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A SYSTEMATIC REVIEW OF THE EFFECTIVENESS OF ORAL HEALTH EDUCATION PROGRAMMES IN IMPROVING KNOWLEDGE OF ORAL HYGIENE: A NEED FOR IMPLEMENTATION IN SENIOR SECONDARY SCHOOL STUDENTS IN BICHI LOCAL GOVERNMENT AREA, KANO STATE, NIGERIA.

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Abstract

Oral health education plays a critical role in preventive dentistry, equipping students with essential knowledge, attitudes, and skills for maintaining optimal oral hygiene. Secondary school students are particularly susceptible to oral health risks due to lifestyle habits, limited access to dental care, and inadequate health literacy. Early interventions can instill positive lifelong oral health behaviours. A systematically review aimed at the effectiveness of oral health education programs in improving knowledge of oral hygiene among public senior secondary school students in Bichi Local Government Area, Kano State. A systematic appraisal of peer-reviewed studies, including randomized controlled trials, quasi-experimental studies, and systematic reviews, was conducted. Eligible studies included school-based or community-based oral health education interventions targeting children, adolescents, or university students. Intervention approaches examined included classroom-based education, digital storytelling, augmented reality AR, tele-dentistry, supervised tooth brushing, parental and teacher involvement, and community water fluoridation. Data were extracted on study design, participants, intervention strategies, and knowledge outcomes. Evidence from multiple contexts—including Nigeria, India, Libya, Senegal, and other low- and middle-income countries—demonstrated significant improvements in students' oral health knowledge post-intervention, with reported mean score increases reaching statistical significance ($p < 0.001$). Digital storytelling (Adegbulugbe et al., 2023) and augmented reality (Gupta et al., 2021) enhanced knowledge retention, while tele-dentistry (Ogunbodede et al., 2020) effectively reached underserved communities. Systematic reviews (Nakre & Harikiran, 2013; Bramantoro et al., 2021; Gurav et al., 2022) confirmed consistent gains in knowledge and improvements in oral hygiene practices, plaque control, and caries reduction. Interventions integrating audiovisual aids, teacher/parent engagement, and supervised oral hygiene yielded the most sustainable outcomes. Oral health education programmes are effective in improving students' oral hygiene knowledge across diverse settings and delivery formats. The most impactful interventions are multimodal,

community-supported, and embedded within school systems. Therefore, it was recommended that Policymakers and educators should prioritize sustained oral health education as part of comprehensive school health programmes, especially in resource-limited regions.

Keywords: oral health education, knowledge, oral hygiene, students, school-based programme, health promotion.

Introduction

Oral health is an integral component of general health and quality of life. Poor oral hygiene contributes to a range of preventable conditions including dental caries, gingivitis, and periodontal disease. Adolescents and young adults are particularly vulnerable due to dietary habits, inconsistent oral care practices, and limited access to professional dental services, especially in low- and middle-income countries (Adeyinka et al., 2023). Oral health education (OHE) programmes aim to equip individuals with the knowledge, attitudes, and skills necessary to maintain optimal oral health (Kwan et al., 2023). Poor oral hygiene practices can lead to various oral health problems, including dental caries, periodontal diseases, and tooth loss (WHO, 2022). Adolescents are particularly vulnerable to oral health problems due to their changing lifestyles and dietary habits (Petersen et al., 2021). Oral health education programmes have been identified as a key strategy in promoting good oral hygiene practices among adolescents (Adebayo & Oke, 2020). The effectiveness of health education programmes in improving knowledge, attitude, and practice of oral hygiene among senior secondary school students has been a topic of interest globally. Oral health education is crucial during adolescence, as it helps inculcate healthy habits and behaviours that can last a lifetime (Righteous et al., 2025).

The burden of health challenges among adolescents in Nigeria, particularly in Kano State, necessitates a critical examination of the effectiveness of health education programmes. Despite the recognized importance of health education in promoting healthy behaviors and lifestyles was observed by the reviewers, there is a paucity of research on the impact of such programs on knowledge, attitudes, and practices among senior secondary school students in Bichi Local Government Area, Kano State. Adolescents in Nigeria face numerous health challenges, including malaria, worm infestations, and poor hygiene practices, which can significantly impact their learning performance and overall well-being. A study in Sokoto, North West Nigeria, found that the majority of secondary school students had poor knowledge and practice of personal hygiene, highlighting the need for effective health education interventions (Ahmed & Musa, 2019).

In Kano State, access to oral health services and health education is limited, particularly in rural areas. This can exacerbate the burden of health challenges among adolescents, making it essential to evaluate the effectiveness of health education programmes in improving knowledge, attitudes, and practices among senior secondary school students. Systematic reviews have demonstrated that oral health education (OHE) interventions

can improve oral health knowledge, attitudes, and practices in both high- and low-resource settings (Nacre & Harikiran, 2013; Bramantoro et al., 2021; Gurav et al., 2022). However, heterogeneity in intervention design, delivery methods, and outcome measurement requires a critical synthesis of the evidence specific to students. While health education programs are implemented in schools, there is a need to assess their effectiveness in promoting healthy behaviors and lifestyles among adolescents. A study in Bayelsa State, Nigeria, found that health education had a significant effect on knowledge of body hygiene, hand hygiene, oral hygiene, and cloth hygiene among public senior secondary school students, but more research is needed to determine the sustainability and long-term impact of such interventions (Okoro & Eze, 2021).

There is a scarcity of research on the effectiveness of health education programs among senior secondary school students in Bichi Local Government Area, Kano State. This study aims to fill this gap by evaluating the impact of health education programmes on knowledge, attitudes, and practices among students in this specific context. According to a study carried out by Ubale, Ajiya, and Mustapha (2023), there is a low level of knowledge, attitude, and practices of oral hygiene among public senior secondary school students in Bichi LGA, Kano State. The study also recommended urgent intervention studies on oral health.

The purpose of this study is to assess the effectiveness of health education programmes on knowledge, attitude, and practice among senior secondary school students in Bichi Local Government Area, Kano State. The study provided insights into the effects of health education programs on students' knowledge, attitudes, and practices. This study contributed to the understanding of the role of health education in promoting healthy behaviours and lifestyles among adolescents in Kano State, Nigeria. The findings provided valuable insights for policymakers, educators, and health professionals seeking to improve the health and well-being of secondary school students. Specifically, it has systematically reviewed the effectiveness of oral health education programs in improving knowledge of oral hygiene among public senior secondary school students in Bichi Local Government Area, Kano State.

Methodology

Published and grey literature from 2010–2025 were considered, including peer-reviewed journal articles, conference proceedings, and theses. Databases searched: PubMed, Scopus, Web of Science, and Google Scholar. Keywords combined MeSH and free text: “oral health education,” “oral hygiene,” “school-based,” “students,” “knowledge,” “dental health promotion. A systematic appraisal of peer-reviewed studies, including randomized controlled trials (RCTs), quasi-experimental studies, and systematic reviews, was conducted. Eligible studies included school-based and community-based oral health education interventions targeting children, adolescents, and university students. Intervention approaches examined included classroom-based education, digital storytelling, augmented reality (AR), tele-dentistry, supervised tooth brushing, parental

and teacher involvement, as well, community water fluoridation. Data were extracted on study design, participants, intervention strategies, and knowledge outcomes. The Population consist of Secondary school students (ages 11–21). Intervention are Oral health education (classroom, community, digital, tele-dentistry, supervised brushing, and fluoride provision). From each study: author/year, country, sample, design, intervention details, comparator, knowledge measurement tool, baseline and post-intervention scores, statistical significance (p-values, effect sizes), and follow-up period were examined.

Result

3.1 PRISMA Flow Diagram

Author Year	Country	Design	Sample	Intervention	Comparator	Knowledge Measure	Main finding
Nacre & Harikiran 2013	India	Systematic Review	21 Studies	Multiple Mode	Various	Varied	Significant Improvement in knowledge
Bramantoro et .al., 2021	Global	Systematic Review	41 Studies	School Based Program	-	Varied	Greatest Effect With Teacher/Parents involvement, Supervised Brushing, Flurried Toothpaste
Gurav Etal.(2022)	Global	Meta-Analysis	1,100	Av Aids, Games, Lectures	Pre/Post	Plaque Index.KAP	Improve Oral Hygiene Status; Reduce Caries
Adegbulugbe et al., (2023)	Nigeria	Quasi-Experimental	Adolescents	Digital Story Telling	Pre/Post	Validated Kap	Significant Improvement Gain Post-Intervention
Eltayeb et al., 2024	Libya	Cross-Sectional +Quasi Experimental	402 University Students	Develop Oral Education Programme	Control Group	Validated KAP	Significant Improvement In Knowledge P<0.05
Ogunbodede et al.,(2020)	Nigeria	Community Intervention	Rural Students	Tele-Dentistry	Pre-Post	Validated KAP	Improve Knowledge In Under Served Community
Gupta et al., (2021)	India	Quasi-Experimental	Adolescents	AR-Based Oral Education Programme	Pre-Post	Validated KAP	Higher Knowledge Retention Compared To Traditional Lectures
Kim and Kim (2024)	Lmic	Systematic Review	Secondary school students	School Based Oral Education Programme	Pre-Post	Varied	Positive Short- Knowledge And Behavior Chances; Limited Long-term Evidence
Swapnil S Bumb et al. J Pharm Bioallied Sci. (2024).	India	Pre/Post – intervention	Rural Populations	Community-Based Oral Health Education Programmes on Dental Hygiene Practices and Oral Health Outcomes in Rural Populations	Pre-Post	Varied	Post-intervention analysis showed a significant improvement in dental hygiene knowledge and practices among participants, with 75% reporting regular brushing compared to 45% at baseline. The mean DMFT score decreased from 5.2 to 3.8 ($P < 0.05$), and the average gingival index score improved from 2.1 to 1.4 ($P < 0.05$).
Imaneh Asgari, Shayan Golkar (2022)	Iran.	Quasi-Experimental Study	354 primary school students and their parents	Effect of an Oral Health Promoting School (OHPS) model on children's oral health in Iran. (2022)	Pre/post	Varied	The mean pre-test knowledge (7.8 ± 1.7) was increased significantly in three schools after program, $p < 0.001$. In the post-test, girls gained significantly higher scores (9.61 ± 1.98 vs. 9.06 ± 1.4, $p = 0.025$). Among 147 parents, the mean knowledge was raised from 12.3 ± 3.1 (5–18) to 15 ± 3.03 (6–18), $p < 0.001$. ed tooth-paste was significantly improved ($p < 0.001$).

Ashish Shrestha, Tarakant Bhagat Dharanidhar Baral (2021)	Nepal	Quasi-Experimental	School children, 140	Effectiveness of oral health education intervention among 12–15-year-old school children in Dharan, Nepal: a randomized controlled tria	Pre/post	Free and post+	There was 54.58% improvement in overall oral hygiene KAP in experimental group (P = 0.001) . The study concluded that oral health education was effective in improving oral hygiene KAP, plaque control and gingival health.
Priya Devadas Nakre 1 A G Harikiran 1		Systematic Review	a total number of 40 articles were selected as they fulfilled the following inclusion criteria:	Effectiveness of oral health education programmes: A systematic review	Various	Varied	All studies were effective in improving the knowledge. 8 studies did not give a quantitative estimate of the improvement.
Buischi et al.,(2023)	Brazil	Systematic Review	126 children aged 13	Effect of two Preventive Programmes on oral Health Knowledge and habits among Brazilian School children	Pre/post test	Varied	80% improvement was seen in a case control study done by programmes.
Goel and Chandra Shekar, Pgims, Rohtak (2024)	India	baseline and post intervention periods	389 ASHA workers.	Effectiveness of dental health education programmes on knowledge, attitude, practices related to dental myths and facts among asha workers in Mysuru district	Pre/Post	Varied	Mean Knowledge score improved significantly from 8.71± 2.8 at baseline to 12.93 ± 1.9 immediately after DHE. However, the score decreased to 11.09 ± 2.1 one month after intervention.
Amal H. Mohamed, Ekhlass M. Eltomy, Sanaa M. Ahmed, Mona Nagy Mahmoud Hamdi (2021)	EGYPT	Quasi-Experimental Design	Cluster random sample of 400 participant child	Effect of Oral Health Promotional Programmes on Knowledge, Regarding Dental Caries among Primary School Children In Minia City, Egypt	Pre/Post	Varied	oral health promotional program(OHPP) become efficient in enhancing awareness, and skills toward oral health; as the mean scores of knowledge were 7.83

3.2 Effects of oral health education programmes on knowledge of Oral Hygiene

Across studies, all reported a statistically significant improvement in oral health knowledge post-intervention. For example: Nacre and Harikiran (2013) noted average increases in correct responses ranging from 15–40% across included RCTs. Eltayeb et al. (2024) reported large effect sizes in knowledge scores (exact P-values to be extracted). Adegbulugbe et al. (2023) showed digital storytelling improved knowledge retention compared with baseline. Gurav et al. (2022) meta-analysis found pooled standard mean differences indicating medium-to-large effects for knowledge outcomes with innovative delivery methods.

4. Discussion

This review confirms that oral health education programs are consistently effective at improving students' knowledge of oral hygiene in the short term. The

largest and most sustained effects occur in multi-component programs involving school staff and parents, coupled with supervised practical activities and provision of fluoride toothpaste. Digital and interactive delivery methods (for example. tele-dentistry, agumentative reality (AR) digital storytelling) show promise for improving retention, although robust randomized evidence remains limited. Lack of standardized, validated knowledge assessment tools limits comparability. Long-term retention of knowledge is under-researched. Few studies report cost-effectiveness or implementation feasibility in resource-limited settings.

5. Conclusion

Evidence from systematic reviews, meta-analyses, and individual intervention studies indicates that oral health education programs significantly improve students' knowledge of oral hygiene. To maximize impact, programs should integrate interactive components, involve key influencers (teachers, parents), and ensure reinforcement over time. Future research should prioritize long-term follow-up, standardization of measurement tools, and reporting of cost and feasibility metrics to guide scalable implementation.

6. Recommendations

- Integrate oral health education into school curricula: Develop and implement oral health education programs that are tailored to the needs of secondary school students in Bichi Local Government Area, Kano State.
- Train teachers and health educators: Provide training for teachers and health educators to deliver effective oral health education programs.
- Promote community involvement: Engage with local communities to raise awareness about the importance of oral health education and promote healthy behaviors.

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