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Review

Oral hygiene practices in pediatric intensive care units: a scoping review

Práticas de higiene bucal em unidades de terapia intensiva pediátrica: uma revisão de escopo

Prácticas de higiene oral en las unidades de cuidados intensivos pediátricos: una revisión de alcance

Fabiana Bucholdz Teixeira Alves[1]
ORCID: 0000-0001-9955-1811
Marcos Cezar Pomini[2]
ORCID: 0000-0001-8129-7165
Paulo Sérgio da Silva Santos[3]
ORCID: 0000-0002-0674-3759
Gabriela Moura Chicrala[3]
ORCID: 0000-0001-6628-3048
Luiz Alberto Valente Soares Junior[4]
ORCID: 0000-0003-0717-7354

[1]Universidade Estadual de Ponta Grossa. Ponta Grossa, Paraná, Brasil.
[2]Universidade Estadual de Campinas. Piracicaba, São Paulo, Brasil.
[3]Universidade de São Paulo. Bauru, São Paulo, Brasil.
[4]Universidade de São Paulo. São Paulo, São Paulo, Brasil.

Corresponding author:
Marcos Cezar Pomini
E-mail: marcospomini@outlook.com

Resumo

Objective: To explore and map the literature on oral hygiene (OH) practices in pediatric patients admitted to Pediatric Intensive Care Units (PICU). **Methods:** The Arksey and O'Malley's five-stage methodological framework for scoping reviews was conducted using Pubmed, Bireme, Scopus, Web of Science and Cochrane Library databases. Clinical trials reporting OH practices in PICU and published in English language were included. Non-interventional studies, case reports and studies with neonates, adolescents or adults were excluded from the review. **Results:** The 11 included studies indicate that OH has been integrated into protocols for the prevention of ventilator-associated pneumonia (VAP) or into prevention bundles. The most common agent used for OH in mechanically ventilated children was 0.12% chlorhexidine. There is not enough evidence to support a safe and uniform protocol for OH in children admitted to PICU. **Conclusion:** A gap regarding OH in non-ventilated children was found in the literature. Further studies are needed to support the development of a uniform, safe, effective and evidence-based OH protocol for children in PICU.

Descriptors: Child; Oral Hygiene; Intensive Care Units, Pediatric; Chlorhexidine.

Whats is already known on this?
Oral hygiene in PICU is an important and effective approach for the prevention of systemic diseases, but there is no well-established protocol on how it should be performed.

What this study adds?
The literature highlights the importance of OH in PICU and that it has mostly been performed using protocols to reduce VAP rates or bundles. The isolated practice of using chlorhexidine (CLX) digluconate did not change the indices, obtaining the best result in the application with bundles. Studies approaching OH in non-ventilated children are limited.

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Resumo

Objetivo: *Explorar e mapear a literatura sobre práticas de higiene bucal (HB) em pacientes pediátricos em Unidades de Terapia Intensiva Pediátrica (UTIPED).* ***Métodos:*** *A estrutura metodológica de cinco passos de Arksey e O'Malley's para revisões de escopo foi conduzida utilizando as bases de dados PubMed, Bireme, Scopus, Web of Sciense e Cochrane Library. Ensaios clínicos que relataram HB em UTIPED e publicados em língua inglesa foram incluídos. Estudos não intervencionais, relatos de caso e estudos com neonatos, adolescentes ou adultos foram excluídos da revisão.* ***Resultados:*** *Os 11 artigos incluídos indicam que a HB em UTIPED tem sido integrada aos protocolos para a prevenção de pneumonia associada à ventilação mecânica (PAV) ou aos bundles de prevenção. O veículo amplamente utilizado para HB em crianças em ventilação mecânica foi a clorexidina 0,12%. Não há evidências suficientes para corroborar um protocolo seguro e uniforme para HB de crianças em UTIPED.* ***Conclusão:*** *Encontrou-se uma lacuna em relação à HB em crianças não ventiladas na literatura. Estudos adicionais são necessários para sustentar o desenvolvimento de um protocolo de HB uniforme, seguro, eficaz e baseado em evidências para crianças em UTIPED.*

Descritores: *Criança; Higiene Bucal; Unidades de Terapia Intensiva Pediátrica; Clorexidina.*

Resumén

Objetivo: *Explorar y mapear la literatura sobre prácticas de higiene oral (HO) en pacientes pediátricos ingresados en Unidades de Cuidados Intensivos Pediátricos (UCIP).* ***Métodos:*** *El marco metodológico de cinco etapas de Arksey y O'Malley para las revisiones de alcance se realizó utilizando las bases de datos PubMed, Bireme, Scopus, Web of Science y Cochrane Library. Se incluyeron los ensayos clínicos que informaban sobre prácticas de HO en UCIP y publicados en lengua inglesa. Se excluyeron de la revisión los estudios no intervencionales, los informes de casos y los estudios con neonatos, adolescentes o adultos.* ***Resultados:*** *Los 11 estudios incluidos indican que la HO se ha integrado en los protocolos de prevención de la neumonía asociada a la ventilación mecánica (NAV) o en los paquetes de prevención. El agente ampliamente utilizado para la HO en niños ventilados mecánicamente fue la clorhexidina al 0,12%. No existen pruebas suficientes que respalden un protocolo seguro y uniforme para la HO en niños ingresados en la UCIP.* ***Conclusión:*** *Se encontró un vacío en la literatura con respecto a la HO en niños no ventilados. Se necesitan más estudios para apoyar el desarrollo de un protocolo de HO uniforme, seguro, eficaz y basado en la evidencia para los niños ingresados en la UCIP.*

Descriptores*: Niño; Higiene Bucal; Unidades de Cuidados Intensivos Pediátricos; Clorhexidina.*

INTRODUCTION

Severely ill patients, such as children admitted to PICU, show changes in the oral microbiome within 48 hours. In these patients, the oral flora is mostly composed of Gram-negative bacteria and *Staphylococcus aureus*, unlike healthy individuals, who have higher levels of Gram-positive bacteria, such as *Streptococcus viridans*.[1,2] Opportunistic microorganisms from the oropharynx include *Klebsiella pneumoniae, Candida* spp, *Staphylococcus aureus* and *Pseudomonas aeruginosa*.[3]

The management of children admitted to PICU often involves airways exposition and manipulation with devices that help to maintain breathing. Due to the presence of oropharyngeal pathogens,[3,4] these patients are more susceptible to opportunistic infections, which can cause harm to their health during their hospitalization, such as ventilator-associated pneumonia (VAP).[4] Furthermore, even when not intubated, children are often exposed to high-flow facial oxygen and oral aspiration, which may result in dryness of the oral mucosa. These conditions make providing quality oral care to maintain a clean and moist oral environment in children in PICU vitally important. In addition to affecting child well-being, an effective, regular and standardized OH protocol can be a positive example for the family nucleus, encouraging and teaching appropriate health and oral hygiene habits.[5]

The introduction of OH practices in children admitted to PICU has been recommended because of the need and the potential it represents in preventing systemic infections,[3,4,6,7] due to the fact that the oropharynx of these patients is often colonized by potential systemic pathogens during critical illness in childhood. Despite the importance of practicing OH in PICU, there is a gap in the literature regarding the establishment of a unified, safe and mainly scientific evidence-based protocol for its establishment, both in non-mechanically ventilated and ventilated children. Therefore, the objective of this scoping review is to explore and map the literature on OH practices performed on pediatric patients admitted to PICU, in order to guide the establishment of oral care protocols and systematic reviews.

METHODS

Scoping review is a relatively new approach to map and synthesize scientific evidence, as well as to identify possible existing gaps in the literature in regard to a topic. The choice of this research method aimed to provide a preliminary assessment of OH practices performed in pediatric patients in PICU.

Study protocol

The methodological approach of this study was based on Arksey and O'Malley's five-part scoping review framework, namely: (1) to identify the research question; (2) to identify potentially relevant studies; (3) to select eligible studies; (4) to map the data; and (5) to compile, summarize and report the results. Because scoping reviews aim to provide only robust key concepts to assess the current state of the literature, methodological quality assessment of the included studies was not performed.[8,9]

The research question posed for this scoping review was: "what OH practices have been performed in pediatric patients admitted to PICU?" With this question, it was hoped to investigate and map the literature on clinical studies reporting OH practices in PICU, as well as to explore the approaches, clinical situations, solutions used for OH, dosages, protocols and outcomes. Therefore, the posed question was projected to answer the purpose of the review, in addition to providing important data to support the development of a safe and uniform care protocol.

The electronic searches were carried out in Bireme, PubMed, Scopus, Web of Science and Cochrane Library databases and considered articles published until April 2020. Additional search was performed in the reference list of the selected articles. The related descriptors "Child" OR "Children" AND "Oral Hygiene" AND "Intensive Care Units" registered in the Medical Subject Headings (MeSH) were selected after reading 10% of the scientific literature on the topic. Articles were included in the review if: (1) they were clinical trials published in a peer-reviewed journal and in the English language and (2) they investigated OH practices in pediatric patients admitted to PICU. Exclusion criteria included: (1) studies involving neonates, adolescents or adults and (2) literature reviews and cross-sectional observational studies.

Two independent researchers performed the electronic searches and data extraction. In case of divergence between them, a third reviewer issued an opinion. The standardized JBI QARI software tool was used to assist and facilitate data extraction. The following details were extracted from the included articles: citations, keywords, objective, population, phenomenon of interest, context, methodology, intervention observations, data analysis and results. While JBI QARI software extracted the data, a plausibility level was allocated based on the reviewers' assessment, identifying potentially relevant studies answering the scoping review question.

The findings were compiled, summarized and reported. Subsequently, a consensual discussion was held between the two reviewers with the objective of including the implications of the selected studies and recommendations to support future research. Lastly, a descriptive synthesis of the data was carried out based on the results.

RESULTS

The search identified a total of 101 references. Of these, 41 were duplicates and were therefore excluded. Of the 60 remaining records, 50 were excluded after analyzing the title and abstract as they did not meet the inclusion criteria. Subsequently, the remaining 10 articles were selected for reading in full. An additional screening of the list of bibliographic references of these articles resulted in the inclusion of five more references for full reading. After analyzing the 15 studies, one was excluded for including non-pediatric patients, two for presenting non-interventional study designs and one for presenting the OH protocol incomplete. At the end of the process, 11 articles were included in this scoping review because they fit the proposed theme based on the guiding question and met the inclusion criteria[10-19]. Figure 01 shows a PRISMA diagram[20] of the study selection process.

Of the 11 studies included in this review, five were conducted in Brazil, two in Spain, two in India, one in Egypt and one involved Colombia, Turkey, El Salvador, India and the Philippines, as it was multicenter. The studies were conducted between 2009 and 2017 and used randomized, double-blind, placebo-controlled,[10-14] quasi-experimental[2,15-18] and prospective cohort[16,19] study research designs. The largest sample size found was 4,339 patients[18] and the smallest 56 patients.[10]

Data on OH practices in PICU, mechanical interventions, pharmacological interventions, VAP prevention protocols and prevention bundles were extracted from the 11 included studies. The characteristics and key findings of the 11 included articles are shown in Tables 1, 2 and 3. For the purpose of this review, the data were grouped based on the oral hygiene protocol, as follows: OH alone (Table 1), OH integrated with protocols for the prevention of VAP (Table 2) or OH integrated with prevention bundles (Table 3). In addition, the tables provide information on the author/year of publication, study design, sample size and characteristics, study objective, intervention (protocol, solution, frequency and duration) and outcome.

Figure 1. Flow diagram of the search and selection of the articles included in the scoping review. Ponta Grossa-PR, Brazil, 2020.

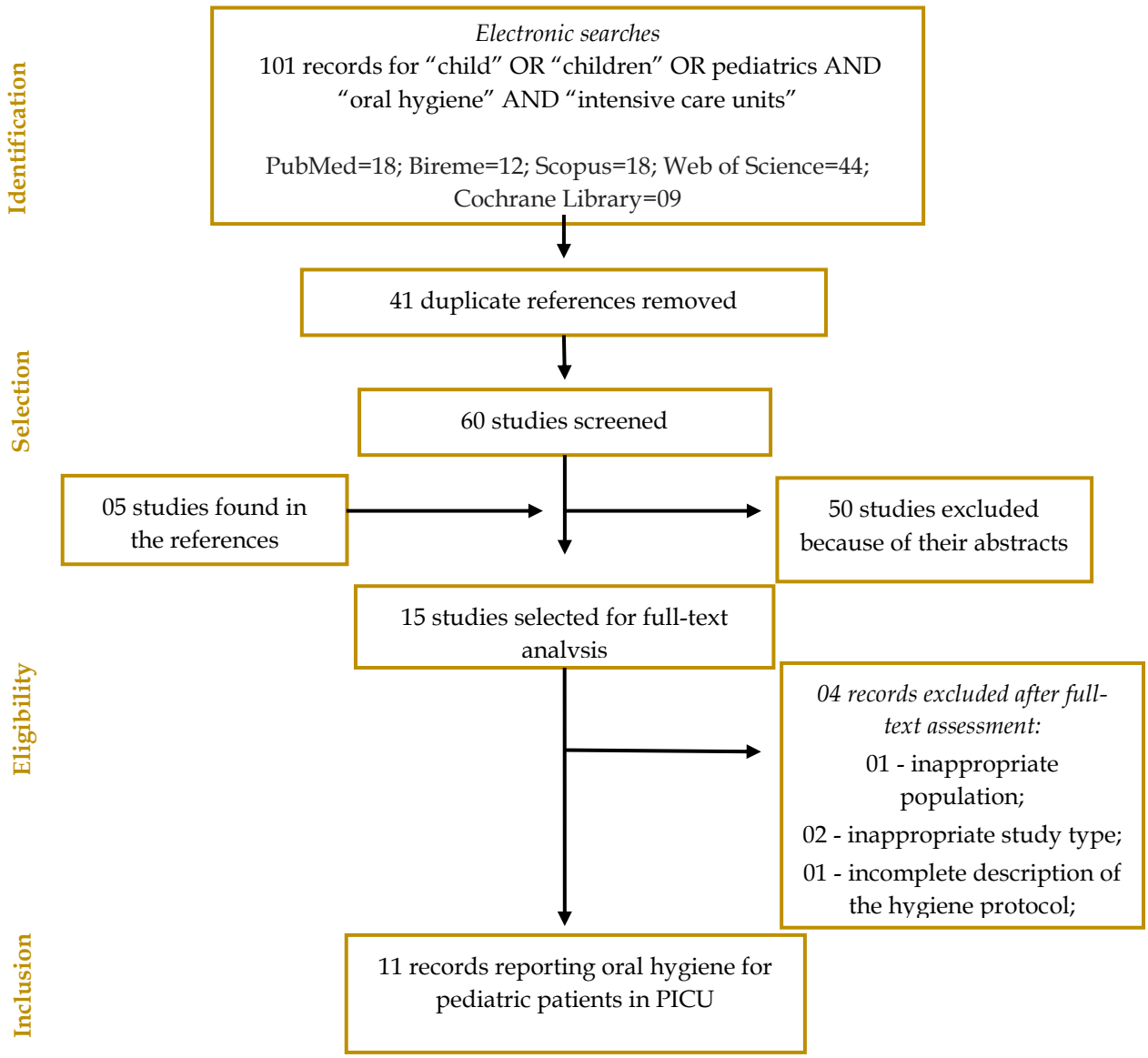

Table 1. Oral hygiene practices in PICU not integrated with protocols for prevention ventilator-associated pneumonia or patient care bundles. Ponta Grossa-PR, Brazil, 2020.

Author details / country	Study design / population	Purpose	Intervention	Outcomes
Pedreira et al. (2009)[10] Brazil	Prospective, randomized, double-blind, placebo-controlled trial. N = 56 mechanically ventilated (MV) children admitted to PICU.	To evaluate the oropharyngeal microbiological profile, duration of ventilation and length of stay in the PICU of MV children with or without pharmacological oral care.	Experimental group: oral gel containing 0.12% chlorhexidine (CLX) digluconate, 2.12% methylcellulose gel (25g), four drops of gooseberry syrup, three drops of 50% menthol solution and distillated water to 30g. Control group: similar gel without CLX. OH was performed by nurses twice a day (approximately 10 min each) with the aid of toothbrush, followed by rinsing with water and aspiration Oropharyngeal secretions were collected and evaluated after 24, 48 and 96 hours and at discharge.	OH with chlorhexidine digluconate did not decrease the oropharyngeal microbiological colonization, duration of ventilation and length of stay of MV children in PICU.
Jacomo et al. (2011)[11] Brazil	Prospective, randomized, double-blind, placebo-controlled trial N = 160 children with congenital heart disease undergoing cardiac surgery.	To assess the effect of OH with 0.12% CLX on the incidence of nosocomial pneumonia and VAP in pediatric patients undergoing cardiac surgery.	Experimental group: solution containing sterile water, glycerin, mint flavor, sodium saccharin, 7.4% alcohol and 0.12% CLX digluconate. Control group: similar gel without CLX. The solution was administered by nurses, or the same physician, prior surgery and continued twice a day after surgery. Administration: patients >6 years of age gargled 0.3 mL/kg for 30 seconds; <6 years of age or intubated patients had the solution applied with a spatula wrapped with gauze.	OH with 0.12% CLX gluconate did not decrease the incidence of nosocomial pneumonia and VAP in pediatric patients undergoing cardiac surgery.
Kusahara et al. (2012)[12] Brazil	Prospective, randomized, double-blind, placebo-controlled trial. N = 74 children in a general PICU at a teaching hospital (55% with oral intubation).	To evaluate the effect of 0.12% CLX on Gram-negative colonization of oropharyngeal and tracheal secretions in children exposed to MV.	Experimental group: cleaning gel containing 0.12% CLX digluconate Control group: similar gel without CLX. Nurses and technicians performed OH twice a day with the aid of appropriate toothbrushes and soft sponges for oral soft tissue. Oropharyngeal and tracheal secretions were collected after 24, 48 and 98 h of the PICU stay. Primary outcomes evaluated: influence of CLX on oropharyngeal colonization profile and influence of demographic characteristics.	The use of 0.12% CLX did not influence oropharyngeal colonization profile of MV pediatric patients in PICU. Younger patients exhibited higher presence of bacteria, regardless of CLX application.
Kusahara, Peterlini and Pedreira (2012)[13] Brazil	Prospective, randomized, double-blind, placebo-controlled trial. N = 96 MV children in a PICU.	To evaluate the effectiveness of OH with 0.12% CLX in reducing VAP in critically ill pediatric patients.	Experimental group: gel containing 0.12% CLX gluconate, 25 g of 2.12% methylcellulose gel, four drops of currant syrup, three drops of 50% menthol and distillated water. Control group: similar gel without CLX. Nurses performed OH twice a day for 15 days with the aid of toothbrushes and oral foam applicator swab.	OH with 0.12% CLX did not reduce the incidence of VAP in MV pediatric patients.

			Oropharyngeal secretions were collected in the first 24 h and after 48 and 98 h of intubation and analyzed using microbiological techniques.	
Sebastian et al. (2012)[14] India	Randomized, double-blind, placebo-controlled trial. N = 86 children aged 3 months to 15 years requiring orotracheal or nasotracheal intubation and mechanical ventilation (MVn).	To evaluate the effectiveness of oral mucosal decontamination with CLX in the prevention of PAV in children aged 3 months to 15 years.	Experimental group: gel containing 1% chlorhexidine Control group: similar gel but lacking CLX. The nursing staff performed OH at 8-hr intervals during MVn (maximum 21 days). The gel was applied with a disposable applicator (0.5 g or 1.5 cm of gel). Prior OH, oral cavities were suctioned and subsequently cleaned with gauze soaked in saline solution. The primary outcome evaluated was the incidence rate of VAP after 48h of intubation and MV. The secondary outcomes include duration in PICU and hospital stay, mortality rate and antibiotic sensitivity.	Oral mucosal decontamination with a 1% CLX gel did not prevent the development of PAV in pediatric patients aged 3 months to 15 years.
Handa et al. (2014)[15] India	Quasi-experimental research. N = 60 pediatric patients admitted to intensive care units aged 1 to 12 years.	To evaluate the effectiveness of an oral care protocol with normal saline on the oral health status of children in PICU	Experimental group: OH based on prepared protocol (normal saline four times a day for three days) Control group: routine OH. Oral health was assessed using Beck Oral Assessment Scale on the first and on the fourth day. A gingival swab was used to collect samples for microbiological analyses. Trained staff performed the procedures.	OH with normal saline improved oral health status of children in PICU, but did not reduce colony count of coagulase-negative staphylococci and Klebsiella.

Table 2. Oral hygiene practices in PICU integrated with protocols for prevention of ventilator-associated pneumonia (VAP). Ponta Grossa-PR, Brazil, 2020.

Author details / country	Study design / population	Purpose	Intervention	Outcomes
Esteban et al. (2013)[16] Spain	Prospective interventional cohort study. N = 2,613 pediatric patients admitted to PICU for more than 24 h.	To evaluate the efficacy of a multifaceted quality improvement intervention (MQI) in reducing the rates of nosocomial infections (NI) in a PICU.	The study comprised pre-intervention, intervention and long-term follow-up. The MQI consisted of: creating an infection control team, hand hygiene education and implementing practices for NI prevention. These practices included prevention of central line–associated bloodstream infection, catheter-associated urinary tract infection and VAP. The latter included 30° head of bed elevation (HOBE), OH with 2% CLX every 8 h, closed suction catheters for MV children and use of cuffed endotracheal tubes.	The MQI decreased rates of nosocomial infection, length of hospital stay and mortality rate in a PICU.
Piau et al. (2016)[2] Brazil	Quasi-experimental controlled trial N = 44 patients (22 MV children in a PICU for more than three days and 22 healthy children).	To evaluate oral microbiological colonization before and after an OH protocol in pediatric patients admitted to a PICU compared to healthy children.	OH intervention was performed by the investigator on the teeth and tongue surfaces with gauze soaked in 0.12% CLX gluconate without alcohol, followed by aspiration. This technique was included in the ventilator protocol of the hospital and was implemented at 8-hr intervals for three days Control group: healthy children. Microbiological evaluation of the oral biofilm in the experimental and control groups was performed before and after the OH protocol.	The majority of the MV children in PICU exhibited pathogenic bacteria in the oral cavity. The incorporation of an OH protocol decreased the bacterial load.
Gomaa et al. (2017)[17] Egypt	Quasi-experimental controlled trial (retrospective control group). N = 50 children admitted to PICU for ≥5 days and MV for ≥2 days.	To evaluate the effect of an OH protocol with 0.12% CLX on the outcomes of MV children in a PICU.	Experimental group: mouth was moistened with saline at 2-hr intervals and teeth brushed with 0.7% sodium monoflurophosphate toothpaste twice a day. Mouth was rinsed twice a day with 0.12% CLX solution. Control group: same protocol, but without CLX. Trained pediatric nurses performed the OH protocol. VAP development was assessed every day.	The adoption of an OH protocol with 0.12% CLX improved the outcomes of pediatric patients in PICU.

Table 3. Oral hygiene practices in PICU integrated with patient care bundles. Ponta Grossa-PR, Brazil, 2020.

Author details / country	Study design / population	Purpose	Intervention	Outcomes
Rosenthal et al. (2012)[18] Colombia, Turkey, El Salvador, India and the Philippines	Quasi-experimental controlled trial (performed over two phases: baseline and intervention periods). N = 4,339 pediatric patients in PICU undergoing MV.	To evaluate the effect of the International Nosocomial Infection Control Consortium Program on reducing VAP rates in PICU of five developing countries.	Intervention composed of: 1) bundle of infection control practices; 2) education; 3) outcome surveillance; 4) process surveillance; 5) report of VAP rates; and 6) performance report of infection control practices. The bundle consisted of: 1) active supervision for VAP; 2) hand hygiene instructions; 3) 30-45° HOBE; 4) daily evaluation of readiness to wean and use of weaning protocols; 5) OH with an antiseptic solution; 6) use of noninvasive ventilation whenever possible; 7) use of orotracheal intubation over nasotracheal; 8) maintenance of an adequate pressure in the ETT cuff; 9) removal of condensate within ventilator circuit; 10) circuit changes only in case of soiling or malfunctioning; 11) avoidance of gastric overdistention; 12) avoidance of H(2) histaminegic receptor; and 13) cleaning of reusable respiratory equipment with sterile water. Intervention performed by the infection control team.	The implementation of the Nosocomial Infection Control Consortium program reduced VAP rate in PICU of developing countries.
Pena-López et al. (2016)[19] Spain	Prospective interventional cohort trial performed over three periods: pre-, early post- and late post-intervention periods. N = 312 pediatric patients in PICU undergoing invasive MV for 48 h or longer.	To evaluate whether the implementation of a ventilator care bundle at a PICU could reduce rates of VAP and ventilator-associated tracheobronchitis (VAT) in critically ill pediatric patients.	The bundle consisted of: 1) elevation of the head of the bed to 30°; 2) OH with 0.12% CLX solution at 1-hour intervals and brushing with standard toothpaste every 12 hours; 3) use of cuffed endotracheal tubes; 4) maintenance of tracheal tube pressure between 20-30 cm H2O; and 5) changes to the circuit only when dirty or malfunctioning. In January 2012, a protocol for tracheostomy care was implemented. The intervals between tube changes altered from weekly to fortnightly. Additionally, stoma care and tracheostomy tubes disinfection were standardized.	The implementation of a ventilator care bundle at a PICU reduced VAP rates and delayed VAP onset.

DISCUSSION

This scoping review provides an important overview of the relevant literature referring to OH practices in pediatric patients admitted to PICU. Examining the extent of research done on this topic showed that a universal and definitive procedure or protocol has not been established yet. OH practices in pediatric patients admitted to PICU play a key role on patients' oral and overall health. These practices aim at reducing plaque accumulation and complications resulting from poor OH, as well as oropharyngeal decontamination. Additionally, it contributes significantly to reduce the risk of local and secondary infections, to maintain oral homeostasis through mucosa hydration, to promote patient comfort and to educate the family nucleus about the impact of oral health on quality of life.[5] Nevertheless, our findings indicate that OH protocols with CLX alone should be carefully evaluated as their efficacy seems to be limited.

Although evidence related to OH in children admitted to PICU was summarized, most of the included OH protocols were directed toward the prevention of VAP.[11-14,16] In this regard, it is important to note that only clinical trials that compared at least two different approaches for OH practices were considered, mainly focused on the prevention of health problems of children admitted to PICU. These criteria may have narrowed down the number of studies included in the review.

Children admitted to PICU have specific care needs, demanding a high standard of care from multidisciplinary teams of professionals. Traditionally, nursing care for critically ill children includes some type of oral health care. This care is corroborated by the findings of this review since most of the included studies presented OH performed by a nursing team. It is highlighted that nursing has been still the main specialty acting in the implementation of oral health practices in PICU children. None of the studies reported OH being performed by a dentist or a dental team. Thus, one should underline the need for better policies aiming at the incorporation of dental professionals in PICU, in order to provide the highest level of care for critically ill pediatric patients.

Oral assessment and care are essential for children admitted to PICU in an effort to prevent oral health problems and acquired complications. In this regard, the literature points out that dental professionals have not been hired to care for patients in PICU, nor have they been consulted for guidance from the nursing team on appropriate oral health practices.[21] In this regard, only one study reported the use of an oral assessment scale as a standardized diagnostic tool to assess the child's oral condition. The cited scale was the Beck's Oral Assessment Scale, which has 41 parameters to assess the oral mucosa, tongue, teeth and saliva. This scale defines oral health through scores ranging from 5 to 20, with higher scores indicating poorer oral health.[15] Therefore, the findings of this review should be interpreted with caution, as limited assessment of oral health was conducted in the studies.

Efforts to prevent acquired infections during hospital stay through improvements in quality of care have presented noticeable results in many hospital settings. In an attempt to prevent VAP, PICU have implemented protocols consisting of a set of prevention measures. These packages comprise a set of interventions, such as elevating the head of the bed, using CLX for HB, stopping sedatives daily, spontaneous breathing, thrombosis prophylaxis and stress ulcers, among others. Two studies included in this review implemented OH through bundles for the prevention of VAP with positive outcomes.[18,19] Based on the findings of these studies, bundles seem to be positive approaches, as significant reduction in VAP rates has been observed after their implementation.[18,19]

The OH with CLX has been widely used in hospitalized patients with the aim of maintaining oral health. CLX is a biguanide of synthetic origin, which has a cationic character and broad-spectrum antibacterial activity. This activity has the ability to disrupt microbial cell membranes. At lower concentrations, CLX is bacteriostatic, essentially affecting the metabolic activity of bacteria; while at higher concentrations, it is bactericidal, causing precipitation of cell contents in the cytoplasm.[22] CLX was widely used as an antiseptic agent in the studies included in this scoping review.[2,10-14,16,17,19] The majority of them used a solution prepared at a concentration of 0.12%. However, Esteban et al. (2013)[16] and Sebastian et al. (2012)[14] used concentrations of 2% and 1%, respectively. In this regard, the literature has indicated that chlorhexidine 0.12% could have a significant effect on preventing VAP according to its cost, adverse reactions and analysis of drug resistance.[23] It is worth noting that only protocols that included OH with CLX integrated into a VAP prevention bundle resulted in a significant reduction in VAP rates in PICU.[2,16-18,19]

Although the use of CLX in oral care seems promising, some studies indicate certain limitations. For example, Johnstone, Spence and Koziol-McClain (2010)[5] state that the use of mouthwash based on CLX

0.12% is questionable for children under 6 years of age hospitalized in PICU, recommending a protocol with saline solution for this public. In the present review, Handa et al. (2014)[15] was the only study reporting the use of saline solution for OH. Regardless of the employed solution, mechanical elimination of dental biofilm is essential and is the main approach to achieving oral health. Chemical control can be used as an auxiliary or adjunctive method when mechanical elimination cannot be performed. In this regard, the purpose of chemical methods is to prevent the accumulation of biofilm, rather than its elimination.[24]

To date, there is not enough evidence to corroborate a safe and uniform protocol for OH in pediatric patients admitted to PICU. However, as the aim of scoping reviews is to provide key concepts on a topic, the result of this review is of interest to researchers and health professionals. In this regard, this review could contribute to the advancement of children's health and reduce the incidence of problems related to oral health and associated complications in PICU. Furthermore, the management of critically ill children must be conducted using a comprehensive, specialized, multidisciplinary and humanized approach, capable of reducing morbidity and mortality rates, as well as length of stay and hospital costs. A safe and uniform protocol for OH in PICU, based on scientific evidence, is essential for improving patients' oral and overall health.

CONCLUSION

The published literature indicates that OH in children admitted to PICU has been integrated into VAP prevention protocols or patient care bundles. The most common agent used for OH in children under MV is 0.12% chlorhexidine. This scoping review identified a large gap in the literature regarding OH in non-ventilated children. Further research is needed to support the development of a uniform, safe, effective and evidence-based OH protocol for children hospitalized in PICU.

CONTRIBUITIONS

Contributed to the conception or design of the study/research: Alves FBT, Chicrala GM.. Contributed to data collection: Alves FBT, Pomini MC. Contributed to the analysis and/or interpretation of data: Alves FBT, Pomini MC. Contributed to article writing or critical review: Alves FBT, Pomini MC, Chicrala GM, Santos PSS. Final approval of the version to be published: Alves FBT, Pomini MC, Santos PSS, Chicrala GM, Soares Júnior LAV.

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