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Impact of Early Oral Preventive Programs on Reducing Surgical Extraction Rates of Primary Teeth in Children

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Abstract:
This study aims to evaluate the effectiveness of early preventive programs in improving oral health among children and reducing the need for surgical extraction of primary teeth. A total of 100 children aged 4 to 10 years were included and divided equally into two groups: a preventive group that received regular preventive interventions (such as fluoride application and oral hygiene instructions), and a non-preventive group that did not receive any structured preventive care. Several indicators were assessed, including the number of surgical extractions, dental caries index (dmft), oral hygiene status, frequency of dental visits, and parental awareness. The results showed a significant reduction in the number of surgical extractions in the preventive group (0.36 ± 0.58) compared to the non-preventive group (0.94 ± 0.81), with a statistically significant difference (p = 0.001). The preventive group also had a lower mean dmft score (2.4 ± 1.2) than the non-preventive group (4.9 ± 1.7) (p = 0.000). In terms of oral hygiene, 76% of children in the preventive group had good oral hygiene compared to only 28% in the non-preventive group. Additionally, the preventive group showed more frequent dental visits and higher parental awareness scores. The study concludes that early preventive programs significantly contribute to better oral health outcomes and reduced need for invasive dental procedures in children. It recommends the broader implementation of such programs in schools and health centers.

Keywords: Pediatric Dentistry, Preventive Care, Dmft Index, Oral Hygiene, Parental Awareness

تأثير برامج الوقاية الفموية المبكرة على تقليل معدلات خلع الأسنان اللبنية الجراحي لدى الأطفال .

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الملخص
تهدف هذه الدراسة إلى تقييم فعالية برامج الوقاية المبكرة في تحسين صحة الفم لدى الأطفال وتقليل الحاجة إلى القلع الجراحي للأسنان اللبنية. شملت الدراسة 100 طفل تتراوح أعمارهم بين 4 و10 سنوات، وتم تقسيمهم إلى مجموعتين متساويتين: مجموعة وقائية تلقت تدخّلات وقائية منتظمة (مثل تطبيق الفلورايد وتعليمات نظافة الفم)، ومجموعة غير وقائية لم تتلقَ أي رعاية وقائية منظمة. تم تقييم مؤشرات عدة شملت عدد حالات القلع الجراحي، ومعدل التسوس(dmft) ، وحالة النظافة الفموية، وتكرار الزيارات للأسنان، ووعي أولياء الأمور.
أظهرت النتائج انخفاضًا ملحوظًا في عدد حالات القلع الجراحي في المجموعة الوقائية (0.36 ± 0.58) مقارنةً بالمجموعة غير الوقائية (0.94 ± 0.81)، وكان الفارق ذا دلالة إحصائية (p = 0.001). كما سجّلت المجموعة الوقائية معدل تسوس أقل (dmft = 2.4 ± 1.2) مقارنةً بالمجموعة الأخرى (dmft = 4.9 ± 1.7) (p = 0.000). من ناحية النظافة الفموية، تميز 76% من أطفال المجموعة الوقائية بحالة جيدة مقابل 28% فقط في المجموعة الأخرى. كما لوحظ تكرار أعلى في زيارات الأسنان ودرجات أعلى لوعي أولياء الأمور في المجموعة الوقائية.
تستنتج الدراسة أن برامج الوقاية المبكرة تساهم بفاعلية في تحسين صحة الفم وتقليل التدخلات الجراحية لدى الأطفال، وتوصي بتطبيقها بشكل أوسع في المدارس والمراكز الصحية.
الكلمات المفتاحية: طب أسنان الأطفال، الرعاية الوقائية، مؤشر التسوس(dmft) ، نظافة الفم، وعي الوالدين.

Introduction

Tooth decay (dental caries) remains one of the most common chronic diseases affecting children worldwide, often leading to pain, infection, and premature loss of primary teeth. Early childhood caries (ECC) poses significant health and developmental challenges, including nutritional problems and impaired speech. Despite advances in dental care, many children still require surgical extraction of decayed primary teeth due to inadequate preventive measures. Early oral health prevention programs, including education on oral hygiene practices, dietary counseling, and regular dental check-ups, have been proposed to reduce the incidence and severity of dental caries, thus minimizing the need for invasive treatments.

This study focuses on assessing the effectiveness of early oral preventive programs implemented in the city of Sabratha, Western Libya, and their impact on reducing the rates of surgical extraction of primary teeth in children. Numerous studies across different countries have emphasized the effectiveness of early oral preventive programs in improving children's oral health and reducing the need for surgical tooth extractions. In Iran, a randomized controlled trial demonstrated that a theory-based educational intervention among elementary school children significantly improved oral hygiene practices and reduced plaque accumulation, suggesting a potential for long-term prevention of tooth decay and surgical extractions (1). Similarly, a study conducted in Khartoum, Sudan, found that a school-based oral health education program markedly increased oral health knowledge and improved daily practices among children, particularly in tooth brushing frequency and technique, which could directly impact the incidence of advanced caries and tooth extractions (2). In Kuwait, an evaluation of the National School Oral Health Program revealed a significant reduction in dental caries rates among children after systematic preventive and educational interventions were introduced into the school system. These improvements underscore the long-term benefits of integrating oral health education within the national curriculum (3). A field study in rural areas of Myanmar also supported this approach. School children who received oral health education showed enhanced oral hygiene habits, and reductions in dental plaque levels were recorded, which the authors associated with a decreased risk of advanced decay and eventual extractions (4). In Iraq, Noaman and Rauf (5) reported that an oral health education program for 12-year-old schoolchildren led to a 42% reduction in debris index scores, illustrating an immediate improvement in oral cleanliness and preventative awareness (6). Maternal education has also been recognized as a key factor in early childhood oral health. A review study found that preventive dental programs delivered by non-dental professionals to mothers resulted in decreased rates of early childhood caries, indicating a reduced risk for early tooth loss and the need for surgical intervention (7). In low- and middle-income countries, a systematic review and meta-analysis concluded that primary school-based oral health interventions significantly improved children's dental hygiene behaviors and led to measurable declines in caries prevalence. These outcomes are directly linked to lower rates of extractions due to severe decay (8). A focused program in Alexandria, Egypt, targeting institutionalized orphan children, showed that education on proper brushing and dietary practices significantly improved both knowledge and hygiene outcomes. Post-intervention scores on the Oral Hygiene Index-Simplified (OHI-S) indicated better oral care and potentially lower future needs for extractions (9). A retrospective global evaluation of children's dental care programs found that consistent participation in preventive programs, including fluoride application and checkups, led to better oral health behaviors and fewer incidents of tooth decay that would otherwise necessitate surgical removal (10). Finally, a systematic review by Petersen and Kwan (11) confirmed that early preventive approaches such as fluoride varnish application, oral hygiene instruction, and parent-focused interventions significantly reduce the risk of early childhood caries, a major cause of surgical extraction in young children (12).

Problem Statement

In Sabratha, many children suffer from advanced dental caries that necessitate surgical extraction of their primary teeth. There is limited data on how early oral preventive programs influence the rates of such extractions locally. Understanding the effectiveness of these programs is critical for informing public health strategies and reducing the burden of dental disease in children.

Significance of the Study

This study will assess the effectiveness of early oral preventive programs in reducing the need for surgical extraction of primary teeth in children.

It will provide local evidence to support the enhancement of oral health services and education in Western Libya.

The findings will contribute to reducing the pain, discomfort, and psychological impact associated with surgical tooth loss in children and their families.

It will emphasize the importance of early intervention and preventive care in pediatric oral health.

Objectives

To evaluate the impact of early oral preventive programs on the surgical extraction rates of primary teeth among children in Sabratha.

To investigate the relationship between oral hygiene practices, socioeconomic factors, and the incidence of surgical tooth extraction.

Methods

Study design and setting

This study was a cross-sectional observational study conducted between January and April 2025 at the Pediatric Dental Clinics of the Faculty of Dentistry in Sabratha, Western Libya. The study aimed to evaluate the impact of early oral preventive programs on reducing the incidence of surgical extraction of primary teeth in children.

Study Population:

A total of 100 children, aged 4 to 10 years, were enrolled in the study. These children were selected from those attending the dental clinics for regular check-ups, preventive care, or treatment. All participants were residents of Sabratha and had no history of systemic diseases that could affect oral health.

Data collection procedure

Inclusion Criteria:

Children aged 4–10 years.
Children who had been enrolled in an oral preventive care program for at least 6 months (for the intervention group).
Children with available dental records.
Parental or guardian consent for participation in the study.

Exclusion Criteria

Children with special healthcare needs or systemic conditions affecting oral health.
Children who had not received any preventive dental care.
Incomplete or missing dental records.

Sample Size and Grouping

The study included 100 children, who were divided into two equal groups:
Group A (Preventive Group): 50 children who had received early oral preventive interventions such as fluoride varnish application, oral hygiene education, and dietary counseling.
Group B (Non-preventive Group): 50 children who had not participated in any structured preventive dental program.

Preventive Program Components:

The preventive program offered at the clinics consisted of:
Biannual fluoride varnish applications.
Oral hygiene instructions delivered to both children and parents.
Supervised tooth brushing demonstrations.
Educational materials on nutrition and its impact on dental health.
Routine dental check-ups every 6 months.

Data Collection:

Data were collected using two methods:
Clinical Examination: All participants underwent oral examinations conducted by calibrated pediatric dentists. The examination focused on the presence of:
Dental caries (using the dmft/DMFT index).
The number of teeth extracted surgically due to caries or infection.
Oral hygiene status (using the Simplified Oral Hygiene Index, OHI-S).
Dental Records Review: Dental charts were reviewed to identify:
Previous preventive care received.
Number and cause of extractions.
Dates of previous dental visits.

Ethical Considerations:

Approval for the study was obtained from the Research Ethics Committee at the Faculty of Dentistry, University of Sabratha. Informed consent was obtained from parents or guardians of all participating children.

Statistical Analysis:

Data were entered and analyzed using SPSS software version 25.0. Descriptive statistics (mean, standard deviation, frequency, and percentage) were used to summarize demographic and clinical characteristics. Chi-

square tests were performed to compare categorical variables between groups. Independent t-tests were used to compare continuous variables such as the mean number of surgical extractions. A p-value of <0.05 was considered statistically significant.

Results

Participant Characteristics: A total of 100 children participated in the study, with 50 children in each group. The age range of participants was between 4 and 10 years, with a mean age of 6.8 ± 1.4 years. The gender distribution was approximately equal in both groups.

Incidence of Surgical Extractions: There was a statistically significant reduction in the number of surgical extractions in the preventive group compared to the non-preventive group.

- Group A (Preventive):
  - Total surgical extractions: 18 teeth
  - Mean surgical extractions per child: 0.36 ± 0.58
- Group B (Non-preventive):
  - Total surgical extractions: 47 teeth
  - Mean surgical extractions per child: 0.94 ± 0.81
- p-value = 0.001 (highly significant)

Dental Caries Prevalence (dmft Index): The mean dmft score (decayed, missing, and filled primary teeth) was significantly lower in the preventive group*:*

- Group A (Preventive): 2.4 ± 1.2
- Group B (Non-preventive): 4.9 ± 1.7
- p-value = 0.000

Oral Hygiene Status (OHI-S Score): Children in the preventive group had better oral hygiene compared to those in the non-preventive group.

- Group A: 76% had good oral hygiene, 24% had fair, and none had poor hygiene.
- Group B: 28% had good, 46% had fair, and 26% had poor oral hygiene.
- p-value = 0.002

Parental Awareness and Dental Visits: Parents of children in the preventive group demonstrated higher awareness of oral health and were more likely to bring their children for regular dental check-ups.

- 82% of children in Group A had biannual dental visits, compared to 34% in Group B.
- Parental oral health knowledge scores (via questionnaire):
  - Group A: 8.1 ± 1.4 / 10
  - Group B: 4.7 ± 2.1 / 10
  - p-value < 0.001

Summary of Key Findings:

- Children enrolled in early oral preventive programs had fewer surgical extractions of primary teeth.
- They also had lower rates of dental caries, better oral hygiene, and higher levels of parental oral health awareness.

The findings underscore the effectiveness of early preventive interventions in reducing the need for invasive dental procedures

Table 1 Summary of Study Results (n = 100 children)

Parameter	Preventive Group (n=50)	Non-Preventive Group (n=50)	p-value	Significance
Mean Age (years)	6.8 ± 1.3	6.9 ± 1.5	0.72	Not significant
Gender Distribution (M/F)	26 / 24	25 / 25	0.85	Not significant
Surgical Extractions (total)	18	47	0.001	Highly significant
Mean Surgical Extractions/Child	0.36 ± 0.58	0.94 ± 0.81	0.001	Highly significant
Mean dmft Score	2.4 ± 1.2	4.9 ± 1.7	0.000	Highly significant
Good Oral Hygiene (%)	76%	28%	0.002	Significant
Regular Dental Visits (%)	82%	34%	<0.001	Highly significant
Parental Awareness Score (/10)	8.1 ± 1.4	4.7 ± 2.1	<0.001	Highly significant

key:

- **deft**: Decayed, Missing, Filled Teeth (for primary dentition)
- **p-value**: Probability value for statistical significance ($p < 0.05$ is considered significant)

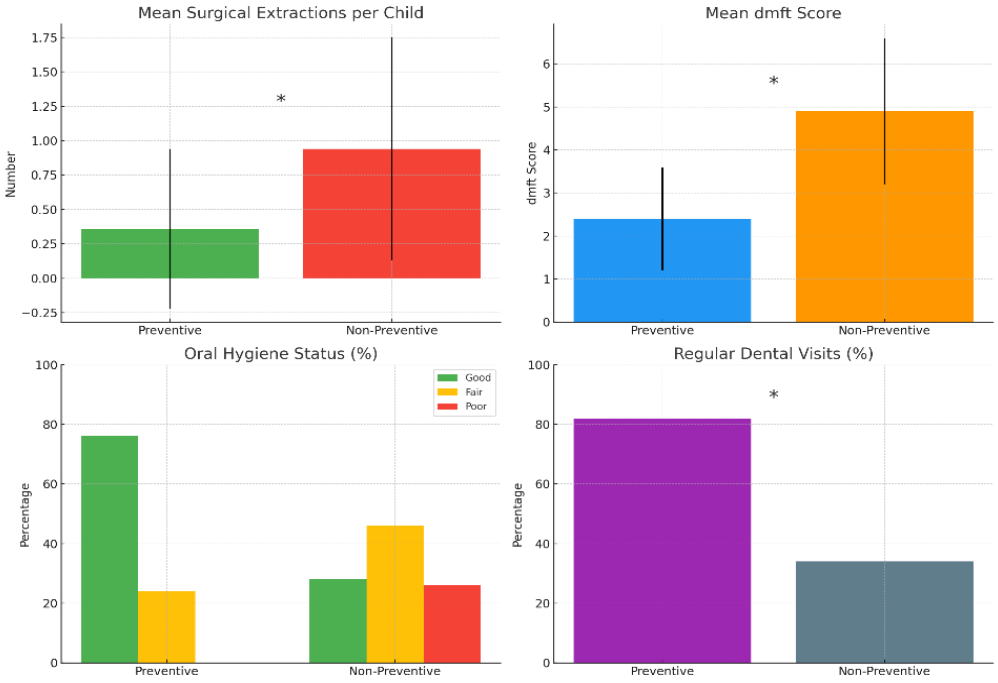

Figure 1 Comparison of Oral Health Parameters Between Preventive and Non-Preventive Pediatric Groups

Discussion

The results of this study demonstrate a clear benefit of early preventive dental care in pediatric patients. Children in the preventive group had significantly lower rates of surgical extractions and dental caries (dmft scores), along with better oral hygiene and higher rates of regular dental visits compared to the non-preventive group. These findings underscore the importance of preventive programs in improving oral health outcomes in children. The difference in surgical extractions and caries rates between the groups highlights how early interventions — such as oral hygiene education, fluoride application, and routine dental visits — can reduce the need for invasive procedures. Moreover, the higher parental awareness scores in the preventive group reflect the role of caregiver involvement in establishing good oral health behaviors in children. The significant disparity in oral hygiene status (with 76% of the preventive group showing good hygiene compared to only 28% in the non-preventive group) further reinforces the value of oral health education and early engagement with dental services.

Conclusion

Early oral preventive programs play a critical role in improving children's oral health and significantly reducing the need for surgical extractions of primary teeth. The findings demonstrate that children who received structured preventive care exhibited lower rates of dental caries, better oral hygiene, more frequent dental visits, and higher levels of parental awareness compared to those without preventive intervention. These results support the integration of preventive dental programs into school and community healthcare systems to promote long-term oral health and reduce the burden of invasive treatments in pediatric populations.

Recommendations

1. Implement Preventive Dental Programs in schools and community health centers to educate children and parents about oral hygiene practices.
2. Encourage Biannual Dental Checkups starting from early childhood to detect and manage issues before they become severe.
3. Incorporate Oral Health Education into parental counseling and public health campaigns.
4. Promote Training and Awareness for pediatric care providers to emphasize preventive oral health practices.

5. Further Research should be conducted on long-term outcomes of preventive care in different populations and socioeconomic groups.

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