

Assessing Atraumatic Versus Conventional Restorative Treatment for Dental Caries in Deciduous Molars: A Comparative Study

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ABSTRACT

Background: Dental caries is a common problem seen in children. Treatment options such as atraumatic and conventional restorative techniques are usually performed among such children. This study aimed to determine the success rate associated with these restorative techniques.

Methods: This descriptive randomized comparative study was performed in the Department of Operative Dentistry, Bolan Medical College, Quetta, for a period of 6 months in children. A total of 110 patients were selected through a simple random technique between the ages of 04 years to 09 years, who had class 1 dental caries/carious lesion in deciduous molars, and of either gender. Two treatment options (ART vs. Conventional restorative technique) were compared for their success rate. Baseline and clinical data were entered and analyzed using SPSS version 26.0, and a comparison between two tests was assessed using a chi-square test with a level of significance set as <0.05.

Results: Equal numbers of ART (50%, n = 65) and conventional restorative techniques (50%, n = 45) were used. The overall mean age was 6.12±09 years with girl predominance (n = 61, 55.45%) as compared to boys (n = 49, 44.54%), p value 0.03. In a group of children treated with ART restoration, the success rate was 78.46% (n = 51) as compared to conventional restoration (71.11%, n = 32), p value 0.77.

Conclusion: This study showed higher success rates of atraumatic restorative treatment among children with deciduous molars. Girls were more likely to experience dental caries than boys.

Keywords: Dental Atraumatic Restorative Treatment, Dental Composite Resin, Children, Deciduous Molar, Dental Caries.

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INTRODUCTION

Dental caries is a common problem observed in children eating sweet things such as chocolates, toffees, and candies, and not taking proper care of their oral hygiene. Dental caries, if not corrected timely may damage tooth structure and cause cavity formation in the hard tissues of the teeth¹. The prevalence of dental caries is increasing day by day due to more frequent and easily available things that harm the teeth. It was estimated that a higher prevalence of dental caries is observed in sociodemographic ally deprived countries, with almost 60% to 90% of school-aged children². In this context, a study from Pakistan has shown that almost 60% of the Pakistani population has dental carries³.

Most patients seek medical attention when they develop symptoms after dental caries, and the most common complaint is the presence of pain, sensitivity to cold or hot things, discomfort, or sometimes bleeding. As a result, overall quality of life gets affected, including studies of children, and also, treatment of dental caries in children sometimes causes a financial burden on the parents⁴.

Two widely used restoration techniques for dental caries are being used in children. Atraumatic and conventional restorative treatment techniques. Both ART and conventional dental treatment for caries differ significantly in their approach and equipment. ART uses hand instruments and adhesive materials to remove decayed tissue and restore cavities, while conventional treatment relies on drills, local anesthesia, and a wider range of restorative materials⁵. Conventional methods involve the use of rotary burs, alone or in conjunction with metal hand instruments, but the conventional method is associated with certain cons such as pain and discomfort that lead patients to refuse utilizing this method⁶. While ART, which uses hand instruments and a limited number of restorative materials, is less invasive and can be more accessible, particularly in resource-limited settings⁷.

Conventional treatment among children may sometimes be challenging due to pain and discomfort, which is why the choice of ART is preferred among those children with molar life expectancy of less than 5 years⁸. In this regard, studies are very limited, particularly from Pakistan, in which comparison of ART vs. conventional treatment for dental caries in deciduous molar was assessed. For that reason, this study has been planned to assess the comparison of ART vs conventional restorative treatment for dental caries in deciduous molars.

METHODS

This descriptive randomized comparative study was performed in the Department of Operative Dentistry, Bolan Medical College, Quetta, for a period of 6 months from February 2022 to September 2022 in children who came for routine control and dental treatment. Ethical approval was taken before commencement of the study (Ref: REU/DSG-2021-001-3827). The sample size was calculated on the basis of literature using the success rate of ART vs. conventional restorative treatment techniques, $p=92.9\%$ at lowest precision, i.e., $d=2\%$ and 95% confidence level, using the following formula: $n = z^2 \cdot p(1 - p) / d^2$. For this study, a total of 110 patients between the ages of 04 years to 09 years, who had class 1 dental caries in deciduous molars, and of either gender, were included in this study. Proper history and consent were taken from parents and patients before enrolment and in this study. A dental radiograph was also taken before selecting and operating on the patients.

Two treatment approaches were adopted in which 65 patients were treated with ART restorative while 45 patients were treated with the conventional restorative method. Adhesive restorative materials, such as GICs with different viscosities or resins, placed with the 'true' ART approach, including ITR with hand instruments, compared with the same or different restorative materials, such as GIC, placed with conventional cavity preparation methods. All the cavities were evaluated at 2-week and 4-week intervals and were evaluated using the International Caries Detection and Assessment System (ICDAS) World Health Organization (WHO) criteria, having a 0-8 score for the restoration success⁹. The restorations having the 0-2 scores were declared as successful, while the 3-6 scores were dropped in the failures. Scores 7 and 8 were given to the exclusion of the cases.

Data was collected regarding baseline and demographic parameters, including age, gender, and area of residence. The success rate of both procedures was assessed as an outcome. Patients with pain, discomfort, sensitivity, loosened crown, and restoration failure were labelled as failure of the procedure, while patients without these complications or symptoms were labeled as successful restorative therapy. The data were entered in SPSS version 26.0 for Windows (IBM Corporation, Armonk, NY, USA). Frequencies and percentages for qualitative data such as gender, area of residence, and success rates. While means were calculated for quantitative data such as age. ART vs. Conventional restorations evaluated and compared using chi-square test. Statistical significance was set at $p < 0.05$.

RESULTS

A total of 110 patients were enrolled for final analysis. Among them, most of the patients received ART restorative treatment (n = 65, 59.06%) and 40.90% (n = 45) received conventional restorative treatment. The overall mean age was 6.12±09 years

with girl predominance (n = 61, 55.45%) as compared to boys (n = 49, 44.54%), p value 0.03. In our study, urban dwellers were more prevalent than rural residents, 78 (70.90%) vs. 32 (29.09%), respectively **Table 1**.

Table 1: Baseline and demographic characteristics of study subjects (N = 110)

Characteristics	Overall (N = 110)	Treatment received ART (N = 65)	Conventional (N = 45)	p value
Age (years)				
Mean±SD	6.12±09	6.20±05	7.14±0.4	0.09
Gender				
Female	61 (55.45%)	35 (31.81%)	26 (23.63%)	0.03*
Male	49 (44.54%)	30 (27.27%)	19 (17.27%)	
Residence				
Urban	78 (70.90%)	42 (38.18%)	36 (32.72%)	0.81
Rural	32 (29.09%)	23 (20.90%)	9 (8.18%)	

* p value <0.05 is considered statistically significant

Table 2: Comparison of clinical evaluation among the studied group (N = 110)

Outcome	Treatment group ART (N = 65)	Conventional (N = 45)	χ ² -test	p value
Success	51 (78.46%)	32 (71.11%)	0.27	0.77
Failure	14 (21.53%)	13 (30.95%)		

* p value <0.05 is considered statistically significant

Table 2 shows a comparison of clinical evaluation among the studied groups. The clinical outcomes of the treated deciduous molars across the study groups were assessed in terms of the success or failure of different restorative techniques. Results were expressed as frequencies and percentages, and analyzed statistically using the Chi-square test. In a group of children treated with ART restoration, the success rate was 78.46% (n = 51) while in a group of children treated with conventional restoration, the success rate was lower to 71.11% (n = 32), p value 0.77.

DISCUSSION

In this study, the success rate of the ART restorative technique was higher, 78.46% as compared to the conventional restorative technique, 71.11%. The decision to choose ART was made by the operative dentist after briefing the children and their parents regarding the benefits of this procedure. In our study, the ART restorative technique was also chosen because its durability is lower than the conventional restorative technique, and deciduous molars are not permanent teeth; hence, they do not last as long a period of time. That is why choosing a restorative therapy that is less painful and cost-effective

became the choice of our operative dentist. Furthermore, our study also observed that girl patients were more likely to have dental caries as compared to boys, 55.45% vs. 44.54%, respectively. This can be confirmed by the previously conducted studies in which girls are more likely to have carious lesions as compared to boys^{10,11,12}. While some studies are not consistent with the findings of our study and observed a higher prevalence of dental carious lesions among boys than girls¹³. Two of the previously published studies observed 1.2¹⁴ and 1.6¹⁵ times higher prevalence of dental caries among boys than girls. The difference could be due to

racial, dietary habits, environmental, locality, and access to the sweet things. While, in another study authors have documented the reason behind higher prevalence of dental carious among girls than boys, earlier eruption of teeth, frequent snacking, and hormonal changes¹⁶.

Children are prone to dental caries due to their habit and interest of eating sweet things and that further enhanced when proper care of teeth has not been taken care of. Deciduous molars are the prevalent teeth affected by dental caries in children¹⁷. In a previously conducted study from Pakistan has shown that more than 70% of the children with primary teeth had dental caries and the most common cause was use of sweets and toffees¹⁸. Prevention and proper care of teeth are the mainstay method to prevent from dental caries but in cases where these preventive measures have not been taken or failure of these preventive measures, other restorative techniques should be adopted, such as conventional restoration or ART restoration¹⁹. The choice of restorative technique depends upon multiple factors, including the age of the patient, the extent and nature of tooth damage, the location of the dental caries, the desired outcome, and the patient's budget²⁰.

Choice of ART restorative technique among children is preferably more reasonable due to its simplicity, minimally invasive technique, and higher success rate as compared to the conservative restorative technique. Previously conducted studies show a success rate of the ART restorative technique ranging from 80% to 97%⁵. This is further confirmed by the previously conducted study in which authors have observed favorable post-operative results of ART in children with success rates of more than 94%, 87%, and 82% at one, two, and five years²¹. The same success rates of the ART restoration technique were observed in a randomized controlled trial²¹.

The study has certain limitations that should be addressed in future studies. Most importantly, our study has a smaller sample size and also, data were collected from one center, which may not be the true representative of all population. Secondly, post-procedural follow-up should be performed to see the short-term outcome of procedures. Lastly, possible reasons for dental caries should be evaluated to see the source of dental caries among boys and girls.

CONCLUSION

The study shows a higher success rate of atraumatic restorative treatment among children with deciduous molars. Girls were more likely to experience dental caries than boys. Considering the significant data obtained from this study, future studies may be conducted on larger scale to further authenticate

the results of this study.

LIST OF ABBREVIATIONS

ART: Atraumatic Restorative Technique

GIC: Glass Ionomer Cement

ITR: Interim Therapeutic Restoration

ICDAS: International Caries Detection and Assessment System

WHO: World Health Organization

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CONFLICT OF INTEREST

None

ETHICAL APPROVAL

Ethical approval was obtained from the institutional ethics review committee of Bolan Medical College under reference number (Ref: REU/DSG-2021-001-3827).

AUTHORS' CONTRIBUTION

SN & SAUS conceptualized the study, **FG & FSK** performed the literature review, and were primarily responsible for drafting and revising the manuscript. Data collection and analysis were coordinated and executed under **RS & TAK** supervision. All authors reviewed and approved the final manuscript and agreed to be accountable for all aspects of the work.

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