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Original Research Article

FACTORS LEADING TO TRANSIENT TACHYPNEA OF NEWBORN (TTN) IN BABIES, DELIVERED BY SPONTANEOUS VAGINAL DELIVERY AT TERTIARY CARE HOSPITAL KARACHI

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Abstract: *Neonatal respiratory distress is a common issue, and one of its types is Transient Tachypnea of the Newborn (TTN), which happens when leftover lung fluid is not removed from the body on time. TTN usually occurs within the first 24 to 72 hours after delivery. This study aims to determine the frequency of TTN in newborns delivered vaginally and spontaneously at a tertiary care hospital in Karachi and identify the factors that may contribute to the condition. The study adopted a cross-sectional design and was conducted in the Neonatal Intensive Care Unit of the Department of Pediatric Medicine, Ziauddin Hospital, Karachi. After obtaining the necessary approvals, the study lasted for 9 months, from December 2021 to September 2022. Both quantitative and qualitative data were collected, assembled, and analyzed. Stratification was employed to adjust for effect modifiers, and a chi-square test was used to test for statistical significance with a p-value of 0.05. The study included 153 patients who met the inclusion and exclusion criteria. The average gestational age, height, weight, OFC, length of hospital stay, and mother's age were 30.7 ± 4.3 weeks, 49 ± 1.79 cm, 3.01 ± 0.38 kg, 36.65 ± 1.08 cm, 3.92 ± 4.65 days, and 39.8 ± 2.78 weeks, respectively. Of the 153 patients, 71 (46.4%) were male and 82 (53.6%) were female. 44.4%, 31.4%, 45.1%, and 31.4% of the patients had maternal diabetes, PROM, obesity, and low APGAR scores, respectively. The study found maternal diabetes and obesity were the primary risk factors for TTN in newborns. The study emphasizes the importance of good antenatal and obstetric care to detect any early problems during pregnancy that may contribute to the incidence of TTN.*

Keywords: Transient Tachypnea of Newborn, Maternal Diabetes, Obesity, PROM, Low APGAR Score

Introduction

Transient tachypnea of the newborn (TTN), also known as retained foetal fluid or wet lung disease, is characterized by tachypnea within the first few hours of life and up to 24-72 hours beyond that (Pramanik et al., 2015). It is a benign, self-limiting disease that can develop soon after birth in neonates of any gestational age (DERNEĞİ). It is brought on by a delay in evacuating the fetal lung fluid after birth, resulting in poor gas exchange, uncomfortable breathing, and tachypnea.

Caring for newborn infants with respiratory distress in the nursery frequently creates a serious diagnostic issue (Reuter et al., 2014). Although there is little epidemiologic data, research indicates that TTN affects 3.6 to 5.7 out of every 1,000 term newborns. Preterm newborns may retain foetal lung fluid more frequently (10 per 1,000 births), although concurrent conditions like respiratory distress syndrome (RDS) frequently obscure its presentation (Gallacher et al., 2016). Male sex, shorter gestational age, macrosomia, maternal diabetes, birth by caesarean section with or without labor, and family history of asthma (particularly in the mother) are risk factors for TTN (Kotecha et al., 2016). One of the most frequent factors contributing to infant respiratory distress is TTN, which may go undiagnosed. Babies born through elective caesarean section are much more likely to experience respiratory morbidity depending on whether labor was present and when it occurred (Ahmed et al., 2015). Supportive medical treatment is provided for newborns with transient tachypnea (TTN). The infant's pulmonary condition improves when the lymphatic system absorbs the residual lung fluid. Until the respiratory rate has slowed sufficiently to permit oral feedings, supportive treatment consists of intravenous fluids and gavage feedings (Bak et al., 2012; Oztekın et al., 2014).

Although TTN is more common in infants who give birth through caesarean section, several cases have documented TTN occurrence in infants who deliver vaginally. According to a study by Takaya et al., 3.7% of infants born at term by spontaneous vaginal delivery (SVD) experienced transient tachypnea of the newborn (TTN) (Takaya et al., 2008). Another research by Toril et al. revealed that 0.8% of people had TTN (Kolås et al., 2006). This study aims to ascertain the prevalence and risk factors of transient tachypnea of the newborn (TTN) among infants born in our system by spontaneous vaginal delivery (SVD). Since TTN is often identified in infants who have had caesarean sections, some instances have been documented in which TTN has also been discovered in infants who have had SVDs (Jobe, 2012).

Additionally, there hasn't been enough local data on the subject to accurately portray the scope of the issue on a local and regional level. Another intriguing feature is that TTN often needs supportive treatment and usually resolves between 24 to 72 hours. Consequently, we think that by doing this study, we will be able to document cases of TTN following vaginal birth with the aid of our research and take the required and timely measures if they develop TTN in the future. If real-time management were taken into account, it would eventually lessen illness burden, lessen problems related to this condition, and enhance newborn outcomes (Warren and Anderson, 2010). To evaluate the prevalence of and contributing variables for transient tachypnea of

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newborns (TTN) in infants delivered vaginally spontaneously at a tertiary care hospital in Karachi.

Methodology

The study was designed as a cross-sectional study conducted at the Neonatal Intensive Care Unit (NICU) of the Department of Pediatric Medicine, Ziauddin Hospital Karachi. The study duration was nine months after approval of the synopsis from 30-12-21 to 30-09-22. The sample size was determined using the WHO sample size calculator to achieve a confidence level of 95%, a desired precision of 3%, and an approximation of the population's TTN of 3.7%. The maximum sample size calculated was 153. The sampling technique used was non-probability consecutive sampling.

The inclusion criteria for the study were all term neonates (gestational age ≥ 37 weeks) who developed respiratory difficulty (respiratory rate > 60/minute) within 4 hours following birth, regardless of gender. On the other hand, preterm neonates, those who develop respiratory difficulty more than 4 hours after delivery, term neonates with respiratory distress due to an underlying cause other than TTN, and neonates with congenital lung anomalies who present with sudden onset of respiratory distress following birth such as diaphragmatic hernia or congenital cystic adenomatoid malformation (CCAM) were excluded from the study. The exclusion of preterm neonates was because they are more prone to retain the lung fluid due to poor clearance, while neonates with obvious underlying causes of respiratory distress other than TTN could not depict the study's inclusion criteria and, thus, affect the results. Therefore, only term neonates who developed respiratory difficulty within 4 hours following birth were included in the study.

Before beginning the trial, the Ziauddin Hospital in Karachi's Ethical Review Committee gave its permission. Before conducting the study, permission from the facility management was obtained. The parents of research participants provided written informed permission. Confidentiality was maintained. Then, after getting approval for synopsis by CPSP, all neonates who met the inclusion criteria will be part of the study. A detailed history of neonates followed by examination with complaints of respiratory difficulty was carried out. Chest X-ray of all neonates to demonstrate the evidence of TTN (fluid in the fissure).

Moreover, neonates with significant respiratory distress were managed by oxygen supplementation accordingly. Before entering the data into Proforma, senior resident analysis of the results was followed by a second round of consultant review. Afterward, all the findings of the study variables such as maternal age, height, weight, BMI, residence, head circumference, gestational age, booking status, birth weight, gender of the neonate, maternal diabetes, PROM, APGAR Score, transient tachypnea of the newborn, length of stay will be noted in predesigned proforma.

SPSS version 22.0 was used for the analysis of the data. The Saphiro-Wilk test was used to determine if the data were normal. For quantitative factors, including age, weight, height, OFC (occipitofrontal circumference), duration of stay in days, BMI, APGAR Score, gestational age, and birth weight, the mean value and standard deviation, or Med (IQR), were determined.

Frequencies with percentages were presented for qualitative variables like gender (male/female), maternal history of Premature rupture of membranes (PROM) (Yes/No), history of maternal diabetes(Yes/No), maternal health according to BMI(underweight/normal range/overweight/obese), low Apgar score(moderately depressed/severely depressed), residence, booking status, transient tachypnea of the newborn. Post-stratification Chi-square Fisher's Exact test (if frequency 5 in any cell) was used. A P-value of 0.05 was taken as statistically significant. Effect modifiers were controlled through stratification of age, gender, length of stay, history of maternal diabetes, history of PROM, gestational age, birth weight, residence, booking status, BMI, and APGAR Score to see the effect of these.

Results

In total, 153 patients who satisfied the inclusion and exclusion criteria and were admitted to the Neonatal Intensive Care Unit (NICU) of the Department of Peadiatric Medicine, Ziauddin Hospital Karachi, were included in the research. In our study, the mean maternal age, height, weight, OFC, hospital stay length, and gestational age were determined from 153 patients. These values were 30.714.30 years, 491.79 cm, 3.010.38 kg, 36.651.08 cm, 3.924.65 days, and 39.82.78 weeks, respectively. According to Table 1. 68 (44.4%) and 85 (55.6%) of the 153 patients, respectively, had and did not have maternal diabetes. According to Figure 1. 48 (31.4%) and 105 (68.6%) of the 153 patients developed maternal PROM, respectively. According to Figure 2. 69 (45.1%) and 84 (54.9%) of the 153 patients had maternal obesity, respectively. As seen in Figure 3.

48 (31.4%) and 105 (68.6%) of the 153 patients had poor APGAR scores, respectively. According to Figure 4. 73 (46.4%) and 82 (53.6%) of the 153 patients were male and female, respectively, according to Figure 5. Out of 153 patients, the frequency distribution of gestational age revealed that 68 (32.5%) and 85 (55.6%) fell into the age groups of 39 weeks and more, respectively. According to Figure 6, which shows the frequency distribution of resident status, out of 153 patients, 126 (82.4%) and 27 (17.6%) lived in urban areas and 27 (17.6%) in rural areas, respectively. Individuals with gestational ages > 39 weeks did not have maternal diabetes in 31 (45.6%) or 54 (63.5%) individuals, respectively. P-value was at 0.02. As seen in Table 2. A gender-based stratification of maternal diabetes revealed that 25 (35.2%) of the male group and 46 (64.8%) did not have the condition, respectively. However, in the female group, 39 (47.6%) had no maternal diabetes, whereas 43 (52.4%) did. P-value was at 0.03. According to Table 3.

Maternal diabetes was found to be present in 59 (46.8%) of urban residents (who had urban residency) and 67 (53.2%) of them (who did not), respectively. Contrarily, maternal diabetes was present in 09 (33.3%) and 18 (66.7%) of the rural residents, respectively. P-value was at 0.20. According to Table 4. Maternal diabetes was a factor in the stratification of booking status, with those who were booked having a rate of 42 (42.4%) and 57 (57.6%), respectively.

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While the unbooked group had maternal diabetes in 26 (48.1%) and none in 28 (51.9%) cases respectively. Indicator P was 0.49. As seen in Table 5.

Maternal diabetes was categorized according to the length of hospital stay, and among patients with stays under seven days, 55 (48.7%) and 58 (51.3%) had the condition, respectively. While 27 (67.5%) and 13 (32.5%) of the patients who stayed in the hospital for more than seven days did not have maternal diabetes, respectively. 0.07 was the P-value, according to Table 6. Maternal PROM was present in 21 (30.9%) and 27 (31.8%) patients who fell into the gestational age group of 39 weeks, respectively, when gestational age was stratified. Patients with gestational ages > 39 weeks did not have maternal PROM in 47 (69.1%) and 58 (68.2%) of the cases, respectively. Indicator P was 0.90. As seen in Table 7.

Table-1: Descriptive Statistics n=153

VARIABLE	MEAN ± SD	STANDARD DEVIATION	MIN-MAX
Maternal Age (Years)	30.71	±4.30	23-40
Height (CM)	49	±1.79	44-54
Weight (KG)	3.01	±0.38	2-4
OFC (CM)	36.65	±1.08	32-36
Length Of Hospital Stay (Days)	3.92	±4.65	3-8
Gestational Age (Weeks)	39.8	±2.78	36-42

Table 2: Maternal Diabetes According To Gestational Age n=153

GESTATIONAL AGE (WEEKS)	MATERNAL DIABETES		TOTAL
	YES	NO	
≤ 39	37 (54.4%)	31 (45.6%)	**68 (100%)**
> 39	31 (36.5%)	54 (63.5%)	**85 (100%)**
Total	68 (44.4%)	85 (55.6%)	**153 (100%)**
P-Value	**0.02**		

Table 3: Maternal Diabetes According To Gender n=153

GENDER	MATERNAL DIABETES		TOTAL
	YES	NO	
Male	25 (35.2%)	46 (64.8%)	**71 (100%)**
Female	43 (52.4%)	39 (47.6%)	**82 (100%)**
Total	68 (44.4%)	85 (55.6%)	**153 (100%)**
P-Value	**0.03**		

Table 4: Maternal Diabetes According To Residence Status n=153

RESIDENCE STATUS	MATERNAL DIABETES		TOTAL
	YES	NO	
Urban	59 (46.8%)	67 (53.2%)	**126 (100%)**
Rural	09 (33.3%)	18 (66.7%)	**27 (100%)**
Total	68 (44.4%)	85 (55.6%)	**153 (100%)**
P-Value	**0.20**		

Table-5: Maternal Diabetes According To Booking Status n=153

BOOKING STATUS	MATERNAL DIABETES		TOTAL
	YES	NO	
Booked	42 (42.4%)	57 (57.6%)	**99(100%)**
Un-booked	26 (48.1%)	28 (51.9%)	**54(100%)**
Total	68 (44.4%)	85 (55.6%)	**153(100%)**
P-Value	**0.49**		

Table 6: Maternal Diabetes According To Length Of Stay n=153

LENGTH OF STAY (DAYS)	MATERNAL DIABETES		TOTAL
	YES	NO	
≤ 7	55 (48.7%)	58 (51.3%)	**113 (100%)**
> 7	13 (32.5%)	27 (67.5%)	**40 (100%)**
Total	68 (44.4%)	85 (55.6%)	**153 (100%)**
P-Value	**0.07**		

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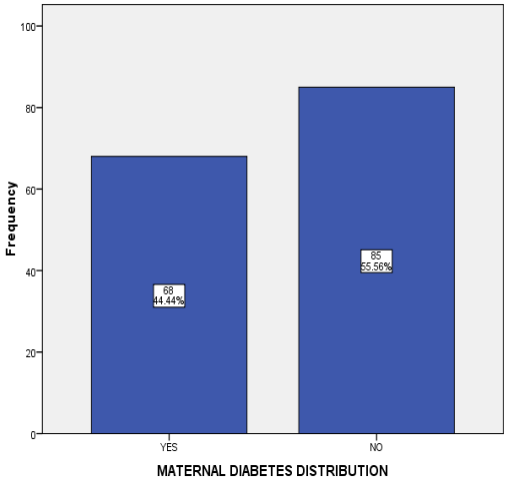

Figure-1: Maternal Diabetes Distribution n=153

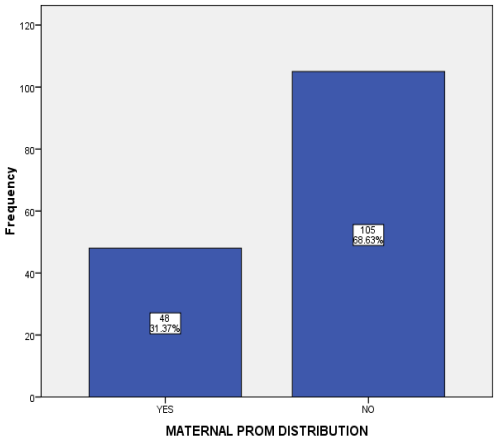

Figure 2: History Of Maternal Premature Rupture Of Membrane Distribution n=153

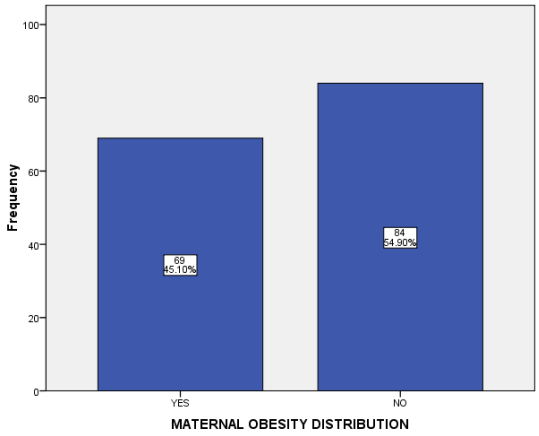

Figure 3: Maternal Obesity Distribution n=153

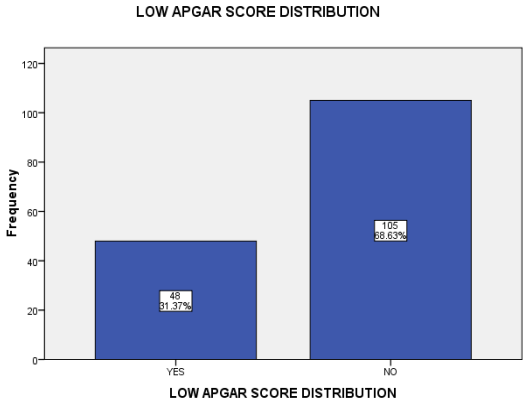

Figure 4: Low Apgar Score Distribution n=153

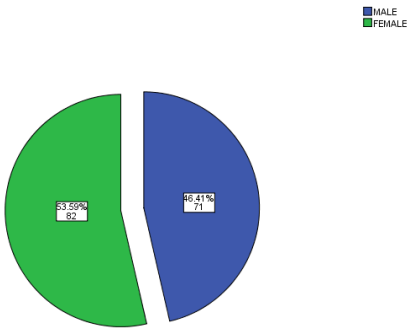

Figure 5: Gender Distribution n=153

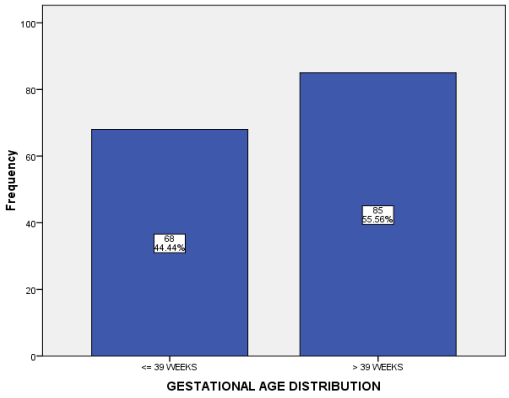

Figure 6: Gestational Age Distribution n=153

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Discussion

Before a kid is born, a number of changes take place to prepare the body for the transition from intrauterine to extrauterine life. The five main events that determine the lungs as the organ of gas exchange at birth are the clearing of fetal lung fluid, the start of spontaneous breathing, the decrease in pulmonary vascular resistance, the release of surfactant, and the cessation of the right-to-left shunting of venous blood returning to the heart (Al-Lawama et al., 2019; Hibbard et al., 2010). The volume of the developing fetal lungs is comparable to the functional residual capacity developed after air-breathing starts because fluid is released into the alveoli to maintain healthy growth and function (Verani et al., 2010). A number of factors can affect lung fluid clearance, and if it is compromised, tachypnea will occur, necessitating admission to an intensive care unit for observation and breathing support (Bahadue and Soll, 2012).

The research comprised 153 patients who met the inclusion and exclusion criteria. The mean values for the mother's age, height, weight, OFC, duration of hospital stay, and gestational age in our research were, respectively, 30.714.30 years, 49.11.79 cm, 3.010.38 kg, 36.651.08 cm, 3.924.65 days, and 39.82.78 weeks. Women comprised 82 (53.6%) and 71 (46.4%) participants. Maternal diabetes, PROM, obesity, and low APGAR scores were present in 44.4%, 31.4%, 45.1%, and 31.4% of the 153 patients, respectively. Maternal asthma 10.5% (p-value=0.01), male sex 66.5% (p-value=0.001), late preterm 21% (p-value=0.009), and elective caesarean section 56% (p-value=0.001) all significantly predicted the development of TTN., Significant variables were low birth weight (16.5%, p=0.003), birth asphyxia (9.5%, p=0.005), prolonged labor or use of forceps or suction (22%, p=0.037), and in vitro fertilization (2.5%, p=0.024).

Demographic information and labor characteristics were gathered from patient charts. Nulliparity, a history of infertility treatments like IVF, augmentation of labor, an unsettling foetal state, vacuum or forceps delivery, and low Apgar scores (7) at 1 and 5 minutes were all significantly associated with a higher risk of TTN, according to a multifaceted study.

A low Apgar score at 1 minute was another factor strongly associated with the incidence of TTN (adjusted odds ratio, 20; 95% confidence intervals, 12-34; p0.001). According to the most recent studies, improved obstetric surveillance is necessary to decrease the frequency of low Apgar scores to prevent TTN in infants born vaginally at 37 weeks or later (Gülmezoglu et al., 2012).

Comparing planned vaginal deliveries to planned caesarean births, transfer rates to the neonatal intensive care unit rose from 5.2% to 9.8% (P.001). The likelihood of developing pulmonary issues, such as respiratory distress syndrome and temporary tachypnea in newborns, rose from 0.8% to 1.6% (P =.01). Low Apgar scores were substantially less likely to be accompanied by neurological signs. A planned caesarean birth doubled the risk of pulmonary issues and the transfer rate to the neonatal intensive care unit compared to a planned vaginal delivery (Carlo et al., 2011).

This study demonstrated the risk factors that emerged as significant in this study, which included male gender, prolonged rupture of the membranes, induction of labor, twin pregnancy, multigravida mother, pregnancy-induced hypertension, birth weight of 35 years, and maternal infertility. Low APGAR score and low birth weight.

Conclusion

Maternal diabetes and obesity were major risk factors in most neonates with transitory tachypnea. Early pregnancy disorders that may connect to an increased prevalence of TTN can be found using good prenatal and obstetric care. Typically, mild to moderate discomfort is present in TTN, and oxygen supplementation is generally sufficient. Even severe TTN problems have been documented in the literature; they are extremely uncommon. Through careful monitoring, doctors at secondary and primary centers can decrease the number of needless examinations and provide better care for newborns with TTN.

Declarations

Data Availability statement
All data generated or analyzed during the study are included in the manuscript.
Ethics approval and consent to participate
Approved by the department Concerned.
Consent for publication
Approved
Funding
Not applicable

Conflict of interest

The authors declared absence of conflict of interest.

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