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Original article

Ventilator-associated pneumonia agents in Brazilian Neonatal Intensive Care Units – a systematic review

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ABSTRACT

Introduction: Ventilator-associated pneumonia (VAP) is one of the most common healthcare-associated infections (HAI) in neonates admitted in neonatal intensive care units (NICUs).
Methods: We did a systematic review using PRISMA methodology to identify the main etiological agents in Brazilian NICUs. Eligible studies published without period restriction were identified in PUBMED, SCIELO, LILACS and DOAJ. Studies were included if they were conducted in neonates hospitalized at NICU. Studies done in outpatient care, neonates outside NICU, emergency department, primary care, long-term care facilities or a combination of these were excluded.
Results: We identified 6384 articles in the initial search and four papers met the inclusion criteria. In all studies included, rates of device-associated infections were described, including VAP rates. The VAP incidence density, in exclusively Brazilian NICU, ranged from 3.2 to 9.2 per 1000 ventilator-days. Pneumonia was described as the main HAI in NICU in one article, as the second type of HAI in two other articles and as the fourth type of HAI in the last one. The main pathogens causing all HAI types were described in three of four articles, but, none of the articles reported which pathogens were related or associated to VAP.
Conclusion: Etiological agents causing VAP in Brazilian NICUs are, until the present time, not known.

Introduction

Surveillance, prevention and control of healthcare-associated infections (HAI) in intensive care units, including pediatric intensive care units (PICU) and neonatal intensive care units (NICU) are a global concern, mainly due to high prevalence of multi-drug resistant bacteria in many of these units.[1] In 2017, World Health Organization (WHO) published a list of antibiotic-resistant "priority pathogens". The most critical group of all includes *Acinetobacter*, *Pseudomonas* and various Enterobacteriaceae (including *Klebsiella*, *E. coli*, *Serratia*, and *expanded*), carbapenem-resistant or extended-spectrum beta-

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lactamase (ESBL) producers. They are frequently related to severe bloodstream and pneumonia infections in intensive care units.[2]

Pneumonia is one of the most common HAI in neonates which is diagnosed using a combination of imaging, clinical and laboratory criteria.[3] Ventilator-associated pneumonia (VAP) occurs when the patient is on mechanical ventilation for more than two calendar days on the date of diagnosis and the ventilator was in place on the date of event or the day before.[4] VAP accounts for up to 32.2 % of HAI among neonates.[5]

A recent meta-analysis of observational studies identified 10 variables as independent risk factors for the development of VAP, including length of stay in NICU (OR 23.45), reintubation (OR 9.18), enteral feeding (OR 5.59), mechanical ventilation (OR 4.04), transfusion (OR 3.32), low birth weight (OR 3.16), premature infants (OR 2.66), parenteral nutrition (OR 2.30), bronchopulmonary dysplasia (OR 2.21), and tracheal intubation (OR 1.12).[6]

Several surveillance systems VAP rates in neonates around the world are NEO-KISS (Nosocomial infection surveillance system for preterm infants on neonatology departments and ICUs) in Germany, neonIN Surveillance Network in UK, and National Healthcare Safety Network (NHSN) in USA.[7–9]

In a recent report of a national electronic surveillance of VAP rates in neonates, covering 376 hospitals from all Brazilian regions, the incidence density was found to be 7.7, 8.4, 7.5, 7.8, and 8.1 for neonates <750 g, 751–1000 g, 1000–1500 g, 1501–2500 g, and >2500 g, respectively. Despite these important data, no information was available concerning the etiology of VAP in neonates.[10] VAP rates vary in different regions of Brazil. In Rio de Janeiro state, the reported VAP incidence density in 2016 was 5.7 cases per 1000 ventilator days in neonates born with more than 2500 g, with no description of etiological agents.[11]

Knowledge about VAP rates in neonates and the respective causal agents is critical to define which strategies should be prioritized by infection control committees to reduce morbidity and mortality.

The aim of this systematic review was to identify studies reporting the etiological agents causing VAP, in Brazilian NICU.

Materials and methods

This systematic review was conducted according to recommendations of the PRISMA guidelines for reporting systematic reviews.[12]

Search strategy

The search was carried out for publications in PUBMED, SCIELO, LILACS and DOAJ using the search term: "ventilator associated pneumonia", without period restriction, limiting results by age (newborns) and English and Portuguese languages (Fig. 1).

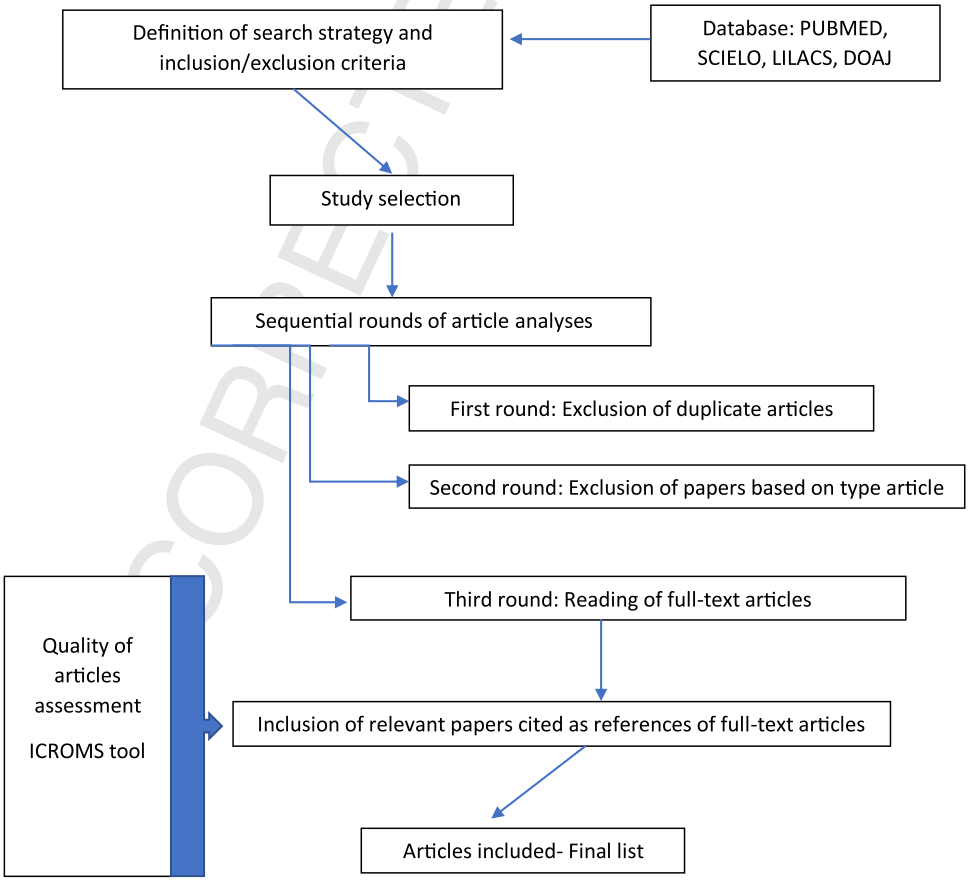

Fig. 1 – Outline of the systematic review and component assessment.

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