

# Practitioners' knowledge and acceptance of paediatric dental procedures under general anaesthesia



G. Rajbanshi<sup>1,2,3\*</sup>, Y. Liang<sup>1,3\*</sup>,  
X. Nong<sup>2,3</sup>, R. Qiu<sup>1,3</sup>, H. Shen<sup>4</sup>,  
A. Chen<sup>1,3</sup>

College of Stomatology, Guangxi Medical University,  
Nanning, China

<sup>1</sup>Department of Pediatric Dentistry,

<sup>2</sup>Department of Oral and Maxillofacial Surgery

<sup>3</sup>Oral and Maxillofacial Rehabilitation and Reconstruction,  
Guangxi Clinical Research Center for Craniofacial  
Deformity, Guangxi Key Laboratory of Oral and  
Maxillofacial Surgery Disease Treatment, Guangxi, China

<sup>4</sup>Department of Anesthesiology

\*These authors equally contributed to this work

e-mail: xnong@gxmu.edu.cn  
rongminqiu@hotmail.com

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## Abstract

**Aim** As paediatric treatment under dental general anaesthesia (DGA) in China is a fairly new technique that was first applied at the beginning of the 21st century, the purpose of this study was to explore practitioners' understanding and acceptance of paediatric dental procedures under general anaesthesia (GA).

**Materials and Methods** This cross-sectional study was conducted among 300 practitioners at the Hospital of Stomatology, Guangxi Medical University, and Guangxi China. A questionnaire was used to collect information about the practitioners' knowledge and acceptance of DGA, and multiple logistic regression analysis was used to test the relationship between the practitioners' knowledge and their acceptance of DGA.

**Results** The average scores for the practitioners' knowledge of DGA was  $4.45 \pm 1.49$ . Also, 77.0% of them were willing to refer children for DGA. Practitioners who accepted DGA had higher DGA knowledge scores than those who did not accept it [ $(4.63 \pm 1.38)$  vs.  $(3.82 \pm 1.48)$ ,  $p < 0.001$ ]. After controlling for demographic factors, the practitioners' knowledge of DGA was significantly related to their acceptance of DGA (OR=1.47, 95% CI=1.21 -1.79).

**Conclusion** Practitioners' knowledge of DGA is a significant indicator for their acceptance of DGA for children.

## Introduction

When paediatric dentistry is performed, effective treatment often requires the management of the child's behaviour [Ramazani, 2016]. Very young children have physical or mental disabilities, and those with extreme anxiety can be supported by the provision of general anaesthesia (GA) when other options are insufficient [Patel et al., 2016]. The American Academy of Pediatric Dentistry (AAPD) emphasises that safe, age-appropriate, nonpharmacological or pharmacological behaviour management techniques foster a positive dental attitude and enable the provision of quality dental care for children [Council on Clinical Affairs, American Academy of Pediatric Dentistry, 2015; Stein et al., 2014]. Also, uncooperative and aggressive behaviours during dental treatment are likely to reduce access to care for children with special needs [Mallineni et al., 2016; Casamassimo et al., 2004]. The most significant barrier to general dentists' willingness to treat children with disabilities is the child's behaviour, with 60% – 80% of dentists stating that they are unwilling to treat patients with developmental disabilities because of their resistant behaviours [Chao et al., 2017]. DGA has shown the conclusive effect of promoting excellence in quality of care and inducing positive attitudes toward dental treatment among patients, and the majority of families report being highly satisfied with the procedure [AAPD, 2016; de Souza et al., 2017].

The rapid development in China has resulted in changes in lifestyles, behavioural patterns, and dietary habits, which increase the incidence of severe early childhood caries (S-ECC) [Du et al., 2018], indicating that more children with caries and dental anxiety will need dental general anaesthesia (DGA). DGA has been used in China for less than two decades, and parental awareness about DGA is low [Zheng et al., 2014; Dong et al., 2018], which could influence parents' acceptance of DGA. In our practice, practitioners' knowledge and acceptance of DGA influence their recommendation of DGA for children who need it. However, the knowledge and acceptance of DGA among practitioners in China are not yet known.

In this study, we aimed to explore the knowledge and

**KEYWORDS** Knowledge, Acceptance, Dental General Anaesthesia.

acceptance of GA for paediatric dental procedures among practitioners at the Hospital of Stomatology, Guangxi Medical University, and Guangxi, China.

## Materials and methods

### Survey design

A cross-sectional study was conducted over 5 months from February to June 2018 at the Hospital of Stomatology, Guangxi Medical University. Practitioners, including dentists, anaesthesiologists, dental technicians, and nurses, were invited to participate in the study. Written informed consent was obtained from the participating practitioners. Approval for this investigation was obtained from the Ethics Committee of the College of Stomatology, Guangxi Medical University.

The Hospital of Stomatology, Guangxi Medical University, is the only public dental hospital in Nanning, and it is also the only hospital in Guangxi where DGA can be administered for children's dental treatment. DGA has been used with children since 2004 at this hospital. There are 366 practitioners, including 12 paediatric dentists and eight nurses, in the Department of Paediatric Dentistry, and six anaesthesiologists in the Department of Anesthesiology. When DGA is performed, the anaesthesiologist is in charge of general anaesthesia, and the paediatric dentist performs the dental treatment. Nanning, the capital city of Guangxi, South China, is a medium-sized city with a population of approximately 7.30 million; annually, the paediatric dentists at this hospital provide dental services for more than 40,000 children aged 0 to 18 years from Nanning and other cities in Guangxi, and more than 800 children per year may be treated under GA.

### Data collection

A questionnaire survey was conducted among dental practitioners. The questionnaire was pilot tested and validated among 20 practitioners to examine their interpretation and to determine the initial acceptance rate of DGA (60.1%). Based on the initial acceptance rate, the minimum sample size was calculated to be 264. The questionnaire comprised five parts, including the practitioners' demographic characteristics and knowledge and acceptance of DGA.

The demographic characteristics of the practitioners were explored by surveying their sex and age, educational level, profession, department, total years in practice, nature of their practice training, and monthly income.

To evaluate the practitioners' knowledge of DGA, they were asked about the indications for paediatric dental treatment under GA and the risks of GA. For the question regarding the indications for paediatric dental treatment under GA, the practitioners were asked, "In which of the following situations do you think children should be referred for DGA?" six answers were provided, including five correct answers and "I do not know". Regarding the risks of GA, the practitioners were asked: "Which of the following statements do you think is true regarding the risks of GA?" four answers were provided, including three correct answers and "I do not know". A score of 1 was given for each correct answer to a question, and a score of 0 was given for the answer "I do not know". The scores of the two questions were summed to obtain the overall

DGA knowledge score, which could range from 0 to 8, with higher scores indicating better knowledge of DGA.

The acceptance of DGA by the practitioners was investigated by asking whether they were willing to refer children for DGA if they were uncooperative during dental treatment. Three answers were provided: "yes", "no" and "uncertain".

A paediatric dentist distributed the questionnaires to the practitioners at the dental hospital. When the questionnaires were returned, the paediatric dentist checked carefully to ensure that all the questions had been answered.

### Statistical analyses

The data were analysed using SPSS statistical software v.24.0 (IBM, Armonk, NY, US).

First, descriptive statistics, such as frequencies of the distributions of all the variables, were computed to provide an overview of the findings.

Second, a two-sample t-test or ANOVA was used to analyse the distributions of the knowledge scores among different categorical variables, and a chi-square test was used to analyse the distributions of practitioners' acceptance of DGA among different categorical variables.

Third, multiple logistic regression analysis was used to test the relationship between practitioners' knowledge and acceptance of DGA via the conditional backward method. In the logistic regression model, the dependent variable was the practitioners' knowledge, the outcome variable was the practitioners' acceptance of DGA, and the confounding factors were the background. A p-value of 0.05 was set as the level of significance.

## Results

A total of 366 practitioners were invited to participate in the study; 300 of these agreed to participate and returned completed questionnaires, and 66 had no interest in the survey. The effective response rate was 81.9%.

The distributions of all the variables are shown in Table 1. Among all the practitioners, 48.0% were dentists or anaesthesiologists, 52.0% were technicians or nurses; 95.7% had previously received training in public hospitals, and 4.3% had trained in private hospitals. Additionally, 77.0% of the practitioners were willing to make referrals for DGA for children who were uncooperative during dental treatment, while 23.0% were unwilling.

The distributions of the practitioners' answers regarding their knowledge of DGA are shown in Table 2. Among the six answers regarding the indications of DGA for children, the percentages of correct answers ranged from 40.4% - 63.9% and only one practitioner chose the answer "I do not know". Regarding the risks of GA, only 40.4% of the practitioners knew about the common adverse effects of GA for children. About 51.3% believed that GA could not cause irreversible damage to the brain, and 6.7% answered "I do not know"; comfortably, 93.3% knew that if the child had conditions, such as obesity, allergic asthma or premature birth, the risks of anaesthesia could be increased when they received DGA. The total scores for knowledge of DGA ranged from 1 to 8, with a mean of 4.45 and a standard deviation of 1.49.

The distributions of the knowledge scores among

Variables	Frequency (n)	Percentage (%)
<b>Sex</b>		
Male	73	24.3
Female	227	75.7
<b>Age</b>		
≤35 years	250	83.3
≥36 years	50	16.7
<b>Profession</b>		
Dentist/ anaesthesiologist	144	48.0
Technician/nurse	156	52.0
<b>Department</b>		
Paediatric dentistry	19	6.3
Oral and maxillofacial surgery	65	21.7
Prosthodontics/endodontics/orthodontics	112	37.3
Anesthesiology	20	6.7
Other	84	28.0
<b>Total years in practice</b>		
≤10	209	69.7
≥10	91	30.3
<b>Location of previous training</b>		
Private hospital	13	4.3
Public hospital	287	95.7
<b>Educational level</b>		
≤ High school graduate	13	4.3
Undergraduate	179	59.7
Post-graduate	108	36.0
<b>Income (monthly)</b>		
2000-4999 RMB	162	54.0
5000-9999 RMB	105	35.0
>10000 RMB	33	11.0
<b>Acceptance of DGA</b>		
Yes	231	77.0
No/uncertain	69	23.0

TABLE 1 Distribution of the categorical variables (n = 300).

different categorical variables are shown in table 1. There were significant differences in the total scores for knowledge of DGA between practitioners from different departments, with total different years of practice and with differences in acceptance of DGA. The practitioners who worked in the department of paediatric dentistry and anaesthesiology had the highest scores compared to those who worked in the other departments ( $p = 0.006$ ). Interestingly, the practitioners who had worked in the hospital for less than 10 years had a higher score than those who had worked there for more than 10 years ( $p = 0.019$ ). The individuals who accepted DGA had higher scores for knowledge of DGA than those who were not willing to accept DGA [ $4.63 \pm 1.38$  vs.  $(3.82 \pm 1.48)$ ,  $p < 0.001$ ].

The distributions of the practitioners' acceptance of DGA among different categorical variables are shown in table

2. The male practitioners had higher acceptance than the female practitioners (86.3% vs. 74.0%,  $p = 0.03$ ). After controlling for demographic factors, the practitioners' knowledge of DGA was significantly related to their acceptance of DGA (OR=1.47; 95% CI=1.21 -1.79). None of the demographic factors were related to the acceptance of DGA (Table 3).

## Discussion

This cross-sectional study was conducted at the Hospital of Stomatology, Guangxi Medical University, which is the only hospital that provides DGA for children in Guangxi Province; it is also one of the few hospitals offering DGA for children in China. The findings of this study would have a positive effect on the further use of DGA for children in China.

It is essential that dental treatment under GA be entirely justifiable to ensure that the right patients receive the right treatment [Shepherd and Ali, 2015]. Therefore, the indications for DGA and the risks of GA should be fully understood by practitioners. However, the present study found that the rate of correct answers was not mainly positive, and the average scores for knowledge of DGA were not very high, which indicated that the practitioners seemed to be uncertain about the indications for and risks of DGA.

The US FDA warned in 2016 that the use of GA and sedation drugs in children younger than 3 years or pregnant women during their third trimester might affect the development of children's brains [Pinyavat et al., 2016; Andropoulos and Greene, 2017]. Thus, the neurotoxicity of medicine used for GA is undoubtedly the major concern of the practitioners, which is why only 51.3% of the practitioners in this study believed that GA could not cause irreversible damage to the brain. However, it has been suggested that a single brief exposure to a general anaesthetic does not cause overt neurocognitive deficits in human infants [Spera et al., 2017], and the most recent evidence shows that slightly less than 1 h of general anaesthesia in early infancy does not alter neurodevelopmental outcomes at age 5 years [McCann et al., 2019]. Moreover, with an increasing number of young children requiring anesthetic management to facilitate their dental treatment, DGA for children has been proven safe and effective when delivered in the hospital by a highly competent and attentive operator [Orser et al., 2018]. Therefore, practitioners should be informed that they can maintain their skills and minimise or even eliminate the risk of adverse events by following guidelines and participating in standardised and ongoing training courses [Ramazani, 2016].

The practitioners who worked in the department of paediatric dentistry had higher scores for knowledge of DGA. During comprehensive dental rehabilitation using GA, effective teamwork is the key to carrying out optimal dental services. The practitioners, including the paediatric dentist and nurse in the department of paediatric dentistry and anaesthesiologists and nurses in the department of anaesthesiology, are the core of the team; thus, they should know more about DGA than other practitioners. Interestingly, the practitioner who had worked in the hospital for less than 10 years knew more about DGA than those who had worked there for longer than 10 years. The probable reason is that DGA has been used at this hospital for only 14 years; a training course about DGA for children

Practitioners' knowledge of DGA	Frequency (n)	Percentage (%)
In which of the following situations do you think children should be referred for DGA?		
1) Child is uncooperative under local anaesthesia	187	61.9
2) Child has a large number of cavities but cannot attend multiple visits	193	63.9
3) Inappropriate due to systemic diseases	122	40.4
4) Child has special needs	130	43.0
5) Child is uncooperative due to age	161	53.3
6) I don't know	1	0.3
Which of the following statements do you think is true regarding the risks of GA?		
1) The common adverse effects of anaesthesia are nausea, vomiting, fever, allergy	122	40.4
2) GA can't cause irreversible damage to the brain	155	51.3
3) The risk of anaesthesia could be increased if the child has common illness such as obesity, allergic asthma or premature birth.	280	93.8
4) I don't know Oral and Maxillofacial surgery	20	6.7

TABLE 2. Distribution of practitioners' knowledge of DGA (n = 300).

Variable	Acceptance of DGA	ORs for acceptance of DGA (95% CI)	
	Percentage (%)	Full model	Reduced model
Knowledge of DGA		1.37 (1.11- 1.70)	1.47 (1.21 -1.79)
<b>Sex</b>			
Male	63(86.3)	1.00 (reference)	
Female	168(74.0)	0.49 (0.20 - 1.23)	
<b>Age</b>			
≤35 years	188(75.2)	1.00 (reference)	
≥36 years	43(86.0)	2.25 (0.76 - 6.66)	
<b>Educational level</b>			
High school	7(53.8)	1.00 (reference)	
Bachelor's degree	138(77.1)	2.68 (0.81- 8.92)	
Master's degree	86(79.6)	2.65 (0.61- 11.54)	
<b>Profession</b>			
Dentist/ anaesthesiologist	113(78.5)	1.00 (reference)	
Technician/nurse	118(75.6)	1.58 (0.57- 4.39)	
<b>Department</b>			
Paediatric dentistry	17(89.5)	1.00 (reference)	
Oral and maxillofacial surgery	52(80.0)	0.47(0.08- 2.69)	
Prosthodontics /Endodontics/Orthodontics	86(76.8)	0.40 (0.79- 2.04)	
Anaesthesiology	17(85.0)	0.88 (0.11- 6.84)	
Other	59(70.2)	0.41 (0.08- 2.19)	
<b>Total years in practice</b>			
≤10	166(79.4)	1.00 (reference)	
≥10	65(71.4)	2.18 (0.97- 4.81)	
<b>Location of previous training</b>			
Private hospital	10(76.9)	1.00 (reference)	
Public hospital	221(77.0)	0.56 (0.12- 2.53)	
<b>Income (monthly)</b>			
2000-4999 RMB	116(71.6)	1.00 (reference)	
5000-9999 RMB	86(81.9)	1.71 (0.81- 3.61)	
>10000 RMB	29(87.8)	2.67 (0.75- 9.48)	

TABLE 3 Summary of logistic regression analysis for practitioners' acceptance of DGA concerning their knowledge of DGA (n =300).

was only recently established for new hires, who therefore knew more about this topic than the more senior staff.

It was reported that dental surgeons' acceptance of DGA for children was 47% in Pakistan [Wali et al., 2016]. In the present study, practitioners at the dental hospital had a positive attitude toward DGA and a higher acceptance rate. In the multiple logistic regression model, the practitioners' knowledge of DGA, and no other factors was significantly related to their acceptance of DGA, which demonstrated that practitioners' knowledge of DGA is a significant indicator of their acceptance of DGA for children. However, the practitioners' knowledge of DGA was not very high, and they did not have a full understanding of the indications and risks of DGA. The findings suggest that more information and training are required to increase practitioners' knowledge of DGA. Nevertheless, we must note that at present, there is no government agency in charge of the monitoring and providing training for DGA in children; however, the Chinese Association of Paediatric Dentistry has been conducting some specific training, and it is hoped that the Chinese government will promote public knowledge about DGA and professional training in its use.

This paper has reported on one of the first attempts to investigate practitioners' knowledge and acceptance of DGA in dental hospitals in China. Limitations of our study include limited question depth and a potentially biased group of respondents. Given that this is the first evaluation of practitioners' knowledge and acceptance, the survey questions only superficially probed a variety of indications and risks of GA. Moreover, most of the practitioners participating in this study were relatively young, and older practitioners had a lower response to the study. Besides, a survey should be conducted involving a more comprehensive range of practitioners in Guangxi.

## Conclusion

This cross-sectional observational study is one of the few studies to explore dental practitioners' knowledge and acceptance of DGA in China. The study provides new evidence to support the potential association between dental practitioners' knowledge and acceptance of DGA and provides information about the major reasons that limit their acceptance. This article emphasises the crucial decision-making role of the government in following guidelines that promote standardised and ongoing training courses in DGA for dental practitioners in China and improve their knowledge and acceptance.

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## Competing interests

The authors declare that they have no competing interests.

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