

# Prevention of VAP Using Hypertonic Saline Nebulization in NICU: A Randomized Controlled Trial

## Original Article

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## ABSTRACT

### OBJECTIVES

To evaluate the efficacy and safety of hypertonic saline (HS) nebulization in reducing the occurrence of ventilator associated pneumonia (VAP) by comparison of modified Clinical Pulmonary Infection Score (mCPIS) in HS nebulized and non-nebulized newborns.

### METHODS

A randomized controlled study with 1:1 participant allocation ratio was conducted in a tertiary centre in North India. Neonates who received mechanical ventilation at the centre were included. Those who had been intubated for >12 hours at outside hospitals were excluded. The study group received nebulization with HS for seven days or till extubation (whichever was earlier). Both groups were compared in terms of occurrence of VAP and mCPIS. mCPIS <sup>3</sup> 6 was used to suggest VAP. VAP was confirmed by a positive blood culture in ventilated newborns with clinicoinvestigative features of VAP.

### RESULTS

A total of 143 neonates were analyzed in each group. VAP rate (per 1000 mechanical ventilation-days) in the HS nebulization and the control groups were 36.72 and 51.51, respectively; P = 0.031. A 33.52% reduction in the rate of VAP was observed due to HS nebulization. [RR (95% CI) 0.67 (0.47, 0.95), P = 0.022]. The mean (SD) mCPIS in HS group was 5.22 (0.88) compared to 5.94 (1.07) in the control group; P = 0.030. Only 5.5% neonates in the intervention group developed wheezing.

### CONCLUSION

Nebulization with HS reduces the incidence of VAP in ventilated newborns without significant side effects.

**Keywords:** Neonates, Ventilator, Pneumonia, Nebulization

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## REFERENCES

- 1.Horan TC, Andrus M, Dudeck MA. CDC/NHSN surveillance definition of health care-associated infection and criteria for specific types of infections in the acute care setting. *Am J Infect Control*. 2008;36:309-32.
- 2.Khattab AA, El-Lahony DM, Soliman WF. Ventilator-associated pneumonia in the neonatal intensive care unit. *Menoufia Med J*. 2014;27:73-7.
- 3.Geffers C, Baerwolff S, Schwab F, et al. Incidence of healthcare-associated infections in high-risk neonates: results from the German surveillance system for very-low-birthweight infants. *J Hosp Infect*. 2008;68:214-21.
- 4.National Nosocomial Infections Surveillance System. National Nosocomial Infections Surveillance (NNIS) System Report, data summary from January 1992 through June 2004, issued October 2004. *Am J Infect Control*. 2004;32:470-85.
- 5.Badr MA, Ali YF, Albanna EA, et al. Ventilator associated pneumonia in critically-ill neonates admitted to neonatal intensive care unit, Zagazig University Hospitals. *Iran J Pediatr*. 2011;21:418-24.
- 6.Cernada M, Brugada M, Golombek S, et al. Ventilator-associated pneumonia in neonatal patients: an update. *Neonatology*. 2014;105:98-107.
- 7.Iosifidis E, Pitsava G, Roilides E. Ventilator-associated pneumonia in neonates and children: a systematic analysis of diagnostic methods and prevention. *Future Microbiol*. 2018;13:1431-46.
- 8.Zhao T, Wu X, Zhang Q, et al. Oral hygiene care for critically ill patients to prevent ventilator-associated pneumonia. *Cochrane Database Syst Rev*. 2020;12:CD008367.
- 9.Ma A, Yang J, Li Y, et al. Oropharyngeal colostrum therapy reduces the incidence of ventilator-associated pneumonia in very low birth weight infants: a systematic review and meta-analysis. *Pediatr Res*. 2021;89:54-62.
- 10.Linssen RSN, Ma J, Bem RA, Rubin BK. Rational use of mucoactive medications to treat pediatric airway disease. *Paediatr Respir Rev*. 2020;36:8-14.
- 11.Ziment I. Mucokinetic agents. In: *Respiratory Pharmacology and Therapeutics*. First edition. Philadelphia, PA: WB Saunders,1978:60-104.
- 12.Pugin J, Auckenthaler R, Mili N, et al. Diagnosis of ventilator-associated pneumonia by bacteriologic analysis of bronchoscopic and nonbronchoscopic "blind" bronchoalveolar lavage fluid. *Am Rev Respir Dis*. 1991;143:1121-9.
- 13.Ezzeldin Z, Mansi Y, Gaber M, et al. Nebulized hypertonic saline to prevent ventilator associated pneumonia in premature infants, a randomized trial. *J Matern Fetal Neonatal Med*. 2018;31:2947-52.
- 14.Zhang L, Mendoza-Sassi RA, Wainwright CE, et al. Nebulised hypertonic saline solution for acute bronchiolitis in infants. *Cochrane Database Syst Rev*. 2023;4:CD006458.
- 15.da Silva PS, de Aguiar VE, de Carvalho WB et al. Value of clinical pulmonary infection score in critically ill children as a surrogate for diagnosis of ventilator-associated pneumonia. *J Crit Care*. 2014;29:545-50.
- 16.Aelami MH, Lotfi M, Zingg W. Ventilator-associated pneumonia in neonates, infants and children. *Antimicrob Resist Infect Control*. 2014;3:30.
- 17.Shamaila G, Gayla E, Michael S. Implementation of an algorithm for management of ventilator associated pneumonia (VAP) and ventilator associated trachietis (VAT) in neonates at the Children's Medical Center NICU. *Pediatrics*. 2022;149:684.
- 18.Tripathi S, Malik GK, Jain A et al. Study of ventilator associated pneumonia in neonatal intensive care unit: characteristics, risk factors and outcome. *Internet J Med Update*. 2009;5:12-19.
- 19.Shein SL, Gallagher JT, Deakins KM, et al. Prophylactic use of nebulized hypertonic saline in mechanically ventilated children: a randomized blinded pilot study. *Respir Care*. 2016;61:586-92.
- 20.Azab SF, Sherbiny HS, Saleh SH, et al. Reducing ventilator-associated pneumonia in neonatal intensive care unit using "VAP prevention Bundle": a cohort study. *BMC Infect Dis*. 2015;15:314.
- 21.Muley VA, Ghadage DP, Bhore AV. Bacteriological profile of neonatal septicemia in a tertiary care hospital from Western India. *J Glob Infect Dis*. 2015;7:75-7.