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# Enhancing Pediatric Oral Health-Related Quality of Life: A Comprehensive Systematic Review of Oral Health Initiatives with Practical Applications and Global Relevance

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**Abstract** **Background:** Over the past two decades, increasing emphasis has been placed on improving oral healthcare through social perspectives that prioritize subjective well-being and oral health-related quality of life (OHRQoL). Children are particularly vulnerable to dental issues, making targeted interventions crucial. This study aimed to assess the effectiveness of oral health initiatives in improving pediatric OHRQoL, emphasizing practical applications, cultural diversity and global relevance. **Materials and Methods:** A comprehensive literature search was conducted across Cochrane, PubMed, Scopus and Web of Science using MeSH terms. The review followed PRISMA guidelines, ensuring rigorous data collection and analysis. Risk of Bias was assessed using the ROBINS-I tool for non-randomized trials and the Cochrane Collaboration tool for randomized trials. The study incorporated subgroup analysis to evaluate cultural and demographic diversity, enhancing the broader applicability of findings. Visual aids such as PRISMA flowcharts were utilized to improve clarity. **Results:** Out of 277 initial articles, 85 were excluded as duplicates. After reviewing titles and abstracts, eight studies met the eligibility criteria. Included studies utilized validated tools such as the Child Perception Questionnaire (CPQ) and Early Childhood Oral Health Impact Scale (ECOHIS). Results highlighted that school-based interventions, preventive treatments and oral awareness programs significantly improved children's OHRQoL. Improvements were seen in social well-being, self-confidence and academic performance, emphasizing the broader psychosocial benefits of these interventions. Consistent follow-up and sustained education programs proved essential for maintaining long-term benefits. **Conclusion:** Oral health initiatives are effective in enhancing pediatric OHRQoL. The study underscores the importance of culturally adaptive strategies, cost-effective approaches and interdisciplinary collaboration to ensure wider impact. Further longitudinal research is encouraged to evaluate the sustained impact of these interventions across diverse populations.

**Key Words** Pediatric oral health, oral health initiatives, quality of life, preventive dental programs, global health strategies

## INTRODUCTION

Oral health significantly influences the psychosocial and functional aspects of an individual's well-being. Among children and adolescents, dental caries remains the most prevalent oral disease, heavily impacting their Oral Health-Related Quality of Life (OHRQoL) [1]. Poor oral health in school-aged children has been linked to diminished social well-being and academic performance, underscoring the importance of effective preventive interventions. Globally, 60-90% of school-going children experience dental caries, with cases rising from 555 million in 1990 to 573 million in 2015 [2].

Oral health initiatives, particularly in developing nations, are essential in combating this issue [3]. These initiatives often include school-based programs such as oral hygiene education, supervised brushing, fluoride application, pit and fissure sealants and conservative treatments. Studies reveal that these programs not only improve dental health but also positively influence children's attitudes, behaviors and overall well-being [4]. Additionally, receiving dental care during childhood has been shown to encourage healthier lifestyle habits in adulthood [5].

Key concepts like subjective well-being (SWB) and quality of life (QoL) are crucial in evaluating an individual's

psychological and social responses to healthcare interventions [6]. Since Cohen and Jago introduced socio-dental health markers in 1976, these indicators have become prominent in oral health research [7]. The World Health Organization (WHO) acknowledges OHRQoL as an integral part of its Global Oral Health Program (2003) [8], emphasizing individual satisfaction with care, self-perception and mental well-being. OHRQoL assessments provide insights into comfort during daily activities, social interactions and self-esteem [9].

By focusing on social, emotional and physical well-being, OHRQoL measures extend beyond traditional dental metrics. Children from disadvantaged backgrounds, particularly those with limited healthcare access or orofacial clefts, are shown to have lower OHRQoL scores and greater unmet treatment needs [10]. This highlights the need for culturally adaptive strategies to promote equitable dental care delivery [11,12].

### Aim

This study aims to assess the effectiveness of oral health initiatives in improving OHRQoL in the pediatric population.

## METHODS

### Protocol and Registration

This systematic review adhered to the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines to ensure transparency and structure. As this is a systematic review, ethical approval was not required. To enhance methodological rigor, subgroup analyses were included to explore cultural and demographic diversity, ensuring broader global relevance.

### Structured Question

The research question was designed to assess the role of oral health initiatives in improving oral health-related quality of life (OHRQoL) among pediatric populations based on available literature.

### PICO Analysis

Population: Pediatric population aged 3-18 years.

- **Intervention:** Oral health preventive or curative programs
- **Comparison:** Studies comparing treated and untreated populations
- **Outcome:** Quality of life outcomes measured using the Early Childhood Oral Health Impact Scale (ECOHIS) and Child Perception Questionnaire (CPQ)

### Inclusion Criteria

Included studies were randomized or non-randomized trials conducted among pediatric populations that offered preventive or curative dental treatments, particularly in school and community settings.

### Exclusion Criteria

Excluded studies included animal studies, grey literature, cross-sectional or observational research, adult or elderly-focused studies and treatments conducted under general anesthesia.

### Sources Used

Literature searches were conducted in PubMed, Web of Science, Scopus, LILACS and Cochrane databases. Additionally, a hand search was performed to identify relevant articles not captured electronically. Institutional library resources such as Community Dentistry and Oral Epidemiology and Journal of Indian Association of Public Health Dentistry were also reviewed.

### Search methodology

(((((((((children) OR (school children)) OR (middle school children)) OR (primary school children)) OR (school going children)) OR (child))) AND ((((randomised control trial) OR (randomised trial)) OR (non randomised trial)) OR (clinical trial))) AND ((((((((((oral health programmes) OR (oral health education programmes)) OR (dental preventive programme)) OR (dental programme)) OR (oral health programs)) OR (dental care program)) OR (dental care programme)) OR (dental treatment programme)) OR (dental treatment programs))) AND (((((Oral health related quality of life) OR (Early Childhood Oral Health Impact Scale)) OR (Oral impacts daily performance))) OR (child perception questionnaire)) (Figure 1-6).

### Risk of Bias Assessment

The ROBINS-I tool was employed to assess non-randomized studies, while the Cochrane Collaboration's tool was used for randomized controlled trials. To enhance data presentation, visual aids such as PRISMA flowcharts were integrated (Table 1-2).

## RESULTS

A systematic search of the literature turned in 277 papers from various registers and databases. A total of 85 duplicate articles were eliminated. Discussions resolved conflicts regarding the studies' inclusion. After reading the titles, 156 article titles were found through the search and were chosen for abstract reading. A separate evaluation was conducted on the abstracts of chosen articles. After reviewing the abstract, 211 articles were turned down. 34 studies that were relevant had their full text articles restored. After reading the comprehensive article, 26 studies were eliminated. Eight publications were selected based on desirable criteria following independent examination of the papers. The population under investigation, the study design, the study setting, the year of publication, the age of the

Table 1: Risk of bias assessment for randomised studies–cochrane collaboration tool

| Study | Random sequence generation | Allocation concealment | Blinding of study team | Blinding of outcome assessor | Incomplete outcome data | Selective outcome reporting | Other Bias | Overall Bias |
|---|---|---|---|---|---|---|---|---|
| Paula *et al.*, | Unclear | Unclear | Unclear | Low risk | Low risk | Low risk | Low risk | Low risk |
| Paula, J.S. *et al.*, | Unclear | Unclear | Unclear | Low risk | Low risk | Low risk | Low risk | Unclear |
| P. Arrow *et al.*, (6-12 months) | Unclear | Unclear | Unclear | Unclear | Low risk | Low risk | Low risk | Low risk |
| Freeman, (12 months) | Unclear | Unclear | Unclear | Unclear | Low risk | Low risk | Low risk | Low risk |
| Tomazoni *et al.*, (3 months) | Unclear | Unclear | Unclear | Unclear | Low risk | Low risk | Low risk | Low risk |

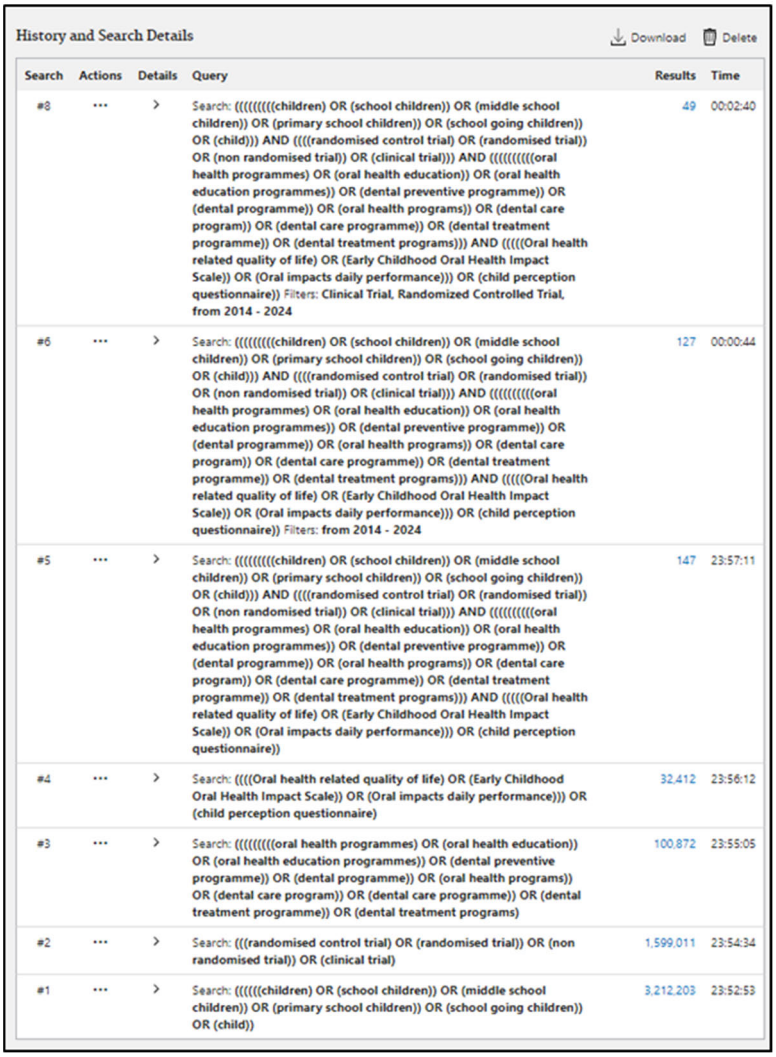
Table 2: Risk of bias assessment for nonrandomized studies–Robins I tool

| | Pre intervention | | At intervention | Post intervention | | | | |
|---|---|---|---|---|---|---|---|---|
| Study | Bias due to confounding | Bias in selection | Bias in classification of intervention | Bias due to deviation from intended intervention | Bias due to missing data | Bias in measurement of outcome | Bias in selection of reported results | Overall risk (considering the entire study) |
| Ana Lú cia Vollú *et al.*, (30 days) | Medium Risk | Low risk | Low risk | Low risk | Low risk | Low risk | Low risk | Medium Risk |
| Karina Guedes *et al.*, (1 month) | Low Risk | Low risk | Low risk | Low risk | Low risk | Low risk | Low risk | Low risk |
| Clare, E. *et al.*, (9 months) | Medium Risk | Low risk | Low risk | Low risk | Low risk | Low risk | Low risk | Medium Risk |

Table 3: Data extraction table

| Author and year duration | Place | Sample size | Blinding | I/E criteria | Randomization | Intervention | OHRQOL tool | Baseline | Final | PF | Attrition | Funding | LOE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Paula *et al.*, (1year) | Brazil | 372 | Not mentioned | Yes | Yes | Curative treatment | CPQ | 41.3 | 21.97 | 46 | 192 | NO | 1C |
| de Paula *et al.*, (4 weeks) | Brazil | 372 | Not mentioned | YES | Yes | Curative treatment | CPQ | 42 ± 15.6 | 20.8±13.3 | 50.4 | NIL | NO | 1C |
| P. Arrow *et al.*, (6-12 months) | Australia | 254 | Not mentioned | yes | yes | Curative treatment | CPQ | 3.9 (3.1) | 3.2 (2.8) | 0.006 | NIL | NO | 1c |
| Ana Lúcia Vollú *et al.*, (30 days) | Brazil | 18 | Not mentioned | yes | no | ECOHIS | CPQ | 14.94 | 2.81 | 1.23 | NIL | NO | 2D |
| Karina Guedes *et al.*, (1 month) | Brazil | 93 | Not mentioned | Yes | No | OHES | CPQ | 2.4(1.5) | 0.9(1.7) | 0.8(1.2) | NIL | No | 1c |
| Freeman, (12 months) | UK | 383 | Not mentioned | Yes | Yes | COHRQoL | CPQ | 109.66 (107.10, 110.01) | 111.18 (108.91, 113.47) | 0.01 | NIL | No | 2D |
| Clare, E. *et al.*, (9 months) | Newzaland | 335 | Not mentioned | Yes | No | OHRQoL | CPQ | 11.8 (8.0) | 10.6 (7.4) | <0.001 | NIL | No | 1c |
| Tomazoni *et al.*, [17], (3 months) | Brazil | 356 | Not mentioned | yes | Yes | OHRQoL | CPQ | 165(47.3) | 191(52.7) | 0.001 | NIL | No | 1c |

PubMed



History and Search Details

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| Search | Actions | Details | Query | Results | Time |
|---|---|---|---|---|---|
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| #6 | ••• | › | Search: (((((((((children) OR (school children)) OR (middle school children)) OR (primary school children)) OR (school going children)) OR (child))) AND ((((randomised control trial) OR (randomised trial)) OR (non randomised trial)) OR (clinical trial))) AND ((((((((((oral health programmes) OR (oral health education)) OR (oral health education programmes)) OR (dental preventive programme)) OR (dental programme)) OR (oral health programs)) OR (dental care program)) OR (dental care programme)) OR (dental treatment programme)) OR (dental treatment programs))) AND (((((Oral health related quality of life) OR (Early Childhood Oral Health Impact Scale)) OR (Oral impacts daily performance))) OR (child perception questionnaire)) Filters: from 2014 - 2024 | 127 | 00:00:44 |
| #5 | ••• | › | Search: (((((((((children) OR (school children)) OR (middle school children)) OR (primary school children)) OR (school going children)) OR (child))) AND ((((randomised control trial) OR (randomised trial)) OR (non randomised trial)) OR (clinical trial))) AND ((((((((((oral health programmes) OR (oral health education)) OR (oral health education programmes)) OR (dental preventive programme)) OR (dental programme)) OR (oral health programs)) OR (dental care program)) OR (dental care programme)) OR (dental treatment programme)) OR (dental treatment programs))) AND (((((Oral health related quality of life) OR (Early Childhood Oral Health Impact Scale)) OR (Oral impacts daily performance))) OR (child perception questionnaire)) | 147 | 23:57:11 |
| #4 | ••• | › | Search: ((((Oral health related quality of life) OR (Early Childhood Oral Health Impact Scale)) OR (Oral impacts daily performance))) OR (child perception questionnaire) | 32,412 | 23:56:12 |
| #3 | ••• | › | Search: (((((((((oral health programmes) OR (oral health education)) OR (oral health education programmes)) OR (dental preventive programme)) OR (dental programme)) OR (oral health programs)) OR (dental care program)) OR (dental care programme)) OR (dental treatment programme)) OR (dental treatment programs) | 100,872 | 23:55:05 |
| #2 | ••• | › | Search: (((randomised control trial) OR (randomised trial)) OR (non randomised trial)) OR (clinical trial) | 1,599,011 | 23:54:34 |
| #1 | ••• | › | Search: ((((((children) OR (school children)) OR (middle school children)) OR (primary school children)) OR (school going children)) OR (child)) | 3,212,203 | 23:52:53 |

Figure 1: Showing the result from Pubmed search

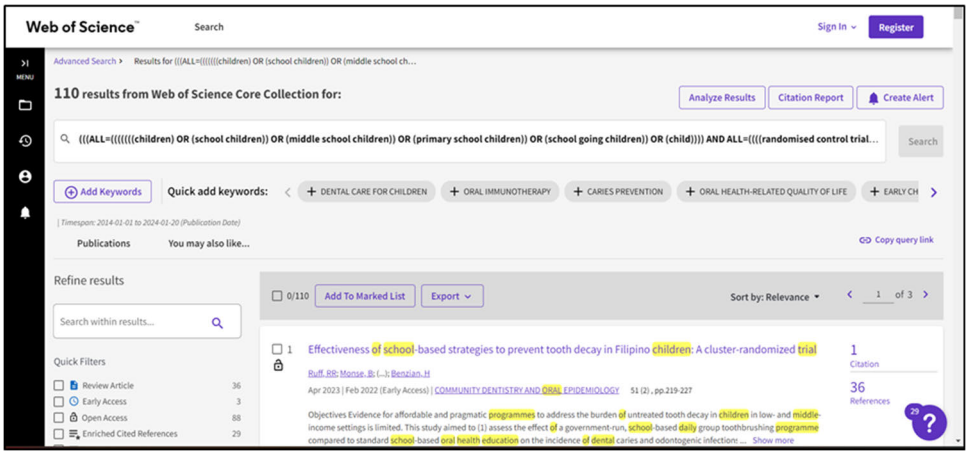


Figure 2: Showing the result from Web of Science search

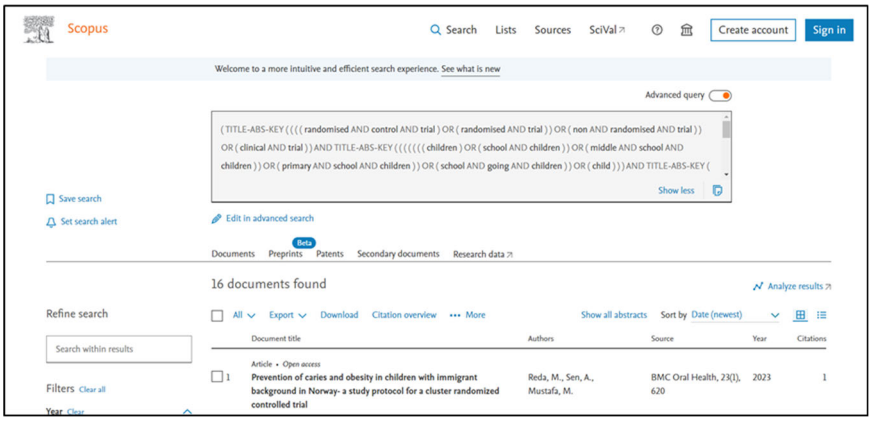


Figure 3: Showing the result from Scopus search


Figure 4: Showing the result from LILACS search

population under study, the measuring tool and the length of the study were among the criteria used to categorise the studies (Table 3). OHRQoL was the outcome measure employed in all of the research and the Child Perception Questionnaire (CPQ-3 studies) and Early Childhood Oral Health Impact Scale (ECOHIS-1 studies) were the instruments used to compute this outcome. Six research with 1C LOE and two with 2D LOE were considered in the level of evidence (LOE) for the intervention. Study hypothesized that children with dental caries may have lower OHRQoL if they cannot easily obtain dental care and the CPQ8-10 has been proven to be an effective instrument for monitoring changes in OHRQoL over time. According to study, the ECOHIS's sensitivity may vary depending on whether a patient receives primary or tertiary treatment under GA. Longevity of life, operational states, health awareness, opportunity/resilience and impairments/diseases are the five overarching aspects of health-related quality of life. Oral health guidance have to be persistently repeated to ensure positive changes over time. The solidity of the study include the controlled clinical trial design with ample sample size and the use of validated and sturdy measures of OHRQoL [13]. Therefore, tools evaluating QoL and OHRQoL must exhaustively cover these domains. For age groups older than six, CPQ and child OIDP were shown to be useful instruments in this review. Notably, CPQ is useful in measuring psychological and social well-being in addition to oral signs and symptoms [11].

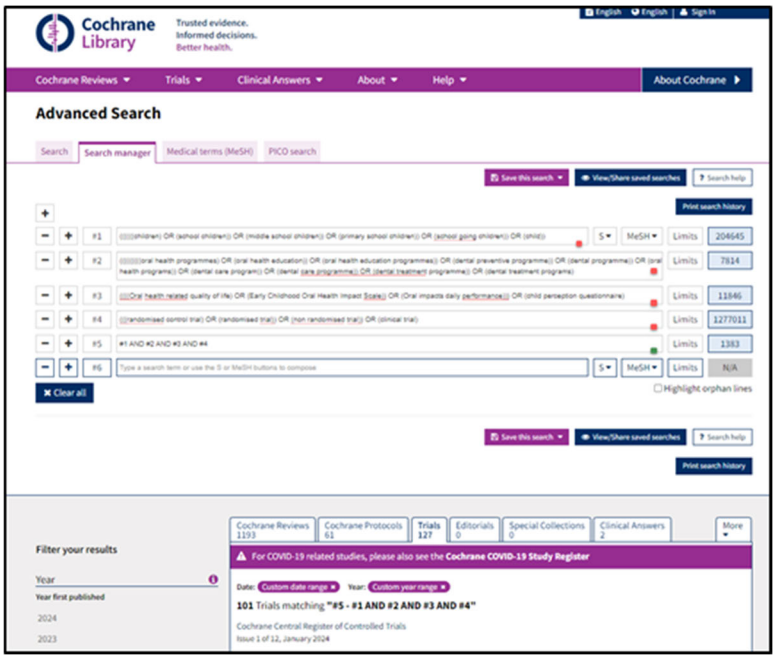


Figure 5: Showing the result from Cochrane search

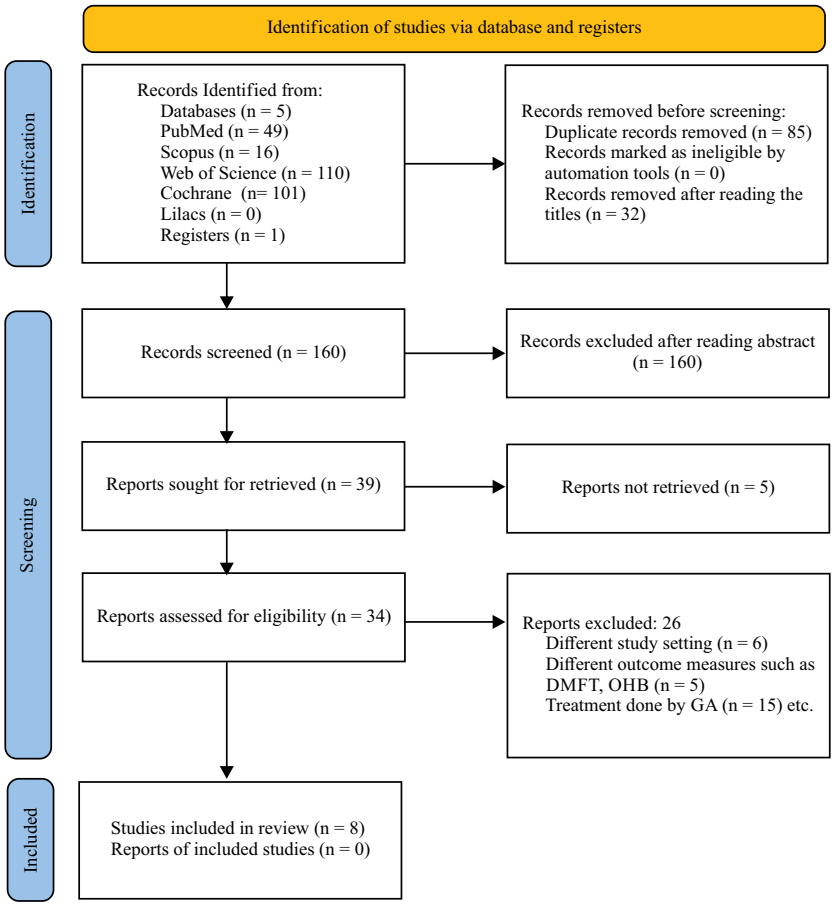


Figure 6: Showing PRISMA flow chart

For children aged below 6 years, ECOHIS was the suitable scale, offering a better indication of Subjective Well-Being (SWB) in this age group. Paula *et al.* [2] indicates that the conservative management of caries has a greater impact on school children's OHRQoL, focussing attention on the significance of health policies that support this population's access to dental care. To assess the ECOHIS's responsiveness to the treatment of ECC, more research is needed that explicitly compares changes in COHRQoL between primary care settings and tertiary GA care [14]. Early childhood caries in preschoolers who had restorative dental care had a positive impact on their overall health and well-being, as well as on the parents and caregivers of these children. The authors advise more research on preschoolers' OHRQoL both before and after dental treatment, with a bigger sample size, given this was only an initial examination. This would help to firmly corroborate the study's findings.

Freeman [15] conducted a study that had drawbacks and strengths that needs to be highlighted. The fact that the students attended public schools in lower socioeconomic areas may have limited how broadly the results may be applied. The study had a shorter follow up time which is the drawback and it can be improvised by conducting a study with longer follow up time (one month after finishing the interventions). Findings suggest that, to ascertain positive changes, persistent oral health education is mandatory. The adequate sample size and controlled clinical trial design and the utilisation of measures of OHRQoL contribute to the strength of the study. The communication tool used in the research group was CPQ8-10-ISF:16 (in preparation for submission).

Quality exploratory design helps to investigate how children in varied maturation of psychological development, perceive health instructions given out by their parents and teachers [16]. It stated that supervised brushing programme delivers an overall progress in HRQoL. This is the first successfully established and implemented toothbrushing program of its kind in New Zealand, with extensive evaluations. This study has demonstrated the viability of a program, which is why Kaitaia Intermediate is still using it now. Such a program is simple to implement with sufficient school assistance. It reaffirms the necessity for policies to take into account alternative strategies in order to enhance kids' oral health in areas with high caries rates and subpar oral health [17].

During the follow-up, the impacts of the remedy on the clinical results in children, including periodontal problems and cavities-was not reevaluated [18]. The potential effects of the intervention were evaluated for three months, however it is thought that this is not long enough to observe variations in dental decay experiences. During the follow-up phase, children's gingival conditions may be reviewed to determine the intervention's clinical success [19].

Since the intervention's assessment was completed in a brief amount of time, future research should examine the intervention's long-term benefits for improving children's sense of well-being in addition to its influence on clinical results. Furthermore, it is possible to expand the impact of the intervention through teacher training [20]. Subsequently, we kept a close watch on a sample of the city's socially vulnerable schools in a particular neighbourhood. The external validity for the entire city, as well as for other parts of Brazil and other nations, can therefore be a drawback. It would be beneficial to conduct more research with a variety of socioeconomic backgrounds.

Yet, we opted to use this sample since our primary goal was to evaluate the intervention's efficacy solely in a population of individuals who were impoverished and in precarious circumstances. Schools have a significant impact on kids' growth and wellbeing. It is obvious that health promotion is necessary in schools, particularly in socially vulnerable communities. The efficacy of an intervention that can be incorporated into current school activities and curricula was demonstrated by this study.

OHRQOL-Oral health-related quality of life, LOE-Level of evidence, CPQ-Child perception questionnaire, ECOHIS-Early childhood oral health impact scale, I/E: inclusion/exclusion criteria, PF: preventive fraction.

## DISCUSSION

This systematic review followed the PRISMA guidelines and analyzed the impact of oral health programs on oral health-related quality of life (OHRQoL) in pediatric populations. The concept of quality of life (QoL) refers to individuals' perception of their circumstances in relation to their goals, expectations, cultural norms and value systems. OHRQoL is recognized as a critical component of patient assessment across various healthcare sectors, including dentistry [21].

Ridell *et al.* [13] emphasized that oral health education significantly contributes to enhancing children's understanding of dental care, promoting positive oral hygiene behaviors and ultimately improving their OHRQoL. Studies have demonstrated that oral health programs provide both immediate and long-term benefits, with improved social well-being, academic performance and reduced dental anxiety.

For example, a study involving 140 children aged 8 to 14 who received basic dental care from a local NGO showed significant improvements in OHRQoL within four weeks post-treatment. The CPQ11-14 was used to assess responsiveness, marking this as one of the few long-term studies evaluating OHRQoL changes following caries treatment over 12 months in children aged 8 to 10 [22].

While most previous research on ECC (Early Childhood Caries) assessed treatment under general anesthesia, this study expands the existing knowledge by evaluating COHRQoL outcomes following primary care dental interventions [23]. However, the absence of a no-treatment control group limited the ability to determine whether OHRQoL improvements resulted directly from the intervention or other environmental factors.

The contrast between dental therapists providing test interventions and dentists delivering standard care introduces a potential variable. However, available evidence suggests that both professional groups are competent in delivering appropriate clinical care. The observed differences are unlikely to stem from variations in the clinicians themselves. The minimal effect sizes observed in this study were consistent with prior research evaluating adolescent dental treatment in primary care settings. This differs from the larger effect sizes often reported in ECC interventions under general anesthesia. The absence of participants with severe pain or acute infections may have limited the potential for greater OHRQoL improvement, as those children may have had lower baseline scores [24].

In contrast, Dhanya *et al.* [24] reported higher baseline scores for key domains such as CIS, FIS and overall ECOHIS. Similarly, it found lower baseline scores in primary care settings compared to other research environments, indicating variability in patient conditions at the study's outset.

Variations in the scales used for measuring OHRQoL further complicated direct comparisons. Gomathi *et al.* [25] and Evanjelin *et al.* [26] reported a CPQ8-10 baseline score of 11.1, with a follow-up score of 10.2. The minimal effect size observed in this review (0.1 overall; 0.2 for children with dental cavities) was consistent with their findings.

Despite these promising outcomes, this study had limitations. Exclusion criteria may have inadvertently omitted children with severe ECC, thus limiting the generalizability of the results. Additionally, short follow-up durations restricted the assessment of long-term intervention effects.

Future research should adopt extended follow-up periods to capture sustained improvements in OHRQoL and incorporate culturally adaptive strategies to enhance intervention effectiveness across diverse populations. Expanding school-based programs, integrating teacher-led initiatives and improving public awareness campaigns are crucial for ensuring the long-term success of oral health interventions.

## CONCLUSION

The findings of this systematic review highlight a positive association between oral health programs and improved oral health-related quality of life (OHRQoL) in children, with evidence indicating that school-based interventions, preventive dental treatments and educational initiatives contribute significantly to enhancing children's overall well-being, social interactions and academic performance. While these results are encouraging, further research is necessary to strengthen these conclusions, particularly given the limited number of studies assessing long-term outcomes and diverse population groups. Future investigations should prioritize longitudinal studies to evaluate the sustained impact of oral health interventions on OHRQoL, with an emphasis on including children from varied socio-economic, cultural and demographic backgrounds to enhance the generalizability of findings. Additionally, exploring cost-effective, culturally adaptive strategies and interdisciplinary approaches involving educators, healthcare providers and caregivers is crucial for maximizing the effectiveness of oral health programs. By addressing these gaps, future research can better inform policymakers and healthcare professionals, ensuring oral health initiatives are designed to deliver meaningful, long-term improvements in children's quality of life.

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## Conflict of Interest

The authors declare no conflict of interest concerning the research, authorship and publication of this manuscript.

## Ethical Considerations

As this study is a systematic review of previously published literature, ethical approval was not required. All included studies were independently reviewed to ensure they met ethical research standards, particularly regarding participant confidentiality, informed consent and appropriate methodology.

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