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FACTORS PREDICTING PROLONGED HOSPITALIZATION AMONG INFANT WITH TRANSIENT TACHYPNEA OF NEWBORNS IN MOSUL CITY

[1]*Dhilal Shahin Ali and [2]Sahar Elham Karany

[1]M.B.Ch.B/F.A.B.H.S, Department of Pediatrics, Al Khansa'a Teaching Hospital.
[2]M.B.Ch.B/F.A.B.H.S, Department of Pediatrics, Ibin Sina Teaching Hospital.

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***Corresponding Author: Dhilal Shahin Ali**

M.B.Ch.B/F.A.B.H.S, Department of Pediatrics, Al Khansa'a Teaching Hospital.

ABSTRACT

Background: Newborns with transient tachypnea have a slower rate of lung fluid clearance after birth. Respiratory distress characterized by retractions, flaring, and grunting, as well as a breathing frequency greater than 60 breaths per minute, are its hallmarks. As a result, the patient is admitted to the newborn intensive care unit (NICU). After birth, these symptoms can go away 48–72 hours, but occasionally they last longer. **Objectives:** to assess the risk factors predicting prolonged hospitalization among infants with transient tachypnea of newborn. **Methods:** This prospective study included both term and preterm who were diagnosed with TTN at Ibin Sina and Al Batool Teaching Hospitals in Mosul between June 2024, and January 2025. One hundred and twenty randomly chosen patients with Transient Tachypnea of Newborns which last less than 3 days were included in the study. They were compared with one hundred controls who had Transient Tachypnea of Newborns but last more than 3 days. In addition to the patient name and gender, the questionnaire consists of three main sections: the first asks questions about peri-natal information, the second asks questions about post-natal information, and the third asks questions about laboratory findings. **Results:** Initially, A total of 943 newborns were enrolled in this study, of them; 723 newborns were excluded; due to major congenital anomalies (5 patients), perinatal asphyxia (22 patients), or diseases other than TTN (696 patients). Statistically significant difference was found between the study groups regarding male gender (P value=0.046), median of birth weight (P value <0.001), median of gestational age (P value <0.001), number of small for gestational age (P value =0.021), number of cesarean section (P value=0.022), median of Apgar score at 5 minutes (P value =0.013), number of antenatal steroid use (P value <0.001), median of initial oxygen saturation (P value=0.002), hospital stay (P value <0.001), median duration of ventilation (P value = 0.023), and median of WBC counts (P value=0.003). **Conclusion:** Male gender, low birth weight, preterm delivery, small for gestational age, low Apgar score at 5 minutes, cesarean section, antenatal steroid use, low initial oxygen saturation and high WBC counts are more associated with prolonged transient tachypnea of newborn. Raised inflammatory markers alone can't predicted the need for prolonged hospital stay.

KEYWORDS: Transient tachypnea of newborn, Prolonged, Factors, Mosul, Iraq.

1. INTRODUCTION

Transient tachypnea of the newborn (TTN) is the most frequent cause of respiratory distress. It was first identified in 1966 and affects roughly 6 out of 1000 newborns.[1] The newborn is at a 7% risk of experiencing respiratory distress.[2] During pregnancy, newborns consume some fluid, which is eventually eliminated by the kidneys as amniotic fluid. [3] The fluid that enters the lungs keeps them inflated.[1-4] Due to the constant opening and closing of the fetal larynx, some of the fluid enters the lungs even if the bulk is swallowed.[5] After delivery, TTN lowers the rate of lung fluid clearance.[6] It is characterized by respiratory distress exhibited by retractions, flaring, and grunting, as well as a breathing frequency greater than 60 breaths per minute. As a result, the patient is admitted to the newborn intensive care unit (NICU).[7-9] These symptoms can go away 48–72 hours after birth, but occasionally can last up to 5 days.[10] A newborn's difficulty to absorb lung fluids on time interferes with the transition time from intrauterine to extrauterine life.[11]

If a higher oxygen concentration (>60%) is needed, ventilatory assistance (CPAP, or continuous positive airway pressure) should be given, even though the majority of neonates only need supplementary oxygen

with a fraction of inspired oxygen (FiO2) of 0.40 or less.[12-13] TTN can worsen to persistent tachypnea in certain infants, necessitating mechanical ventilation and intubation. Furthermore, a very small percentage of these neonates may experience air leakage (also known as pneumothorax and pneumomediastinum).[14] Patients using continuous positive airway pressure therapy (CPAP) have a higher risk of these side effects. But some of these patients get malignant TTN, commonly known as pulmonary hypertension.[15] Antibiotic therapy, liquid therapy, hyperbaric oxygenation therapy, and supportive treatment are all used to manage TTN.[16] The effects of furosemide, adrenaline, inhaled salbutamol and limitation in fluid intake, can be useful during TTN in addition to the conservative management.[17]

Globally; the main risk factors for TTN development include: elective cesarean birth without labor preceding (particularly in cases where gestational age is less than or equal to 38 weeks), male sex, multiple gestations, macrosomia (birth weight greater than 4 kg), maternal diabetes, maternal asthma, and abrupt delivery.[1] Birth asphyxia, excessive maternal sedation and analgesia, exposure to B-mimetic agents, prolonged labor, polycythemia, and delayed clamping of the umbilical cord (optimal time 45 seconds) are less common risk factors for TTN. These factors lead to increased placental transfusion, which in turn causes left ventricular dysfunction.[18]

The aim of the current study was to assess the risk factors predicting prolonged hospitalization among infants with transient tachypnea of newborn.

2- PATIENTS AND METHODS

This prospective study included both term and preterm who were diagnosed with TTN at Ibin Sina and Al Batool Teaching Hospitals in Mosul between June 2024, and January 2025. The Local Ethics Committee approved this study.

Infants with perinatal asphyxia, meconium aspiration syndrome, congenital anomalies, metabolic diseases, sepsis, antibiotic-treated patients, those with a congenital infection caused by the TORCH complex, patients with respiratory distress syndrome, congenital cardiac diseases, or non-respiratory causes of tachypnea (hypocalcemia, persistent hypoglycemia, polycythemia) were not included in the study.

The questionnaire asked about birth weight, gender, gestational age, small for gestational age (SGA), mode of delivery, presence of complicated delivery, maternal antibiotic use, antenatal steroid use, Apgar score, need for resuscitation during delivery, hemogram and CRP.

The study data was statistically analyzed using IBM SPSS 30 (US) software. The Shapiro-Wilk test was used to determine the normality of numerical data. Descriptive measurements were expressed as numbers and percentages for categorical and median variables, with interquartile range values for non-normal distributions. Nonparametric tests were employed to assess data that did not fit the normal distribution, such as the Mann-Whitney-U test for numerical data and the chisquare test for categorical data. A p-value of <0.05 indicated statistical significance.

3- RESULTS

In the current prospective study, all of the patients were neonates diagnosed with TTN. The study included 943 babies, of which 723 were removed due to significant congenital defects (5), neonatal asphyxia (22), or disorders other than TTN (696). Thus, a total of 220 neonates identified with TTN were assessed, with 120 having tachypnea for less than 3 days and 100 having tachypnea for more than 3 days.

Table 3.1 shows comparison between patient with tachypnea last less than 3 days and those with tachypnea last more than three days regarding their clinical characteristics, its evidence that statistically significant difference was found between the two groups regarding male gender (P value=0.046), median of birth weight (P value <0.001), median of gestational age (P value <0.001), number of small for gestational age (P value =0.021), number of cesarean section (P value=0.022), median of Apgar score at 5 minutes (P value =0.013) and number of antenatal steroid use (P value <0.001). From the other hand; no statistically significant difference was found between the two groups regarding numbers of complicated delivery and maternal antenatal antibiotic use (P value > 0.05) for all.

Table 3.1: Clinical characteristics of the study populations.

Variables	Patients with tachypnea last less than 3 days (number=120)	Patient with tachypnea last more than 3 days (number=100)	P value
Gender, number (%) - Male - Female	 65 (54.1%) 55 (45.9%)	 45 (45%) 55 (55%)	**0.046**
Birth weight in grams, median ± interquartile range	2750 (2300-3300)	2250 (1900-2700)	**<0.001**
Gestational age in weeks, median ± interquartile range	37 (34-39)	33 (31-36)	**<0.001**

Small for gestational age, number (%)	6 (5%)	13 (13%)	**0.021**
Apgar score at 5 minutes, median ± interquartile range	8 (8-9)	6.5 (5-9)	**0.013**
Delivery mode, Cesarean section, number (%)	33 (27.5%)	13 (13%)	**0.022**
Presence of complicated delivery, number (%)	5 (4.1%)	11 (11%)	0.173
Antenatal antibiotic use, number (%)	31 (25.8%)	23 (23%)	0.529
Antenatal steroid use, number (%)	30 (25%)	68 (68%)	**<0.001**

Table 3.2 illustrates comparison between patient with tachypnea last less than 3 days and those with tachypnea last more than three days regarding post-natal events. Statistically significant difference was found regarding median of initial oxygen saturation (P value=0.002), hospital stay (P value <0.001) and median duration of ventilation (P value = 0.023), while no statistically significant difference regarding number of patients who need resuscitation during delivery and mode of ventilation therapy (number of patients who received CPAP and NIPAP) (P value >0.05) for all.

Variables	**Patients with tachypnea last less than 3 days (number=120)**	**Patient with tachypnea last more than 3 days (number=100)**	**P value**
Need for resuscitation during delivery, number (%)	12 (10%)	21 (21%)	0.092
Initial oxygen saturation (percent), median ± interquartile range	94 (87-98)	90 (81-95)	**0.002**
Mode of ventilation therapy, number (%): CPAP NIPPV	 8 (6.6%) 66 (55%)	 8 (8%) 52 (52%)	0.284
Duration of ventilation, (days) median ± interquartile range	2 (1-3)	3 (2-4)	**0.023**
Duration of Hospital Stay, (days), median ± interquartile range	9 (7-12)	14 (11-19)	**<0.001**

Table 3.3 explains comparison between patient with tachypnea last less than 3 days and those with tachypnea last more than three days regarding different hemogram parameters, it's evident that the median of WBC counts was statistically significant with higher readings among patient with tachypnea which is last more than three days (P value=0.003), while no statistically significant difference were found regarding the mean of hemoglobin, platelet count and c-reactive protein (P value >0.05) for all.

Hemogram parameters	**Patients with tachypnea last less than 3 days (number=120)**	**Patient with tachypnea last more than 3 days (number=100)**	**P value**
WBC (10^3/uL), median ± interquartile range	13000 (9000-16500)	16000 (11000-19500)	**0.003**
Hemoglobin, mean ± standard deviation	17.3 ± 2.3	17.6 ± 2.5	0.849
Platelet (x 1,000/mm3), mean ± standard deviation	283000 ± 65000	277000 ± 63000	0.208
C-reactive protein (mg/dl), mean ± standard deviation	3.3 ± 0.3	2.9 ± 0.4	0.234

4. DISCUSSION

Newborn transient tachypnea is a serious diagnosis that poses a treatment challenge in the intensive care unit. Persistent tachypnea is linked to prolonged hospital stays, antibiotic use, and parent concern due to the respiration rate, which can exceed 60–120 breaths per minute, maternal-infant separation may lead to respiratory supportive devices.[19-21] Additionally, recent

evidence points to a possible link between TTN and wheezing symptoms in later childhood.[1, 22]

The significant gender disparity founded in this study could be caused by variations in male and female lung development and maturation, which would lead to distinct vulnerabilities. Comparable finding was obtained from Belde Kasap et al.[23]

Consistent with Fatih Kılıçbay et al study findings, the study observed that patients lower birth weight, lower gestational age, and smaller for gestational age had significant prolong tachypnea.[24] Moreover; in the current study, patients with prolonged tachypnea were linked more with cesarean section which might due to the decreasing forces of lung compression during this mode of delivery with lower Apgar score at 5 minutes than those with less than 3 days tachypnea. Maryam Yeganegi et al was reported that cesarean section is associated with an increased risk of respiratory complications, and low 5-minute APGAR scores.[25] in contrast to Fatih Kılıçbay et al study findings who found that cesarean section and Apgar score at 5-minute were not predictive for prolong tachypnea.[24] depending on the study findings, it is considered that decreasing the rate of elective C/S would prevent morbidities like TTN.

This study found that the patients with prolong TTN had lesser oxygen saturation, more days of ventilation and hospital stay. Which is goes in the same way of Anna Bruett Hedstrom et al study findings.[26] while the need for resuscitation during delivery and mode of resuscitation seems to be not predictive for prolonged TTN which parallel to Fatih Kılıçbay et al study findings.[24]

In the present study, the WBC counts of patients with prolonged TTN founded to be significantly higher than those of less than three days tachypnea. From the other hand; Hemoglobin level, platelet count and c-reactive protein was not differed between the two groups. Comparable findings were obtained from Fatih Kılıçbay et al.[24] In contrast to Yusuf ÇELİK study findings.[27] This is means; that decisions of antimicrobial therapy should not be based on inflammatory markers alone.

There were limitations on the study. Initially, this study featured a small sample size and a prospective only two-centers design. Further limitations included the fact that cord blood samples were not obtained. Third; comparison between the hemogram parameters before and after resolutions of patients' symptoms was not done. Anyhow; to validate the study results, identify the factors affecting prolonged TTN need larger prospective trials.

5. CONCLUSION

Male gender, low birth weight, preterm delivery, small for gestational age, low Apgar score at 5 minutes, cesarean section, antenatal steroid use, low initial oxygen saturation and high WBC counts are more associated with prolonged transient tachypnea of newborn. Raised inflammatory markers alone can't predicted the need for prolonged hospital stay. Further prospective studies are need to identify the factors affecting prolonged TTN.

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CONFLICT OF INTERTEST

About this study, the authors disclose no conflicts of interest.

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