



## ASSOCIATION BETWEEN CONVULSIONS AND ARTERIAL BLOOD GASES IN INFANTS WITH SEVERE BRONCHIOLITIS AT THE TIME OF THEIR ADMISSION INTO A TERTIARY CARE HOSPITAL\*

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### ABSTRACT

The single most important cause of infant morbidity is acute bronchiolitis; nearly 1 out of 5 infants suffer with clinical bronchiolitis and among these 2-3% require hospital admission<sup>1</sup>.

The American Academy of Pediatrics (AAP) defines bronchiolitis as 'acute inflammation, edema and necrosis of epithelial cells lining small airways, increased mucus production, and bronchospasm'<sup>2</sup>. AAP definition has little clinical significance, another useful definition, which was used in many clinical studies, is: the first episode of wheezing in a child younger than 12 to 24 months who has physical findings of a viral respiratory infection and has no other explanation for the wheezing, such as pneumonia or atopy.<sup>3</sup>

Bronchiolitis is caused by viruses, most common virus implicated was RSV and others are Para influenza, rhinovirus and adenovirus. Emerging pathogens are Human Metapneumovirus & Boca virus<sup>4</sup>.

In current study we made an attempt to find any association between changes in the Po<sub>2</sub>, Pco<sub>2</sub> & pH with convulsions in infants with acute severe bronchiolitis and studies on this are lacking.

**Aims and objectives:** To know the association between convulsions and arterial blood gases in infants with severe bronchiolitis. To ascertain significance between convulsions and blood gases in infants with severe bronchiolitis.

**MATERIAL AND METHODS:** Study was carried out in a tertiary care hospital on infants who were admitted with signs and symptoms of severe bronchiolitis for the period September 2018 to November 2018. At the time of admission, detailed history was taken, thorough clinical examination was done and samples for CBP and ABG were sent in all infants admitted with clinical diagnosis of severe bronchiolitis and the results were analyzed with SSPS software.

**Results:** A total of 28 infants were studied in current study; 11/28 were presented with history suggestive of convulsions and mean duration of illness in infants with convulsions was prolonged (66%cases) comparative to other infants. In the present study, infants with convulsions most of them will fall under age group 6 to 10 months, 63.6% of infants with convulsions have had spo<sub>2</sub> in the range 71-90% remaining were 27.3%, 9.1% of infants had spo<sub>2</sub> values <70, >90 respectively. Infants with convulsions 54.50% were having po<sub>2</sub> values less than 61 mmhg and 9.1% of infants had po<sub>2</sub> more than 85mmhg and remaining 36.4% had po<sub>2</sub> range between 61-85mmhg. 45.5% of infants with convulsions had pco<sub>2</sub> value 41 to 80mmhg, rest of the infants had pco<sub>2</sub> >80mmhg. In this study mean pH was 7.27, and 45.0% of infants with convulsions having pH range between 7.21 to 7.24, almost all infants (18.2%) having pH less than 7 had convulsions, remaining 36.4% of infants with convulsions had pH in between 7.01 to 7.20.

**Conclusion:** It was found that the association between po<sub>2</sub> and convulsions is significant with p-0.048 and the association between pco<sub>2</sub> and convulsions is spastically significant with p value 0.007, there is no association between spo<sub>2</sub> and convulsions (p-0.268) in present study, and significant association was found between pH and convulsions p-0.02.

### KEYWORDS :

#### INTRODUCTION:

The single most important cause of infant morbidity is acute bronchiolitis; nearly 1 out of 5 infants suffer with clinical bronchiolitis and among these 2-3% require hospital admission<sup>1</sup>.

The American Academy of Pediatrics (AAP) defines bronchiolitis as 'acute inflammation, edema and necrosis of epithelial cells lining small airways, increased mucus production, and bronchospasm'<sup>2</sup>. AAP definition has clinically little significance, another useful definition, which was used in many clinical studies, is: the first episode of wheezing in a child younger than 12 to 24 months who has physical findings of a viral respiratory infection and has no other explanation for the wheezing, such as pneumonia or atopy.<sup>3</sup>

Bronchiolitis is caused by viruses, most common virus implicated was RSV and others are Para influenza, rhinovirus and adenovirus. Emerging pathogens are Human Metapneumovirus & Boca virus<sup>4</sup>.

Acute bronchiolitis is characterized by bronchiolar obstruction with edema, mucus, and cellular debris. If obstruction becomes complete trapped distal air will be resorbed and the child will develop atelectasis<sup>4</sup>. The infant first develops minor upper respiratory tract infection with frequent sneezing episodes and watery nasal discharge, accompanied by diminished frequency of feed and fever of 100<sup>o</sup>f. Within 24 to 48hrs the disease picture may progressively worsen; the infant may develop tachypnea, dyspnea, irritability, vomiting, wheezing episodes and chest retractions. Most

of the infants with bronchiolitis improve over next 3 to 5 days and disease process resolves spontaneously. Some of the infants develop more serious illness and may end up in severe bronchiolitis requiring mechanical ventilator support.

Hypoxemia is a consequence of ventilation perfusion mismatch early in the course of disease and with severe obstructive disease and exhaustion of respiratory efforts hypercapnea will supervene.

In current study we made an attempt to find any association between changes in the Po<sub>2</sub>, Pco<sub>2</sub> & pH with convulsions in infants with acute severe bronchiolitis and studies on this are lacking.

#### AIMS AND OBJECTIVES:

To know the association between convulsions and arterial blood gases in infants with severe bronchiolitis.

To ascertain significance between convulsions and blood gases in infants with severe bronchiolitis.

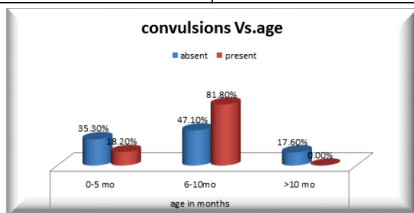
**MATERIAL AND METHODS:** Study was carried out in a tertiary care hospital on infants who were admitted with signs and symptoms of severe bronchiolitis for the period September 2018 to November 2018. All the infants with signs and symptoms of severe bronchiolitis were admitted in the hospital were included in the study, the infants with comorbid illnesses like congenital heart diseases, hematological abnormalities like thalassemia and sickle cell anemia

and any infant with renal diseases were excluded from the study. At the time of admission a detailed history was taken, thorough clinical examination was done and samples for CBP and ABG were sent in all infants admitted with clinical diagnosis of severe bronchiolitis and the results were analyzed by SSPS 21 software.

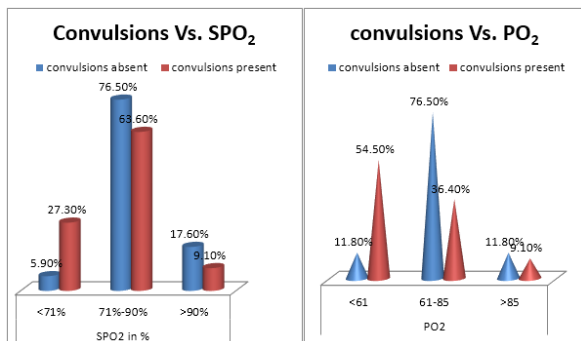
**RESULTS:** A total of 28 infants were studied in current study; 11/28 were presented with history suggestive of convulsions and mean duration of illness in infants with convulsions was prolonged (66%cases) comparative to other infants. In the present study, infants with convulsions most of them will fall under age group 6 to 10 months, 63.6 % of infants with convulsions have had spo<sub>2</sub> in the range 71-90%, 27.3% of infants had spo<sub>2</sub> values <70, 9.1% of infants had spo<sub>2</sub> values >90 respectively. Infants with convulsions 54.50% were having po<sub>2</sub> values less than 61mmhg and 9.1% of infants had po<sub>2</sub> more than 85mmhg and remaining 36.4% had po<sub>2</sub> range between 61-85mmhg. 45.5% of infants with convulsions had pco<sub>2</sub> value 41 to 80mmhg, rest of the infants had pco<sub>2</sub> >80mmhg. In this study mean pH was 7.27 and 45.0% of infants with convulsions having pH range between 7.21 to 7.24, almost all infants(18.2%) having pH less than 7 had convulsions, remaining 36.4% of infants with convulsions had pH in between 7.01 to 7.20.

**Table 1: mean values**

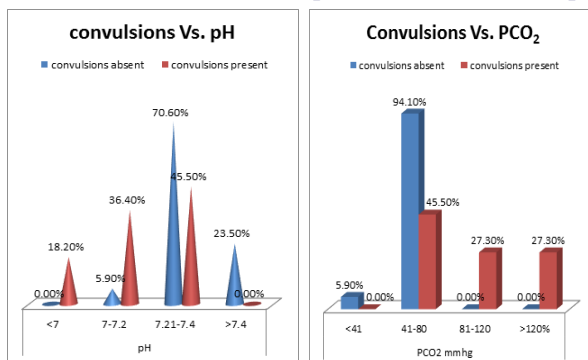
Age	7.11
Duration of illness	3.18
Tachycardia	170.25
SpO <sub>2</sub> at admission at Room air	80.18
PO <sub>2</sub>	66.029
PCO <sub>2</sub>	71.543
PH	7.2715



**GRAPH 1: CONVULSIONS VS. AGE**



**GRAPH 2: CONVULSIONS VS. SPO<sub>2</sub> AND CONVULSIONS VS. PO<sub>2</sub>.**



**GRAPH 3: CONVULSIONS VS. PCO<sub>2</sub> AND CONVULSIONS VS. pH**

**DISCUSSION:**

**AGE AND CONVULSIONS:** It was observed that among infants with severe bronchiolitis (n=28), 60.7% fall under age group 6-10 months, 28.6% of the infants were aged less than 6 months and the remaining 10.7% aged more than 10 months. Among the infants aged 6-10 months 9/17(81.8%) had convulsions, the association between age and convulsion was found not significant (p=0.13).

**Spo<sub>2</sub> and convulsions:** In current study we found that 20(71.4%) of children with severe bronchiolitis (n=28) had Spo<sub>2</sub> levels between 71-90%, 14.3% infants were having Spo<sub>2</sub> levels less than 70% reaming 14.3% infants had >90% Spo<sub>2</sub>. In the present study, it was observed that 7/11 infants with convulsions (63.6%) had Spo<sub>2</sub> levels between 70-90%, and infants with Spo<sub>2</sub> less than 70%, 3/4(75%) had convulsions.

Association between Spo<sub>2</sub> levels and convulsions in this study was found not significant (p-0.268, df=2).

**Convulsions and Po<sub>2</sub>:** In the present study we observed that 60.7% infants had po<sub>2</sub> values in between 61 to 85mmHg, 28.6% of cases had po<sub>2</sub> less than 60 mmhg and remaining were having po<sub>2</sub> more than 85mmhg. We all know that bronchiolitis in severe cases may present with apneic episodes and infants may have hypoxia which causes anoxic or hypoxic seizures & not all seizures manifest as clinically evident convulsions. We observed that in infants with po<sub>2</sub> between 60 to 85mmhg, 36.4%(4/11) had convulsions and infants with po<sub>2</sub> less than 61%, 54.5%(6/11) of them had convulsions in the present study. The association between PO<sub>2</sub> and convulsions found statistically significant with p value 0.048 (df=2).

**Convulsions and Pco<sub>2</sub>:** Current study we found that 75.0% had Pco<sub>2</sub> values in between 41-80mmhg, 21.4% had more than 80mmHg of Pco<sub>2</sub> 3.6% of infants had pco<sub>2</sub> less than 40mmhg. In the present study we observed that 45.5%(5/11) infants with convulsions had pco<sub>2</sub> levels 40 to 80mmhg and 54.5(6/11) infants with convulsions had pco<sub>2</sub> levels more than 80mmhg, this observation was against the seizure preventive role of hypercapnea<sup>5,6</sup>. Literature states that hyperventilation induce hypocapnea increases the risk of convulsions<sup>8</sup> if oxygen concentration at the alveolar level was maintained constantly above 92%.

This was explained by the fact that hypercapnea is secondary to apnea and air trapping inside the alveoli later result in atelectasis and ventilation perfusion mismatch; all results in hypoxia which induces seizures, and Acute hypercapnia can cause seizures in patients with CO<sub>2</sub> intoxication & the seizure threshold may increase initially owing to inhibitory effect, and then decreases<sup>9</sup>

The association between Pco<sub>2</sub> and convulsions in infants with severe bronchiolitis was found significant statistically with p value 0.007(df=3)

**pH and convulsions:** Literature states that respiratory acidosis prevents seizures in epileptic patients when therapeutic administration of 5% co<sub>2</sub> is used and the seizure potential of neurons is depends on intracellular changes of pH, in the present study most(45.5%) of the children with convulsion had pH values around 7.21-7.4 and not even single case was with pH more than 7.4, the difference was explained by therapeutic intervention to the infants before their admission into our hospital and the hypoxic events will better explains the convulsions and secondary lactic acidosis may decrease pH.

In the current study we found that there was significant association between pH and convulsions (p=0.02).

**CONCLUSION:** It was found that the association between po<sub>2</sub> and convulsions significant with p-0.048 and the association between pco<sub>2</sub> and convulsions is statistically significant with p value 0.007, there is no association between spo<sub>2</sub> and convulsions(p-0.268) in present study and significant association was found between pH

and convulsions p-0.02.

**Limitation of the study:** This study was single center based cross-sectional observational study and was done on small sample so results cannot be generalized to large population and needs randomized control trial.

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