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Research Article

**FREQUENCY OF PNEUMOTHORAX IN PREMATURE
NEONATES: A STUDY DONE IN NICU**¹Dr Sahrash Rafique, ²Dr Reesha Khalid Khan, ³Dr Ali Nawaz¹Allied Hospital Faisalabad, Pakistan.**Abstract:**

Objective: Pulmonary air-leakage, pneumothorax [ptx], is a severe life-threatening complication in neonates especially pre mature neonates. The study is focused to assess the factors that predispose the neonates to such complications and the frequency of pneumothorax among the premature low birth weight [lbw] infants, under mechanical ventilation.

Methods: This is a cross sectional study, conducted in 119 Low birth weight premature intubated infants at neonatal intensive care unit of Allied Hospital Faisalabad. This study was done in 18 months from January 2017 to June 2018. Gestational age[GA], Birth weight, sex, initial diagnosis, mode of delivery, respirator settings, 5th minute apgar score and history of surfactant therapy were noted and recorded in all neonates with or without pneumothorax. Multivariate and Univariate regression analysis were done.

Results: In our study, 43 [36.13%] infants developed pneumothorax. The mean gestational age of the affected neonates with pneumothorax [case group] was 29±4.19 Weeks and the gestational age of neonates with no pneumothorax [control group] was 30.09±3.01 weeks. The mean birth weight of the infants under study in both the groups were 1295 ± 395gr and 1502 ± 512grams respectively. In the neonates of case group 71% and in the control group 49% were delivered by cesarean section. 55.7% of the infants of case group and 52.9% of the control group were of male sex. No statistical significance was recorded among the mentioned items. Respiratory distress was found to be the most common lung disease in both the groups. The rate of pneumothorax was found to be higher in cases having low apgar score on 5th minute [P=0.006]. The frequency of pneumothorax was recorded to be low in patients who were treated with surfactant therapy [P=0.023]. Only low apgar score at 5th minute increased the risk of pneumothorax.

Conclusion: The frequency of pneumothorax in our study was a bit higher than other studies done and the reason may be the assessment of only Low birth weight premature neonates. Only low apgar score at 5th minute increased the risk of pneumothorax. significantly after multivariate logistic regression analysis.

Keywords: syndrome, Gestational, Ventilation, Statistical, Surgical Intervention, Surfactant Therapy.

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INTRODUCTION:

Pneumothorax is a life threatening complication of respiratory system and it is quite a frequently encountered problem demanding urgent surgical intervention in emergency departments as well as in neonatal intensive care unit [NICU] [1]. Pneumothorax is more frequently seen in low birth weight neonates [1-2%] than in children with older age [1.2-28.100.000] [2]. The rate can rise up to 30% in neonates who have respiratory distress syndrome or other concurrent underlying lung pathology leading to air leak or who need mechanical ventilation [3] and the frequency may be variable in units with similar population of infants [4]. Pneumothorax during the time of respiratory distress is closely related to an increased risk of chronic lung disease, intraventricular hemorrhage and even death [4, 5]. Therefore, it is very important to keep a check on its clinical findings and predisposing factors [1]. A number of studies have been conducted identifying the factors predisposing to neonatal pneumothorax [6]. The focus of our study is to determine the risk factors and frequency of pneumothorax in premature neonates with low birth weight [LBW] who underwent mechanical ventilation.

METHODS AND MATERIALS:

This is a retrospective type of cross sectional study conducted on all intubated premature Low birth weight neonates at Neonatal ICU of Allied Hospital Faisalabad, from Jan 2017 to June 2018. Informed consent from the attendants of the patients

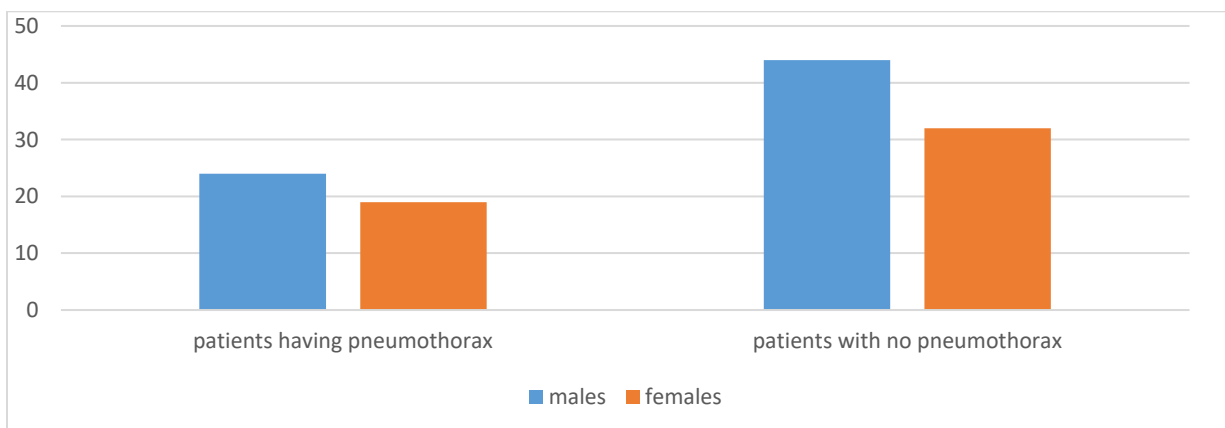
were taken and permission for the study was also sought from the ethical committee of the hospital that was granted as well. The details of the Newborns having pneumothorax were compared to the neonates without pneumothorax. The data that is collected from all neonates included: birth weight, sex, mode of delivery, gestational age [GA], 5th minute Apgar score, initial clinical diagnosis, peak inspiratory pressure [PIP], Surfactant therapy, occurrence of pneumothorax, and positive end expiratory pressure [PEEP] at the onset of pneumothorax.

For the confirmation of pneumothorax chest X-rays was done. All of the enrolled neonates were under the baby log 8000 plus-drager ventilator on SIMV mode. The neonates having pneumothorax before the intubation of the neonate and the neonates with mal-positioned tracheal tube were excluded from the study. All of the data was recorded and analyzed with the help of spss21.0 version. Multivariate and univariate regression analysis was done. Chi square test was applied with p value less than 0.05 considered significant

RESULTS:

In our study, 119 low birth weight preterm neonates under mechanical ventilation were enrolled. And 43 [36.13%] of them [24male, 19female] were having pneumothorax [case group] and 76 [63.86%] of them [44 males, 32female] were having no pneumothorax [control group].

	Mean apgar 5 th minute score	C-section	Surfactant therapy
Case group	6.39 ± 1.4	67.4%	46.51%
Control group	7.41 ± 1.92	65.7%	75.0%



The median birth weight and gestational age of the case group were 1295 ± 395 gr 29 ± 4.19 weeks respectively. Mean peep and pip at time of occurrence of pneumothorax was 3.5 ± 0.54 [max5] cmH₂O and 16.98 ± 2.84 [max 25] cmH₂O and respectively. In case group 29 [67.4%] babies and in the control group 50 [65.78%] babies were born by cesarean section [C.S]. Mean Apgar score on 5th minute in both the groups were as 6.39 ± 1.4 and 7.41 ± 1.92 [P=0.06]. Surfactant replacement therapy for respiratory distress syndrome was done in 20 [46.51%] of neonates in case group and 57 [75.0%] neonates of control group [P=0.023] as shown in the table. The respiratory distress syndrome [RDS] was the most common cause for the patients to be put on mechanical ventilation in both the groups.

DISCUSSION:

During our study period, 43 [36.13%] of low birth weight mechanically ventilated premature infants were recoded to develop pneumothorax. The frequency of pneumothorax has a wide range in different studies varying from 1% - 30 % [3]. Abdellatif and Malek et al reported pneumothorax in 25.7% and 26% of ventilated infants respectively [5,2]. They studied both preterm and term neonates. In another study done by Lim et al, reported incidence is 1.3% in preterm and term neonates with or without ventilation [7]. The difference in the frequency of pneumothorax might be attributed to differences in the assessed groups. Since pneumothorax is more prevalent among premature and low birth weight infants, our finding was a bit higher than other mentioned ranges. The results of our study indicated that the pneumothorax was more common in male babies and some other investigations done have also agreed with the findings [2, 5,7]. In a study done by Ngercham et al, it was found that the male sex as one of the etiological factors for pneumothorax during the first day after birth [6].

In our Study-Section was more common in case group but the values have no statistical significance. In another study conducted by Benterud et al, it is reported that C-Section was noted to have significant association with the need for mechanical ventilation in preterm infants. Their study involved 2694 cases [8]. Infants with gestational age less than 32 weeks in the case group had increased rate of pneumothorax than infants with same gestational age in the control group [P=0.817]. Moreover, the cases with birth weight less than 1500gr reported to be having higher rate of pneumothorax as compared to the infants with same weight in the control group [P=0.241]. In a study, Abdellatif et al reported the highest frequency of pneumothorax in neonates with gestational age less

than 32 weeks [47.5%] and neonates with birth weight less than 1500 gr [42.37%], but there was a limitation that they did not have any control group and 89.83% of their infants in their study were under mechanical ventilation [2]. The most common cause of mechanical ventilation was respiratory distress syndrome and this finding is comparable to some other studies [2, 5 and 9].

The mean peep and pip values at the onset of pneumothorax were 3.5 cmH₂O and 16.98 respectively that were relatively not much high settings but on individual basis might not be the optimum setting at that time for the lung physiology in neonate. These figures were lower than reported by Malek et al [PIP: 22.7 and PEEP: 4.2 cmH₂O] [5] and Abdellatif et al [pip: 18.61 ± 4.88 and peep: 4.39 ± 0.67 cmH₂O] [2] in their respective studies. Esme et al in his study suggested that the neonatal pneumothorax developed due to underlying lung pathology rather than due to a complication of mechanical ventilation [1]. In contrast, a previous study mentioned that pneumothorax in low birth weight infants is related with etiological factors present on day of pneumothorax and on the not initial severity of respiratory disease. Vigorous and proper control of ventilation can decrease the risk to develop pneumothorax, including minimizing pip and optimizing peep [10]. Furthermore, Vellank et al reported a decrease in the frequency of pneumothorax in low birth weight neonates by maximizing vigilance and real time monitoring of pip and tidal volume. High tidal volume [>6 cc.kg] was recorded around the time when the incidence of pneumothorax occurred [11]. Our study has limitations, that was use of no monitoring of tidal volume and pressure-limited ventilator and another one was that we did not compare the settings of respirator with that of ventilated neonates with pneumothorax. The reason behind was that there are wide varieties of respirator settings for the neonate with mechanical ventilation and their comparison with highest peep and pip was not done because some of the cases suffered from pneumothorax after they have started to wean rather suffering when at the maximal settings. In our study, low 5th minute score Apgar score after birth was recorded to be a significant risk factor for the occurrence of pneumothorax, so effective resuscitation would reduce the risk of occurrence of pneumothorax. The mean Apgar score was recorded to be 6.39 at 5th minute in the case group, which is more than 6.2 in Esma et al investigation. They had no any control group for pneumothorax and reported the association of low Apgar score with increased risk factors for death [1]. Weinberger et al also found the

same results that low Apgar score has close association with increased neonatal death rate [including pneumothorax] in premature newborns. Antenatal history of mother and complications of pregnancy have no clear association with low Apgar scores. So, it was suggested that Apgar score was a useful tool to assess the neonatal prognosis in short-term [12].

Surfactant replacement therapy reported to have reduced the risk of pneumothorax [P=0.023]. Malek et al, in his study recorded the same results [5] and found lower risk of pneumothorax after the patient is treated with surfactant therapy [P>0.05] [13]. In our study, it has been noted that after multivariate logistic regression analysis, the patients with low 5th minute Apgar score have increased the risk of pneumothorax. The difference of two types of analysis could be due to small sample size or association of other factors among each other. So, more studies with larger sized samples are recommended.

CONCLUSION:

The frequency of pneumothorax was found to be higher than the range mentioned in other studies and reviews due to enrollment of only intubated low birth weight premature infants. Our results highlight that the low Apgar score at 5th minute, increases the risk of pneumothorax significantly and surfactant therapy on optimum time can decrease it.

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