

ORIGINAL ARTICLE

EFFECT OF COMPREHENSIVE DENTAL TREATMENT UNDER GENERAL ANAESTHESIA ON CHILDREN'S ORAL-HEALTH-RELATED QUALITY OF LIFE: A COMPARATIVE CROSS-SECTIONAL STUDY

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Background: Despite reductions in dental caries experience in developed countries, early childhood caries remains the most prevalent health problem in developing countries. This has a direct impact on the oral health-related quality of life of both children and parents. The objective of this study was to examine the impact of comprehensive dental treatment under general anaesthesia on oral health-related quality of life in children, using a parental and caregiver perception questionnaire. **Methods:** A comparative cross-sectional study was conducted in the Children Hospital, Pakistan Institute of Medical Sciences, Islamabad from July to December 2015. A total of 40 children were enrolled in the study. The oral health-related quality of life questionnaire was completed by either a parent or caregiver during the initial visit and afterward in follow-up appointments, conducted 4-8 weeks after comprehensive dental treatment under general anaesthesia. **Results:** The mean age of all the enrolled children was 5.7 ± 1.7 years. Among 40 children, 55% (22) were girls and 45% (18) were boys. A highly significant reduction was observed between the pre and post-treatment P-CPQ total scores from 76.9 ± 15.8 to 13.3 ± 9.5 with a p -value < 0.0001 . Regarding the P-CPQ domains, a significant reduction from the pre- to post-treatment scores was observed for oral symptoms; functional limitations, emotional well-being, and social well-being with a p -value < 0.0001 . **Conclusion:** The oral health-related quality of life was significantly improved after comprehensive dental treatment under general anaesthesia. The findings of this study may be utilized to improve future guidelines and betterment of dental health of children by health care providers and initiatives for future health programs.

Keywords: Early Childhood Caries; Dental General Anaesthesia; Oral health-related quality of life.

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INTRODUCTION

Early childhood caries (ECC) is considered the most prevalent and destructive oral health infectious disease among toddlers and preschool children. It predominantly affects primary dentition and may extend to permanent teeth as they emerge.¹ The severe forms of early childhood caries significantly diminish the quality of life for young children. One of the most concerning and frequently overlooked aspects of extensive tooth decay is its detrimental impact on their daily activities, academic achievements, school attendance, potential for success, and self-confidence.^{2,3}

The American Academy of Paediatric Dentistry (AAPD) defines ECC as “The presence of one or more decayed (non-cavitated or cavitated lesions), missing (due to caries), or filled tooth

surfaces in any primary tooth in a child under the age of six.” The etiology of ECC is multi-faceted and dynamic, involving environmental, socioeconomic, behavioural, and biological factors.⁴ The prevalence of ECC has been reported to be greater in developing countries like China (53%), India, (53%) and South Africa (46%), in comparison with developed countries such as England (32%) and Italy (22%) where prevalence is significantly low.⁵ Studies in Pakistan and India show a prevalence of 50–60% of dental caries in preschool children in different regions of both countries.^{6,7} In a recent study in Peshawar, Pakistan, a total of 406 children were examined and it was found that 88.6% had experienced Early Childhood Caries and Severe Early Childhood Caries (S-ECC) were recorded in 64.2% of children.⁸

In case of delayed treatment of early childhood caries and severe early childhood caries, the

condition of the child deteriorates, management becomes more difficult as well as the cost of the treatment is also increased. Initially starting with pain, the child's daily activities are disturbed preventing him or her from properly performing routine activities, such as sleeping, eating, playing and talking.⁹ In such instances, decreased appetite or malnutrition may arise. Early tooth loss is a frequent consequence of severe early childhood caries, leading to diminished self-esteem and teasing experiences both at home and school. Speech development difficulties and delayed physical growth are also observed in children affected by ECC, all of which contribute to various aspects of their overall quality of life.¹⁰ The dental team should first utilize behavioural management techniques (BMTs) to treat children, fostering positive communication. BMTs involve non-pharmacological interventions like tell-show-do, distraction, and positive reinforcement to manage anxiety in the dental setting, aiding in patient comfort and cooperation.¹¹ However, in certain situations where the patients are highly anxious or unco-operative and behavioural management techniques have exhausted, the dentist has to resort to general anaesthesia (GA) and more advanced techniques.^{12,13,14}

General anaesthesia is a suitable choice for patients with severe oral issues, behavioural challenges, disabilities, or needing complex procedures like maxillofacial surgery. Its use depends on factors like age and treatment needs.¹ Where dental general anaesthesia has its advantages, certain limitations and demerits are present as well. These include difficult access to GA facility, higher expenses and time limitation which is an additional burden for patients, caregivers and dental practitioners.^{1,14} An Australian study found in-patient oral healthcare under dental general anaesthesia (DGA) cost over \$40 million in four years. Thus, complete oral rehabilitation under general anaesthesia use must be justified, evidence-based, and cost-effective for children and families.¹⁵

Children's oral and dental health has a significant impact on children's and parents' quality of life.¹⁶ Previous studies on OHRQoL in dental treatment under GA have concentrated on young children with special needs, showing treatment efficacy.¹⁷ Though preventable, dental caries in children is a public health issue which adversely affects children's ability to eat, socialize and to attend school.¹² Extensive oral issues cause pain, impacting mental and physical health, worsening quality of life. Oral Health-Related Quality of Life (OHRQoL) assesses treatment effectiveness, aiding in cost-benefit analysis and treatment decisions.¹⁸ To our knowledge the impact of comprehensive oral rehabilitation under GA on OHRQoL has so far not been measured in a Pakistani population. The study aimed to examine the impact of comprehensive dental treatment

under general anaesthesia on oral health-related quality of life in children and to compare it pre-treatment and post-treatment using a parental caregiver perception questionnaire (P-CPQ).

MATERIAL AND METHODS

A comparative cross-sectional study was conducted in the Paediatric Dentistry Department of Children Hospital, Shaheed Zulfiqar Ali Bhutto Medical University (SZABMU), Pakistan Institute of Medical Sciences (PIMS) from July to December 2015. Ethical approval for this study was taken from the SZABMU ethical review committee. A total of 40 children were recruited in this study to be treated under GA. Keeping a confidence interval of 99% with a 1% alpha error and a mean score difference in OHRQoL of 16.0 with a common sigma of 13.5, the sample size was estimated to be 28.¹⁰ Considering cases of non-response and those lost to follow-up, the sample was increased to 40. The World Health Organization (WHO) sample size calculator was used for the estimation of the sample size. Non-probability consecutive sampling was used for recruiting the patients. Patients were recruited as per the criteria given below:

Inclusion Criteria: The following will be included: Children of both genders male and female in the age group 3-10 years in whom non-pharmacological behaviour management techniques have failed, children with acute situational anxiety, and uncooperative behaviour. Children who need invasive procedures and patients requiring comprehensive oral rehabilitation. The patient should be classified ASA I* and ASA II* for general anaesthesia who are mentally and physically healthy patients with no underlying systemic disorder.

Exclusion Criteria: The following will be excluded: Patients that can be treated with non-pharmacological behaviour management techniques. Child patients with mental and physical disabilities e.g. Cerebral Palsy and Down's syndrome. Medically compromised patients with ASA III* and ASA IV* category for GA were also excluded.

Informed consent was given by parents/ caregivers. The Parental-Caregiver Perceptions Questionnaire (P-CPQ) was used for measuring the OHRQoL among the children in this study.¹⁸ The parents of the patients who were recruited were asked to fill out the P-CPQ questionnaires at the initial visit. During the follow-up visit 4-8 weeks after the comprehensive dental treatment under general anaesthesia (CORGA), the parents were asked to fill out the questionnaire again. The P-CPQ is comprised of 33 items scored on a Likert scale response, ranging from "Never" to "Almost every day". The P-CPQ contains the following domains of OHRQoL: Oral symptoms (OS); Functional limitations (FL); Emotional well-being (EWB) and Social well-being (SWB).

Frequencies and percentages for the pre-treatment, post-treatment, and the difference in the OHRQoL individual domains responses were described. Mean and standard deviation was described for the overall P-CPQ score. Paired sample *t* test and *chi-square* test were used to compare the any difference in the pre and post-treatment P-CPQ scores. The Effect size (ES) was also calculated by dividing the mean change score by the standard deviation. The ES is a distribution-based measure of change in the P-CPQ, categorized as follows: (ES score: <0.2 = small change; 0.2–0.7 = moderate change; >0.7 = large change). Statistical significance was considered at a 5% level with *p*-value<0.05.

RESULTS

The mean age of the 40 children was (5.7±1.7) years. There were 22 (55%) girls and 18 (45%) boys who underwent CORGA. Most respondents (n=31, 77.5%) were from urban areas, while only nine (22.5%)

children were from rural areas. Most of the participants were from a low socioeconomic background, with a monthly income of less than Rs. 40,000 (n=28 (70%). The overall P-CPQ and domain scores have been illustrated in table 1. As shown, a significant difference in the OHRQoL was observed in all the domains as well as the overall P-CPQ score. The responses of each item were re-categorized. ‘Often’ and ‘Everyday/ Almost every day’ were categorized in one category. The pre and post-treatment frequencies of these responses were compared using Chi-squared test. The frequency distribution of all the 33 item responses has been illustrated in table 2.

The study outcome was measured in terms of impact of comprehensive dental treatment under GA on OHRQoL on children and their families, by comparing the difference in mean scores of P-CPQ scores of individual domains pre and post-treatment.

Table 1: Pre and post-treatment and score difference for P-CPQ and its domains

P-CQP	Pre-treatment	Post-treatment	Score Difference	<i>p</i> -value	Effect size (ES)	Description of (ES)
P-CPQ total score						
Mean (SD)	76.9 (±15.8)	13.3 (±9.5)	63.6 (±12.6)	<0.0001	4.0	Large
P-CPQ domain						
Oral symptoms: Mean (SD)	14.9 (±3.8)	1.9 (±1.9)	13.0 (± 2.8)	<0.0001	3.4	Large
Functional limitations: Mean (SD)	27.4 (±5.2)	4.8 (±3.9)	22.6 (±4.5)	<0.0001	4.3	Large
Emotional wellbeing: Mean (SD)	20.2 (±5.7)	2.3 (±4.4)	17.9 (±5.0)	<0.0001	3.1	Large
Social wellbeing: Mean (SD)	14.4 (±5.6)	3.3 (±3.1)	11.1 (±4.3)	<0.0001	1.9	Large

Table-2: Comparison of P-CPQ in terms of response “often” and “everyday/almost every day” between pre-treatment and post-treatment

Item	Pre-treatment n=40 n (%)	Post-treatment n=40 n (%)	<i>p</i> -value
Oral symptoms			
Pain in the teeth, lips, jaws or mouth	36 (90.0)	0 (0.0)	<0.001
Food caught between teeth	28 (70.0)	0 (0.0)	<0.001
Bleeding gums	16 (40.0)	0 (0.0)	<0.001
Swelling of gums/face/infection	36 (90.0)	0 (0.0)	<0.001
Functional limitations			
Taken longer than others to eat a meal	38 (95.0)	1 (2.5)	<0.001
Had difficulty eating or drinking hot and cold foods	14 (35.0)	0 (0.0)	<0.001
Diet restriction to certain foods	39 (98.5)	0 (0.0)	<0.001
Trouble sleeping	37 (92.5)	0 (0.0)	<0.001
Absent from school due to pain/infection	12 (30.0)	0 (0.0)	<0.001
Difficulty biting/chewing firm foods	38 (95.0)	0 (0.0)	<0.001
Difficulty pain/bleeding while brushing	29 (72.5)	0 (0.0)	<0.001
Emotional wellbeing			
Worried that he/she is not good looking as others	17 (42.5)	1 (2.5)	<0.001
Hard time paying attention in school	21 (52.5)	0 (0.0)	<0.001
Concerned what people think about your teeth	13 (32.5)	0 (0.0)	<0.001
Felt irritable/frustrated	21 (52.5)	2 (5.0)	<0.001
Worried that child is less healthy than others	16 (40.0)	0 (0.0)	<0.001
Social wellbeing			
Not wanted to or able to participate in class activities	7 (17.5)	0 (0.0)	<0.001
Teased/called names in class	8 (20.0)	1 (2.5)	<0.001
Avoided smiling/laughing	24 (60.0)	2 (5.0)	<0.001
Asked questions by other children about his/her mouth/teeth	13 (32.5)	1 (2.5)	<0.001
Argued with children/family	23 (57.5)	5 (12.5)	<0.001

DISCUSSION

Early childhood caries is one of the most prevalent public health issues among toddlers and preschoolers.²⁰ The dental caries in primary dentition affects 621 million children worldwide. Dental treatment under general anaesthesia is recommended in some children under special circumstances. It has numerous benefits such as suitability, ease, efficiency, and superior restorative and preventive treatment in a single appointment.^{22,23} Despite its efficacy, dental general anaesthesia is costly, resource-intensive, and risky, necessitating substantial evidence of its benefits for children and families by evaluating the impact it will have on the OHRQoL of children and their families.²³ OHRQoL assesses how oral conditions affect daily life, well-being, and interactions between oral health, general health, and social factors.²⁴

In the present study, the average age of the enrolled patients was 5.7 ± 1.7 years. It shows a high prevalence of ECC in this age group. Similarly in a study carried out in Karachi, Pakistan, 50–60 % prevalence of dental caries was observed between the age of 3–6 years in preschool children.⁶ Another study conducted in India showed a high caries prevalence of 68.5% in five years old children which is similar to the age group of the current study.⁶ In Australia, Yawary *et al.* Yawary *et al.*²⁵ utilized the Early childhood oral health Impact scale (ECOHis) to evaluate OHRQoL post-treatment changes in children under six and reported that 59.0% of their study cases were males and 41% were females. In the present study, female gender was slightly predominant with a 55.0% proportion. However, this contrasts with many other studies. Cantekin *et al.*²² recorded 61.7% boys and 38.3% girls in their research, which is also a dissimilar correlation to the current study. Regarding the socioeconomic status of the respondents, about 70% had monthly incomes up to 40,000 PKR, out of which 30% had monthly incomes as low as 15000 PKR. The study found a correlation between low monthly income and increased caries experience. Low socioeconomic status significantly worsened OHRQoL for both children and families, evidenced by high P-CPQ scores. Paula *et al.* found that low socioeconomic status and disadvantaged home environments negatively affected children's OHRQoL.²⁶ Otero *et al.*, stated low and insecure income groups experience the highest caries burden and ECC prevalence.²⁷ In the present study the overall comparison between mean P-CPQ scores showed a marked reduction from $76.9 (\pm 15.8)$ pre-treatment to $13.3 (\pm 9.5)$ post-treatment.

The significant findings of the study reflected across almost all P-CPQ domains,

underscore the considerable improvement in children's OHRQoL and family impact scale after comprehensive dental treatment emphasizing its value in dental assessments. In an Iranian study conducted by Jabarifer *et al.* in Isfahan, one hundred parents of 3–10-year-old children who needed dental treatment under GA completed a P-CPQ and FIS before, and 4 weeks after dental treatment under GA.²⁸ The mean scores and (SD) of OHRQoL of the children before and after dental treatment were $43.3 (\pm 7.14)$ and $39.24 (\pm 5.47)$ ($p < 0.001$) respectively. A UK-based study found that using dental general anaesthesia (DGA) for young children with early childhood caries (ECC) led to significant improvements in parents' perception of their child's oral health-related quality of life (OHRQoL) and its impact on their lives. Pre- and post-treatment comparisons showed notable reductions in both overall P-CPQ scores and its domains, including Oral Symptoms (OS), Functional Limitations (FL), Emotional Well-being (EWB), and Social Well-being (SWB). These findings suggest that comprehensive oral rehabilitation under DGA positively affected parents' views on their children's oral health and its influence on daily life.¹⁴ Baghdadi and Muhajarine perceived the enormous effect of treatment when they noticed mean overall P-CPQ mean scores reducing from $33.3 (\pm 18.7)$ in pre-treatment to $4.4 (\pm 6.6)$ in post-treatment.³ The significant improvement in OHRQoL post-treatment observed in various studies aligns with the current study therefore longer-term follow-up studies are needed to confirm sustained improvement.

The results of the present study indicate that comprehensive dental treatment administered under general anaesthesia significantly impacts the oral health-related quality of life of children and their families dealing with diverse dental issues, as evidenced by the P-CPQ scores. Oral rehabilitation under GA emerges as a viable choice, significantly enhancing both the dental health and OHRQoL of patients and their families. This underscores the importance of considering dental general anaesthesia as an effective option in the comprehensive oral rehabilitation of children and in improving the overall well-being of patients and their families.

AUTHORS' CONTRIBUTION

HSQ: Conceptualization of study, Data collection, write-up, Literature Review, Ethical approval. UN: Manuscript formatting, Statistical analysis, Data Interpretation. HN: Literature search, Proofreading, Study Design. OA: Data analysis, Bibliography, Data Analysis. PB: Literature review, Critical Review, and Appraisal. SA: Data interpretation, Proofreading, Formatting.

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