Risk Factors for Transient Tachypnea of the Newborn in Full Term Neonates

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ABSTRACT:

BACKGROUND:

Transient tachypnea of the newborn (TTN) is a condition characterized by tachypnea that develops shortly after birth but resolves within 2 to 5 days. TTN has been reported to occur more frequently in Caesarean delivery, maternal sedation, perinatal asphyxia, maternal asthma, and birth of male infants.

AIM OF THE STUDY:

To assess the risk factors for transient tachypnea of newborn in Duhok.

METHODS:

This study included 100 cases with TTN and 100 controls who are full term neonates without any respiratory problems. All participants were chosen from deliveries in Maternity Hospital in Duhok from Nov. 2018 till Nov. 2019. The diagnosis of TTN was established with clinical and radiology data and by excluding other causes of respiratory distress. Potential risk factors for TTN are selected as follows: maternal age, parity, history of infertility, pregnancy-induced hypertension, premature rupture of membranes, induction or augmentation or both of labor, mode of delivery, neonatal birth weight and Apgar score of the neonates.

RESULTS:

This study showed the risk factors that emerged to be significant in this study that included multigravida mother, pregnancy induced hypertension, birth weight <2,500grams , APGAR score<7 at 5min and delivery by Caesarean section(elective and emergency) .Other risk factors that were not significant included maternal age >35years ,maternal infertility, in vitro fertilization, maternal diabetes mellitus, maternal asthma, male gender, prolonged rupture of membrane, induction of labor and twin pregnancy.

CONCLUSION:

Low birth weight, APGAR score <7 at 5 minutes, delivery by Caesarean section, pregnancy induced hypertension in the mother and multiparty are significant predisposing factors for transient tachypnea of newborn.

KEY WORDS: term neonate, tachypnea, Caesarean section, maternal diabetes, Apgar score

INTRODUCTION:

Transient tachypnea of the newborn (TTN), is the commonest cause of neonatal respiratory distress (>40%), followed by respiratory distress syndrome (RDS) and meconium aspiration syndrome [1].It occurs in around 6/ 1000 births and was first described by Avery in 1966[2]. Some of the in utero produced fluid is swallowed by the neonate and then excreted through the kidneys into amniotic fluid but some fluid enters the lungs to keep them expanded .Increased epinephrine levels leads to drop of production of the lung fluid [3].

Maternal age >30 is an independent risk factors of TTN[5,7-9]. Multi parity is a significant predisposing factor[9].

Different studies have found that low birth weight, low apgar score, history of infertility, in vitro fertilization, pregnancy induced hypertension and delivery by Caesarean section were significant predisposing factors[2,5-8,10-12,14]. Twin delivery, diabetes and asthma in the mother and male gender were also found to predispose to TTN[2,4,6-8,10,14,16,18-20]

Aim:

This study aims to assess the risk factors for transient tachypnea of newborn in Duhok.

MATERIALS AND METHODS:

The study included 100 cases with TTN and 100 controls who were full term (equal to and more than 37 weeks gestational age) neonates without any respiratory problems. All participants were chosen from deliveries in Maternity Hospital in Duhok from 1st. of Nov. 2018 through 1st. of Nov. 2019. The diagnosis of TTN was established with clinical and radiology data and by excluding other causes of respiratory distress.

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Diagnosis was made depending on clinical findings such as tachypnea (more than 60/min) that occurs during the first 24 h after birth, increased aeration on chest x-ray with or without perihilar edema (as assessed by a specialized radiologist), and need of supplemental oxygen for at least 6 hours .We excluded from the study babies less than 37 weeks gestation, babies with major congenital anomalies, those with complicated delivery like instrumental delivery and neonates with respiratory distress with a diagnosis other than TTN. Potential risk factors for TTN as maternal age, parity, history of infertility, pregnancy-induced hypertension, premature rupture of membranes, induction or augmentation or both of labor, mode of delivery, neonatal birth weight and Apgar score of the neonates were assessed.

Statistical analyses were performed using SPSS 22 where cases and controls were compared by means of the Chi square or Fisher's exact test for categorical variables $p<0.05$ was considered significant.

Definition of variables:

Primigravida: a woman who is pregnant for the first time.

Multigravida: a woman who has been pregnant more than once.

Infertility: being unable to get pregnant after at least one year of unprotected sex.

In vitro fertilization: fertilization process where an egg is combined with a sperm outside the body.

Maternal diabetes mellitus: is diabetes mellitus present during pregnancy whether permanent or gestational(only during pregnancy).

Pregnancy induced hypertension: is hypertension newly developing in pregnant women after 20 weeks of gestation.

Apgar score: a method to quickly summarize the health status of the newborn. It stands for **A**ppearance, **P**ulse, **G**rimace, **A**ctivity and **R**espiration.

Prolonged rupture of membranes: the rupture of membrane for greater than 18 hours before delivery.

Parity: The number of children to which the women has given birth.

RESULTS:

As shown in Table (1) the significant maternal variables for the transient tachypnea of newborn are parity and pregnancy induced hypertension.

Table1:Analysis of maternal variables by the incidence of transient tachypnea of newborn .

Variables	Cases No. %	Controls No. %	P value
Maternal age			0.058
<20 years	7 (7)	7 (7)	
20-35 years	69 (69)	80 (80)	
>35 years	24 (24)	13 (13)	
Parity			0.037
Primigravida	15 (15)	27 (27)	
Multigravida	85 (85)	73 (73)	
History of infertility			0.801
Yes	8 (8)	9 (9)	
No	92 (92)	91 (91)	
In vitro fertilization			0.319
Yes	1 (1)	0 (0)	
No	99 (99)	100 (100)	
Maternal diabetes mellitus			0.735
Yes	5 (5)	4 (4)	
No	95 (95)	96 (96)	

Maternal Asthma			0.319
Yes	1 (1)	0 (0)	
No	99 (99)	100 (100)	
Pregnancy induced hypertension			0.031
Yes	20 (20)	9 (9)	
No	80 (80)	91 (91)	

Table (2) shows the maternal factors that had impact on transient tachypnea of the newborn are multigravida mother and pregnancy induced hypertension logistic multivariable regression analysis.

Table 2: Crude odds ratios and 95% confidence intervals for transient tachypnea of newborn and maternal factors using logistic multivariable regression analysis.

	Crude OR	95% CI	*P* value
Maternal age >35 years	1.044	0.998, 1.092	0.059
multigravida mother	2.096	1.036, 4.239	0.037
Maternal infertility	0.879	0.325, 2.379	0.800
Maternal diabetes mellitus	1.263	0.329, 4.484	0.734
Pregnancyinduced hypertension	2.528	1.089, 5.868	0.031

Table(3) shows the significant neonatal and pregnancy variables affecting transient tachypnea of newborn are birth weight, APGAR score<7 at 5 minute and mode of delivery.

Table 3:Analysis of neonatal and pregnancy related variables by the incidence of transient tachypnea of newborn.

variable	Cases No. %	Controls No. %	P value
Gender			0.885
male	56 (56)	57	
female	44 (44)	43	
Birth weight			<0.001
<2500 grams	25 (25)	7 (7)	
2500-4000 grams	65 (65)	87 (87)	
>4000 grams	10 (10)	6 (6)	
Apgar score at 5 minutes			<0.001
<7	2 (2)	0 (0)	
≥7	98 (98)	100(100)	
Prolonged rupture of membranes			0.601
Yes	22 (22)	19 (19)	
No	78 (78)	81 (81)	

Induction of labor			0.112
Yes	32 (32)	22 (22)	
No	68 (68)	78 (78)	
Mode of delivery			0.017
vaginal	32 (32)	45 (45)	
Caesarean section	68 (68)	55 (55)	
Twin			0.122
Yes	8 (8)	3 (3)	
No	92 (92)	97 (97)	

Table (4) shows us the significant impact of baby birth weight <2,500 and delivery by Caesarean section on transient tachypnea of newborn using logistic multivariable regression analysis.

Table 4: Crude odds ratios and 95% confidence intervals for transient tachypnea of newborn and neonatal and pregnancy related factors using logistic multivariable regression analysis.

Variable	Crude OR	95% CI	*P* value
Male gender	0.960	0.549, 1.679	0.887
Birth weight <2500 grams	0.539	0.296, 0.983	0.044
Prolonged rupture of membranes	1.202	0.604, 2.393	0.600
Induction of labor	1.668	0.886, 3.141	0.113
Delivery by Caesarean section	1.556	1.078, 2.248	0.018
Twin	2.812	0.724, 10.924	0.135

DISCUSSION:

It was found clearly that maternal age >35 years is more frequent among mothers who gave birth to neonates with TTN but there was no significant difference. Similar results were found in other studies that found no role of the maternal age in predisposition for TTN [8,10]. This is in contradiction with another study that showed that maternal age between 18-35years is predisposing to TTN [9].

Multiparty is a significant predisposing factor for TTN in concordance with a study done in Sudan [9]. The complexity of respiratory problems increases with multiparty for unclear reasons that remain [10] but this is in contrary to a study in Japan that showed nulliparity as significantly associated with TTN [5] while a study in Turkey showed no correlation between parity and TTN [8].Ethnicity differences may explain this unexpected variation in results.

This study did not find significant association between history of infertility and in vitro fertilization (IVF) and developing TTN in contrast to other studies which found strong association between history of infertility and IVF and TTN [2, 5]. Babies born by IVF are more likely to have many serious health problems due to the chance of multiple gestations, prematurity and low birth weight of babies born as such but there is no explanation for this variation among different studies up to our knowledge.

Although maternal diabetes mellitus has been found to be more frequent in mothers of neonates with TTN, no significant association was found in agreement with what has been found in another study[4].This is in contrast to other studies which found maternal DM to be significant risk factor[2, 4, 9,14, 16].This difference is better explained by the good glycemic control of the mother during pregnancy and delivery helps reversing the pathophysiology that causes the TTN.

Maternal asthma is not significantly associated with TTN in this study and this does not agree with other studies which found that maternal asthma is significant predisposing factor [2, 9, 11, 14, 17, 18].Differences in ethnicity may explain this variation though the mechanism responsible for this association is not well understood.

In this study, pregnancy induced hypertension(PIH) was significantly related to TTN which agrees with a study in Taiwan. This is mostly because B type Natriuretic Peptide(BNP) and N-terminal pro BNP that are induced by PIH are released into the fetal circulation and may lead to TTN[9]. But this is unlike a study in Sudan which found no significant relation between PIH and TTN [9]

Though male gender was more frequent among TTN neonates, no significant difference was found. This agrees with a study in Turkey [8]. But other studies showed significant association between male gender and TTN [2, 4, 8, 19, 20] Male gender increases the complexity of respiratory problems [21].When asphyxiated, male fetuses produce less catecholamines in response [22]. Also, male fetuses have less cuboidal cells which will be converted Type II alveolar cells so less surfactant is produced. Therefore, males become more easily distressed when encountering hypoxia [8].

This study found a highly significant association between low birth weight (1500gm_2500gm) and TTN in agreement with other studies[11,12,19] but this disagrees with a study done in Baghdad which found that low birth weight was not a significant risk factor for respiratory distress in full term newborns.

APGAR score <7 at 5 minutes is a significant predisposing factor for TTN in the present study which is similar to other studies [2, 9]. This is because in asphyxia, there is increased protein in the fetal lung fluid leading to more pulmonary capillary permeability making absorption of fluid difficult [8].

There was no correlation between prolong rupture of membrane and developing TTN in the present study in accordance with a Japanese study [5].

This study did not find a significant association between induction of labor and TTN in contrast to a Japanese study which showed induction of labor as risk factor for TTN since the hyponatremia that results from infusion of Oxytocin and glucose water impairs the function of sodium pump that reabsorbs the fetal lung fluid [9].

Delivery by Caesarean section (both emergency and elective) had been found significantly associated with TTN in agreement with other studies [2, 4, 6, 11, 15, 23]. Infants delivered by elective Caesarean section usually lack the physiological stress related to labor thus leading to failure of postnatal respiratory transition [2]. There is lack of the beneficial effects of normal labor on the newborn including reducing water in the lung enhancing catecholamines secretion of surfactant stores into the alveolar space and increasing levels of pulmonary vasodilator [24]. Twin pregnancy has not been found to be a predisposing factor in our study while studies in Mosul and Japan showed significant association between twin pregnancy and TTN due to the low level umbilical cortisol level in multiple pregnancy as compared to singleton [2, 5].This difference in results is poorly understood but may be related to the dose and duration of infusion of labor inducers.

CONCLUSION:

Low birth weight, APGAR score <7 at 5 minutes, delivery by Caesarean section, pregnancy induced hypertension in the mother and multiparty are significant predisposing factors for transient tachypnea of the newborn.

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