

Impact of Dental Treatment under General Anaesthesia on Oral Health-related Quality of Life, Weight and Oral Hygiene Measures in Children: A Quasi-experimental Study

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ABSTRACT

Introduction: Dental treatment for children who cannot be controlled by standard behaviour management strategies or who are unable to endure more advanced pharmaceutical approaches is challenging. Dental treatment under General Anaesthesia (GA) is suitable for these uncooperative children. There is a gap in the literature regarding whether dental treatment under GA is associated with changes in weight and oral hygiene measures.

Aim: To evaluate children's Oral Health-related Quality of Life (OHRQoL) and the changes in weight, dental history, dental pain, and oral hygiene measures after dental treatment under GA.

Materials and Methods: The present pretest-post-test quasi-experimental study involving children aged 3-6 years scheduled for dental treatment under GA was conducted in the Department of Paediatric Dentistry, King Abdulaziz University, Jeddah, Saudi Arabia, from September 2022 to December 2023. A convenience sampling method was used, with a total of 93 children participating. A validated measure was employed to assess OHRQoL. Additionally, weight, dental history, dental pain and oral hygiene measures were assessed before and after

dental treatment under GA. A follow-up visit was scheduled six weeks after the GA. Data were entered and analysed using Statistical Package for Social Sciences (SPSS) software version 22.0 Statistics for Windows.

Results: The mean±Standard Deviation (SD) age of the children in the current study was 4.88±1.06 years. The findings showed a significant improvement in OHRQoL after dental treatment under GA. The mean±SD score of the total OHRQoL before dental treatment was 15.73±10.2. The mean±SD score after GA was 6.64±8.52 (p-value <0.001). The mean±SD weight of the children before GA was 16.72±3.17, and six weeks after dental treatment under GA, the mean±SD weight was 16.99±3.73, with no statistically significant difference (p-value=0.21). The findings also indicated an improvement in oral hygiene practices among children after dental treatment under GA.

Conclusion: Dental treatment under GA improves OHRQoL in children. No significant difference was found concerning weight change after six weeks of dental treatment. An improvement in oral hygiene practices was observed following dental treatment under GA.

Keywords: Behaviour management, Child function, Dental caries, Toothbrushing

INTRODUCTION

The World Health Organisation (WHO) states that dental caries have emerged as a global issue that poses a significant threat to the paediatric population [1]. Dental caries can influence children's OHRQoL in various ways [2]. For instance, it can cause eating and sleeping difficulties, and if left untreated, it can lead to pain and progress into abscesses [2]. Several studies have shown that dental caries can have numerous impacts on children's weight and overall quality of life in both preschool and school-aged children [3-5].

In Saudi Arabia, a systematic review and meta-analysis estimated the prevalence of dental caries in children of different school age groups [6]. The prevalence of dental caries in children aged 5-7 years was 84%, indicating a decrease since 2013. In contrast, for children aged 12-15 years, the prevalence of dental caries was 72% [6]. The incidence of dental caries may be correlated with the age at which individuals start brushing their teeth, thus necessitating parental education on proper oral hygiene practices, including assistance in brushing their children's teeth when required. Overall, proper control of dental plaque, along with other contributing factors, particularly dietary habits, especially nighttime feeding habits from the age of six months could help prevent the occurrence of dental caries [7,8]. Dental treatment under GA is provided in a single appointment, allowing the patient to be discharged on the same day after receiving

high-quality preventive and restorative dental procedures [9]. Dental treatment under GA is suitable for patients who cannot be managed by standard behaviour management strategies or who are unable to tolerate more advanced pharmaceutical approaches, such as conscious sedation [10].

The OHRQoL can be defined as the 'impact that oral health has had on an individual's day-to-day general well-being or quality of life' [11]. Several studies have assessed the impact of comprehensive dental treatment under GA on children's OHRQoL [12-14]. It has been found that various factors contribute to the outcome of OHRQoL in children, including pain, dental biofilm and socio-economic status (which involves parental educational level and family income) [15]. Many longitudinal studies have assessed post-test OHRQoL within one month following treatment; however, associations with changes in weight, dental history, dental pain and oral hygiene measures have not been investigated in depth [12,16]. Therefore, the present study aimed to assess changes in children's OHRQoL, weight, dental history, dental pain and oral hygiene measures before and after six weeks of dental treatment under GA.

MATERIALS AND METHODS

This study was a pretest-posttest quasi-experimental study involving children aged 3-6 years who were scheduled for dental treatment under GA was conducted at King Abdulaziz University, Jeddah, Saudi Arabia, from September 2022 to December 2023. Ethical

approval for this research was obtained from the Research Ethics Committee of the Faculty of Dentistry, King Abdulaziz University, Saudi Arabia (REC-FD 033-02-22). The study was conducted in accordance with the guidelines set forth in the Declaration of Helsinki. Written informed consent was obtained from each parent or guardian.

Sample size calculation: A non randomised purposive sampling of three to six-year-old children who received dental treatment under GA was included in the analysis. The sample size was determined using GPower software with a power of 80%. It was estimated that a sample size of 88 was adequate, with a calculated effect size of 0.423. The effect size was calculated using the change in the Early Childhood Oral Health Impact Scale (ECOHIS) scores [17].

Inclusion criteria: The study included 93 healthy children whose parents agreed to participate, with an age range of three to six years. Children who were referred for dental treatment under GA due to an inability to cooperate were included.

Exclusion criteria: All medically compromised children were excluded from the study.

Study Procedure

The study used a validated measure to assess OHRQoL [17]. The ECOHIS questionnaire was used to assess OHRQoL among children before and after dental treatment under GA [18]. The ECOHIS questionnaire is primarily used in preschool children and is composed of two main sections with 13 questions for both parents/caregivers and the child: the child impact section (9 items) and the family impact section (4 items). The response options are coded on a 6-point scale: 0=never; 1=hardly ever; 2=occasionally; 3=often; 4=very often; and 5=do not know. The values could range from 0 to 52 for the total scale (0–36 for the child section and 0–16 for the family section) [17]. This scale has been translated into many languages, including Arabic. Its reliability and validity were measured in an Arabic version of A-ECOHIS [16]. The questionnaire was completed by the same parent before and after the GA. Additionally, participants were asked to answer a questionnaire related to oral health behaviour. The instrument included 19 questions related to demographic variables and dental health-related questions from a validated Oral Health Behaviour Questionnaire (OHBQ) [19,20]. The modified version of the OHBQ, which selected items related to the aim of the study, included questions about participants' demographic data, dental history, dental pain, dental extractions and oral hygiene measures.

Weight and oral hygiene measures were assessed before and after dental treatment under GA. Oral hygiene measures were assessed at baseline using the frequency of oral hygiene practices and at the follow-up visit.

Follow-up visit: All 93 children attended the follow-up visit, and no dropouts were noted. The follow-up visit was scheduled six weeks after GA. The same parent completed the same questionnaire six weeks after GA. At each visit, height and weight measurements were collected using the electronic weight scale (Medisana Personal Scale Bamboo PS 440) with minimal clothing, without shoes, and using a standardised height scale.

STATISTICAL ANALYSIS

The participants completed preoperative and postoperative questionnaires, and the data were entered and analysed using

SPSS Statistics for Windows, version 22.0 (SPSS Inc., Chicago, IL, USA). All data were anonymised and saved on a password-protected desktop. The primary outcome was the OHRQoL, while the secondary outcomes included changes in weight, dental history, dental pain and oral hygiene measures. Categorical demographic variables were reported as percentages and frequencies, while means and SDs were calculated for continuous data. A paired t-test was used to compare the mean scores before and after the GA. The significance level was set at a p-value of <0.05.

RESULTS

Ninety-three participants met the inclusion criteria and agreed to participate in the study. The mean±SD age of the children in the current study was 4.88±1.06 years. Their mean±SD weight was 16.72±3.17 kg, and the mean±SD height was 107.92±9.01cm. Finally, this study included 42 (45.16%) males and 51 (54.84%) females. The demographic variables of the participants has been shown in [Table/Fig-1]. Fifty-seven (61.2%) parents were aged between 31 years and 40 years, while only 14 (15.1%) parents were between 20 years and 30 years old. A total of 65 (69.9%) mothers had either a college or a postgraduate degree, while only 12 (12.9%) mothers reported having less than a high school education.

Demographic data		Frequency (n)	Percentage (%)
Parent age (years)	20-30	14	15.1
	31-40	57	61.2
	>40	22	23.7
Mother's education	No education/primary school/middle school	12	12.9
	High school/diploma	16	17.2
	College/postgraduation	65	69.9
Father's education	No education/primary school/middle school	6	6.5
	High school/diploma	30	32.3
	College/postgraduation	57	61.2
Marital status	Married	81	87.1
	Divorced/widowed	12	12.9
Monthly income (Saudi Riyal)	<7000	21	22.6
	7000-10000	33	35.5
	>10000	39	41.9
Total		93	100

[Table/Fig-1]: The demographic data of the participants (N=93).

Among the 93 participants, the mean±SD score of the total OHRQoL before dental treatment was 15.73±10.2. The mean±SD score after treatment was 6.64±8.52 with a p-value <0.001, indicating that the children's OHRQoL had a statistically significant improvement in QHRQoL after dental treatment under GA [Table/Fig-2].

The changes in weight and height at baseline and after dental treatment under GA are tabulated in [Table/Fig-3]. The children's mean±SD weight before GA was 16.72±3.17 kg and changed to 16.99±3.73 kg after six weeks of dental treatment under GA. No statistical difference was observed in weight before and after dental treatment under GA (p-value=0.21). No correlation was found between the change in OHRQoL and the weight change of children six weeks after dental treatment under GA; the Pearson's

Parameters		Total OHRQoL	Child impact section	Child symptoms	Child function	Child psychology	Child self-image and social interaction	Family impact section	Parent distress	Family function
Baseline	Mean±SD	15.73±10.21	10.73±7.58	2.10±1.36	5.28±3.79	2.34±2.30	1.30±2.08	5.00±3.79	3.39±2.50	2.28±2.09
Follow-up	Mean±SD	6.65±8.52	4.13±6.08	0.45±1.04	2.31±3.05	0.72±1.39	0.78±0.58	2.52±3.32	1.42±2.00	1.10±1.60
p-value**		<0.001*	<0.001*	0.07	0.03*	0.16	0.06	0.22	0.917	0.002*

[Table/Fig-2]: The mean OHRQoL scores before and after dental treatment under general anaesthesia.

**Using paired t-test; *The p-value <0.05 was considered statistically significant

Variables	Before GA (Mean±SD)	After GA (Mean±SD)	p-value [§]
Weight	16.72±3.17	16.99±3.72	0.21
Height	107.92±9.01	108.26±9.01	0.17
Examination	1.08±0.30	1.29±0.46	0.001*
Dental visit	1.12±0.32	1.27±0.45	0.007*

[Table/Fig-3]: Changes in weight, height, number of dental examinations and dental visits before and after treatment among participants in the study N=93.
[§]Paired t-test; *The p-value <0.05 was considered statistically significant

correlation coefficient was 0.05, with a p-value of 0.6. There was a statistically significant increase in the mean number of dental visits and examinations before and after dental treatment under GA, with p-values of 0.001 and 0.007, respectively.

The number of parents who reported having dental visits for their children before GA, 82 (88.2%), and 85 (91.4%) parents reported that their children had a dental examination in the dental chair before GA [Table/Fig-4]. After dental GA, 68 (73.1%) children had dental visits, and 66 (70.97%) had dental examinations. There were no significant differences in the percentage of parents who reported having dental visits and examinations for their children before and after dental treatment under GA, with p-values of 0.47 and 0.35, respectively. The most common reason for extraction before GA was due to dental caries, 45 (48.4%). There were no significant differences in the reasons for extraction due to gum disease, dental caries, and exfoliation before and after dental treatment under GA, with p-values of 0.26, 0.47 and 0.15, respectively.

Variables		Before GA n (%)	After GA n (%)	p-value [§]
Previous dental visits	Yes	82 (88.2)	68 (73.1)	0.47
	No	11 (11.8)	25 (26.9)	
Previous dental examination	Yes	85 (91.4)	66 (70.97)	0.35
	No	8 (8.6)	27 (29.03)	
Extraction due to gum disease	Yes	8 (8.6)	11 (11.8)	0.26
	No	85 (91.4)	82 (82.2)	
Extraction due to caries	Yes	45 (48.4)	3 (3.2)	0.47
	No	48 (51.6)	90 (96.6)	
Extraction due to exfoliated teeth	Yes	5 (5.4)	3 (3.2)	0.15
	No	88 (94.6)	90 (96.8)	

[Table/Fig-4]: Number and percentage of parents' responses to children's previous dental visits, previous dental examinations, and extraction due to gum disease, caries and exfoliation (N=93).
[§]Chi-square test and Fishers exact test used; *The p-value <0.05 was considered statistically significant

The percentage of parents reporting their children's dental pain was assessed at baseline and again after six weeks of dental treatment under GA. A decrease in the number of children reporting pain was observed, from 78 (83.9%) to 41 (44.1%). There was no significant difference in pain levels before and after GA, with a p-value of 0.73 using the Chi-square test. The percentage of patients brushing their teeth three times daily increased from 3 (3.2%) to 15 (16.1%). This improvement in oral hygiene practices was statistically significant before and after dental treatment under GA, with a p-value of 0.046. Parents reported different responses regarding their children's dental pain. At baseline, nearly half of the parents, 43 (46.2%), reported giving painkillers whenever their children experienced dental pain. The remaining 36 (38.7%) parents reported that they took their children to the dentist after they complained of pain, while only 8 (8.6%) parents stated that their children never complained of pain. After GA treatment, nearly 32 (34.4%) parents reported that their children did not complain of dental pain. Additionally, there was a significant difference in the frequency of pain before and after dental treatment under GA, with a p-value of 0.025 [Table/Fig-5].

Variables		Before GA n (%)	After GA n (%)	p-value [§]
Child pain	Yes	78 (83.9)	41 (44.1)	0.73
	No	15 (16.1)	52 (55.9)	
Parent's response to pain	Giving painkillers	43 (46.2)	17 (18.2)	0.31
	Going to dentist	36 (38.7)	38 (40.9)	
	Family consultation or another medical care	6 (6.5)	6 (6.5)	
	Never complained	8 (8.6)	32 (34.4)	
Frequency of dental pain	3 times a day	4 (4.3)	3 (3.2)	0.025*
	2 times a day	8 (8.6)	8 (8.6)	
	Once daily	10 (10.7)	3 (3.2)	
	More than 3 times	54 (58.06)	20 (21.5)	
	Never	17 (18.2)	59 (63.4)	
Frequency of tooth-brushing	3 times a day	3 (3.2)	15 (16.1)	0.046*
	2 times a day	48 (51.6)	58 (62.4)	
	Once daily	25 (26.9)	15 (16.1)	
	2 times a month	2 (2.2)	0	
	Never	6 (6.5)	5 (5.4)	
	Rarely	9 (9.7)	0	

[Table/Fig-5]: Difference in the percentage of parents' responses to child dental pain and frequency of brushing at baseline and after six weeks after dental treatment under GA (N=93).
[§]Chi-square test and Fishers exact test used; *The p-value <0.05 was considered statistically significant

DISCUSSION

The present study assessed the association of dental treatment under GA among children aged 3-6 years with OHRQoL, weight change and oral hygiene measures. The findings showed a significant improvement in OHRQoL after dental treatment under GA. Additionally, the present study found no significant difference in weight and dental pain before and after dental treatment under GA. A cross-sectional study by Boukhobza S et al., which used the ECOHIS questionnaire among three to six-year olds, found an improvement in child psychology, including self-image and social interaction [21]. The findings of the present study align with previous studies in the literature that assessed the improvement of OHRQoL with dental treatment under GA, showing significant improvements in OHRQoL after four weeks, three months and one year [22-26]. This can be attributed to significantly improved function, including decreased pain and an enhanced ability to eat, from baseline to follow-up, allowing the child to be fed more adequately [16,22,24,25,27]. On the other hand, the current study found no statistically significant difference in child self-image and social interaction. According to Boukhobza S et al., the items with the highest ECOHIS scores were related to child functioning, which is consistent with the results showing that, in the child functioning section, there were questions about difficulty eating, drinking, speaking, and missing school days [21]. This may be due to the possibility that prolonged discomfort and neglected dental disorders can have adverse consequences, resulting in a more general decline in OHRQoL [21,22]. The study included three to six-year-old children; this age group was selected because it is the most common age group for dental treatment under GA, given that their underdeveloped cognitive abilities and personal growth make it challenging for a paediatric dentist to treat them in the dental chair [12]. The findings of the current study revealed an improvement in family impact and family function sections with p-values of 0.22 and 0.002, respectively. A longitudinal study by Ludovichetti FS et al., in Italy assessed the OHRQoL of three- to six-year-old children after GA treatment, showing similar results regarding family environment [12]. They found a significant decrease in post-treatment scores, both psychologically and economically, with a follow-up period of only four weeks using the same ECOHIS questionnaire [12].

The current study's results showed no statistical difference in the change in children's weight before and after dental treatment under GA. This is likely due to the short follow-up period after GA, as six weeks is not enough time for children to significantly change their weight. These results align with a previous longitudinal study that examined the body weight of 51 United States (US) children with early childhood caries 1.5 years after GA [28]. They found that dental rehabilitation resulted in only a slight (non significant) increase in weight [28]. A recent study by Ferrazzano GF et al., conducted in Italy and including 43 children, showed that 76.5% of children increased their weight percentile curves after eight months of follow-up [29]. This suggests the need for future studies to follow children for a longer duration to assess weight changes after dental treatment under GA.

The findings of the current study indicated that tooth brushing among children improved by the follow-up visit after six weeks. Similarly, a longitudinal study by AlMadhi NA et al., conducted in Saudi Arabia, showed that all subjects aged three to eight years had poor or below-average oral hygiene before therapy; nonetheless, half of them demonstrated a statistically significant improvement after dental treatment under GA [30]. These findings agree with a cross-sectional study by Malden P et al., which involved 208 children aged 0-14 years and found that parents had an optimistic outlook towards maintaining healthy oral hygiene practices after their child's dental GA in the one- to three-week follow-up [31]. However, another study by Öztürk G and Gümüş H which included 150 children aged three to six years, found that oral hygiene practices had worsened after one year of follow-up [22]. This study clarified that children from lower socio-economic backgrounds exhibited fewer oral healthcare practices than those from higher socio-economic levels, as most participants were from lower socio-economic backgrounds [22]. There are implications for reinforcing oral hygiene instructions by paediatric dentists after dental treatment under GA to avoid the need for retreatment.

In the current study, a strict methodological strategy was employed, incorporating measures to ensure consistency, accuracy and reliability. These elements collectively contribute to the robustness and credibility of the study's findings. For instance, the questionnaire was completed by the same parent both pre and post-GA to guarantee consistency in responses. Weight and height were measured using a calibrated device to ensure accuracy. This uniformity minimises measurement error, which can impair the precision and reliability of the results.

Limitation(s)

Some of the limitations of the current study are as follows: sampling bias (selection bias) is one of the main limitations that results from using a convenience sample. The data were recruited from one institute; thus, the inability to generalise findings can be considered another limitation. The short follow-up time is not sufficient to assess weight gain. Attrition during follow-up is a common limitation associated with these studies.

CONCLUSION(S)

Dental treatment under GA improves the OHRQoL in children. However, there was no statistical difference in weight before and after dental treatment under GA. A statistically significant increase in the mean number of dental visits and examinations after dental GA was observed. A decrease in reported dental pain among children was seen after dental treatment under GA, although this was not statistically significant. An improvement in oral hygiene practices was found after dental treatment under GA. Longitudinal studies with a larger sample size that consider multiple centres and longer follow-up periods among preschool children are recommended to assess the impact of dental treatment under GA on quality of life.

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- iThenticate Software: Jan 18, 2025 (15%)

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