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**TRANSIENT TACHYPNEA OF THE NEWBORN**

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**Abstract:** Transient tachypnea of the newborn is a mild breathing problem. It affects babies during the first hours of life. Tachypnea means fast breathing rate, and usually affects term newborns, more likely those delivered by C-section. The problem usually goes away without treatment in 3 days or less. Only a small number of all newborn babies get this breathing problem. Your baby's healthcare provider may use a chest X-ray to help diagnose the problem. On X-ray, the lungs look streaked and overinflated. The symptoms of this breathing problem may be similar to other more serious respiratory problems. These include lung infection (pneumonia) or premature lungs (respiratory distress syndrome). Often transient tachypnea of the newborn is diagnosed when symptoms go away in the first few hours to days of life.

The **Aim** of this study was to evaluate and describe the frequency and course of perinatal and postnatal factors in neonates experiencing transient tachypnea during the first hours of life and to determine risk factors for complications of this condition.

**Methods:** This was prospective observational study during the period of six months in 2019, at the University Clinic for Gynecology and Obstetrics in Skopje. In the evaluation process were included newborn children born later than 34 gestational weeks, admitted to the Neonatal Department. The correlation between gestational age and need of oxygen support was determined, and the overall outcome of those newborns presented. If necessary, X-ray of lungs was performed.

**Results:** In this study 2268 newborns were evaluated, born as late preterm (35<sup>th</sup> and 36<sup>th</sup> gestational age) and term newborns. None of the evaluated newborns was admitted to the Intensive Neonatal Care Unit. The C-section rate in the facility during this period for the evaluated newborns was 38,5%. Transient tachypnea was detected in 178 newborn babies, 65/178 were late preterm and 113/178 were term newborns. The proportion of preterm/term newborns was 246/2022. The accurate diagnosis has to be confirmed with X-ray in 30% of all of them presenting unclear signs of respiratory problems. The condition was resolved by its own in 83%, and the other have developed symptoms of more severe respiratory diseases, as respiratory distress syndrome in premature infants, congenital pneumonia, or respiratory condition of extra-pulmonary origin.

**Discussion:** Transient tachypnea of the newborn occurs in approximately 1 in 100 preterm infants and 3.6-5.7 per 1000 term infants. It is most common in infants born by Cesarean section without a trial of labor after 35 weeks' gestation. It is self-limiting condition and the symptoms are resolved spontaneously, excluding some cases which could be complicated. The likelihood of complications is 1-2%.

**Conclusion:** Transient tachypnea is very common cause of respiratory condition in neonates. Fortunately, the prognosis is very good, but when managing transient tachypnea of the newborn, it is imminent to observe for development of respiratory fatigue and signs of clinical deterioration that may suggest some other diagnoses.

**Keywords:** transient tachypnea, term newborn, C-section

## 1. BACKGROUND

Transient tachypnea of the newborn (TTN) is a self-limited disease commonly seen in neonates and is encountered by all physicians who take care of newborn infants. Transient tachypnea of the newborn is a mild breathing problem. It affects babies during the first hours of life with tachypnea and other signs of respiratory distress, increased oxygen

requirement, and Blood Gases that do not reflect carbon dioxide retention. Tachypnea presents with some or all of the below listed symptoms and signs, according to Jha, updated 2019:<sup>34</sup>

- Rapid breathing rate of more than 60 breaths per minute
- Grunting sounds with breathing
- Flaring of the nostrils
- Pulling in at the ribs with breathing

This health condition usually affects term newborns, more likely those delivered by C-section. The problem usually goes away without treatment in 3 days or less. Only a small number of all newborn babies get this breathing problem and when managing transient tachypnea of the newborn, it is imminent to observe for development of respiratory fatigue and signs of clinical deterioration that may suggest some other diagnoses.

Some investigations are necessary in more severe cases, as chest X-ray to help diagnose the problem. On X-ray, the lungs look streaked and overinflated. The symptoms of this breathing problem may be similar to other more serious respiratory problems. These include lung infection (pneumonia) or premature lungs (respiratory distress syndrome). Very rare, an ultrasound examination can confirm the diagnosis, and this method is currently very innovative as mentioned by Liu, Palacio, Sharma,<sup>35,36,37</sup> looking for the “double lung point”. Often transient tachypnea of the newborn is diagnosed when symptoms go away in the first few hours to days of life. The average incidence of TTN was 5,7 per 1000 births.

What are the causes of this self-limiting disorder?

Delayed resorption of fetal lung fluid is thought to be the underlying cause of TTN. Fluid fills the air spaces and moves into the interstitium, where it pools in perivascular tissues and interlobar fissures until it is eventually cleared by the lymphatics or absorbed into small blood vessels. The excess lung water in TTN results in decreased pulmonary compliance. Tachypnea develops to compensate for the increased work of breathing associated with reduced compliance. In addition, accumulation of fluid in the peribronchiolar lymphatics and interstitium promotes partial collapse of the bronchioles with subsequent air trapping. Continued perfusion of poorly ventilated alveoli leads to hypoxemia, and alveolar edema reduces ventilation, sometimes resulting in hypercapnia.

During late gestation, in response to increased concentrations of catecholamines and other hormones, the mature lung epithelium switches from actively secreting chloride and liquid into the air spaces to actively reabsorbing sodium and liquid. Passive resorption of liquid also occurs after birth because of differences among the oncotic pressure of air spaces, interstitium, and blood vessels. The majority of water transport across the apical membrane is thought to occur through aquaporin 5 (AQP5) water channels. According to Isik, very important role plays the levels of dimethyl arginine.<sup>38</sup>

There are several maternal risk factors that have an impact on the likelihood of development of TTN, including delivery by caesarean section, maternal obesity as per McGillick<sup>39</sup>, endocrine disturbances, especially thyroid dysfunction, shown in studies done by Kayiran et al.<sup>40</sup>

As neonatal risk factors for the development of TTN are considered:

- Delivery before completed 39<sup>th</sup> gestational week
- Prematurity
- Male sex
- Large for gestational age

<sup>34</sup> Jha K, Makker K. Transient Tachypnea of the Newborn. [Updated 2019 Jan 13]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2019 Jan-. Accessed on August, 21<sup>st</sup>, 2019. Available from:

<https://www.ncbi.nlm.nih.gov/books/NBK537354/>

<sup>35</sup> Liu J, Chen XX, Li XW, et al. (2016). Lung Ultrasonography to Diagnose Transient Tachypnea of the Newborn. *Chest*; 149:1269.

<sup>36</sup> Palacio M, Bonet-Carne E, Cobo T, et al. (2017). Prediction of neonatal respiratory morbidity by quantitative ultrasound lung texture analysis: a multicenter study. *Am J Obstet Gynecol*; 217:196.e1.

<sup>37</sup> Sharma D, Farahbakhsh N. Role of chest ultrasound in neonatal lung disease: a review of current evidences (2019). *J Matern Fetal Neonatal Med*; 32:310.

<sup>38</sup> Isik DU, Bas AY, Demirel N, et al. (2016). Increased asymmetric dimethylarginine levels in severe transient tachypnea of the newborn. *J Perinatol*; 36:459.

<sup>39</sup> McGillick EV, Lock MC, Orgeig S, Morrison JL. (2017). Maternal obesity mediated predisposition to respiratory complications at birth and in later life: understanding the implications of the obesogenic intrauterine environment. *Paediatr Respir Rev*; 21:11.

<sup>40</sup> Kayiran SM, Erçin S, Kayiran P, et al. (2019). Relationship between thyroid hormone levels and transient tachypnea of the newborn in late-preterm, early-term, and term infants. *J Matern Fetal Neonatal Med*; 32:1342.

- Small for gestational age
- Perinatal asphyxia
- Maternal asthma
- Maternal gestational diabetes
- Endocrine diseases of the mother (thyroid)

Treatment may include: general management, respiratory treatment, nutrition, fluids, medications.

- **Supplemental oxygen.** Oxygen is given to the baby by placing a mask on the face or prongs (cannula) in the nose, or by putting the baby under an oxygen hood.
- **Blood gases tests.** These tests measure the amount of oxygen and carbon dioxide in the baby's blood. Tests may also be done to look for infection.
- **Continuous positive airway pressure.** This treatment uses a mechanical breathing machine. The machine pushes a continuous flow of air to the baby's airways to help keep tiny air passages in the lungs open.
- **IV (intravenous) fluid.** The baby may need this for hydration and nutrition if the condition does not go away within the first few hours. This is because babies who are having trouble breathing aren't able to eat.<sup>41</sup>
- **Tube feeding.** The newborn may need this if his or her breathing rate is too high for more than a few hours. This will help give him/her more nutrition without the risk of breathing in food from the mouth into the lungs.
- **Medications** (Shown in extensive studies done independently by Moresco and Vaisbourd.<sup>42,43</sup>

Once the problem goes away, the patient should get better quickly. He or she should not have a higher risk for other breathing or long-term problems.

Therefore, the **main purpose** of this research was to evaluate and describe the frequency and course of perinatal and postnatal factors in neonates experiencing transient tachypnea during the first hours of life and to determine risk factors for complications of this condition.

## 2. MATERIAL AND METHODS

This was prospective observational study during the period of the first six months in 2019, at the Department of Neonatology within the University Clinic for Gynecology and Obstetrics in Skopje. Inclusion criteria were gestational age more than completed 34 gestational weeks admitted to the Neonatal Department and no other health problem but suspected TTN.

Evaluation of the known and supposed maternal and neonatal risk factors, as follows:

- Maternal age
- Potentially existing gestational or preexisting Diabetes mellitus
- Maternal Body Mass Index
- Thyroid dysfunction
- Allergic diseases in the family members
- Mode of delivery
- Birth weight matched with gestational age (birth weight appropriate for the age [AGA], small for gestational age [SGA], and large for gestational age [LGA])

Exclusion criteria were mainly prematurity of less than 34 vcompleted gestational weeks, known high risk factors for infection, congenital pneumonia, congenital anomalies of the lungs or/and heart, birth asphyxia.

The correlation between gestational age and need of oxygen support was determined, and the overall outcome of those newborns presented. If necessary, X-ray of lungs was performed. The collected data were sorted according to the evaluated determinants.

As control group were considered 200 consecutively vaginally delivered full term or near term (35 and 36 gestational weeks) who have not developed any signs of respiratory failure.

<sup>41</sup> [Kassab M, Khriesat WM, Anabrees J. \(2015\). Diuretics for transient tachypnoea of the newborn. \*Cochrane Database Syst Rev\*:CD003064.](#)

<sup>42</sup> [Moresco L, Bruschetini M, Cohen A, et al. \(2016\). Salbutamol for transient tachypnea of the newborn. \*Cochrane Database Syst Rev\*: :CD011878.](#)

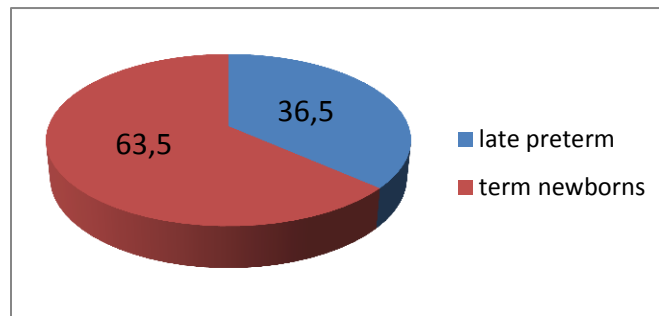
<sup>43</sup> [Vaisbourd Y, Abu-Raya B, Zangen S, et al. \(2017\). Inhaled corticosteroids in transient tachypnea of the newborn: A randomized, placebo-controlled study. \*Pediatr Pulmonol\*; 52:1043.](#)

**3. RESULTS**

In this study 2268 newborns were evaluated, born as late preterm (35<sup>th</sup> and 36<sup>th</sup> gestational age) and term newborns. None of the evaluated newborns was admitted to the Intensive Neonatal Care Unit.

The proportion of preterm/term newborns was 246/2022. Transient tachypnea was detected in 178 newborn babies, 65/178 were late preterm and 113/178 were term newborns.(Figure 1). In our study, the common incidence was 7,8/1000, and in late preterm was 26,4/1000 preterm newborns, whilst in term newborns 5,6/1000 newborns.

**Figure 1. Proportion of the preterm and full term newborns in the group with TTN**



Maternal age was non-significantly higher in the evaluated group (Table 1).

**Table 1. The mean maternal age of the newborns included in the study**

|                                    | Maternal age | Statistical significance |
|------------------------------------|--------------|--------------------------|
|                                    | Mean ±SD     | p<0,05                   |
| Group of newborns with TTN (n=178) | 33.4±2.3     | n.s.                     |
| Control group (n=200)              | 30.2±3.8     | n.s.                     |

\*TTN Transient Tachypnea of the newborn

Existence of gestational Diabetes mellitus was significantly more frequently present in the group of newborns with TTN compared to healthy newborns, but thyroid dysfunction was equally present in both groups (Table 2).

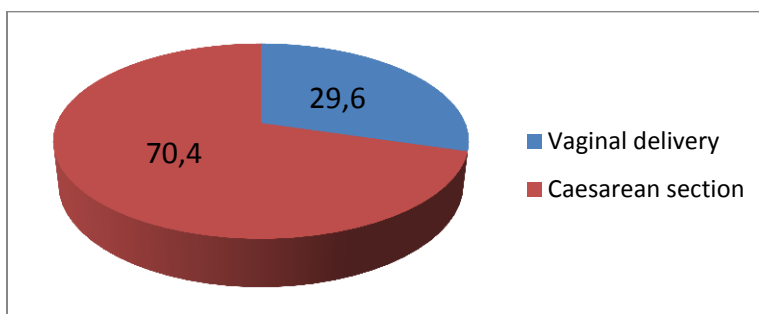
**Table 2. The presence of endocrine disease in both groups of newborns**

|                                     | Presence of maternal disease |                     |
|-------------------------------------|------------------------------|---------------------|
|                                     | Diabetes mellitus            | Thyroid dysfunction |
| Group of newborns with TTN<br>n=178 | 46 (25,8%)                   | 10 (5,6%)           |
| Control group<br>n=200              | 27 (13,5%)                   | 9 (4,5%)            |
|                                     | p<0,05**                     |                     |
|                                     |                              | p>0,05              |

\*TTN Transient Tachypnea of the newborn

\*\* statistical significance on p<0,05

The C-section rate in the facility during this period for the evaluated newborns was 38,5%. The signs and confirmation of TTN was found mainly in those born by Caesarean section (Figure 2).

**Figure 2. The proportion of the newborns with TTN according to the mode of delivery**

There was not statistically significant difference in frequency of presence of other risk factors in both groups. The accurate diagnosis had to be confirmed with X-ray in 30% of all of them presenting unclear signs of respiratory problems. The condition was resolved by its own in 83%, and the other have developed symptoms of more severe respiratory diseases, as respiratory distress syndrome in premature infants, congenital pneumonia, or respiratory condition of extra-pulmonary origin.

#### 4. DISCUSSION AND CONCLUSION

Transient tachypnea of the newborn occurs in approximately 1 in 100 preterm infants and 3,6-5,7 per 1000 term infants. In our study, the common incidence was 7,8/1000, and in late preterm was 26,4/1000 preterm newborns, whilst in term newborns 5,6/1000 newborns, which is close to the overall incidence in other studies. It is most common in infants born by Caesarian section without a trial of labor after 35 weeks' gestation. It is self-limiting condition and the symptoms are resolved spontaneously, excluding some cases which could be complicated. The likelihood of complications is 1-2%. Therefore, the condition of Transient Tachypnea of the newborn is very common cause of respiratory condition in neonates. Fortunately, the prognosis is very good, but when managing transient tachypnea of the newborn, it is imminent to observe for potentially dangerous development of respiratory fatigue and signs of clinical deterioration that may suggest some other diagnoses.

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