

# The Need and Use of Procedural Sedation and General Anesthesia in Dentistry

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## ABSTRACT

Dental fear and anxiety are common problems in children and adolescents worldwide and are among the factors that prevent patients from accessing oral care. Management of dental fear and anxiety is complex and includes basic and advanced behavioral techniques, including Procedural Sedation and General Anesthesia. Dental fear and anxiety, the complexity of anticipated dental treatment, and poor cooperation are among the main indications for Procedural Sedation and General Anesthesia in Dentistry. Studies estimate that 7% of the general population will need complex dental sedation and show that the majority of the patients who received dental treatment under Procedural Sedation and General Anesthesia would again request it, and 50% of those study participants having high levels of dental fear and anxiety would go to the dental clinic more often if Procedural Sedation or General Anesthesia were offered. Here, in this article, we aim to review tools that are used to assess the need for Procedural Sedation and General Anesthesia in Dentistry, the attitudes of healthcare workers and the general population towards them, and compare the methodology used worldwide to the methodology that we will use in our study.

**Keywords:** Dental anxiety; dental fear; general anesthesia; procedural sedation.

## INTRODUCTION

### Prevalence of dental fear and anxiety

Oral health is one of the most essential measures of general health and quality of life. It significantly affects one's self-esteem, well-being, and capacity to work and socialize without pain, discomfort, or embarrassment.<sup>1</sup>

Despite the importance of appropriate oral care, access to oral health services is not equal, which in part can be attributed to unequal distribution of oral healthcare professionals and a lack of appropriate oral healthcare facilities and in part to patient characteristics, such as their age, gender, ethnicity, socioeconomic status, perception of need, emotional vulnerability and the level of dental fear and anxiety.<sup>1,2</sup>

Dental fear and anxiety are among the main factors that prevent a patient from accessing oral care. Dental fear (DF) is a normal unpleasant reaction to the specific stimuli associated with dental treatment and is a common condition in children.<sup>3</sup> Dental anxiety (DA) is an exaggerated and often unreasonable emotional state during dental procedures.<sup>4</sup> Usually associated with previous painful experiences, it may occur when a patient anticipates the possibility of pain and perceives a loss of control. Treatment of DA and DF needs specific approaches that are considered time and finance-consuming.<sup>5</sup>

Age, gender, education, socioeconomic status, clinical environment, number, type, and complexity of anticipated dental interventions, previous traumatic experiences,

previous general anesthesia, and parental anxiety are among those factors that influence the prevalence of DF and DA.<sup>6,7</sup> DA and DF are widespread in children with special needs and those aged 5 to 10. It has been estimated that the prevalence of dental fear and anxiety in children ranges from 5% to 20%.<sup>3</sup> In adults, its prevalence is estimated to be from 9 to 14%.<sup>8-10</sup> The severity of the problem and the frequency of its spread are adversely correlated. According to a review, which included 72 577 individuals aged more than 18 years old, the prevalence of dental fear and anxiety, high DF, and severe DF were respectively 15.3%, 12.4%, and 3.3%.<sup>11</sup>

Studies aiming to estimate the prevalence of DF and DA are conducted worldwide, and the results differ between studies and nations. Current statistics on the prevalence of DF and DA might underestimate the extent of the problem since they do not include those patients with severe DA who avoid visiting dental clinics.<sup>3</sup> Despite underestimating the actual prevalence, the study results show a high prevalence of DA and DF worldwide. In most cases, DF is acquired during childhood and persists throughout life, confirming the severity of the problem. However, there needs to be more data about the spread of DF and DA in the countries of the Caucasus region, including Georgia; we were not able to find any study trying to estimate the prevalence of it. It is crucial to conduct a study to assess its prevalence in Georgia to know the local extent of the problem and manage it.



### Management of dental fear and anxiety

Patients with high levels of DA are challenging to treat, take longer to recover, and may display complex behavioral issues, resulting in a stressful experience for both the patient and the Dentist. The management of DF and DA includes behavior guidance techniques, which are divided into pharmacological and non-pharmacological subgroups. They aim to establish good communication and a trusting relationship between patient and physician, alleviate patients' anxiety, and raise patients' awareness about the importance of proper oral care.<sup>12</sup>

Depending on the severity of the problem and considering the patient's age, developmental level/delay, and dental attitudes, including prior unpleasant and or painful dental experiences, healthcare specialists can choose between basic and advanced behavior guidance techniques. Basic behavior guidance techniques include communicative guidance such as positive imagery, direct observation, tell-show-do, voice control, distraction, positive reinforcement, desensitization, and animal-assisted therapy.<sup>13</sup> Sometimes dentists need to supplement basic behavioral therapy with more advanced behavioral techniques, such as protective stabilization - restriction of patients' movement, procedural sedation and general anesthesia.<sup>13</sup> These techniques are used to treat children with extensive dental problems, preschoolers, patients with physical or mental disabilities, patients with general behavioral issues, medically engaged patients, or patients who are undergoing maxillofacial surgery.<sup>14</sup> Some of those techniques are implemented and used in Georgia, too.

### A brief review of the need for procedural sedation and general anesthesia in dentistry

Procedural Sedation (PS) is a drug-induced reversible depression of the central nervous system (CNS) during which patients can purposefully respond to verbal commands and independently maintain respiration.<sup>15</sup> PS is commonly used in dentistry to reduce anxiety, minimize pain, discomfort, and unpleasant memories related to dental procedures, and provide safe and effective dental care for mentally, physically, or medically compromised patients and patients in general.<sup>13,16</sup> PS includes the use of anesthetic drugs such as Midazolam, Fentanyl, Ketamine, Etomidate, Propofol, Dexmedetomidine, Methohexital, and Nitrous Oxide; Propofol and Fentanyl are two anesthetics that are widely used in Georgia. PS can be performed in ambulatory settings by qualified dental professionals with the necessary education in sedation techniques. Ideally, PS should be done by two dental professionals, one performing sedation and another monitoring patient and team coordination.<sup>16</sup> There is no official data about the local dental clinics that provide PS.

General Anesthesia (GA) is a drug-induced reversible CNS depression that results in a loss of sensation and response to all external stimuli.<sup>17</sup> Depression of the CNS results in total loss of consciousness accompanied by the loss of all protective reflexes and the ability to maintain respiration independently. Due to the risks of serious complications, GA should be performed only in a hospital or ambulatory setting, including a dental office by well-trained dentist-anesthesiologists.<sup>13</sup> GA in dentistry is indicated for patients with a mental, physical, or medical disability, patients who are highly fearful, anxious, or uncooperative, children or adolescents who are not able to communicate verbally or use sign language for communication, to reduce the number of anesthetic procedures in patients who require several dental interventions, in patients who have acute inflammation/infection, an anatomic variation where local anesthesia is ineffective.<sup>13</sup> In Georgia, GA in dentistry is only performed in four stationary clinics: "Tbilisi State Medical University Pediatric Academic Clinic named after Givi Zhvania, "LLC VIP Dentistry," Dental Clinics Network Dens and LLC "Khozrevanidze Clinic."<sup>18</sup>

Besides dentistry, PS and GA are widely used during gastrointestinal and gynecological manipulations. In both cases, the indications for PS and GA are well-established. However, there still seems to be a gap in studying the indications of PS and GA in dentistry and the attitudes of the population and healthcare workers towards using them. Moreover, a literature review has indicated a need for more data regarding the use and need of PS and GA in the settings of ambulatory dentistry, especially in Georgia. We plan to conduct a cross-sectional study aiming to assess the needs and attitudes of dentists, dental patients, and the general population towards using PS and GA in the settings of ambulatory dentistry; for this purpose, we will use particular self-administered questionnaires, which we generated based on the questionnaires used in studies worldwide.

The main objectives of this article are to review the literature on (i) the tools that are used to assess the need for PS and GA in dentistry, (ii) the attitudes of healthcare workers and the general population toward using them in ambulatory dentistry, to compare research methodology that we will use in our study with the methodologies used worldwide.

### REVIEW

#### Tools to assess the need for the use of procedural sedation and general anesthesia in dentistry

Since one of the main indications for using PS and GA in dentistry is poor cooperation and DF, it is vital to have a proper tool for anxiety, which will assist healthcare specialists in choosing appropriate management techniques.<sup>19-22</sup>

Historically, tools that were trying to assess the need for dental sedation (DS) included telephone-based surveys, which mainly focused on the anxiety level, using the Dental Anxiety Question, the Corah Dental Anxiety Scale, or the Modified Dental Anxiety Scale (MDAS).<sup>23,24</sup> Coulthard and coauthors claim that these scales can underestimate the need for DS and suggest using the Indicator of Sedation Need (IOSN) tool, which assesses the medical history and anticipated treatment complexity besides the level of anxiety.<sup>25</sup>

In the IOSN tool, a patient's level of anxiety is assessed using MDAS. Dentists assess medical history and take into consideration comorbidities, the presence of gag reflexes, and fainting attacks. In the 3rd part, the Dentist assesses the complexity of the anticipated treatment, which can be simple or complex.

The final score for the IOSN tool ranges from 3 to 11; scores 3-4 indicate the minimal need for sedation, 5-6-moderate need, 7-9 high need, and 10-11 very high need, so patients who fall in the 7 to 11 scores category are usually addressed to PS or GA (Tab.1). The IOSN tool can be completed in several minutes, is relatively easy to fill and gives a basic understanding of the need for more advanced behavioral techniques.<sup>26</sup> The IOSN score directly correlates with the complexity of sedation modality, starting from local anesthesia and ending with PS and GA.<sup>27</sup>

The IOSN tool was tested in several studies. Pretty and colleagues conducted a study to determine the need for sedation among attending patients in North-West England.<sup>28</sup> They analyzed 607 IOSN tools and indicated that 5% of the pat will need DS clients at some DS. Researchers from the same group conducted a sizeable telephone-based survey.<sup>29</sup> They found that 17% of all study participants avoided attending dental care, and the main barrier to accessing dental care was DF and DA. The authors conclude that the percentage of need for sedation would be higher in their previous study if they included those patients who avoid dental care. The estimated sedation need would be around 7%.

Abbas and coauthors used a modified version of the IOSN tool to assess the need for DS in a population more than 12 years old. They found that almost 20% of study participants were highly anxious due to undergoing dental procedures, and more than 30% of them had high sedation needs, which was significantly associated with the female sex, higher education status, and a history of previous traumatic dental experience.<sup>30</sup>

Madouh and Tahmassebi conducted a similar study in the pediatric population. The study included 40 pediatric patients evaluated using the IOSN tool; out of them, 20 scored more than six and were subjected to more advanced methods of DS. The authors investigated dental treatment outcomes and confirmed that p-IOSN is a proper tool for

identifying patients needing PS/GA during dental procedures.<sup>31</sup>

TABLE 1. IOSN tool (need of sedation) and its interpretation

IOSN tool section <sup>a</sup>	Scores	Explanation/ Interpretation
Dental fear and anxiety <sup>b</sup>	1-3	<ul style="list-style-type: none"> <li>• <b>Question 1.</b> If you went to your Dentist for treatment tomorrow, how would you feel?</li> <li>• <b>Question 2.</b> If you were sitting in the waiting room (waiting for treatment), how would you feel?</li> <li>• <b>Question 3.</b> If you were about to have a tooth drilled, how would you feel?</li> <li>• <b>Question 4.</b> If you were about to have your teeth scaled and polished, how would you feel?</li> <li>• <b>Question 5.</b> If you were about to have a local anesthetic injection in your gum above the upper back tooth, how would you feel?</li> </ul>
Medical history	1-4	<ul style="list-style-type: none"> <li>• No medical complication;</li> <li>• Systemic diseases (fainting attacks, hypertension, angina, asthma, epilepsy, other) that may be exacerbated by treatment;</li> <li>• Systemic disorders that make it difficult to communicate (Arthritis, Parkinsonism, MS, other);</li> <li>• Gag Reflex.</li> </ul>
Treatment complexity	1-4	<ul style="list-style-type: none"> <li>• Routine – Examples: Scale, single-rooted extraction, minor soft tissue biopsy -1</li> <li>• Intermediate – Examples: Scale and root planning, multi-rooted tooth extraction -2</li> <li>• Complex – Examples: Periodontal surgery, apicoectomy posterior tooth -3</li> <li>• High Complexity -4</li> </ul>

<sup>a</sup> For IOSN Scores 3-6, sedation is unnecessary; for scores 7-11, dental treatment under sedation is needed and preferred;

<sup>b</sup> Medical and Dental Anesthesia Solutions (MDAS) tool consists of 5 questions, and each question has identical possible answers: (i) Not Anxious (ii) Slightly Anxious (iii) Fairly Anxious (iv) Very Anxious (v) Extremely Anxious, the score for each question is from 1 to 5. MDAS score from 5 to 11 corresponds to minimal anxiety, equivalent score in IOSN -1; MDAS score from 12 to 18 corresponds to moderate anxiety, equivalent score in IOSN -2; MDAS score from 19 to 25 corresponds to high anxiety, equivalent score in IOSN -3.

The validity of the IOSN tool in adults was also confirmed in another study, which included 93 patients with different degrees of DA. Seventy-nine patients scored 7-9 on the IOSN scale, indicating a high sedation need; 2 patients scored 10 and 12, indicating a very high sedation need. The authors conclude that the IOSN tool assists dentists in decision-making for those patients who require more complex sedation modalities.<sup>32</sup> All these studies confirm the validity of the IOSN tool. Even though the IOSN tool is an excellent tool for assessing the need for sedation in dentistry, some authors suggest that there is a risk of underestimating or overestimating the need.<sup>33</sup> The main problem in overestimation is that 100% of patients who received dental treatment under PS and GA would again request it, increasing dental treatment's overall cost and financial burden.<sup>34</sup>

General population attitude toward the use of procedural sedation and general anesthesia in dentistry

Even though DF and DA are widespread worldwide and several techniques, including PS and GA, are widely used to manage them, there is a need for more literature aiming to assess general population attitudes towards using PS and GA in dentistry. Chanpong and colleagues cite one of the earliest studies done in the UK to assess general population attitudes towards using PS or GA in dentistry conducted by Lindsay, Humphris, and Barnby.<sup>35</sup> The authors found that 31% of the study participants preferred using PS or GA during dental procedures.

Later, Gordon et al., assessed the attitudes of people with special healthcare needs and found that 40% of the study participants would not avoid attending dental procedures if PS or GA were offered.<sup>36</sup> The same group of researchers conducted a random-digit-dialing telephone survey in the USA and found that more than half of the study participants were nervous about going to dental clinics, and more than 50% of them would go to the dental clinic more often if PS or GA were offered.<sup>37</sup>

Chanpong et al., conducted a national survey in Canada and found that around 10% of study participants were somewhat terrified of undergoing dental procedures, and 5.5% were. More than 10% of study participants would choose to undergo dental treatment under PS or GA. 31.1% of those study participants with high levels of DF and DA would undergo dental treatment under PS or GA.<sup>35</sup>

Later, Allen and Girdler studied the attitudes of patients attending an emergency dental clinic towards PS. They found that around 40% of patients did not know that dental procedures could be performed under PS; more than half would agree to receive PS during dental treatment if it was available.<sup>38</sup> Following, Huh and colleagues studied patients' awareness and factors that were influencing patients' demands for PS and found that 51% of the patients were interested in undergoing treatment under PS and according to authors, the leading indicators for PS were costs and the level of DA.<sup>39</sup>

Harding and coworkers in their study found that participants' preference towards undergoing PS or GA changed depending on the dental intervention; for dental filling, more than 25% of the study participants would prefer to use PS or GA, and willingness to undergo PS or GA tripled in case of extraction.<sup>40</sup>

In the same line of research, White and colleagues found that 82% of the patients' parents would choose PS over protective stabilization and restraint, and all considered PS a safe option.<sup>41</sup> On the contrary, de Castro and colleagues found basic guidance techniques more acceptable.<sup>42</sup> Taken together, patients and their acquaintances would choose PS and GA as options for dental treatment if available, and they would feel safe about undergoing it.

In our study, we also plan to use a special self-administered questionnaire for a different subgroup of the population, including patients, their acquaintances/parents, and the general population; we will collect information about their demographic and dental characteristics, including dental visits and interventions and their awareness and attitudes towards using PS and GA in ambulatory dentistry. Table 2 specifies the correspondence of our study tools and groups with the studies reviewed in this chapter.

TABLE 2. Assessment of general population attitude towards procedural sedation and general anesthesia in dentistry

Comparison of questionnaires and groups used in different studies and our planned study			
Study	Study tools	Collected data	Correspondence to the tools used in our study
Dionne et al.	A Random-digit-dialing telephone survey	<ul style="list-style-type: none"> <li>Demographic characteristics;</li> <li>Frequency of use of dental healthcare services;</li> <li>Level of dental fear/anxiety;</li> <li>Preferred methods to control pain and anxiety during dental visits.</li> </ul>	A self-administered questionnaire collects following data: <ul style="list-style-type: none"> <li>Demographic Characteristics;</li> <li>Dental Characteristics (including frequency of dental visits);</li> <li>The awareness and the attitude towards PS and GA in dentistry.</li> </ul>
Chanpong, Haas, and Locker	A Random-digit-dialing telephone survey	<ul style="list-style-type: none"> <li>Sociodemographic data;</li> <li>Dental history;</li> <li>Level of their dental fear and anxiety;</li> <li>The willingness to undergo dental treatment under PS or GA.</li> </ul>	
Harding et al.	A self-administered questionnaire	<ul style="list-style-type: none"> <li>Demographic characteristics;</li> <li>Dental history;</li> <li>DA level;</li> <li>Preferences for dental DA management tools.</li> </ul>	
Allen and Girdler	A self-administered questionnaire survey	<ul style="list-style-type: none"> <li>Patients' awareness of procedural sedation</li> </ul>	
Huh et al.	A self-administered questionnaire consisted of 24 questions	<ul style="list-style-type: none"> <li>Patients' awareness and factors that were influencing patients' demands for procedural sedation in endodontics</li> </ul>	
White et al.	A Self-administered questionnaire for patients' parents and acquaintances	<ul style="list-style-type: none"> <li>Patients and their acquaintances' attitudes towards PS and GA</li> </ul>	A section in a self-administered questionnaire assesses the attitude of patients' acquaintances towards PS and GA in dentistry



### Healthcare workers' attitude toward the use of procedural sedation and general anesthesia in dentistry

There is a scarcity of literature on the healthcare workers' attitudes towards the use of PS and GA in dentistry. Adair and coworkers found that dentists from American Academy of Pediatric Dentistry use both non-pharmacological and pharmacological behavior management techniques to manage DA and DF.<sup>43</sup>

Costa and collaborators studied the attitudes of dentists, dentists, dentists, and the population regarding using PS in dentistry. They found that 75% of all dentists knew about PS in dentistry, but only 15% had used it; from dental students, 60% were aware of PS, half of the population had heard about PS, and 40% of them were willing to undergo dental treatment under PS.<sup>44</sup>

Jason and coauthors found that special education significantly increases acceptance towards advanced behavioral guidance techniques, including PS and GA.<sup>45</sup> Similarly, Woolley and colleagues assessed if dentists had special training for PS, if they were using it during their practice, and their attitudes towards it. They found that 55% of the study participants received special training regarding PS during their undergraduate education, and 75% received special training during their specialization. All of them had performed dental treatment using the PS technique, and more than 90% of them considered that PS should be available at the ambulate story level and in hospitals, too.<sup>46</sup>

Goodchild and Donaldson studied the use of sedation in dental outpatient settings. 76% of dentists who participated in their study had used sedation in their primary practice. 67% received special training in PS.<sup>47</sup> Similarly, Olabi and colleagues found that more than 70% of pediatric dentists in the USA used some form of sedation at their offices.<sup>48</sup> In line with these results, Tingey and coauthors found that around 50% of the dentists from their study performed PS during their practice.<sup>49</sup> The same results were observed in the study done by Cody and coworkers, who found that 63% of dentists were using PS as a management technique.<sup>50</sup>

Strom and colleagues compared dentists' attitudes toward patients with DA and their ability to use behavioral management techniques. They found that the dentists who received special training in behavioral management techniques reported anxious patients as a positive challenge and were less worried about their treatment.<sup>51</sup> Studies show that both PS and GA are widely used in dentistry and confirm the importance of particular medical education in order to perform and implement them in dental treatment properly.

### CONCLUSION

PS and GA in dentistry are usually used when a patient is poorly cooperative, has high levels of DA, or requires complex treatment. Studies estimate that 7% of the population will need dental intervention under PS/GA at some point. The vast majority of them would choose dental

treatment under PS/GA if available, which, on the one hand, makes the dental experience pleasant, but on the other hand, increases the cost of the treatment and requires special training for dental staff. Our review found a scarcity of literature assessing general populations' attitudes towards using PS/GA in ambulatory dentistry. Moreover, we found no study assessing DA and DF in Georgia. We plan to conduct a cross-sectional study using self-administered questionnaires to assess the needs and attitudes of patients, their acquaintances/parents, and healthcare workers toward PS and GA in ambulatory dentistry in Georgia.

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### REFERENCES

1. World Health Organization. Oral Health, Overview. Accessed November 19, 2023. [https://www.who.int/health-topics/oral-health#tab=tab\\_1](https://www.who.int/health-topics/oral-health#tab=tab_1)
2. Freeman R. Barriers to accessing dental care: patient factor. *British dental journal*. 1999 Aug;187(3):141-4.
3. Seligman LD, Hovey JD, Chacon K, Ollendick TH. Dental anxiety: An understudied problem in youth. *Clinical psychology review*. 2017 Jul 1;55:25-40.
4. Cianetti S, Lombardo G, Lupatelli E, Pagano S, Abraha I, Montedori A, Caruso S, Gatto R, De Giorgio S, Salvato R. Dental fear/anxiety among children and adolescents. A systematic review. *Eur J Paediatr Dent*. 2017 Jun 1;18(2):121-30.
5. Rafique S, Banerjee A, Fiske J. Management of the petrified dental patient. *Dental update*. 2008 Apr 2;35(3):196-207.
6. Alasmari AA, Aldossari GS, Mohammed S. Dental anxiety in children: A review of the contributing factors. *children*. 2018;5(7):10-7860.
7. Armfield JM. The extent and nature of dental fear and phobia in Australia. *Australian dental journal*. 2010 Dec;55(4):368-77.
8. Nicolas E, Collado V, Faulks D, Bullier B, Hennequin M. A national cross-sectional survey of dental anxiety in the French adult population. *BMC oral health*. 2007 Dec;7:1-7.
9. Jeddy N, Nithya S, Radhika T, Jeddy N. Dental anxiety and influencing factors: A cross-sectional questionnaire-based survey. *Indian Journal of Dental Research*. 2018 Jan 1;29(1):10.
10. Folayan MO, Idehen EE, Ojo OO. The modulating effect of culture on the expression of dental anxiety in children: a literature review. *International Journal of Paediatric Dentistry*. 2004 Jul;14(4):241-5.
11. Klingberg G, Broberg AG. Dental fear/anxiety and dental behaviour management problems in children and adolescents: a review of prevalence and concomitant psychological factors. *International journal of paediatric dentistry*. 2007 Nov;17(6):391-406.
12. Silveira ER, Cademartori MG, Schuch HS, Armfield JA, Demarco FF. Estimated prevalence of dental fear in adults: A systematic review and meta-analysis. *Journal of dentistry*. 2021 May 1;108:103632.
13. American Academy of Pediatric Dentistry. Behavior guidance for the pediatric dental patient. *The Reference Manual of Pediatric*

- Dentistry. Chicago, Ill.: American Academy of Pediatric Dentistry; 2022:321-39.
14. López-Velasco A, Puche-Torres M, Carrera-Hueso FJ, Silvestre JF. General anesthesia for oral and dental care in paediatric patients with special needs: A systematic review. *Journal of clinical and experimental dentistry*. 2021 Mar;13(3):e303.
  15. Green SM, Krauss B. Procedural sedation terminology: moving beyond “conscious sedation”. *Annals of emergency medicine*. 2002 Apr 1;39(4):433-5.
  16. Benzoni T, Cascella M. Procedural sedation.
  17. Dowd FJ, Johnson B, Mariotti A. Pharmacology and therapeutics for dentistry-E-book. Elsevier Health Sciences; 2016 Sep 3.
  18. Agency for Regulation of Medical and Pharmaceutical Activities in Georgia. Letter N. REG 2 23 00996603. 2023 Sep. 21
  19. Kim J, Kim H, Seo KS, Kim HJ. Analysis of sedation and general anesthesia in patients with special needs in dentistry using the Korean healthcare big data. *Journal of Dental Anesthesia and Pain Medicine*. 2022 Jun;22(3):205.
  20. El Hachem C, El Osta N, Haddad M, Abou Chedid JC, Daou M. Characteristics of pediatric and medically compromised patients treated under general anesthesia in a middle eastern country. *The journal of contemporary dental practice*. 2021 Apr 1;22(4):388-93.
  21. Savanheimo N, Vehkalahti MM. Five-year follow-up of children receiving comprehensive dental care under general anesthesia. *BMC oral health*. 2014 Dec;14:1-8.
  22. Hariharan S, Hosey MT, Bernabe E. Comparing the profile of child patients attending dental general anaesthesia and conscious sedation services. *British Dental Journal*. 2017 May 12;222(9):683-7
  23. Neverlien PO. Assessment of a single-item dental anxiety question. *Acta Odontologica Scandinavica*. 1990 Jan 1;48(6):365-9.
  24. Humphris GM, Freeman R, Campbell J, Tuutti H, D’souza V. Further evidence for the reliability and validity of the Modified Dental Anxiety Scale. *International dental journal*. 2000 Dec 1;50(6):367-70.
  25. Coulthard P, Bridgman CM, Gough L, Longman L, Pretty IA, Jenner T. Estimating the need for dental sedation. 1. The Indicator of Sedation Need (IOSN)—a novel assessment tool. *British dental journal*. 2011 Sep 10;211(5):E10-.
  26. Coulthard, P., 2013. The indicator of sedation needs (IOSN). *Dental update*, 40(6), pp.466-471.
  27. Liu T, Pretty IA, Goodwin M. Estimating the need for dental sedation: evaluating the threshold of the IOSN tool in an adult population. *British Dental Journal*. 2013 Apr 27;214(8):E23-.
  28. Pretty IA, Goodwin M, Coulthard P, Bridgman CM, Gough L, Jenner T, Sharif MO. Estimating the need for dental sedation. 2. Using IOSN as a health needs assessment tool. *British dental journal*. 2011 Sep 10;211(5):E11-.
  29. Goodwin M, Pretty IA. Estimating the need for dental sedation. 3. Analysis of factors contributing to non-attendance for dental treatment in the general population, across 12 English primary care trusts. *British dental journal*. 2011 Dec 24;211(12):599-603.
  30. Abbas B, Maqsood A, Rahat Geelani SR, Sattar M, Rahim M, Khurshid Z. Estimating the need for sedation in patients with dental anxiety and medical Complexities reporting to Tertiary care dental Hospital using the IOSN tool. *International Journal of Dentistry*. 2022 Apr 26;2022.
  31. Madouh M, Tahmassebi JF. Utilising a paediatric version of the indicator of sedation need for children’s dental care: a pilot study. *European Archives of Paediatric Dentistry*. 2016 Aug;17:265-70.
  32. Yuan S, Carson SJ, Rooksby M, McKerrow J, Lush C, Freeman R. Assessing sedation need and managing referred dentally anxious patients: is there a role for the Index of Sedation Need? *British Dental Journal*. 2015 Dec 18;219(12):571-6
  33. Shokouhi B, Kerr B. A review of the indicator of sedation needs (IOSN): what is it and how can it be improved? *British Dental Journal*. 2018 Feb 9;224(3):183-8.
  34. Goodwin M, Coulthard P, Pretty IA, Bridgman C, Gough L, Sharif MO. Estimating the need for dental sedation. 4. Using IOSN as a referral tool. *British Dental Journal*. 2012 Mar 10;212(5):E9-12.
  35. Chanpong, B., Haas, D.A. and Locker, D., 2005. Need and demand for sedation or general anesthesia in dentistry: a national survey of the Canadian population. *Anesthesia progress*, 52(1), pp.3-11.
  36. Gordon, S.M., Dionne, R.A. and Snyder, J., 1998. Dental fear and anxiety as a barrier to accessing oral health care among patients with special health care needs. *Special care in dentistry*, 18(2), pp.88-92.
  37. Dionne, R.A., GORDON, S.M., MCCULLAGH, L.M. and PHERO, J.C., 1998. Assessing the need for anesthesia and sedation in the general population. *The Journal of the American Dental Association*, 129(2), pp.167-173.
  38. Allen, E.M. and Girdler, N.M., 2005. Attitudes to conscious sedation in patients attending an emergency dental clinic. *Primary Dental Care*, (1), pp.27-32.
  39. Huh, Y.K., Montagnese, T.A., Harding, J., Aminoshariae, A. and Mickel, A., 2015. Assessment of patients’ awareness and factors influencing patients’ demands for sedation in endodontics. *Journal of Endodontics*, 41(2), pp.182-189.
  40. Harding, A., Vernazza, C.R., Wilson, K., Harding, J. and Girdler, N.M., 2015. What are dental non-attenders’ preferences for anxiety management techniques? A cross-sectional study based at a dental access centre. *British Dental Journal*, 218(7), pp.415-421.
  41. White J, Wells M, Arheart KL, Donaldson M, Woods MA. A questionnaire of parental perceptions of conscious sedation in pediatric dentistry. *Pediatric dentistry*. 2016 Apr 15;38(2):116-21.
  42. de Castro AM, de Oliveira FS, de Paiva Novaes MS, Araújo Ferreira DC. Behavior guidance techniques in Pediatric Dentistry: attitudes of parents of children with disabilities and without disabilities. *Special Care in Dentistry*. 2013 Sep;33(5):213-7.
  43. Steven M. Adair, DDS, MS Jennifer L. Waller, PhD Tara E. Schafer, DMD, MS Roy A. Rockman. A Survey of Members of the American Academy of Pediatric Dentistry on Their Use of Behavior Management Techniques, DDS
  44. Costa LR, Dias AD, Pinheiro LS, Chaves ME, Ferreira RD, Almeida RB, Lima AR. Perceptions of dentists, dentistry undergraduate students, and the lay public about dental sedation. *Journal of Applied Oral Science*. 2004;12:182-8.
  45. Sotto JJ, Azari AF, Riley III J, Bimstein E. First-Year Students’ Perceptions About Pediatric Dental Behavior Guidance Techniques: The Effect of Education. *Journal of dental education*. 2008 Sep;72(9):1029-41.
  46. Woolley SM, Hingston EJ, Shah J, Chadwick BL. Paediatric conscious sedation: views and experience of specialists in paediatric dentistry. *British Dental Journal*. 2009 Sep 26;207(6):E11-.
  47. Goodchild JH, Donaldson M. The use of sedation in the dental outpatient setting: a web-based survey of dentists. *Dent Implantol Update*. 2011 Nov 1;22(11):73-80.
  48. Olabi NF, Jones JE, Saxen MA, Sanders BJ, Walker LA, Weddell JA, Schrader SM, Tomlin AM. The use of office-based sedation and general anesthesia by board certified pediatric dentists practicing in the United States. *Anesthesia progress*. 2012 Mar 1;59(1):12-7.
  49. Benjamin T. Tingey, Steven H. Clark, Lewis A. Humbert, John D. Tingey, and Colleen M. Kummet. Use of Intravenous Sedation in Periodontal Practice: A National Survey.
  50. Johnson C, Weber-Gasparoni K, Slayton RL, Qian F. Conscious sedation attitudes and perceptions: a survey of american

academy of pediatric dentistry members. Pediatric dentistry. 2012 Mar 15;34(2):132-7.

51. Strøm K, Rønneberg A, Skaare AB, Espelid I, Willumsen T. Dentists' use of behavioural management techniques and their attitudes towards treating paediatric patients with dental anxiety. European archives of paediatric dentistry. 2015 Aug;16:349-55.