Incidence, clinical profile and outcome of transient tachypnea of newborn

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Abstract

Introduction: Respiratory distress is a common problem in neonates necessitating admission. Transient tachypnea of newborn (TTNB) is most common after term cesarean delivery. It is characterized by the early onset of tachypnea with retractions, or expiratory grunting and, occasionally, cyanosis. Distinguishing the disease from respiratory distress syndrome (RDS) and other respiratory disorders may be difficult, and TTNB is frequently a diagnosis of exclusion; the distinctive features of TTNB are rapid recovery of the infant and the absence of radiographic findings for RDS (hypoaeration, diffusereleticulogranular pattern, air bronchograms) and other lung disorders. Objective: To study incidence, clinical profile of TTNB and to identify clinical clues that may help in prediction of severity of disease and need for early intervention for better outcome in patients with TTNB.

Study design: This is a prospective study conducted at a tertiary care institute in late preterm and term babies admitted in neonatal intensive care unit (NICU) with respiratory distress during the study period. Results: Total admissions during study period were 510 of which 22 Newborns had TTNB. The average gestational age of 36+1.2 weeks and birth weight of 2924 + 404 gm. Neonates were included in the study following inclusion criteria. Risk factors identified for TTNB includes caesarean section (most common), male sex, infant of diabetic mother. Outcome can be predicted based, on Downe’s score at presentation and time of development of respiratory distress after birth. Conclusion: According to this study all late preterm and term newborn delivered through LSCS are at greater risk for developing TTNB and early development of respiratory distress and higher Downe’s score at presentation are associated with longer hospital stay.

Keywords: TTNB, Newborn, Outcome, Risk factors

Introduction

Respiratory distress is one of the most common indications for admission of newborn in NICU. TTNB is a common condition in full-term or late preterm infant with an estimated incidence between 0.5% and 2.8% of all deliveries as a result of inadequate or delayed clearance of fetal lung fluid [1]. Clinical symptoms include tachypnea, expiratory grunting, nasal flaring and retraction immediately after birth or later. Symptoms usually resolve within 48-72hrs after birth but can last up to 5 days [2]. Disorder is more prevalent among infants who are male, premature, or via cesarean section without labour or born to a mother with diabetes or asthma and among infants who have perinatal asphyxia [3].

Initial symptoms of TTNB are not easily differentiated from those of respiratory distress syndrome, pneumonia and persistent pulmonary hypertension of newborn leading to unnecessary imaging, blood testing and empiric antibiotic therapy as a result of misdiagnosis.

Treatment comprises supportive care including supplemental oxygen, with holding of enteral feeds and administration of intravenous fluids [4].
its transient nature TTNB is a nontrivial cause of neonatal respiratory distress associated with a substantial use of health care resources [5]. Many studies were conducted on the risk factors and association for predicting outcome at the time of presentation [6].

Materials and Methods

**Place and type of study:** This is a prospective study carried out in pediatric department of C Anand Rao Institute of Medical Sciences, a tertiary care hospital at Karimnagar, Telangana. After taking clearance from hospital ethical committee and consent from parents,

**Sample collection & duration of study:** All newborns admitted in NICU between May 2016 to April 2017 were included in the study.

**Inclusion criteria**
1. Completed 34wks gestational age
2. Onset of respiratory distress within 6hrs.
3. Respiratory distress at the time of admission (Respiratory rate >60/min, grunting, nasal, flaring and retractions).
4. Typical chest radiography findings (fluid in minor fissures, Hyperinflation or increased anteroposterior diameter, prominent vascular/perihilar markings (sunburst pattern).

**Exclusion criteria**
1. Preterm <34 weeks GA
2. Patients having polycythemia, hypoglycemia, hypocalcaemia, meconium aspiration, pneumonia, aspiration, congenital heart disease, perinatal asphyxia, congenital malformations, tachycardia and early onset sepsis.

At the time of admission respiratory rate (breaths/min), Heart rate (beats/min), O₂ saturation, fraction of inspired O₂, blood glucose, complete blood count, arterial blood gas analysis, chest x-ray and clinical scoring for TTNB (Table 1) was done.

**Table-1: Downe's clinical scoring [7]**

<table>
<thead>
<tr>
<th>Score</th>
<th>0</th>
<th>1</th>
<th>2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cyanosis</td>
<td>None</td>
<td>In room air</td>
<td>In 40% FiO₂</td>
</tr>
<tr>
<td>Retractions</td>
<td>None</td>
<td>Mild</td>
<td>Severe</td>
</tr>
<tr>
<td>Grunting</td>
<td>None</td>
<td>Audible with stethoscope</td>
<td>Audible without stethoscope</td>
</tr>
<tr>
<td>Air entry</td>
<td>Normal</td>
<td>Decreased</td>
<td>Barely audible</td>
</tr>
<tr>
<td>Respiratory rate</td>
<td>&lt;60/min</td>
<td>60-80/min</td>
<td>80/min or apnea</td>
</tr>
</tbody>
</table>

**Interpretation:** Score > 4 = Clinical respiratory distress- monitor arterial blood gases, Score >7 = Impending respiratory failure

All newborns during the study period admitted to NICU with complaints of respiratory distress, tachypnea, grunt within 6hrs of birth were evaluated clinically using Downe’s score and laboratory work up as needed to rule out other causes of respiratory distress and child was monitored for requirement of oxygen, continuous positive airway pressure (CPAP), and ventilator support and outcome noted as discharge or death.

The support given to the newborn was categorized as shown in table 2.
Table-2: Level of Support.

<table>
<thead>
<tr>
<th>Level</th>
<th>Respiratory support</th>
<th>Oxygen concentration</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>No oxygen</td>
<td>-</td>
</tr>
<tr>
<td>2</td>
<td>Face mask</td>
<td>30</td>
</tr>
<tr>
<td>3</td>
<td>Hood</td>
<td>40</td>
</tr>
<tr>
<td>4</td>
<td>Nasal cannula</td>
<td>50(5L/min)</td>
</tr>
<tr>
<td>5</td>
<td>NCPAP(^*) (PEEP(^#): 5cm H(_2)O)</td>
<td>50-60</td>
</tr>
</tbody>
</table>

\(^*\)Nasal continuous positive airway pressure  \(^#\)Positive end expiratory pressure

**Data Analysis:** Comparison of continuous variation was done by one way ANOVA and proportions by Chi-square test or student T test. Analysis was done using windows based SPSS statistical package 19.0.

**Results**

Total live births during study period were 1670 of which 510 (30.53%) neonates were admitted in NICU for various conditions. Of these case, 22 (4.31%) were identified as TTNB with an incidence of 13.17 cases per 1000 live births. All of the 22 infants were included in the study. The average gestational age of newborn was 36+1.2wks and birth weight was 2924+404gm. Of newborns, males were 20 and females were 2. out of 22 cases, 20 cases were born out of cesarean section and 2 cases born by normal vaginal delivery (NVD). One newborn was born to mother with overt Diabetes mellitus (Table 3).

Table-3: Demographic characteristics of maternal and newborn.

<table>
<thead>
<tr>
<th>Gestational age in weeks (mean±SD)</th>
<th>36±1.6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Birth weight (mean±SD)</td>
<td>2924+404</td>
</tr>
<tr>
<td>Gender(male/female)</td>
<td>20/2</td>
</tr>
<tr>
<td>Elective cesarean section/NVD</td>
<td>90.09%/9.91%</td>
</tr>
<tr>
<td>APGAR score at 5 min</td>
<td>10(7-10)</td>
</tr>
<tr>
<td>Initial respiratory rate</td>
<td>82+9</td>
</tr>
<tr>
<td>TTNB score</td>
<td>5+2</td>
</tr>
<tr>
<td>WBC(mean±SD)</td>
<td>15.8±4.7</td>
</tr>
<tr>
<td>Peak respiratory rate</td>
<td>81±8</td>
</tr>
<tr>
<td>Respiratory support</td>
<td></td>
</tr>
<tr>
<td>Oxygen</td>
<td>21</td>
</tr>
<tr>
<td>CPAP</td>
<td>1</td>
</tr>
<tr>
<td>Mechanical ventilation</td>
<td>0</td>
</tr>
<tr>
<td>Oxygen saturation(^%)(mean±SD)</td>
<td>92±5</td>
</tr>
<tr>
<td>Duration of hospital stay</td>
<td>4+2</td>
</tr>
<tr>
<td>Heart rate</td>
<td>130±8</td>
</tr>
<tr>
<td>Blood glucose</td>
<td>60±7</td>
</tr>
<tr>
<td>CRP</td>
<td>Negative</td>
</tr>
</tbody>
</table>

APGAR at 5min was 7±3, on average neonatal tachypnea was first detected 3±1.5hrs of life and initial respiratory rate was 82±9 breaths/min.

Of 22 cases 21 cases managed on supplemental oxygen one case was managed on CPAP and duration of CPAP was for 48 hours and no cases required mechanical ventilation and all case discharged at 4+2 days.
Transient tachypnea of the newborn (TTNB), first
described by Avery and coworkers in 1966 as a
result from delayed clearance of fetal lung fluid [3].
TTNB is also known as wet lung syndrome, type 2
respiratory syndromes, prolonged transition/
transient RDS and retained fetal lung fluid. It is a
clinical syndrome associated with respiratory
distress usually seen shortly after delivery in infants.
Affected term or late preterm infants usually present
within the first 6 hours of life with tachypnea;
respiratory rates are typically 60 to 120 breaths per
minute. The tachypnea may be associated with mild
to moderate respiratory distress with retractions,
grunting, nasal flaring, and/or mild cyanosis that
usually responds to supplemental oxygen at <0.40
FiO₂.

Mechanism of clearing alveolar fluid in fetus mainly
occurs during labour and after birth. During late
pregnancy as a result of increased secretion of
epinephrine and other hormones, neonatal mature
lung switches from secreting fluid into air spaces to
starting reabsorbing it. Resorption of neonatal lung
fluid also occurs after birth because of changes of
oncotic pressure between alveoli, interstitial tissue
and small blood vessels [3, 8].

Delayed resorption of lung fluid in fetus is
considered main cause of TTNB where fluid fills air
spaces and moves into interstitial perivascular tissue
and interlobar fissure until drained by lymphatics or
capillaries. Excess lung fluid in TTNB results in
decreased lung functions. Tachypnea will occur to
compensate for decreased gas exchange associated
with increased lung fluid. Risk factors for TTNB
include birth by cesarean section without labor,
precipitous birth, and preterm birth [9, 10].
These have been attributed to delayed or abnormal
fetal lung fluid clearance due to the absence of the
hormonal changes that accompany spontaneous
labor. Other risk factors include male gender and
family history of asthma (especially the mother).
The mechanism underlying the gender and asthma
associated risks is unclear but may be related to
altered sensitivity to catecholamine’s that play a role

The chest radiograph of an infant with TTNB is
consistent with retained fetal lung fluid, with
characteristic prominent perihilar streaking (sunburst
pattern) due to engorgement of periarterial
lymphatics that participate in the clearance of
alveolar fluid. Coarse, fluffy densities may reflect
alveolar edema. Hyper aeration with widening of
intercostal spaces, mild cardiomegaly, widened and
fluid-filled interlobar fissure, and mild pleural
effusions may also be observed [4].

Treatment is mainly supportive with provision of
supplemental oxygen, as needed. More severe cases
may respond to CPAP to improve lung recruitment.
Infants often undergo an evaluation for infection and
are treated with antibiotics for 24 to 48 hours until
blood cultures are negative [12]. If tachypnea
persists and is associated with increased work of
breathing, gavage feed or intravenous fluids may be
needed. Strategies aimed to facilitate lung fluid
absorption have not shown clinical efficacy. Oral
furosemide has not been shown to improve the
duration of tachypnea or length of hospitalization
[13].

In our study one case of infant of Diabetic mother
developed TTNB which is a well-known risk factor
[14]. In a study done by Basseyetal over a period of
5yrs i.e., 2008 to 2012 showed that the commonest
intrapartum complications was fetal distress in
42.86%[15]. We observed high incidence of TTNB
in neonates delivered by caesarean section which is
one of the most important risk factor for TTNB.

Kasap et al have also observed similar male
preponderance in their study [16]. There are several
risk factors that aggravate TTNB symptoms such as
male sex, caesarean section, low APGAR score [4].

Higher Downe’s scores were predictive for further
respiratory support in our study newborns with
higher Downe’s score required CPAP for 48hrs
similar to the study done by Kahveciogluet al
that higher Silverman scores were predictive for
further respiratory support [17]. Study by Shashidhar et
al stated that the inter rater reliability was higher in
Downes score (alpha=0.69- acceptable) as compared
to Silverman scores (alpha=0.33- questionable)[18].

Hence we used Downes score for TTNB assessment
in our study. Study by Weintraub et al in 745
neonates with the initial diagnosis of TTNB, 336
(45%) infants required CPAP or high flow nasal
cannula treatment [11]. In one case respiratory peak during 20hrs >90/min caused prolonged tachypnea similar to study by Kasapetal [16]. Percentage of inspired oxygen on admission is predictors of significant respiratory support.

**Summary and Conclusions**

To conclude our study confirms that simple scores can help predict likelihood of deterioration and may be helpful for clinical intervention of neonate with diagnosis of TTNB and better outcome.

The estimated incidence of TTNB of all deliveries were higher (4.3%) than normal (0.3-2.8%) as ours is a tertiary care institute with higher cases of high risk pregnancy deliveries. As the study group consists of small number larger studies may require endorsing the results.

**What the study added?**

- The study reinforces that TTNB is a benign condition.
- Recognition of the symptoms and signs is important
- Avoid unnecessary investigations and treatment
- Our study works as a reference to all practitioners of this area as it is first of its kind from this area.

**Author's contributions:** SM: Conceived the study, made intellectual contribution to the study protocol, wrote the first draft of the manuscript.

SC/AK/SB/PR: Made intellectual contribution to the study protocol, read and edited the manuscript. All authors read and approved the final manuscript.

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**List of abbreviations**

- **TTNB:** Transient tachypnea of newborn, **RDS:** Respiratory distress syndrome, **GA:** Gestational age, **NICU:** Neonatal intensive care unit, **CPAP:** Continuous positive airway pressure, **NCPAP:** Nasal continuous positive airway pressure, **PEEP:** Positive end expiratory pressure, **ANOVA:** Analysis of variation, **SPSS:** Statistical Package for the Social Sciences, **LSCS:** Lower section cesarean section, **SD:** Standard deviation, **NVD:** Normal vaginal delivery, **CRP:** C reactive protein, **WBC:** White blood cells.

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