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Changes in oral-health related quality of life, oral hygiene status and body growth in children with special health care needs following oral rehabilitation under general anaesthesia

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Abstract---Aim: To assess changes in oral health related quality of life, oral hygiene status and body growth in children with special health care needs following dental treatment under general anaesthesia. Methodology: Twenty children with special health care needs undergoing dental treatment undergoing general anaesthesia at the Unit of Pediatric Dentistry and those with Special needs, Faculty of Dentistry, Cairo University were selected in this study. For each patient oral hygiene status (assessed by Plaque index), weight, height and body mass index were assessed at baseline and at 3,6 and 9 months. OHRQoL was assessed using the early childhood oral health impact scale (ECOHIS) at baseline as well as 3-, 6- and 9-months intervals. Results: At follow up, there was a slight increase in body weight in 100% of patients, 87.5% in height, 25% in body mass index that their percentile curve had been changed while in 75% of cases remain the same percentile curve but higher BMI. The overall Early Childhood Oral health impact scale scores decreased significantly ($P < 0.001$) demonstrating large effect sizes, at baseline score was significantly higher than at 3, 6 and 9 months respectively. The greatest decreases were for the domains of child oral symptoms (67%

never had pain again) and the least change was in the psychological and social domain. Conclusion: Dental rehabilitation under general anaesthesia (DGA) provides immediate relief from a child's oral symptoms, a significant improvement in the child's quality of life. These benefits result in an increase in BMI confirming the relationship between caries, poor oral hygiene, and stunted growth in children with disabilities. However, oral hygiene status deteriorates soon after long time follow up period.

***Keywords*---**children with special health care needs, oral health related quality of life, full mouth rehabilitation under general anaesthesia, oral hygiene status, body growth status.

Introduction

Children with special health care needs (CSHCN) was defined according to American Association of Pediatric Dentistry (AAPD) as those with "Special health care needs include any physical, developmental, mental, sensory, behavioural, cognitive, or emotional impairment or limiting condition that requires medical management, health care intervention, and/or use of specialized services or programs. The condition may be congenital, developmental, or acquired through disease, trauma, or environmental cause and may impose limitations in performing daily self-maintenance activities or substantial limitations in a major life activity"[i]. World Health Organization (WHO) in 2021 stated that over 1 billion people are estimated to experience disability worldwide. This corresponds to about 15% of the world's population[ii]. A community-based survey was conducted in Alexandria in 2018 by Wahdan and ElNimr using a cluster sampling technique. The prevalence of CSHCN in Egypt was found to be 12.2% with higher prevalence in males, with a male to female ratio of 1.25:1 with about 23% of these special needs are in cognitive impairments with percentage 16.4% and impaired mobility with percentage 9.8% [iii].

One of the most common health problems that threaten children is the dental caries as it is considered the 10th most prevalent disease worldwide, affecting 621 million children globally [iv] and 90% of adults all over the world [v]. The children with special needs are considered as high-risk and vulnerable groups for acquiring dental disease due to many facial, skeletal and dental alterations or defects caused mainly due to neuromuscular, acquired or genetic disorders. A study showed that CSHCN generally receive less restorative care than their nondisabled counterparts and that nearly 80% of children with disabilities have untreated caries [vi].

The oral health status of CSHCNs is influenced by many different sociodemographic factors such as age, living conditions, degree of disability, special diets and the type of drugs and medication taken daily[vii]. In addition to the limitations that society imposes on them. In some societies, people with special needs are usually kept out of society and have limited access to educational and health facilities [viii] which makes attending a routine dental appointment difficult[ix]. Also, caregivers of CSHCNs often face difficulties while carrying out their

children's daily oral hygiene requirements as they may be uncooperative, resist care and are difficult to manage[x]. Poor dental health can have an adverse effect on self-esteem, quality of life, and general health; therefore, it may not just result in physical issues but also have broader effects[xi].

Oral health related quality of life (OHRQoL) is one aspect of individual's overall QoL, the concept of OHRQoL reflect the fact that it is not only to prolong life, but to make it free of disease and make it better. AlJameel et al., 2016 suggested that OHRQoL can be defined as "a person's assessment of how functional factors, psychological factors, social factors and experience of pain/discomfort affect his or her wellbeing" and acknowledged that poor oral health is an important cause of negative impacts on daily performance and quality of life [11]. Caries also left untreated in children usually affects the weight, growth, quality of life, cognitive development and may result in hospitalization and emergency dental visits [xii].

The growth of some infants, children, and youth with special health care needs differs from that of other children because of reasons not related to nutrition. For all children, growth potential is determined by genetics and influenced by biological and environmental factors. These factors can include disease, nutrient intake, poverty, and other environmental circumstances. CSHCNs are at higher risk for other factors that can influence growth, such as impaired motor skills, the need for long-term use of medications, and other, secondary medical conditions [xiii]. The most common problems associated with malnutrition in disabled children are inadequate nutrient intake either due to feeding problems or poor feeding knowledge among care providers [xiv]. CSHCNs are particularly vulnerable to poor growth due to developmental delays and lack of interest in food. In addition, some conditions cause an increase in the metabolism. For instance, some cerebral palsy patients experience frequent muscle spasms that burn calories. Other children might be found to just eat one type of food every day, which could result in vitamin shortages [xv].

General anesthesia is commonly used to facilitate and assist dental treatment in patients with anxiety or unpleasant behavior, many of whom are children or patients with special needs. Lim et al., 2017 concluded in their study that 30.2% of the adult and pediatric patients treated under general anaesthesia had an intellectual impairment, these intellectual impairments were more likely to be autism, behavioral problems, scoliosis, and seizure disorders[xvi].

Research Hypothesis

This research adopted null hypothesis, which assumed that OHRQOL, body mass index and oral hygiene status will not change in the children with special health need after full mouth rehabilitation under GA treatment.

Participants and Methods

Approvals and Committees

The study was carried out after being reviewed and approved by the Medical Biostatistics Unit, Evidence Based Committee, the board of Pediatric Dentistry

Department, Faculty of Dentistry, Cairo University. Ethical approval Obtained from research Ethics Committee, Faculty of Dentistry, Cairo University on 27th of July 2021. This study was registered at clinical trial.gov with identifier NCT04861675.

Sample Size Calculation

A power analysis was designed to have adequate power to apply a statistical test of the null hypothesis that the intervention has no effect. By adopting an alpha level of (0.05) a beta of (0.2) i.e. power=80% and an effect size (d) of (1.2369) calculated based on the results of Jankauskiene et al. [xvii], the predicted sample size (n) was a total of (16) cases. Sample size was increased by (25%) to account for possible dropouts to be (20) cases. Sample size calculation was performed using G*Power version 3.1.9.7[**].

Study Settings and Recruitment

Children with intellectual disabilities undergoing oral rehabilitation under general anaesthesia who attended the general anesthesia operating room at The Unit of Pediatric Dentistry and those with Special Needs, Faculty of Dentistry, Cairo University, Egypt were selected.

Inclusion criteria

children with special health care needs attending at General Anaesthesia Unit, Faculty of Dentistry Cairo University having carious teeth requiring oral dental rehabilitation under general anaesthesia with age range from 2 to 7 years old.

Exclusion criteria

parents who refused to participate, refused to sign the consent or have no phone to enable post-operative contact, participation in any other concurrent clinical trials, presence of any serious medical condition or transmissible diseases such as AIDS or malignancies.

Data and Sources measurements

This study involved a structured questionnaire (ECOHIS) on OHRQoL that had been filled by the parents of CSHCN before and after treatment with follow-up period 3, 6 and 9 months for confirmation and standardization of results. It also involved a clinical examination for the children's oral health status by using plaque index, measuring body mass index through their height and weight. Demographic data section and clinical assessment form.

[**]Faul, Franz, et al. "G* Power 3: A flexible statistical power analysis program for the social, behavioral, and biomedical sciences." *Behavior research methods* 39.2 (2007): 175-191.

OHRQoL assessment

OHRQoL was assessed with the early childhood oral health impact scale (ECHOIS) [xviii] that is composed of items which assess the effect of oral health condition on different aspects of life of the patient before oral rehabilitation under general anaesthesia (ORGA) and after 3, 6 and 9 months follow up recall. ECOHIS questions target the physical and psychological condition of the child, consists of 13-item measured with two scales: Child Impact (9 items) and Family impact (4 items) [xix]**.** A total score of ECOHIS ranging from 0 to 52 was calculated as a simple sum of the responses with a maximum total score of 52. Higher scores will represent a great effect on their lives badly. The different ranges of the subscale scores were as follows: each question was scored on a scale from 0 to 4 (0 = never, 1 = hardly ever, 2 = occasionally, 3 = often, 4 = very often, and "don't know" was scored as 5) [17]**.**

Clinical Examination for the Children

Oral health status

The measurement of the state of oral hygiene by Silness-Löe plaque index (PI)[xx] was based on recording both soft debris and mineralized deposits, according to Basha & Swamy, 2012 [xxi] in children with 2 to 6 years old, where permanent teeth were not erupted, the respective deciduous teeth were scored (Federation Dentaire International (FDI) tooth numbers-55, 52, 64, 75, 72, and 84.Each of the four surfaces of the teeth (buccal, lingual, mesial and distal) was given a score from 0-3. The sum of scores of the four areas of the tooth are divided by four in order to give the plaque index for the tooth. Scores criteria: 0: absence of any plaque, 1: A film of plaque adhering to the free gingival margin, 2: Moderate accumulation of soft deposits within the gingival pocket, or the tooth and gingival margin which can be seen with the naked eye and 3: Abundance of soft matter within the gingival pocket and/or on the tooth and gingival margin. Missing teeth are not substituted and was given a score = 0.

Body Mass index

Body mass index (BMI) is a person's weight in kilograms divided by the square height in meters [xxii]. Length: Children's height was measured using wall measuring tape for children who can stand and for those who can't stand a normal measuring tape was used for measuring their height with no shoes [xxiii]. Weight: children's weight was measured by a digital glass scale (Beurer) while they were wearing light clothes without shoes for CSHCN who can stand, and for those who could not stand on the scale, measuring his parent holding him and weigh the parent alone and subtracting from each other giving the child's weight [22]. BMI was then calculated using BMI Percentile Calculator for Child and Teen, this calculator provides body mass index (BMI) and the corresponding BMI-for-age percentile based on growth charts of CDC for children and teens ages from 2 to 19 years old [21]. And after Calculating BMI, it was compared by CDC reference growth values (BMI-Percentile CDC) and then children were classified based on their BMI-Percentile-CDC to Underweight, healthy weight, overweight and obese.

Data and Statistical analysis

Numerical data were explored for normality by checking the distribution of data and using tests of normality (Kolmogorov-Smirnov and Shapiro-Wilk tests). Age, height and BMI data showed normal (parametric) distribution while weight, PI and ECOHIS scores showed non-normal (non-parametric) distribution. Data were presented as mean, standard deviation (SD), median and range values. For parametric data, repeated measures ANOVA test was used to study the changes by time. Bonferroni's post-hoc test was used for pair-wise comparisons when ANOVA test is significant. For non-parametric data; Friedman's test was used to study the changes by time. Kruskal-Wallis test was used to compare between more than two groups. Dunn's test was used for pair-wise comparisons when Friedman's test or Kruskal-Wallis test is significant. Mann-Whitney U test was used to compare between two groups. Spearman's correlation coefficient was used to determine correlation between ECOHIS and different quantitative variables. The significance level was set at $P \leq 0.05$. Statistical analysis was performed with IBM SPSS Statistics for Windows, Version 23.0. Armonk, NY: IBM Corp.

Results

Sample description

The follow-up response rate was 80% where 16 children completed the 9 months follow up recall period (3 children didn't complete the follow up and refused to come and 1 child passed away during the first 3 months follow up period).

Descriptive statistics
Demographic data of children

The present study was conducted on 16 children: 12 boys (75%) and four females (25%). The mean (SD) values for age were 5.5 (1.5) years old with a minimum of two and half years old and a maximum of seven years old.

Demographic data of caregivers

The most prevalent educational level was high school graduates (62.5%). As regards employment, approximately one half of caregivers (50%) were full-time employees. The majority of participants (87.5%) had income less than 30000 L.E. / year as shown in table (1).

Table 1
Frequencies (n) and percentages (%) for demographic data of caregivers (n = 16)

Caregiver data	n (%)
Caregiver gender	
Father	8 (50%)
Mother	8 (50%)
Educational level	
Uneducated	1 (6.3%)

High school	10 (62.5%)
More than high school	5 (31.3%)
Employment status	
Unemployed	1 (6.2%)
Housewife	4 (25%)
Part time	3 (18.8%)
Full time	8 (50%)
Income status	
Less than 30000 L.E. / year	14 (87.5%)
More than 30000 L.E. / year	2 (12.5%)

Type of disability

The most common disability was brain atrophy in one third of children (31.1%) as shown in table (2).

Table 2
Frequencies (n) and percentages (%) for types of disability (n = 16)

Disability	N	%
Autism	2	12.5%
Brain atrophy	3	18.8%
Brain atrophy +blind+ mitral valve regurgitation	1	6.3%
Cerebral palsy + brain atrophy + brain shunt+ virus C	1	6.3%
Cleft lip and palate + AV fistula shunt	1	6.3%
Cleft lip and palate + hearing defect (ear tubes)	1	6.3%
Hydrocephaly	1	6.3%
Language problems	1	6.3%
Language problems + Autistic features	1	6.3%
Lung problem	1	6.3%
Microcephaly	1	6.3%
Microcephaly+ language problem	1	6.3%
Pneumonia	1	6.3%

ECOHIS scores

There was a statistically significant change in ECOHIS by time (*P*-value <0.001, Effect size = 0.762). The total ECOHIS and all ECOHIS domains were significantly and dramatically decreased except for the child social interaction and avoiding talking questions which were unchanged after dental treatment under GA as shown in table (3).

Table 3
Descriptive statistics for ECOHIS questionnaire scores at different time intervals

ECOHIS items		Baseline	3 Months	6 Months	9 Months
1-Pain in the teeth	Mean (SD)	3.3 (1.3)	0.5 (1.4)	0.5 (1.4)	1 (1.6)
	Median (Range)	4 (0 - 5)	0 (0 - 4)	0 (0 - 4)	0 (0 - 4)
2-Difficulty drinking hot or cold	Mean (SD)	2.6 (2.1)	0.5 (1.4)	0.5 (1.4)	0.9 (1.6)

	Median (Range)	3.5 (0 - 5)	0 (0 - 4)	0 (0 - 4)	0 (0 - 4)
3-Difficulty eating some foods	Mean (SD)	3.1 (1.6)	0.7 (1.5)	0.8 (1.6)	0.9 (1.6)
	Median (Range)	4 (0 - 4)	0 (0 - 4)	0 (0 - 4)	0 (0 - 4)
4-Difficulty pronouncing any words	Mean (SD)	4.4 (1.3)	4.5 (1.3)	4.5 (1.3)	4.5 (1.3)
	Median (Range)	5 (0 - 5)	5 (0 - 5)	5 (0 - 5)	5 (0 - 5)
5-Missed preschool, day care or school	Mean (SD)	3.6 (2.2)	2.8 (2.6)	2.8 (2.6)	2.8 (2.6)
	Median (Range)	5 (0 - 5)	5 (0 - 5)	5 (0 - 5)	5 (0 - 5)
6-Trouble in sleeping	Mean (SD)	1.9 (2)	0.1 (0.5)	0.2 (0.5)	0.4 (1.1)
	Median (Range)	1 (0 - 5)	0 (0 - 2)	0 (0 - 2)	0 (0 - 4)
7-Irritability or frustrated	Mean (SD)	3.1 (1.5)	0.5 (1.4)	0.5 (1.4)	0.8 (1.8)
	Median (Range)	4 (0 - 5)	0 (0 - 4)	0 (0 - 4)	0 (0 - 5)
8-Avoiding smiling or laughing	Mean (SD)	2 (2.2)	0.3 (1)	0.3 (1.)	0.3 (1)
	Median (Range)	1.5 (0 - 5)	0 (0 - 4)	0 (0 - 4)	0 (0 - 4)
9- Avoiding talking	Mean (SD)	3.3 (2.4)	3.4 (2.4)	3.4 (2.4)	3.4 (2.4)
	Median (Range)	5 (0 - 5)	5 (0 - 5)	5 (0 - 5)	5 (0 - 5)
10-Family member been upset	Mean (SD)	2.6 (1.9)	0.1 (0.5)	0.3 (0.9)	0.7 (1.3)
	Median (Range)	4 (0 - 4)	0 (0 - 2)	0 (0 - 3)	0 (0 - 4)
11- Family member felt guilty	Mean (SD)	1.9 (2)	0 (0)	0.2 (0.8)	0.6 (1.3)
	Median (Range)	1.5 (0 - 4)	0 (0 - 0)	0 (0 - 3)	0 (0 - 4)
12- Family member taken time off from work	Mean (SD)	3.1 (2.2)	1.9 (2.5)	2.5 (2.6)	2.4 (2.5)
	Median (Range)	4 (0 - 5)	0 (0 - 5)	0 (0 - 5)	0 (0 - 4)
13- Dental problems effect on a finance	Mean (SD)	2.9 (1.7)	1.2 (1.8)	1.2 (1.8)	1.2 (1.8)
	Median (Range)	4 (0 - 4)	0 (0 - 4)	0 (0 - 4)	0 (0 - 4)
Total score	Mean (SD)	37 (11.69)	16.2 (8.14)	17.4 (8.71)	19.8 (12.82)
	Median (Range)	36 (13 - 54)	14 (9 - 36)	15 (9 - 37)	15 (9 - 52)

Changes by time in different variables

Weight (Kg): There was a statistically significant change in weight by time (*P*-value <0.001, Effect size = 0.672), as shown in table (4).

Table 4
Descriptive statistics and results of Friedman's test for the changes in weight (Kg) at different time periods

Weight (Kg)	Base line	3 m	6 m	9 m	*P*-value	*Effect size (ω)*
Mean (SD)	20.38 (9.93) ^{C}	21.68 (10.15) ^{BC}	22.19 (10.67) ^{AB}	22.73 (11.45) ^{A}	<0.001*	0.672
Median (Range)	18.1 (8.8-43.6)	19.2 (9.5-47.2)	19.5 (10.9-50)	19.5 (10.5-54)		

*: Significant at P ≤ 0.05, Different superscripts indicate statistically significant change by time

Height (cm) There was a statistically significant change in height by time (*P*-value = 0.009, Effect size = 0.238), as shown in table (5)

Table 5
Descriptive statistics and results of repeated measures ANOVA test for the changes in height (cm) at different time periods

	Baseline	3 Months	6 Months	9 Months	*P* - Value
Mean (SD)	111.69[b] (13.8)	111.88[b] (14.01)	113.03[ab] (13.8)	113.53[a] (14.04)	
Median (Range)	113.5 (90 - 141)	113.5 (90 - 142)	114.5 (92 - 142)	115 (92 - 142)	<0.001*
95% CI	(104.33 - 119.04)	(104.41 - 119.34)	(105.68 - 120.39)	(106.05 - 121.01)	

*: Significant at P ≤ 0.05, Different superscripts indicate statistically significant change by time

BMI (Kg/m²) The results showed an increase in the BMI score with time. There was no significant difference between BMI scores at 9 months, 6 months, and 3 months as shown in table (6).

Table 6
Descriptive statistics and results of repeated measures ANOVA test for the changes in BMI (Kg/m²) at different time periods

	Baseline	3 Months	6 Months	9 Months	*P* - Value
Mean (SD)	15.57[b] (4.6)	16.22[ab] (4.53)	16.5[a] (4.4)	16.68[a] (4.68)	
Median (Range)	13.5 (9.2 - 26.7)	14.5 (9.9 - 26.9)	14.65 (11.3 - 27.3)	14.9 (10.9 - 27)	<0.001*
95% CI	(13.12 - 18.02)	(13.8 - 18.64)	(14.15 - 18.85)	(14.19 - 19.17)	

*: Significant at P ≤ 0.05

Plaque Index (PI)

There was a statistically significant change in PI by time (*P*-value = 0.001, Effect size = 0.352) as shown in table 7.

Table 7
Descriptive statistics and results of Friedman's test for the changes in PI at different time periods

PI	Base line	3 m	6 m	9 m	*P*-value	*Effect size (ω)*
Mean (SD)	1.91 (0.74) [A]	1.15 (0.79) [B]	1.02 (0.71) [B]	1.02 (0.7) [B]	0.001*	0.352
Median (Range)	1.67 (0.42-3)	1 (0-3)	0.67 (0.3-3)	1 (0.17-3)		

*: Significant at P ≤ 0.05, Different superscripts indicate statistically significant change by time

ECOHIS scores

There was a statistically significant change in ECOHIS by time (*P*-value <0.001, Effect size = 0.762).

Table 8
Descriptive statistics and results of Friedman's test for the changes in ECOHIS at different time periods

ECOHIS	Base line	3 m	6 m	9 m	*P*-value	*Effect size (w)*
Mean (SD)	37 (11.69) [A]	16.2 (8.14) [B]	17.4 (8.71) [B]	19.8 (12.82) [B]	<0.001*	0.762
Median (Range)	36 (13 - 54)	14 (9 - 36)	15 (9 - 37)	15 (9 - 52)		

*: Significant at P ≤ 0.05, Different superscripts indicate statistically significant change by time

There was a statistically significant change in ECOHIS by time (*P*-value <0.001, Effect size = 0.762).

Associations between ECOHIS and different variables

There was no statistically significant difference between Child's gender, Child's age, Caregiver's gender, Caregivers' educational level, Caregivers' occupation, PI, Weight, height, BMI with ECOHIS scores.

Discussion

This is an observational study that aimed to assess the OHRQoL, body growth status and oral hygiene index in a group of CSHCN after full mouth rehabilitation under GA. However, there were many studies that investigated the effect of oral rehabilitation under GA and its effect on OHRQOL [*] [4] [xxiv] [xxv] [xxvi] [xxvii] [xxviii], but only few studies investigated the effect in CSHCN [18] [xxix] [xxx] and limited information is available on the effect of oral rehabilitation under GA of CSHCN on their oral health related quality of life in Egypt [29] Participants included in the study were selected from the Unit of Pediatric Dentistry and those with Special Needs, Faculty of Dentistry, Cairo University, which is considered the biggest and the most important educational dental hospital in Egypt offering dental treatment under GA for preschool, school children and those with special health care needs. As there would be a great diversity of patients with SHCN.

The A-ECOHIS is a short, valid and reliable tool that can be used with Arabic-speaking caregivers of pre-schoolers aged from 2 to 6 years that had been performed well on all psychometric tests to which it was applied [xxxi] and provides more informative answers that increase the reliability of the questionnaire [xxxii] its use in the evaluation of interventions related to oral health problems have been

[*] Almaz, M. E., Sönmez, I. Ş., Oba, A. A., & Alp, S. (2014). Assessing changes in oral health-related quality of life following dental rehabilitation under general anesthesia. *Journal of Clinical Pediatric Dentistry*, *38*(3), 263-268.

supported in the previous studies [26] [31] [xxxiii] [29] [30]. Male children with SHCN were more than female children with SHCN these findings were similar to results of studies with higher male CSHCN prevalence [xxxiv] [18] [24] [25] [31]. Male gender was more likely to be associated with special health care needs [xxxv]. One possible biological mechanism to account for the male predominance is the effect of fetal testosterone (fT). other alternative biological theory had to be considered, the X and Y chromosome theories, and the reduced autosomal penetrance theory [xxxvi] means that boys are genetically predisposed to have one form or another of disabilities opposed to females [xxxvii].

Neurodevelopmental disorders like brain atrophy are predominant in this study as a type of special needs in children followed by Autistic spectrum disorders which is not a true reflection of the prevalence of CSHCN in Egypt. In Egypt sensory impairments ranked first among the most prevalent conditions requiring special health care, followed by cognitive impairments. Impairment mobility was the third most common condition requiring special care [3]. This study could indicate that complexity of the disability might play a major role in the severity of oral health status. This may be attributed to difficult brushing ability, associated with coordinated muscular movements impairment.

Growth is a significant indicator of child health; it is so critical that the world health Organization (WHO) recommended that it is the best single measure for the assessment of the nutritional health and condition of the child [xxxviii]. Growth status measuring method used was measuring Body mass index (BMI) as the recommendation made by CDC and AAP as BMI in kg/m^2 is a screening tool for relative weight status. BMI has proven to be a reliable screening tool to describe a typically developing individual's weight status [xxxix] [xl]. According to BMI-percentile-CDC classification most of the children in our study at the baseline were underweight, that was consistent with their complaint about pain in their teeth while eating and they were unable to masticate or swallow as a complication of their disabilities, which increased slightly with no statistically significant difference after full mouth rehabilitation under GA and after 9 months follow up.

In the present study, all patients achieved slight increase in weight but not significant enough to shift to a higher percentile curve. And almost 87.5% of patients achieved a slight height increase but not significant enough to fit into a higher percentile curve that was similar to the results of El-Sayed [27]. While for the BMI in 25% of cases it increased; 3 cases from underweight BMI percentile curve to healthy one and one case from overweight to obese percentile curve while in 75% remained in the same percentile curve but slightly higher. Children's dental plaque index was significantly reduced after the DGA treatment, but a majority of the patients still had insufficient oral hygiene status and reduction in PI at the 9-month follow-up [18]. Insufficient oral hygiene among young patients both before and after DGA treatment clearly shows the lack of parental efforts and responsibility. Also, there was a statistically significant decrease in the PI after 3 months followed by non-statistically significant changes from 3 to 6 as well as from 6 to 9 months.

However, the big challenge with these child patients is that their oral health very easily deteriorates soon afterwards; DGA patients are highly susceptible to

developing new and recurrent caries lesions, especially on the newly erupted teeth, if their dietary and oral hygiene habits do not improve, as the present study and other studies had found [xli] [xlii] [xliii]. So long term assessment is necessary to judge the sustainability of results because an early follow-up might not yet show the full quality of life gains from the treatment. Studies with follow-up period more than 6 months have reported similar findings [xliv] [xlv] [44], that these children required retreatment so fast that reflects the rapid progression of dental caries in high-risk patients and ongoing poor oral health behavior. Thus, it is likely that their OHRQoL will deteriorate again in future, as DGA just treats existing decay it does not prevent further decay.

The result of the present study as regards the OHRQoL of CSHCN in need of comprehensive oral rehabilitation under GA were seriously impaired with high scores of the ECOHIS scale. Parents experienced great suffering due to the poor oral health of their children, who often complained of pain in the mouth and sensitivity during chewing; they had difficulty completing meals and problems with insomnia and behavior. The results of ECOHIS further demonstrated significant improvements in the children's OHRQoL with positive impact on the child's and family's quality of life after comprehensive oral rehabilitation under GA, which was sustained throughout the follow-up period that was in agreement with most of OHRQoL studies [23] [4] [25] [31] [33] [27] [28] [29] [30]. The greatest improvement in this study was reported in child function domain due to the absence of pain and a greater ability of the child to eat and sleep [xlvi] [xlvii] [24] [31] and as Gaynor and Thomson in 2012 stated that the immediate benefits include instant relief from the child's oral symptoms and less family distress [xlviii]. The elimination of toothache was directly reflected in the questionnaire scores. The least improvement was with social well-being domain with no change in avoiding talking and difficulty in pronouncing words, which can be explained by the fact that the children had special needs that impaired their talking and pronunciation.

Limitations

- It was not possible to include a negative control group (non-cooperating patients with severe dental caries not undergoing treatment) for ethical reasons.
- Other considerations have to be taken in the psychological and social wellbeing section in ECOHIS regarding its limitation towards CSHCN as it wasn't applicable to most patients in this study as already, they are having speaking defects due to their disabilities.
- The oral examination did not include radiographs to detect interproximal caries; thus, the reported caries levels are almost certainly underestimated of the true prevalence. This limitation did not bias the results as it applied to all children examined.
- After DRGA most of children had an extraction procedure which affect the calculation and the score of the Plaque index after extraction so the oral hygiene status won't be accurate, so taking another index would be more accurate in these situations.

Conclusion

Dental rehabilitation under general anaesthesia (DGA) provides immediate relief from a child's oral symptoms, a significant improvement in the child's quality of life. These benefits result in an increase in BMI confirming the relationship between caries, poor oral hygiene, and stunted growth in children with disabilities. However, oral hygiene status deteriorates soon after long time follow up period.

Conflict Of Interest

There were no conflicts of interest to disclose.

Authorship Statement

We confirm that all listed authors meet the authorship criteria and that all authors agree with the manuscript's content.

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