratory rate greater than 100 breaths per minute, Silverman score >7 with need for mechanical ventilation, congenital anomalies of the digestive system, suspected or definite diagnosis of necrotizing enterocolitis (NEC), hemodynamic instability in critically ill neonate, and the need to sedation. Complete history, physical examination, and laboratory investigations were performed. Neonates were assigned according to the time to initiate enteral feeding to group I (early nutrition) who were started feeding before 48 hours of birth (82 cases), and group II (late nutrition) which included neonates who were received feeding after 48 hours of life (88 cases). Neonates were given breast milk or formulas through orogastric tube on average 25-35 ml/kg/day in divided volumes every 3 hours, and increased gradually according to tolerance and clinical status of neonate until reaching the volume 150ml/kg. Vital signs including respiratory rate, heart rate, and oxygen saturation level were monitored with switching over from feeding by tube to oral route in case of resolution of respiratory distress. Measurement of neonate weight was performed daily.

Statistical Analysis

Statistical analysis was performed by using IBM SPSS version 20. Basic descriptive statistics included means, standard deviations (SD), median, Frequency and percentages. To examine the relationships and comparisons between the two group, chi-square test or Fisher's test was used. Independent t student test was used to compare 2 independent groups. All the tests were considered significant at a 5% type I error rate ($p<0.05$), β:20%, and power of the study: 80%.

RESULTS

During the study period, 170 full term neonates were hospitalized in the NICU due to respiratory distress. The baseline characteristics of newborns were as shown in Table (1). 114(67.1%) of the study participants were males and 56(32.9%) were females. Delivery was via elective cesarean section in 162 cases (95.3%) and with a normal vaginal delivery in 8 cases (4.7%). Gestational age of newborns ranged from 37 to 41 weeks with a mean age was 37.49±0.6 week, and birth weight ranged from 1885 to 4500 g with a mean weight was 2788.70±321.8 g.

The Apgar score at 1st minute ranged from 7 to 10 with a mean value 9.55±0.7, and ranged from 9 to 10 at 5th minute with a mean value was 9.94±0.2. A Silverman-Anderson score of respiratory distress ranged from 2 to 6 with a mean value was 4.57±0.3. Neonatal sepsis represented the main reason for respiratory distress which found in 95 cases (55.9%), followed by transient tachypnea (40.6%), cardiac lesions (1.8%), and meconium aspiration syndrome (1.8%).

Table 1: Demographic characteristic of the study population.

Variable	Result
Gender	
Male	114(67.1%)
Female	56(32.9%)
Mode of delivery	
Vaginal delivery	8(4.7%)
Cesarean section	162(95.3%)
Gestational age(week)	37.49±0.6(37-41)
Birth weight(g)	2788.70±321.8(1885-4500)
Apgar score	
1- minute	9.55±0.7(7-10)
5-minute	9.94±0.2(9-10)
Respiratory rate	78.21±7.1(70-95)
Silverman score	4.57±0.3(2-6)
Etiology	
Neonatal sepsis	95(55.9%)

Transient tachypnea	69(40.6%)
Cardiac lesions	3(1.8%)
Meconium aspiration syndrome	3(1.8%)

When the neonates were compared with regard to the time of initiating enteral feeding, there were no significant differences between the two groups according to the demographic variables (p>0.05). In group I, males represented 70.7% and females 29.3% with an average of gestational age 37.48±0.4 week, and 2783.84±305.1 g for birth weight. In group II, males represented 63.6% and females 36.4% with an average of gestational age 37.60±0.7 week, and 2793.23±338.3 g for birth weight. Cesarean section represented the method of delivery in 96.3% of group I versus 94.3% of group II, p:0.5. An average of Apgar score at 1st minute was 9.48±0.7 in group I versus 9.61±0.7 in group II, p: 0.2, whereas at 5th minute the mean value of score was 9.96±0.1 versus 9.93±0.2, p:0.3.

Table 2: The relationship between time of initiating enteral feeding and demographic variables of the study population.

Variable			P value
	Group I: Early EN (82)	Group II: Delayed EN (88)	
Gender			
Male	58(70.7%)	56(63.6%)	0.3
Female	24(29.3%)	32(36.4%)	
Gestational age(week)	37.48±0.4	37.60±0.7	0.09
Birth weight(g)	2783.84±305.1	2793.23±338.3	0.8
Mode of delivery			
Vaginal delivery	3(3.7%)	5(5.7%)	0.5
Cesarean section	79(96.3%)	83(94.3%)	
Apgar score			
1- minute	9.48±0.7	9.61±0.7	0.2
5-minute	9.96±0.1	9.93±0.2	0.3

As shown in table (3), there were no significant differences between group I and II regarding to respiratory rate (83.7±3.8 versus 74.9±2.9, p:0.09), Silverman score (5.19±0.6 versus 4.24±0.3, p:0.2), and the need to oxygen therapy (62.2% versus 67.1%, p:0.1). There were significant differences between group I and II regarding neonatal sepsis (35.4% vs 75%, p:0.0001) and transient tachypnea (62.2% vs 20.5%, p:0.0001), whereas there were no significant differences between two groups regarding other causes of respiratory distress such as presence of cardiac lesions (p:0.6) and meconium aspiration syndrome (p:0.6). Peripheral intravenous catheters were inserted in all newborns in group II versus 30 cases (36.6%) in group I, p:0.0001.

Table 3: The relationship between time of initiating enteral feeding and characteristics of respiratory distress of the study population.

Variable			P value
	Group I: Early EN (82)	Group II:Delayed EN (88)	
Respiratory rate	83.7±3.8	74.9±2.9	0.09
Silverman score	5.19±0.6	4.24±0.3	0.2
Need for supplemental oxygen	51(62.2%)	59(67.1%)	0.1
Etiology			
Neonatal sepsis	29(35.4%)	66(75%)	0.0001
Transient tachypnea	51(62.2%)	18(20.5%)	0.0001
Cardiac lesions	1(1.2%)	2(2.3%)	0.6
Meconium aspiration syndrome	1(1.2%)	2(2.3%)	0.6
Need for peripheral venous catheters			
Present	30(36.6%)	88(100%)	0.0001
Absent	52(63.4%)	0(0%)	

Worsening of respiratory distress symptoms while feeding and enteral feeding intolerance were more frequent in group II (5.7% versus 2.4%, p:0.3) and (9.1% versus 2.4%, p:0.04) respectively. Duration of oxygen therapy, hospitalization, and transition of respiratory distress were significantly longer in group II than I; (3.6±3.19 versus 1.2±0.7), (9.55±6.7 versus 4.53±3.2) and (6.40±3.1 versus 2.65±1.41) respectively, p:0.0001.

Table 4 The relationship between time of initiating enteral feeding and outcome of affected newborns.

Variable			P value
	Group I: Early EN (82)	Group II: Delayed EN (88)	
Age of respiratory distress transition (day)	2.65±1.41	6.40±3.1	0.0001
Duration of supplemental oxygen (day)	1.2±0.7	3.6±3.19	0.0001
Duration of hospitalization(day)	4.53±3.2	9.55±6.7	0.0001
Worsening respiratory distress	2(2.4%)	5(5.7%)	0.3
Feeding intolerance	2(2.4%)	8(9.1%)	0.04

DISCUSSION

In this analytic cross-sectional study, we report the outcome of early versus late initiation of enteral feeding among full term neonates who experienced of respiratory distress. There is no detailed information about the outcome of timing of enteral feeding in full term neonates, and studies were performed only in preterm neonates with respiratory distress.

The results of the current study revealed that, compared with late nutrition group, early nutrition was associated significantly with a significant reduction in duration of hospitalization, oxygen therapy, and transition of respiratory distress ($p<0.05$). In addition to, need for peripheral venous catheters was significantly lower in early nutrition with better feeding tolerance. Finally, early enteral feeding wasn't associated with any increasing in respiratory distress. These findings might be explained by the following: First, inadequate nutrient intake especially energy and protein in late nutrition may compromise infant's respiratory function. Second, transient tachypnea was observed more frequently in early nutrition groups, and as a result the duration of hospitalization was shorter. Third, improved feeding tolerance in group I was a result of stimulating gastrointestinal movements and enhancing presence of gastrointestinal enzymes in significant amounts. The results of current study are consistent with the previous studies.

McClure et al. (1999) demonstrated in a study conducted in 100 preterm neonates that early nutrition was associated with shorter duration of hospitalization and oxygen therapy, better feeding tolerance, without any increasing in the rate of complications compared to late nutrition.[9]

Man et al. (2000) showed in a study conducted in 36 preterm neonates with respiratory distress that early nutrition was associated with reduction in duration of hospitalization and the need to mechanical ventilation.[10]

Sinha et al. (2016) demonstrated in a study performed in 200 preterm neonates with a diagnosis of respiratory distress that early nutrition was associated with reduction in hospitalization time and the need to oxygen therapy.[11]

In summary, clinical results of the current study support early initiation of feeding in presence of respiratory distress unless there is contraindication for enteral feeding.

Declarations

Competing of Interests

All the authors do not have any possible conflicts of interest.

Ethical consideration

After discussing the study with the parents, all of them gave a complete and clear informed consent to participate in the study. This study was performed in accordance with the Declaration of Helsinki.

Availability of data and materials

Most of the data was in the article, and other data can be asked from the corresponding author.

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Author contributions

All authors performed the measurements and wrote the article. Literature review was done by Dr. Dima Hasan, and all authors performed analytic calculations and performed the numerical simulations

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