Review Article

Empowering pediatric nursing in oral health: A narrative review of antiseptic and educational interventions

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Abstract

Background: Pediatric nurses, have a crucial role in enhancing the oral health of children mainly through a number of areas, including direct care, assessments, educating and encouraging families in hospitals, schools, clinics, and community environments. **Objectives:** This review analyzes the evolution of pediatric oral health care, shifting the focus from purely dental-led procedures to nurse-led interventions. It evaluates the efficacy of antiseptic strategies (specifically chlorhexidine) and educational programs implemented by nurses in hospital and community settings. **Methods:** A narrative review was conducted using a search strategy across PubMed, Scopus, Google Scholar, and ResearchGate for English-language articles published between 2005 and 2025. Fifteen studies meeting specific criteria for nurse-involvement or nursing-relevant protocols were analyzed. **Results:** Current evidence indicates that nurse-led interventions—combining chlorhexidine application with health education—significantly reduce dental plaque and gingivitis. However, efficacy relies heavily on the structured training of nursing staff, which is currently inconsistent across settings. **Conclusion:** Nurses are pivotal in bridging the gap between dental recommendations and daily patient care. To maximize outcomes, nursing curricula must expand oral health competencies, and healthcare systems must adopt standardized, nurse-driven oral hygiene protocols.

Keywords: oral hygiene, health education, chlorhexidine, pediatric nursing

1 Introduction

Child health serves as a foundation for long-term public health and national development. Despite this, oral health is frequently marginalized in general pediatric care, often resulting in preventable complications. In hospitalized children, oral health can deteriorate rapidly, with significant increases in dental plaque and gingival infection observed within 7 to 20 days of admission. These conditions extend beyond the oral cavity, potentially compromising physical development, quality of life, and systemic health [1, 2, 3, 4, 5].

Historically, the management of dental plaque—a bacterial biofilm causing gingivitis and caries—has been the domain of dental professionals. However, nurses are often the primary healthcare providers for children, particularly in intensive care units (ICUs) and community settings where dental access is limited. While the antiseptic efficacy of agents like chlorhexidine (CHX) is well-established in dentistry, its systematic application by nurses remains underutilized and non-standardized [6, 7, 8, 9]. This issue has been thoroughly researched regarding its efficacy in controlling dental plaque and managing gingivitis. Specific pediatric populations frequently use it [10]. Despite, additional research is required to determine the safety of chlorhexidine for oral hygiene, according to a randomized controlled study conducted by Lee et al. [11].

Nurses play a critical role in maintaining child health through a broad spectrum of responsibilities spanning from preventative and promotional care to therapeutic and rehabilitative services. They provide care for children due to diminished awareness and an incapacity to meet their fundamental requirements [6, 2]). The practices by nurses are employed for maintaining hygiene in children, ensuring the oral cavity remains clean. Furthermore, incorporating oral health promotion into standard nursing and midwifery practice has resulted in enhanced caries prevention, dental hygiene, and health behaviors among mothers and children [1, 12, 13].

Recent literature suggests a paradigm shift. Emerging evidence from 2020–2025 highlights the expanding scope of nursing practice to include active oral health management. Yet, gaps remain regarding specific

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nursing competencies, training needs, and the barriers nurses face in implementing these protocols. This review aims to synthesize existing evidence on nurse-led oral health interventions, focusing on the integration of antiseptic strategies and the necessity of establishing robust nursing protocols [14, 15].

2 Methodology

Design. This study utilizes a narrative review approach underpinned by a search strategy. This hybrid design allows for the comprehensive analysis of diverse study types, including randomized controlled trials (RCTs), quasi-experimental studies to capture the multifaceted nature of nursing practice.
Search strategy. A comprehensive search was conducted for articles published between 2005 and 2025, ensuring the inclusion of historical context and recent innovations. Databases included PubMed, Scopus, Google Scholar, and ResearchGate. Search terms combined intervention keywords ("Chlorhexidine," "Antiseptics") with nursing-specific terms ("Nurse-led care," "Health Education" "Pediatric Nursing," "Oral Hygiene Protocols").

2.1 Selection Criteria

Inclusion. Studies involving children (aged 3–18 years); interventions led or implementable by nurses; outcomes related to plaque, gingivitis, or oral hygiene behaviors; English language; open access.
Exclusion. Studies focusing exclusively on complex restorative dentistry, adult populations, and non-peer-reviewed articles.
Data synthesis. Of 70 initial articles, 15 met the inclusion criteria. Data were synthesized thematically, categorizing findings into clinical efficacy, educational impact, and implementation challenges.

3 Results

The review identified a distinct transition in pediatric oral care, moving from ad-hoc hygiene measures to structured, evidence-based nursing interventions.

1. *Efficacy of Nurse-Administered Antiseptics.* Chlorhexidine (CHX) remains the gold standard among pharmacological agents used in nursing protocols. In Pediatric Intensive Care Units (PICU), nurse-implemented CHX protocols (mouthwash, gel, or spray) have demonstrated a significant reduction in ventilator-associated pneumonia and mucositis. For example, a recent study by Ebrahim et al. [16] confirmed that 0.12% CHX gluconate administered by nurses was superior to routine care in mechanically ventilated children [17, 14].

2. *Impact of Nurse-Led Educational Interventions.* Beyond direct care, nurses function as primary educators. Community and school-based studies indicate that nurse-led educational programs significantly improve oral hygiene behaviors. Mohamed et al. (2025) found that a structured nursing initiative in schools improved students' knowledge, attitudes, and brushing practices after just three sessions. Similarly, Cheng et al. [17] reported that incorporating oral health promotion into well-child nursing visits increased brushing frequency and fluoride use among toddlers [18, 19, 20, 21].

3. *Safety and Adverse Effects.* While effective, CHX use in nursing care requires monitoring. Reported adverse effects are generally minor, including temporary tooth discoloration and taste alteration. These findings suggest that while safe, nurse-led CHX interventions should be time-limited and monitored, highlighting the need for specific nursing guidelines on duration of use [22, 23, 24, 25].

Table 1: General characteristics of the included studies

Authors/ (Year)	Study Design	Sample Size	Population/Age	Intervention	Major Findings
Bozkurt et al. [26]	RCT	51	Older adolescents	Oral sprays	Reduced plaque and gingival inflammation
Lorenz et al. [27]	RCT	90	adolescents	Chlorhexidine mouth rinses	Reduced plaque and gingivitis, but caused discoloration
Ersin et al. [19]	RCT	149	11-13-year-olds Schoolchildren	Chlorhexidine varnish, NaF gel, and education	Similar plaque scores and modest caries increments
Rodrigues et al. [28]	Clinical trial	72	6–8-year-old children	Chlorhexidine-thymol varnish	Do not reduce caries development
Chibinski et al. [18]	Clinical trail	29	12-year-old children with special needs	Chlorhexidine gel and spray	reduction in dental biofilm and gingival bleeding
Viana et al. [21]	Clinical trail	26	7–14 years old Children with mental health issues	Chlorhexidine spray	Significantly reduced the rates of dental and gingival biofilm
Cheng et al. [17]	Quasi-experimental	2097	children younge than 5 years of age	Dental education and referrals, fluoride varnish by nurses	Changes in oral health behaviors
Mandanas & Bautista [20]	RCT	28	Healthy children	Chlorhexidine spray vs. rinse	Improved plaque control, gingival health
Ghaempanah et al. [29]	Clinical trail	70	Adolescents in ICU with ETT	Oral care protocol vs 0.2% CHX	Reduced plaque and the gingival index
Bhor et al. [23]	RCT	72	14–15-year-old schoolchildren	0.4% Triphala vs. 0.12% chlorhexidine	Reduced plaque, gingivitis, and microbial growth
Ebrahim et al. [3]	Quasi-experimental study	60	Ventilated children in the PICU	Tooth brushing and 0.12% CHX vs routine care by nurses	Poor oral status in ventilated children
Butera et al. [24]	RCT (split-mouth)	30	Children with Periodontal problems	Antimicrobial gel vs. chlorhexidine	Both are effective in home care of children
More et al. [25]	Clinical trial	60	6–14-year-old children with mixed dentition	Chlorhexidine, fluoride, combination varnish	Reduced S. mutans count
Basha et al. [22]	RCT	45	24–36 months toddlers	Povidone-iodine vs. chlorhexidine gel	Reduced plaque regrowth
Mohamed et al. [14]	Quasi-experimental	400	11–12-year-old Schoolchildren	Nurse-led oral hygiene program	Improved oral hygiene behaviors

4 Discussion

The findings underscore that nurses are not merely supporters of dental care but are independent practitioners capable of improving oral health outcomes. However, maximizing this potential requires addressing competencies, protocols, and barriers.

1. *Expanding the Nursing Scope.* From Assistance to Leadership The role of the pediatric nurse has evolved from performing basic hygiene to managing complex oral health regimens. Recent studies (2020–2025) emphasize that nurses are uniquely positioned to perform oral risk assessments and administer preventive treatments like fluoride varnish and chlorhexidine. This shift is vital in settings like the PICU, where oral care is synonymous with infection control [17, 16, 30, 14].

2. *Nursing Competencies and Training Needs.* Despite the clear benefits of nurse-led care, a significant gap exists in formal training. Many nurses report performing oral care without standardized strategies, often relying on intuition rather than evidence-based protocols. Askari [31] highlights that while nurses value oral health, their practical knowledge often lags behind their theoretical understanding. To bridge this gap, oral health competencies—such as recognizing gingivitis, proper brushing techniques for intubated patients, and pharmacological application—must be integrated into continuing nursing education (CNE) and undergraduate curricula [32, 2, 16, 33].

3. *Standardization of Protocols.* The variability in outcomes often stems from inconsistent protocols.

While some hospitals utilize chlorhexidine, others rely on saline or oxygenated water, which may be less effective. The evidence supports the standardization of nurse-led protocols, specifically the use of CHX for high-risk populations (ventilated or immobilized children) and fluoride varnish for community populations. Developing universal "Nursing Oral Care Bundles" could reduce variability and improve patient safety [34, 30].

4. *Barriers to Implementation.* Nurses face distinct barriers in providing optimal oral care. These include high workloads, lack of time, and the prioritization of acute medical tasks over hygiene procedures. Furthermore, a lack of clear interdisciplinary boundaries can lead to "care gaps," where neither nurses nor doctors take full responsibility for oral hygiene. Addressing these barriers requires administrative support to ensure oral care is recognized as a critical medical intervention, not just a comfort measure [14, 35, 36].

5 Limitation

The lack of access to certain data, mainly evidence-based nursing research on oral health in children, longer follow-up of CHX use, and only English publications within a specific time period, limited the generalizability of findings.

6 Conclusion

This review confirms that nurse-led interventions, particularly those utilizing chlorhexidine and structured education, are highly effective in managing dental plaque and gingivitis in children. However, the current "ad-hoc" approach to oral hygiene in nursing limits potential gains. Future research should focus on the long-term cost-effectiveness of these nursing interventions and the development of global nursing standards for pediatric oral care.

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Conflict of interest

The authors declare that they have no competing interests.

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