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Rate of Repeated Dental Treatment under General Anesthesia for Paediatric Patients: A Retrospective Study

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Abstract

General anesthesia (GA) is one of the pharmacological modalities used in the treatment of pediatric dental patients. This study aims to assess the rate and associated factors of repeated dental rehabilitation under general anesthesia in pediatric patients; The electronic health records of three- to 12-year-old children who received dental treatment under GA between 2015 and 2019 were identified and analyzed. Subjects were classified into cases with repeated dental treatment under GA within 5 years and controls who had dental GA once. Each case was matched to three controls based on gender and age. The collected data included the child's age at the first and second dental GA, gender, health status, Type, and the number of dental treatments provided. A total of 2376 patients had dental treatment under GA. Forty-five controls were matched to 15 cases in a 3:1 ratio. The prevalence of repeated dental GA over 5 years was 0.63%. The number of restorations, pulp therapies, and extractions showed no statically significant differences except for the number of crowns, which was higher in controls compared to cases (p=0.011). Treatment of patients under GA requires a more aggressive course of treatments compared to local anesthesia. Consequently, it is advisable to choose full-coverage crowns rather than composite or amalgam restorations.

Keywords: General anesthesia, uncooperative behavior, pediatric dental patients, dental caries, repeat dental treatment, full coverage crowns.

1. INTRODUCTION

Dental caries is the most common problem in clinical pediatric dentistry (Pereira *et al*., 2001). Although it is a preventable disease, the prevalence of dental caries in the young population is high (Anil & Anand, 2017). The estimated prevalence of dental caries in children in Saudi Arabia is approximately 80% for primary dentition and approximately 70% for children's permanent dentition (Al Agili, 2013). The detrimental impacts of dental caries on children are characterized by frequent hospitalizations and emergency room visits, high treatment costs, loss of school days, diminished ability to learn, and diminished oral health-related quality of life (The Reference Manual of Pediatric Dentistry. Chicago, Ill, 2020).

Treating young patients with multiple carious teeth, dental anxiety, behavioral difficulties, or medical disabilities can be challenging for pediatric dentists (Camilleri *et al*., 2004). Behavior management can be provided to these children using pharmacological and non-pharmacological behavioral management techniques. General anesthesia (GA) is one of the pharmacological modalities permitted in the required dental treatment for such patients during single visits (Guidry *et al*., 2017). A survey conducted in Saudi Arabia that assessed behavioral management reported that 60% of pediatric dentists used GA for their patients (Abushal & Adenubi, 2000). However, dental treatment under GA is generally costly and requires a specialized hospital setting and pre-operative preparation for the patients and dental team (Bohaty & Spencer, 1992). Moreover, United Kingdom General Dental Council guidelines stated that "GA is a procedure which is never without a risk" (GDC General Dental council, 1997). A study that assessed the mortality of dental GA by a review included 20 studies from 1955 to 2017 concerned with deaths associated with dental GA. They found 218 deaths out of 71,435,282 patients (3 deaths per 1,000,000 persons) with a mortality rate of

1:327,684 (Mortazavi, 2017) . Dental pain was the most common postoperative dental morbidity during the first 3 days after dental GA. Therefore, The Royal College of Anesthetists guidelines recommends using sedation instead of dental GA whenever suitable (Hulin *et al*., 2017).

Unfortunately, many pediatric dental patients treated under GA had an unsuccessful outcome, where dental GA needed to be repeated. In Jeddah, Saudi Arabia, a study found that 4.6% of pediatric dental patients needed repeated dental treatment under GA (El Batawi, 2013). The need for repeated dental GA was due to multiple factors, including but not limited to 1) Patient factors, such as extensive dental caries in the anterior maxillary teeth, continuous use of the nursing bottle, uncooperative behavior, compromised medical status, and the need for dental GA before the eruption of second primary molar; 2) Parental factors, such as poor compliance with recall dental visits after dental GA, absence of parental supervision while brushing, education level, and socioeconomic status (Worthen & Mueller, 2000), (Sheller *et al.*, 2003), (Guidry *et al*., 2017).

Preventive strategies are an essential part of dental care. These measures include brushing twice daily with fluoridated toothpaste, implementing dental home, changing a cariogenic diet to a healthy diet, and attending recall visits for periodic reassessment after dental GA (The Reference Manual of Pediatric Dentistry. Chicago, Ill. American Academy of Pediatric Dentistry, 2017), (Sheller *et al.*, 2003). With careful utilization of such strategies, a second attempt to treat the child under dental GA can be minimized.

Given the widespread use of general anesthesia in treating early childhood caries in Saudi Arabia, the rate of repeated dental general anesthesia is important to investigate, along with the possible leading factors. Therefore, our study aims to assess the prevalence and associated factors of repeat dental rehabilitation under general anesthesia for pediatric patients.

2. MATERIALS AND METHODS

Study Design

This retrospective study was conducted at King Abdullah Specialized Children's Hospital (KASCH) in Riyadh, Saudi Arabia, using patients' electronic health records (BESTCARE) who received dental treatment under GA at KASCH between April 2015 and October 2019.

Study Population

Subjects aged 3–12 years had at least one dental treatment under GA. Medically compromised subjects were included in the study. All Subjects were patients of Pediatric Dentistry department at King Abdullah Specialized Children's Hospital (KASCH). They were treated by different residents from the pediatric dentistry postgraduate program under the supervision of different consultants after proper clinical and radiographic diagnosis and treatment planning. Subjects were classified into cases with repeated dental treatment under GA and controls who had dental GA once. Each case was matched to three controls based on gender and age.

Data Collection

Dental records were accessed retrospectively for all patients who had received dental treatment under GA using the electronic BESTCARE health records. Patient records with repeated dental GA were independently identified and analyzed by two pediatric dental residents. The collected data from the dental records include:

1. Age of the child at the first and second dental GA.
2. Gender of the child.
3. Health status of the child.
4. Type and number of dental treatments provided under GA at the first and second dental GA.
5. Reason for first and second dental GA.
6. Post-GA visit within the first two weeks at the first and second dental GA.
7. Frequency of recall visits within two years at the first and second dental GA.

Statistical Analysis

Descriptive statistics include the mean, median, frequencies, and percentages for all variables. Data were analyzed using Statistical Package Social Sciences software (version 22.0, SPSS, Chicago, IL, USA). A Chi-square test was used to determine the association between different variables of the study. The significance level for all tests was set at $p<0.05$.

Ethical Approval

Approved by King Abdullah International Medical Research Center (KAIMARC) at King Abdulaziz Medical City RC20/075/R.

3. RESULTS

A total of 2376 patients who had dental treatment under GA between April 2015 and December 2019 were included in this study. Forty-five controls were matched to 15 cases in a 3:1 ratio. Table 1 shows the subjects' demographic data in cases and control groups. The majority of cases had two repeated dental GA, and two cases were excluded due to statistical accuracy as they exceeded two dental GA. The prevalence of repeated dental GA over 5 years was 0.63% (95% CI: 0.35% to 1.04%). A statistically significant difference in the mean value of age, gender, medical status was observed. Both the follow-up visits within two weeks and recall visits were higher in the controls than cases 14 (82.4%) and 19 (79.2%), respectively. However, no statically significant difference was found between them. The three clinical variables, which are numbers of restorations, pulp therapy, and extractions, showed no statically

significant difference except the number of crowns, which was higher in controls compared to cases (p=0.011) (Table 2).

Table 1: Comparison of study variables between cases and controls

Study variables	Case (N=15)	Control (N=45)	P Value
Age in years Mean (Sd.,)	6.07(3.2)	6.07(3.1)	--
Gender (%)			
Male	6(25%)	18(75%)	--
Female	9(25%)	27(75%)	
Medical status: (%)			
Fit	6(25%)	18(75%)	--
Compromised	9(25%)	27(75%)	
Follow-up 2 weeks: (%)			
Yes	3(17.6%)	14(82.4%)	0.485
No	11(26.2%)	31(73.8%)	
Recall 2 years (%)			
Yes	5(20.8%)	19(79.2%)	0.665
No	9(25.7%)	26(74.3%)	

Table 2: Comparison of mean values of clinical variables between cases and controls

Variables	Case (N=15) Mean (Sd.,)	Control (N=45) Mean (Sd.,)	Mean difference	P-value	95% CI for the difference of mean
Number of extractions	3.6(3.8)	4.3(3.5)	-0.70	0.50	(-2.89,1.43)
Number of crowns	1.3(1.4)	3.5(3.1)	-2.2	0.011*	(-3.92, -0.52)
Number of Pulp therapy	0.9(1.1)	1.9(2.4)	-1.0	0.10	(-2.32,0.23)
Number of restorations	4.8(3.9)	5.3(3.5)	-0.5	0.65	(-2.64,1.66)

**Statistically significant*

4. DISCUSSION

This study aimed to assess the prevalence and associated factors of repeat dental rehabilitation under general anesthesia for pediatric patients within five years at King Abdullah Specialized Children's Hospital (KASCH) in Riyadh.

The prevalence of repeated dental GA in this study is 0.63% which is considered low in comparison with other studies that reported prevalence ranging from 1%-20% (Almeida *et al.*, 2000) (EA O'Sullivan and Curzon, 1991). The large sample size of this study could explain such a difference.

Full coverage restoration such as stainless-steel crowns is considered a preferable treatment option in restoring multi-surface carious posterior teeth in pediatric patients undergoing dental treatment under GA (Seale, 2002). Aleheideb and Herman, 2003, reported long durability and a high success rate of performing stainless steel crowns under GA (95.5%) compared to composite and amalgam restorations (50%). The current study shows a high number of stainless-steel crowns in controls compared to cases that agree with Sheller et al., 2003 (Sheller *et al.*, 2003), which could be considered a contributing factor in the low prevalence of repeated dental treatment under GA in this study.

In the current study, the mean age of patients who underwent repeated dental GA is six years, similar to Jogezai *et al*., 2019. The period between the first and the second GA was evaluated by several studies, which range between two to four years, which is in line with our study (Sheller *et al.*, 2003), (Jogezai *et al.*, 2019), (Guidry *et al.*, 2017). Reinforcement of preventive strategies and strict follow-up attendance during this period is important in reducing the repetition of dental GA.

Irregular or missed follow-up and recall visits are associated with an increased risk of repeated dental GA (Kakaounaki *et al*., 2011). The initial follow-up and subsequent recall visits play an important role in minimizing the need for repeated dental treatment under GA, as it provides an opportunity to reinforce and implement preventive strategies (Guidry *et al.*, 2017). In the present study, only three (17.6%) of the patients returned for follow-up visits within two weeks, which is low compared with other studies that reported return percentages of 68.68% and 26 %, respectively (Guidry *et al*., 2017), (Sheller *et al.*, 2003). This low return rate could be explained by a low level of parental awareness of the importance of follow up visits as the main contributing factor in maintaining a child's oral health and the fact that King Abdullah Specialized Children's Hospital is a tertiary care center that accepts cases from other outside regions and some of the patients do not travel long distance for follow up care.

Specialists and postgrad students provided dental treatments under GA; thus, it is considered one of the limitations of this study due to the possibility of variations in treatment quality. Moreover, the need for emergency visits after performing dental GA and the presence of postoperative complications were not investigated in this study. Including patients with only two dental GA in the current study is a drawback. Although, a total of only two cases needed to be excluded as they exceeded two dental GA. Therefore, a prospective study design will better understand the associated risk factors of repeat dental rehabilitation under general anesthesia for pediatric patients.

The strength points of the current study are the large sample size and five years retrospective period. Also, the low prevalence of repeated dental GA in our study is an important finding that added to the study's strength. This study is not limited to healthy patients but also covers the medically compromised children who are considered an important and common group of patients receiving full dental rehabilitation under general anesthesia.

Knowing the rate and the associated factors of repeated dental treatment under GA is a major step toward improving the outcomes and reducing the possibility of its repetition. Treating patients under GA requires a more aggressive treatment course than local anesthesia. Consequently, choosing full-coverage crowns rather than composite or amalgam restorations is advisable. We believe that educating parents about the importance of attending follow-up and recall visits can help in proper assessment and early intervention, allowing the pediatric dentist to lower the need for a second extensive dental treatment under GA.

5. CONCLUSION

Within the limitations of our study, the prevalence of repeated dental GA over 5 years is relatively low (0.63%). No statistically significant differences were found between all the demographic and clinical variables except the number of stainless-steel crowns which was higher in controls than cases.

Author Contributions

AA Conceptualization and supervision, SA and NA methodology, collected the data, analyzed the data, and led the writing and original draft preparation. SA Review and editing. All authors have read and agreed to the published version of the manuscript.

Conflicts of Interest: The authors declare no conflict of interest.

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