

## Comprehensive Dental Care of Pediatric Patients Treated Under General Anesthesia in a Hospital Setting in Saudia Arabia

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### Abstract

The aims of this study were to determine the characteristics of patients and type of dental treatment carried out using dental general anesthesia (DGA) during two years in a following three year period. A total of 182 patients received treatment between 1999 and 2001. The mean age was 4.9 years. The main indication for DGA was behavior management problems. Complete oral rehabilitation including complex restorative treatment and extractions was provided under DGA at a single visit. Failure to return for recalls was common; 83% of patients returned for the post-operative recall but only 26% after a three year period. Most of the patients requiring further treatment accepted it in the dental chair. Only one patient received a second DGA during the three years following treatment.

**Keywords:** Dental general anesthesia, children, dental treatment, comprehensive dental treatment

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## Introduction

Non-pharmacologic behavior management techniques are primary techniques for treating children in the dental chair. Alternative methods such as conscious sedation and other forms of sedation are also widely used. However, in some circumstances these techniques may fail, and the use of general anesthesia (GA) becomes the only resource to provide dental treatment for children in a safe and effective way.<sup>1,2</sup>

Dental treatment under GA or dental general anesthesia (DGA) is an expensive alternative but on occasion the method of choice for treating unmanageable children. It is indicated for very young children who require extensive conservative dentistry and are unable to accept treatment in the dental chair, for children who are medically compromised, or for children who require oral surgical procedures.<sup>2,3,4,5,6,7</sup>



This approach offers the advantage of providing extensive complete oral rehabilitation in a short period of time and at single visit, allowing immediate relief of pain with little or no cooperation from the child.<sup>2,7,8,9</sup> However, it has little effect in promoting oral health and acceptance of routine dental care.

The administration of GA is relatively safe, even though mortality following DGA in healthy children is unlikely, morbidity is common<sup>1,4,10</sup>; therefore GA should be avoided whenever possible.

In dentistry anesthesia falls into three groups:

- Out-patient short case 'dental chair' anesthesia
- Out-patient 'day stay' intubation anesthesia
- In-patient 'hospital stay' intubation anesthesia

The medical condition of the child is the factor that determines which anesthesia type is to be used. In the hospital, where this study was conducted, intubation anesthesia was the method most commonly administered.

Previous studies on caries activity levels have demonstrated this disease represents a particular problem among children in Saudi.<sup>11,12</sup> In the city of Jeddah the percentage of six-year-old children who have dental caries is in the range of 70-76%.<sup>12,13,14</sup> Therefore, comprehensive treatment under DGA is an important method of treatment for children in the kingdom due to the high caries levels and the high need for treatment in this country.<sup>12</sup> This service is offered in several centres in the country where there are appropriate facilities such as military hospitals.

In Saudi Arabia there are seven main military hospitals, located in the major cities of the country, in addition to several other smaller hospitals and polyclinics around the kingdom. These hospitals provide dental services free of charge for military personnel and their dependants. In the city of Jeddah, which is one of the three major cities in the kingdom and the largest in the Western Province, one main military hospital and three polyclinics serves this community.

The aims of this study were to determine the characteristics of children patients treated under GA for complete oral rehabilitation at the military hospital in Jeddah, in the two year period between May 1999 and May 2001, and to describe indications for and types of dental treatment provided during GA and in the following three year period at the hospital.

## Material and Methods

The study was carried out through an assessment of hospital records of patients who received treatment under DGA in the Dental Centre at King Fahad Armed Forces Hospital (KFAFH) in Jeddah, Saudi Arabia between May 1999 and May 2001.

The hospital is funded through the Ministry of Defense and Aviation, and treatment is provided free of charge to military personnel and their dependants. Direct referrals are accepted from general dental practitioners employed at the polyclinics and from the main hospital.

All referred patients were seen by a pediatric dental specialist who planned treatment and placed patients on a waiting list for DGA. One week before the surgery, patients were called for pre-anaesthetic and paediatric assessment.

Priority for treatment was given for medically compromised patients and patients with severe dental pain and abscesses.



Once a patient was cleared for surgery, pre-operative instructions were given to the parents along with an admission date. Depending on the patient's medical condition, the child was admitted one day prior to surgery and discharged the following day, or the child was admitted on the morning of the surgery and discharged later the same day. At the time of the study, one session was held per week with 2-3 patients receiving treatment per session. All treatment was carried out by the two pediatric dentists in the hospital (one of which is the principle investigator).

Permission to carry out the study was obtained from the 'Medical Research Committee' in the hospital. Data collected from the records included age (at last birthday) at the time of treatment, the waiting time for having DGA, the main indication for treatment under DGA, and treatment provided including the number of primary and permanent teeth extracted and restored. The type of restoration was also recorded. Note was made of attendance at recall and any dental treatment provided during the three year period following the DGA.

A total of 196 patients received treatment through the service between May 1999 and May 2001. Records were unavailable for 14 cases, these cases were excluded. The study, therefore, included information for a total of 182 patients who received comprehensive treatment under DGA.

Data were collected from the files and entered into the computer. Information was collated and analysed using SPSS software. The study was descriptive and analysis was, therefore, confined to descriptive statistics. Data were compared

using the Mann Whitney U test for non-parametric test comparison of independent groups.

### Results

The 182 patients, whose records were included, were made up of 102 males (56%) and 80 females (44%). The number of children in relation to age and gender are shown in Table 1. The mean age at the time of DGA was 4.9 years with a range between 30 months to 16 years old. The age of the medically compromised children was generally older than the healthy children with a mean age of 6 and 4.2 years, respectively.

The indications for treatment under DGA are shown in Table 2. One hundred forty-four patients (73.6%) were ASA I children and 42 (23%) were ASA II and IV children. The most common indication (45.6%) for DGA was due to behavior management problems. Six of the 182 patients received DGA at least partly for surgical procedures (Table 3).

The types of medical and developmental disabilities were physical disability, cerebral palsy, mental disability, Down's syndrome, heart disease, bleeding disorders, autism, and diabetes.

The results showed the waiting time for treatment under DGA ranged from one week to 28 weeks. Medically compromised children had to wait less time to receive dental treatment under GA when compared to healthy children and that was statistically significant ( $P < 0.001$ ) (Table 4).

The dental treatment provided is summarized in Table 5, which shows the number and percentage of restorations and extractions and mean number of different types of treatment per child across different indications for children having DGA.

A frequency distribution comparing the number of patients with the number of teeth restored can be seen in Figure 1. Approximately 40% of the patients had two to three teeth restored, however, 7.1% had four restorations.

Restorations and extractions were carried out for both primary and permanent teeth. Glass ionomer cement restorations, amalgam restorations, and extractions were the most frequent dental procedures provided for children under DGA.

Table 1. Number of child patients treated under DGA in relation to age and gender.

Age Group	Male(%)	Female(%)	Total(%)
2-3 yrs	27 (14.83)	20 (10.98)	41 (25.8)
4 yrs	27 (14.83)	23 (12.63)	50 (27.5)
5 yrs	18 (9.89)	17 (9.34)	35 (19.2)
6 yrs	12 (6.59)	8 (4.39)	20 (11)
7 yrs and above	18 (9.89)	12 (6.59)	30 (16.5)
<b>Total</b>	<b>102 (56.04)</b>	<b>80 (43.95)</b>	<b>182 (100)</b>

Table 2. The indications for treatment under DGA.

Indications for DGA	Number of patients (%)
Behavior management & unable to accept treatment using local anesthesia	83 (45.6)
Extensive caries & young child	51 (28.0)
Medically compromised	42 (23.0)
Surgical Procedures	6 (3.4)
<b>Total</b>	<b>182 (100)</b>

Table 3. Diagnosis of the medical compromised patients treated under DGA.

Types of medical compromised patients	Total No	Total (%)
Physically handicapped & cerebral palsy	11	26.2
Mentally handicapped & Down's syndrome	20	47.6
Heart disease	7	17
Blood disorder	2	4.7
Autism	1	2.3
Diabetic	1	2.3
<b>Total</b>	<b>42</b>	<b>100</b>



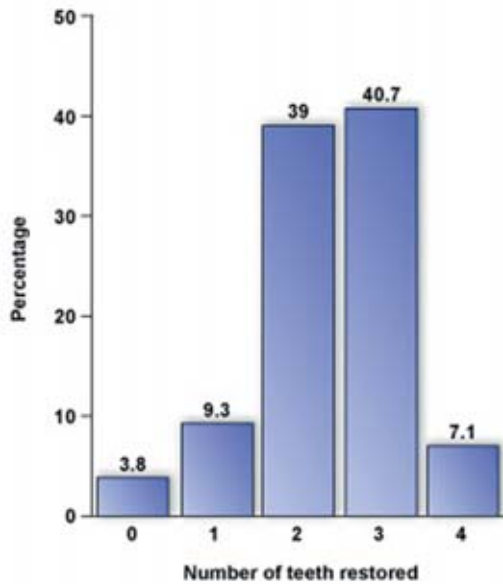
Table 4. Waiting time to receive treatment under DGA in comparison of uncooperative children, young children with extensive caries and medically compromised children.

Waiting period	Uncooperative Children No (%)	Extensive Caries & Young Children No (%)	Medically Compromised No (%)
One week	27 (32.5)	12 (23.5)	28 (66.7)
2 weeks	27 (32.5)	11 (21.4)	7 (16.7)
3 weeks	11 (13.3)	10 (19.6)	2 (4.8)
4 weeks	12 (14.5)	15 (29.4)	4 (9.5)
One month and over	6 (7.2)	3 (5.9)	1 (2.4)

Mann Whitney U test (p<0.001)

Table 5. Mean and number of restorative treatments and extractions in relation to indications for DGA.

Procedures	Uncooperative Children	Extensive Caries & Young Children	Medically Compromised
<b>Number of fissure sealants</b> Mean no. per child (+SD)	7 (8.4) 0.04 (0.28)	2 (3.9) 0.03 (0.20)	6 (14.3) 0.14 (0.35)
<b>Number of composite restorations</b> Mean no. per child (+SD)	5 (6) 0.06 (0.24)	2 (3.9) 0.039 (0.20)	7 (16.7) 0.14 (0.38)
<b>Number of GIC Restorations</b> Mean no. per child (+SD)	78 (94) 0.94 (0.24)	49 (96.1) 0.96 (0.20)	35 (83.3) 0.83 (0.38)
<b>Number of amalgam restorations</b> Mean no. per child (+SD)	66 (80.5) 0.86 (0.50)	35 (68.6) 0.69 (0.47)	29 (69) 0.93 (0.56)
<b>Number of pulp therapy</b> Mean no. per child (+SD)	57 (68.7) 0.69 (0.47)	29 (54.9) 0.55 (0.50)	12 (28.6) 0.33 (0.48)
<b>Number of SSC restorations</b> Mean no. per child (+SD)	55 (66.3) 0.66 (0.48)	28 (56.9) 0.57 (0.50)	14 (33.3) 0.29 (0.48)
<b>Number of extracted teeth</b> Mean no. per child (+SD)	59 (71.1) 0.41 (0.45)	45 (88.2) 0.88 (0.2)	34 (90) 0.95 (0.58)



**Figure 1.** A frequency distribution comparing the number of patients with the number of teeth restored.

### Restorations

The restorations provided included fissure sealants, tooth-coloured restorations (glass ionomer, composite), and amalgam restorations. Overall, there were 321 restorations of different restorative materials with an average of 2.73 teeth restored per child. There was no significant difference between groups and restoration types. However, for permanent teeth, more amalgam restorations were performed for medically compromised children, which was statistically significant ( $P < 0.001$ ). Fissure sealant placement was higher among medically compromised children but not statistically significant.

### Pulp Therapy

Pulp therapy included vital and non-vital pulpotomies for deciduous teeth. A total of 98 (53.8%) were recorded with a mean of 0.53 per patient. More pulp therapy was performed for the uncooperative and the extensive caries group compared to the medically compromised children; this was highly statistically significant ( $P < 0.001$ ).

### Stainless Steel Crowns

Ninety-seven stainless steel crowns were placed with an overall average of 0.52 per patient. These were placed only in primary teeth. The use of stainless steel crowns was significantly greater for

uncooperative children and children with extensive caries than medically compromised children ( $P < 0.001$ ).

### Extraction

A total of 138 extractions were recorded; 129 (93.5%) deciduous teeth and 9 (6.5%) permanent teeth. The mean of deciduous and permanent extraction was 0.75 and 0.049 per patient, respectively. The number of extracted teeth was highly significantly lower in the medically compromised group than in all the healthy children ( $P < 0.001$ ).

### Surgical Procedures

Among the six patients who were admitted for surgical procedures, one had a gingivectomy, one had a ranula removed, two had exposure of impacted canines, one had a mesiodens, and one had a lingual frenectomy.

### Recall Visit and Follow-up

Patients were reviewed one week after DGA and then recalled at six, 18, and 36 months after DGA. The proportion of children having recall visits after the DGA in the first week was 151 (83%) compared to 66 (36%) in the next six months, and 59 (32%) in 18 months. Forty-eight children (26%) presented for recall after a three year period. Twenty-eight of the children, 15% that presented for recall, were provided with preventive treatment in the form of prophylaxis and topical application of fluoride and fissure sealant placed. Fifty-six of the children (32%) required further restorative treatment in the dental chair during their recall visits and accepted treatment using various behavioral management techniques. Seven of the children (4%) needed some form of sedation to provide treatment under local anesthesia and only one child (0.6%), with Down syndrome, required further treatment under a second DGA.

### Discussion

The aims of this retrospective study were to describe patient characteristics and dental treatment provided under DGA at a military hospital in Jeddah, Saudi Arabia. The results showed the facility at this hospital provided primarily treatment of extensive caries, especially for those with behavior problems and very young children. This is consistent with findings of previous studies.<sup>1,15,16</sup> Alternative methods used

to provide dental treatment, such as inhalation sedation, should be kept for consideration in some cases particularly in older children.<sup>17</sup> However, there will always be children whose needs are too great or who are too young to accept treatment in the dental chair. Therefore, DGA is an important method for providing treatment for this group of children.

Approximately 23% of our patients were medically compromised children. A high standard of care can be provided to mentally and physically disabled patients using DGA, which is not possible in the dental chair.<sup>15</sup> The study showed sick children had immediate priority to receive dental care.

The present study revealed dental care received under GA included both restorations as well as extractions. The mean number of teeth restored per child was 2.7, which was higher than previously reported.<sup>8</sup> Provided restorative care included simple restorations with glass ionomer, composite, amalgam, as well as stainless steel crowns. In the present study more teeth were restored than extracted and that was true for both primary and permanent teeth. This may be due to a conservative approach by the dentist providing the treatment at the hospital.



An extensively decayed deciduous molar tooth is more likely to have a carious pulp exposure that requires pulpotomy followed by a stainless steel crown placement. Fuks and Birnstein<sup>18</sup> reported any failure of pulpotomy can lead to chronic sepsis and, as expected in this study, the provision of pulpotomy was high among uncooperative patients when compared to

medically compromised children. Any tooth having pulp therapy was covered with a stainless steel crown. Preformed metal crowns which have been shown to have greater longevity, whether provided using local anesthesia or under GA, were less popular in this study. This was in disagreement with other studies where stainless steel crown technique was popular among their sample.<sup>15,19</sup>

Extractions in medically compromised children were performed more frequently than restorations in favour to prevent any sepsis associated with failed pulp therapy that could be life-threatening, involving additional medical interventions. This agrees with findings of other studies.<sup>7,8</sup> All abscessed and non-vital teeth were extracted since these procedures have a poor prognosis, particularly in medically compromised patients.

A great deal of restorative treatment and extractions were needed for the majority of patients. The extensive amounts of restorative care have been reported in previous studies from Saudi Arabia.<sup>19,20</sup> Other methods to provide treatment would have been possible in some cases, but this would have needed a large number of dental visits to complete the treatment; therefore DGA was an attractive option for some families to receive treatment in a single visit. This is in agreement with other studies.<sup>1,15</sup>

Instructions for home prevention and recall visit one week after DGA were given to parents before discharging the patient. A six month interval for follow-up was also given after the one week review. The findings of this study indicated a high percentage of children (80%) returned for the post-operative dental care after one week. However, for recall visits after 6 months and 18 months, the rates were 36% and 32%, respectively. This poor attendance for patients for recall visits after DGA has been reported in other studies.<sup>21,22,23</sup> A report by Ibricevic et al.<sup>21</sup> demonstrated only 10% of patients returned for recall visits once treatment was completed. It may be that parents do not consider the need for dental visits after treatment is completed since the child no longer suffers from pain.

Caries recurrence and outcomes of treatment provided under GA have been reported in previous studies.<sup>1,15,22,23</sup> Berkowitz et al.<sup>22</sup> found

over 50% of children treated under GA presented with caries, requiring further treatment at the six month recall. Thus, it is not unusual for patients to return for additional treatment after DGA. In the present study both groups were at high risk for re-treatment after GA, mostly due to poor oral hygiene. Uncooperative children were more likely to accept treatment in the dental chair than medically compromised children. Thirty-two percent of the children who needed further dental treatment accepted treatment in the dental chair using various behavior management techniques, and seven of the children (4%) required sedation to accomplish treatment under local anesthesia. Only one child was re-treated under GA but this was a Down's syndrome patient. Similar findings were reported previously.<sup>1,23</sup>

An important consideration for children who are unable to co-operate due to fear, anxiety, or young age is their subsequent acceptance of care using other methods with low risk and

low impact. The aim in using GA is to restore the child's oral health at a single visit allowing behavior modification methods to be introduced more readily afterwards.<sup>8,18,22</sup> In this study authors take the view full mouth rehabilitation under GA can enable a child to cope with future dental care and leave a child in a position where they may be more amenable to dental care.

In Saudi Arabia there is little tradition for routine dental visits, despite the fact dental treatment is available free of charge for the population. Therefore, it is very important to educate and motivate parents before subjecting the child to DGA for the success of treatment.

### Conclusion

Complete oral rehabilitation was provided under DGA at a single visit. Failure to return for recalls was common. Most of the patients requiring further dental treatment accepted it in the dental chair.

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