

# Indigenous Bubble Continuous Positive Airway Pressure for Children

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**Keywords:** Continuous positive airway pressure, Pediatric intensive care unit, Pneumonia, Respiratory distress.

*Indian Journal of Critical Care Medicine* (2023); 10.5005/jp-journals-10071-24585

Pneumonia remains a leading cause of death among children under 5 years of age. The World Health Organization report estimated that the annual incidence of pneumonia was 0.37 episodes per child in 2010. India accounted for 36% of the total cases in Southeast Asia and about one-fifth of these episodes were classified as severe pneumonia.<sup>1</sup>

Delivering oxygen is a life-saving measure for a child in respiratory distress but many a time we need to deliver oxygen with pressure. It has shown that if the airway can be kept patent by continuous positive airway pressure (CPAP) it helps a child with breathing and reduces the pressure required to deliver tidal volume. Bubble continuous positive airway pressure (bCPAP) is well-established mode of therapy among neonates, but its role among older children is not as well established.<sup>2</sup>

In this issue of the *Indian Journal of Critical Care Medicine*, Lalitha et al. have explored the safety and utility of bCPAP in children with respiratory distress.<sup>3</sup> In addition, they have also compared the effectiveness of bCPAP therapy to high-flow nasal cannula (HFNC) therapy. This prospective observational study was conducted over 3 months in a pediatric intensive care unit (PICU) of an academic and referral hospital. Children of age from 6 months to 5 years of age were recruited based on respiratory distress assessed by respiratory rate, air entry, retractions, grunt, saturation in room air and level of consciousness with objective scoring done by Wood–Downes score.

In these 3 months, a total of 52 children with respiratory infections were admitted to PICU out of which 30 children were managed with bCPAP, 20 children on admission, and 10 children later because of worsening distress. Four children who were older than 5 years were treated with high-flow nasal cannula while 10 patients required invasive ventilation. Only one child failed bCPAP therapy after 6 hours requiring ventilation.

Lalitha et al. found bCPAP to be effective in pediatric populations with respiratory distress; they recommend that bCPAP can be used as a safer mode of respiratory support, an alternative to HFNC in children with respiratory distress.

The biggest obstacle in providing noninvasive ventilation is acceptability and nontolerance of interface especially less than 5 years old.<sup>4</sup> Sometimes they need to be sedated which not only increases the pressure requirements but also endangers the airway. In this study, Lalitha et al. have used a machine designed specifically to deliver bubble CPAP therapy to this age-group. This product ResPAP™ Kit consists of an airflow unit (AFU), a pressure generator [positive airway pressure (PAP valve)], and a nasal interface and as per the experience of authors, it is well tolerated and easy to place. The use of bubble CPAP in the neonatal population for neonatal

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**How to cite this article:** Gupta D, Simalti AK. Indigenous Bubble Continuous Positive Airway Pressure for Children. *Indian J Crit Care Med* 2023;27(11):788–789.

**Source of support:** Nil

**Conflict of interest:** None

respiratory distress is well established and physiologically sound.<sup>5</sup> Among older children benefits of CPAP have not been consistent primarily because of the heterogeneity of pathologies associated with symptoms of respiratory distress. Furthermore, CPAP would prevent against collapse of airways but may not help much where the primary issue is alveolar pathology.

As our experience grows with the use of a heated humidified high-flow nasal cannula (HHFNC), there is growing concern related to cost effectiveness of this therapy in view of expensive machines and the recurring cost of breathing circuits and nasal devices. There is a need for indigenous alternatives that would be less expensive and thus more suitable for resource-limited settings.

One limiting factor in this study is that authors have not commented upon cost issues as well as conflict of interest about this new product but we assume that it must be less than a patented product that is available in the market. Another limitation is the lack of predefined objective criteria to select mode of respiratory support that is either the intervention being studied (in this case bCPAP) or intervention against which it is being compared (in this case other oxygen delivery devices ranging from low flow oxygen delivery device, HFNC, to invasive ventilation). If a greater number of cases can be recruited it should help in improving the weightage of evidence. We hope this study encourages Indian manufacturers to innovate and manufacture more such equipment which are designed keeping in mind specific needs and challenges of our country.

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## REFERENCES

1. Farooqui H, Jit M, Heymann DL, Zodpey S. Burden of severe pneumonia, pneumococcal pneumonia and pneumonia deaths in Indian states: Modelling based estimates. *PLoS One* 2015;10(6):e0129191. DOI: 10.1371/journal.pone.0129191.
2. Tagare A, Kadam S, Vaidya U, Pandit A, Patole S. Bubble CPAP versus ventilator CPAP in preterm neonates with early onset respiratory distress—A randomized controlled trial. *J Trop Pediatr* 2013;59(2):113119. DOI: 10.1093/tropej/fms061.
3. Lalitha AV, Pujari CG, Raj JM. Bubble continuous positive airway pressure oxygen therapy in children under five years of age with respiratory distress in pediatric intensive care unit. *Indian J Crit Care Med* 2023;27(11):847–854.
4. Nava S, Hill N. Non-invasive ventilation in acute respiratory failure. *Lancet* 2009;374(9685):250–259. DOI: 10.1016/S0140-6736(09)60496-7.
5. McCollum ED, Smith AG, Eckerle M, Mvalo T, O'Brien KL, Baqui AH. CPAP treatment for children with pneumonia in low-resource settings. *Lancet Respir Med* 2017;5(12):924–925. DOI: 10.1016/S2213-2600(17)30347-8.