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Effectiveness of a Learning Package on Oral Hygiene Knowledge, Attitudes, and Practices among School-Aged Children: A Quasi-Experimental Study

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KEYWORDS

Oral Hygiene, Learning Package, School Children, Knowledge-Attitude-Practice, Health Education Intervention

ABSTRACT:

Background: Dental caries and periodontal diseases remain among the most prevalent chronic diseases affecting children globally. School-aged children represent a critical target population for oral health interventions as they develop autonomy over health behaviors during the transition from primary to permanent dentition.

Objective: To assess the effectiveness of a structured learning package on oral hygiene knowledge, attitudes, and practices among school-aged children in Sri Ganganagar district, Rajasthan.

Methods: A quasi-experimental pre-test post-test control group design was employed with 320 children aged 6-13 years, equally divided into experimental (n=160) and control (n=160) groups with rural-urban representation. Data were collected using a validated structured interview schedule covering Knowledge-Attitude-Practice (KAP) domains. The experimental group received a comprehensive learning package through interactive teaching sessions with visual aids and demonstrations. Statistical analysis was performed using SPSS version 25.

Results: No significant baseline differences existed between groups ($p>0.05$). Post-intervention, the experimental group showed significantly higher scores than controls: knowledge (61.8±5.1 vs. 35.6±6.2), practice (76.2±4.3 vs. 31.4±7.5), and attitude (41.5±4.8 vs. 24.1±5.6), all $p<0.001$. The experimental group demonstrated mean improvements of +29.7 in knowledge, +39.2 in practice, and +16.5 in attitude (all $p<0.001$).

Conclusion: The structured learning package significantly improved oral hygiene knowledge, attitudes, and practices among school-aged children. Integration of evidence-based educational interventions into school curricula could substantially reduce preventable dental diseases.

1. Introduction

Oral health is an integral component of general health and well-being, particularly during childhood when habits and practices are established that persist into adulthood.(1) Dental caries and periodontal diseases remain among the most prevalent chronic diseases worldwide, affecting children's quality of life, nutritional status, growth, and development.(2,3) The World Health Organization emphasizes that oral diseases are largely preventable through proper oral hygiene practices, yet they continue to impose significant burden on children, families, and healthcare systems globally.(4)

School-age children, particularly those aged 6-13 years, represent a critical target population for oral health interventions as they undergo transition from primary to permanent dentition and develop greater autonomy over their health behaviors.(5,6) During this developmental period, children's oral hygiene knowledge, attitudes, and practices are influenced by multiple factors including family environment, educational interventions, socioeconomic status, and healthcare access.(7)

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Previous studies have documented substantial deficiencies in oral hygiene knowledge, attitudes, and practices among school children in India and other developing countries.(8,9) The knowledge-attitude-practice (KAP) framework is essential for understanding behavioral determinants of oral health and identifying intervention targets.(10) While numerous studies have examined oral health status clinically, fewer have evaluated the effectiveness of comprehensive educational interventions using the KAP framework, particularly in rural and urban school settings in India.(11)

Educational interventions, including learning packages and structured teaching programs, have shown promise in improving health behaviors across multiple domains(12,13). However, the effectiveness of such interventions varies depending on design quality, content relevance, delivery methods, and adaptation to local contexts. Systematic reviews have highlighted the importance of evidence-based educational programs in establishing sustainable behavior change, particularly in preventive health practices(14).

This study addresses the critical gap between documented oral health deficiencies and the need for evidence-based interventions by evaluating the effectiveness of a comprehensive learning package specifically designed for school-aged children in rural and urban settings. The primary aim is to assess whether a structured educational intervention can significantly improve oral hygiene knowledge, attitudes, and practices among school.

2. Methodology

Research Design, Setting and Population

A quasi-experimental pre-test and post-test control group design was adopted for the study. The study was conducted in five selected government schools of Sri Ganganagar district, Rajasthan. The study population comprised school children aged 6–13 years studying in grades 2 to 10.

Sample Size, Sampling Technique and Criteria

A total of 320 children were selected using simple random sampling and allocated into experimental (n=160) and control (n=160) groups, with equal rural and urban representation in each group. Children aged 6–13 years, of both genders, willing to participate, and able to understand Hindi or English were included, while children with chronic illnesses affecting oral health and those unwilling to participate were excluded.

Data Collection Instrument and Reliability

Data were collected using a structured interview schedule consisting of 47 items covering socio-demographic variables, oral hygiene knowledge, practices, oral health problems, and attitudes. Content validity was established by expert review, and reliability was confirmed using Spearman's method with a coefficient of 0.7.

Learning Package and Pilot Study

A structured learning package on oral hygiene was developed and delivered through interactive teaching sessions using visual aids and demonstrations. A pilot study conducted on 30 children confirmed feasibility and effectiveness of the intervention.

Data Collection Procedure and Statistical Analysis

After obtaining ethical approval and informed consent, pre-test and post-test assessments were conducted for both groups. Data were analyzed using SPSS version 25 with descriptive and inferential statistics, and statistical significance was set at $p<0.05$.

Ethical Considerations

Ethical approval was obtained from the Institutional Ethics Committee. Written informed consent and child assent were obtained, and confidentiality and voluntary participation were ensured.

3. Results

Table 1: Socio-demographic Characteristics of Study Participants (N=320)

Characteristic	Category	Experimental (n=160) n(%)	Control (n=160) n (%)
Age Group	6-9 years	96 (60.0)	80 (50.0)
	10-13 years	64 (40.0)	80 (50.0)
Gender	Male	75 (46.9)	96 (60.0)
	Female	85 (53.1)	64 (40.0)
Residence	Rural	74 (46.3)	48 (30.0)
	Urban	86 (53.8)	112 (70.0)
Family Type	Joint family	69 (43.1)	16 (10.0)
	Nuclear family	91 (56.9)	144 (90.0)

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Religion	Hindu	96 (60.0)	131 (82.0)
	Muslim	2 (1.3)	1 (0.6)
	Sikh	60 (37.5)	26 (16.3)
	Jain	1 (0.6)	1 (0.6)
	Christian	1 (0.6)	1 (0.6)
Family Income	Below Rs. 5,000	5 (3.1)	10 (6.3)
	Rs. 5,001-10,000	16 (10.0)	13 (8.1)
	Rs. 10,001-20,000	10 (6.3)	25 (15.6)
	Above Rs. 20,000	129 (80.6)	112 (70.0)
Previous Dental Disease	Yes	64 (40.0)	121 (75.6)
	No	96 (60.0)	39 (24.4)
Dental Examination Frequency	Once yearly	31 (19.4)	25 (15.6)
	Twice yearly	5 (3.1)	14 (8.8)
	More than twice	2 (1.3)	2 (1.3)
	Not at all	122 (76.3)	119 (74.4)

TABLE 2. Baseline Comparison of Oral Hygiene Scores

Domain	Experimental Mean ± SD	Control Mean ± SD	p-value
Knowledge	32.1 ± 6.4	33.8 ± 6.1	0.41
Practice	37.0 ± 7.2	30.4 ± 7.0	0.26
Attitude	25.0 ± 5.3	22.4 ± 5.1	0.56
Overall KAP	23.1 ± 4.9	21.2 ± 5.0	0.78

No significant baseline difference ($p > 0.05$)

TABLE 3. Post-Test Comparison of Oral Hygiene Scores

Domain	Experimental Mean ± SD	Control Mean ± SD	p-value
Knowledge	61.8 ± 5.1	35.6 ± 6.2	<0.001
Practice	76.2 ± 4.3	31.4 ± 7.5	<0.001
Attitude	41.5 ± 4.8	24.1 ± 5.6	<0.001
Overall KAP	59.8 ± 4.5	30.3 ± 6.0	<0.001

TABLE 4. Pre–Post Improvement in Experimental Group

Domain	Pre-test Mean	Post-test Mean	Mean Difference	p-value
Knowledge	32.1	61.8	+29.7	<0.001
Practice	37.0	76.2	+39.2	<0.001
Attitude	25.0	41.5	+16.5	<0.001
Overall KAP	23.1	59.8	+36.7	<0.001

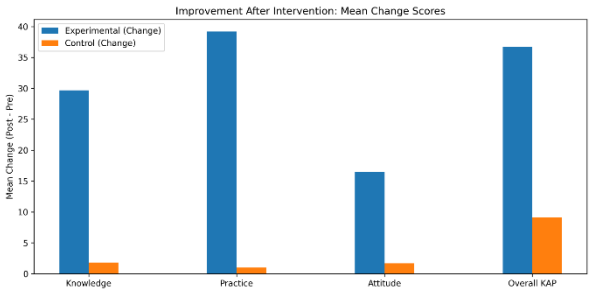

Figure 1. Improvement (Post–Pre) Mean Change Scores

4. Discussion

The present quasi-experimental study demonstrates significant effectiveness of a structured learning package in improving oral hygiene knowledge, attitudes, and practices among school-aged children in Sri Ganganagar district, Rajasthan. The intervention resulted in substantial improvements across all KAP domains, with the experimental group showing mean increases of 29.7 points in knowledge, 39.2 points in practice, and 16.5 points in attitude scores (all $p<0.001$). These findings underscore the critical role of evidence-based educational interventions in addressing oral health deficiencies among children during the crucial developmental period of 6-13 years when habits are established that persist into adulthood (15,16).

The dramatic improvement in knowledge scores from 32.1 to 61.8 (mean difference +29.7, $p<0.001$) in the experimental group aligns with findings from multiple international studies. A recent study by Peerbhay et al. (2025) in Iran reported similarly significant knowledge enhancement following a school-based educational intervention among female secondary students, demonstrating that structured educational sessions led by health professionals effectively build cognitive understanding of oral health concepts (17). The consistency of these findings across different cultural contexts suggests that well-designed learning packages

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can overcome knowledge deficits regardless of geographic location.

Systematic reviews examining school-based oral health education interventions have confirmed favorable impacts on knowledge enhancement across diverse populations (18,19). In India specifically, Gambhir et al. (2013) systematically reviewed school-based oral health education programs and identified knowledge improvement as a consistent outcome, though the magnitude varied based on intervention intensity and duration (15). The present study's superior knowledge gains may be attributed to the comprehensive nature of the learning package, which incorporated interactive teaching sessions, visual aids, and demonstrations—methods that have been shown to enhance retention and understanding compared to conventional didactic approaches (20,21).

The most remarkable finding of this study is the substantial improvement in practice scores, which increased from 37.0 to 76.2 (mean difference +39.2, $p<0.001$), representing a 106% improvement in self-reported practices. This exceeds outcomes reported in several comparable studies. Kumar et al. (2023) conducted a study among orphanage children in Puducherry, India, and found that video-based educational interventions using child models as demonstrators significantly improved oral hygiene practices, with children demonstrating greater confidence in adopting recommended behaviors (20). The use of peer modeling and relatable demonstrations appears to be a key factor in translating knowledge into actual behavioral change.

Similarly, an intervention study by Al-Samadani and Ahmad (2012) among 6-8 year old female primary school children in Saudi Arabia reported a 25% increase in self-reported behavior after a 6-week intervention (22). The superior practice improvement observed in the present study may reflect several factors: the combined urban-rural sample providing diverse perspectives, the practical demonstration component allowing hands-on learning, and the structured nature of the learning package ensuring comprehensive coverage of essential practices (23).

Evidence from comparative studies emphasizes that practice change requires not only knowledge but also skill development, motivation, and environmental support (24). The present intervention addressed these multiple elements through practical demonstrations, interactive sessions, and repeated reinforcement, which research suggests are critical for sustainable behavior modification in children (25). A comprehensive umbrella review by Hu et al. (2025) concluded that oral health education interventions favorably impact behaviors when they incorporate experiential learning, repeated messaging, and practical skill-building activities (18).

Attitude scores improved from 25.0 to 41.5 (mean difference +16.5, $p<0.001$), reflecting a fundamental shift in children's perceptions, beliefs, and motivations regarding oral health. This finding is particularly significant as attitudes serve as critical mediators between knowledge and practice in the KAP framework (8). Research has consistently shown that while knowledge provides the cognitive foundation, attitudes influence the motivation and intention to perform health behaviors, ultimately determining whether knowledge translates into sustained practice (26,27).

The present study's success in modifying attitudes suggests that the learning package effectively addressed motivational factors beyond mere information transfer. The intervention likely fostered positive emotional responses to oral health practices and enhanced children's perceived importance of maintaining good oral hygiene (17). Interactive teaching methods create supportive learning environments where children feel motivated and empowered to adopt healthy behaviors, contributing to attitude change (28).

The absence of significant baseline differences between experimental and control groups ($p>0.05$ for all KAP domains) strengthens the internal validity of the study and supports causal attribution of observed improvements to the intervention rather than pre-existing differences. Post-intervention comparisons revealed highly significant differences, with the experimental group achieving substantially higher scores across all domains compared to controls (knowledge: 61.8 vs. 35.6; practice: 76.2 vs. 31.4; attitude: 41.5 vs. 24.1; all $p<0.001$). These findings mirror results from a recent randomized controlled trial by Singhal et al. (2024) conducted in rural India, which demonstrated the efficacy of comprehensive school-based oral health education programs in improving periodontal health outcomes, knowledge, and practices among school

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children (29). The minimal change observed in control group scores highlights the inadequacy of passive knowledge acquisition through regular school curricula and underscores the necessity of structured, targeted interventions for meaningful behavior change.

5. Conclusion

This study provides robust evidence supporting the effectiveness of structured learning packages in improving oral hygiene knowledge, attitudes, and practices among school-aged children in India. The substantial improvements across all KAP domains demonstrate that well-designed, theory-based educational interventions can successfully modify health behaviors during middle childhood. Future research should focus on evaluating long-term sustainability, optimizing reinforcement strategies, and adapting interventions to diverse contexts to maximize population-level impact.

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