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To Assess the Knowledge, Awareness and Practice of Conscious Sedation and General Anaesthesia for Routine Dental Procedures among Dental Practitioners

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Abstract

Background: Conscious sedation is a valuable approach to address anxious patients and treat them with the utmost comfort level. The use of intravenous conscious sedation in dentistry has gained significant popularity over the last decades to help manage pain and anxiety in the dental office setting for practitioners providing moderate sedation in the offices, it is imperative that they are knowledgeable about guidelines and are adequately trained to safely administer moderate sedation.

Aim and Objective: This study aims to assess the knowledge, awareness and practice of conscious sedation and general anaesthesia for routine dental procedures among dental practitioners.

Materials and Methods: This questionnaire based study was conducted in the form of an online survey. Sample size comprised of 1200 dental practitioners. The study was a questionnaire based survey consisting of 18 questions. The self-administered questionnaire was based on demographic data and based on the knowledge, awareness and practice of conscious sedation and general anaesthesia for routine dental procedures among dental practitioners. The survey questionnaire was designed based on the previous questionnaire studies conducted by Academy of General Dentistry and American Dental Association.

Results: The results showed that only 24.5% of the participants chose to use conscious sedation when dealing with anxious patients. Also 63.8% if dental practitioners responded that majority of dental patients cancel or avoid dental appointments because of fear or anxiety during treatment. 98.3% of the practitioners were aware that conscious sedation brings a partial; loss of consciousness with response to verbal and physical stimulus. However, 27.3% dental practitioners need proper training for providing the sedation to patients in their dental office.

Conclusion: Within the limits of this study it can be concluded that there is a moderate level of awareness regarding practice of conscious sedation among dental practitioners. The current study also helps to identify the possible limitations and barriers to the provision of sedation and general anaesthesia in dental practice.

Keywords: *Dental Anxiety; Conscious Sedation; General Anaesthesia; Dental Procedures; Dental Practitioners*

Introduction

Significant fear and anxiety related to dental care has been well-documented and is commonly seen in dental practice. Dental anxiety can produce serious and negative effects in patients, such as failed or postponed dental visits, lack of preventive care, and overall poor oral health. It is important to accurately assess patients' level of dental anxiety in order to facilitate the management and treatment of anxious patients during dental care. It is apparent that dentists and patients alike recognize the need for anaesthesia within dentistry. Traditionally, it has been supported that anxiety or fear mainly drives patient preference for sedation/GA [1,2]. However, a growing body of literature is identifying factors in addition to anxiety that may drive patient preference for adjunctive sedation services with dental care such as: treatment complexity and medical/behavioural indicators [3,4]. More specifically, sedation was considered useful, for patients with medical conditions exacerbated by stress, for complex or unpleasant procedures, and for patients with involuntary movement disorders, physical or learning challenges or for patients with strong gag reflexes [5].

Despite awareness of patient fear, current dental strategies are not demonstrably thorough enough to present adequate solutions to manage patient fear or anxiety [6,7]. Dental professionals have employed numerous non-pharmacologic and pharmacological methods to manage patient anxiety and fear, including empathy, audio or video distraction, guided relaxation and hypnosis to reduce dental anxiety [8]. Successfully, dentists armed with proper usage and knowledge of local anaesthetics have alleviated the pain associated with dentistry. A viable adjunct to local anaesthesia, that is highly effective at reducing anxiety levels, is intravenous (IV) sedation and/or general anaesthesia (SGA).

According to American Dental Association in 2007, Conscious sedation is defined as "a minimally depressed level of consciousness, produced by a pharmacologic method that retains the patient's ability to independently and continuously maintain an airway and respond normally to tactile stimulation and verbal command. Although cognitive function and coordination may be modestly impaired, ventilator and cardiovascular functions are unaffected". Remarkably, the first use of general anaesthesia was only for dentistry. Two American dentists pioneered the use of general anaesthesia with Dr. Horace Wells' first attempt in 1844. This was followed by his student American dentist, Dr. William Morton on October 16, 1846 who introduced ether as a general anaesthetic, in clinical treatment for the first time [9]. However, 166 years since that revolutionary day, little is known about the views and use of sedation and general anaesthesia (GA) within dental practices.

Nitrous oxide/oxygen inhalational sedation and intravenous sedation with midazolam are the most widely used sedative agents in dental practice. Midazolam is often combined with a short-acting opioid, such as fentanyl or alfentanyl to provide a more balanced anaesthetic technique [10]. Multiple studies have suggested the use of intravenous sedation for dental surgical procedures in patients with high anxiety levels as a viable method to control anxiety [11]. Periodontal surgeries are one of the most feared procedures in dentistry with one study showing 68.2% preferring sedation or general anaesthesia for periodontal surgeries while only 46.5% preferred sedation or general anaesthesia for tooth extraction [12]. Sedation in dentistry has several aims and indications: 1) to allay anxiety and fear, 2) to provide analgesia, 3) to provide amnesia, 4) to control secretions, 5) to counteract hyperactive gag reflex, 6) to allow for lengthy and difficult dental procedures, 7) to enable treatment of medically compromised patients (unable to tolerate the stress of the dental visit, and 8) to enable treatment of special populations: (a) developmentally disabled patients and (b) children. Multiple factors need to be considered to determine which type of sedation or anaesthesia for pain control should be used. These include patient history of medications or health problems, behavioural patterns, level of fear and anxiety, and age. Thus, it is important for dentists to be aware of the prevalence of fear and anxiety in their patient population and the consequent need and demand for sedation and general anaesthesia services from their patients.

Conscious sedation is becoming a popular practice and a useful adjunct for the treatment of patients in dentistry due to advances in anaesthetic safety, changing patient views, and increasing treatment needs [13]. However, a lack of knowledge among dental profession-

als regarding sedation appears to be a factor influencing the practice of dental sedation [14]. There is a need to develop more standardized tools to guide dentists whose patients are anxious to better assess which patients could benefit from sedation services. Also there is a less data available regarding the knowledge, awareness and practice of conscious sedation among dentists.

Therefore, the present study was conducted to assess the knowledge, awareness and practice of conscious sedation and general anaesthesia for preforming routine dental procedures among dental practitioners.

Materials and Methodology

The cross-sectional questionnaire-based study was conducted from August 2022 to October 2022, to assess and obtain information about the knowledge, awareness and practice of conscious sedation and general anaesthesia for routine dental procedures among dental practitioners. Prior to start of study, a protocol and purpose of the present study was discussed with the participants and included those participants who were willing to participate in the study. A sample size of 1200 general dental surgeons (BDS) specialized dental surgeons (MDS) and post graduate dental students were selected for the study. Those Participants who were willing to participate and filled the entire questionnaire were included in the study.

Questionnaire design

The open-ended questionnaire was divided into two main sections and had multiple choices. The survey questionnaire was designed based on the previous questionnaire studies conducted by Academy of General Dentistry and American Dental Association. The open ended questionnaire was divided into two main sections. For each question numerous choices were provided to respondents. The primary intent of this questionnaire was to explore the attitude of dentist towards sedation and general anaesthesia in dentistry. The first section of questionnaire captured the information regarding socio-demographic characteristics (gender, age, educational qualification, years of experience) of the participants.

The second section of questions included attitude of dentists toward the provision of sedation and general anaesthesia in dentistry, their current behaviour and practice, use of sedation and general anaesthesia, their perception of patient demand for such services and their perception of patients fear and anxiety to dentistry. The dental procedures listed in the questionnaire survey were routine scaling, filling or caps, root canal treatment (RCT) and periodontal surgeries. Additional dental invasive procedures included bridge and dental implants because usually it is believed that patient may request for sedation/general anaesthesia (GA) in such kind of invasive procedures.

The questionnaire was entered in Google forms for conducting the online survey. Along with the link directing to the Google survey site, the purpose of the study was clearly stated. The percentage response for each question from all participants was obtained and the data was calculated and analysed using Statistical Package for Social Sciences (SPSS) software for window version 23. The descriptive statistics have been generated in terms of percentage.

Results

Sociodemographic analysis of dental practitioners

Table 1 shows the socio-demographic data described respondents' gender, age, educational qualification and years of clinical experience. Out of 1200 respondents, 1011 responded positively and completed the questionnaire survey. The response rate was 84.2% indicating the interest to participate in study. The sample (n = 1011) consisted of 48.5% males (n = 490) and 51.5% females (n = 521) dentists the majority of respondents were general practitioners (n = 598/1011), representing 59.1% of sample with the remaining representing 40.9% specialist dentist and post graduate students from all the dental disciplines. The majority of participants (43.2%) were in the clinical practice with an experience of < 5 years. 33.8% and 22.9% participants were in clinical practice with and experience of 5 - 10 years and more than 10 years respectively.

Variable		Dentist (n)	n (%)
Age	< 30 Years	475	47
	> 30 Years	536	53
Gender	Male	490	48.5
	Female	521	51.5
Educational qualification	General dentist (BDS)	598	59.1
	Specialist dentist (MDS)	413	40.9
Years of experience	< 5 Years	47	43.2
	5 - 10 Years	342	33.8
	> 10 Years	232	22.9

Table 1: *Socio-demographic analysis of study participants (n = 1011).*

Knowledge of dental practitioners based on conscious sedation

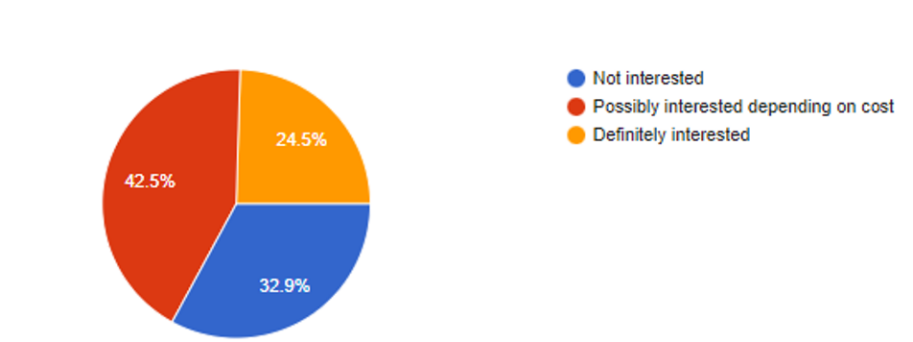
Table 2 shows the knowledge among dental practitioners based on conscious sedation. Around 1/3rd of the dental practitioners (30%) knew that systemically healthy patients are the best candidates for conscious sedation. Inhalation (30.1%) and intravenous (26.1%) routes were quoted as the most common routes of administration for conscious sedation. 48.3% dental practitioners stated that conscious sedation brings about partial loss of consciousness with response to verbal and physical stimuli. Propofol (23.7%) and Ketamine (20.9%) were the most common drugs used for intravenous conscious sedation. Adverse physiological effects (infectivity in tranquilizing patients) (34.6%) was stated as the most common complication of conscious sedation.

Variables		Dentist (n)	n (%)
Who are the best candidates for conscious sedation?	Systemically healthy patients	336	30.1
	Patient who has undergone renal transplantation	181	17.9
	Patient with pre-existing cardiac problem	190	18.8
	All of them	336	33.2
What are the most common routes of conscious sedation?	Oral	154	15.2
	Intravenous	264	26.1
	Inhalational	304	30.1
	Any Route	289	28.6
Conscious sedation brings about	Complete Loss of consciousness	135	13.4
	Partial Loss of consciousness with response to verbal and physical stimuli	488	48.3
	Partial loss of consciousness with less or no response to any stimuli	388	38.4
What is the most common drug used for intravenous conscious sedation?	Midazolam	164	16.2
	Dexmedetomidine	196	19.4
	Propofol	240	23.7
	Ketamine	211	20.9
	Diazepam	200	19.8
What do you think is the complication of conscious sedation?	Adverse physiological effects (infectivity in tranquilizing patients)	350	34.6
	Pain on Injection	260	25.7
	Severe respiratory insufficiency	269	26.6
	Myasthenia Gravis	132	13.1

Table 2*: Knowledge of dental practitioners based on conscious sedation.*

Dentist- estimated patient interest for sedation/general anaesthesia

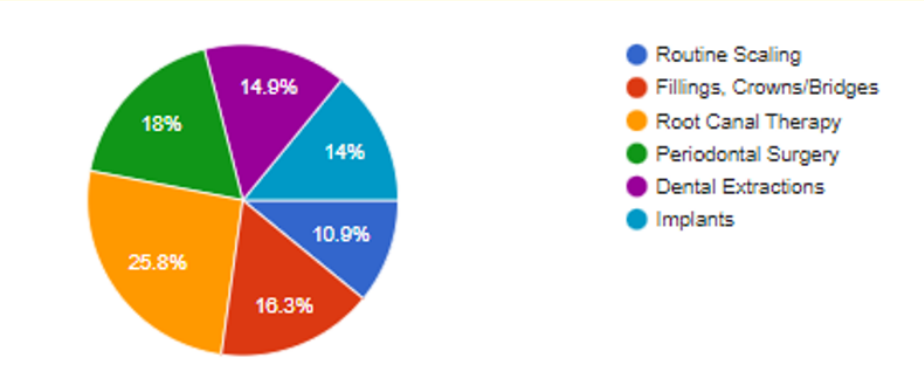
When asked "what percentage of all dental patients do you think are interested in sedation/general anaesthesia for dental treatment"? 32.9% of respondents (n = 248) indicated that the patients are not interested in sedation/GA. The remaining 42.5% indicated that patients had some degree of interest (Pie chart 1).



Pie Chart 1: *Estimation of patient interest for sedation/general anaesthesia.*

When asked to "estimate the percentage of all dental patients that would prefer to have conscious/moderate sedation for following dental procedure: routine scaling; fillings; crowns and bridge; root canal therapy; periodontal surgery; dental extraction and dental implants". Dental practitioners (n = 1011) believed that patients had a variable levels of interest on sedation depending upon the procedure (Pie chart 2).

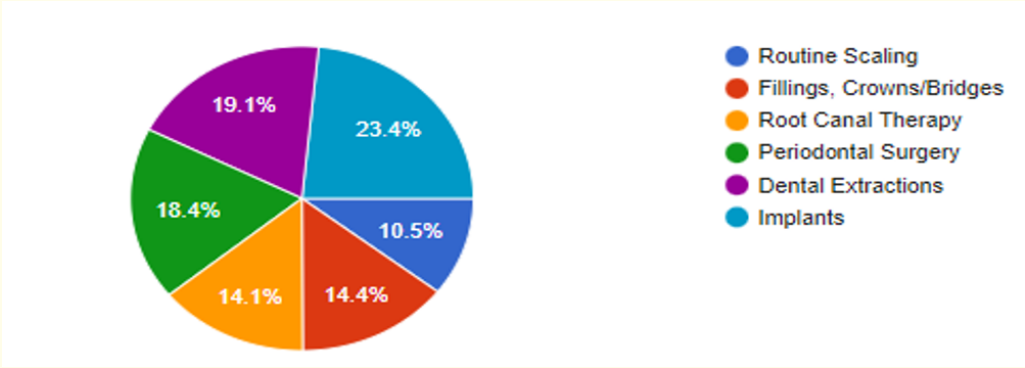
Further analysis was done by the dental practitioners to estimate the patient preference for the listed dental procedures based on the type of sedation/general anaesthesia. 25.8% patients preferred root canal therapy under conscious/moderate sedation, followed by 18% for the periodontal surgery, 16.3% for fillings/crowns and bridges and least interested for dental extraction and implants (14%) under conscious/moderate sedation.



Pie Chart 2: *Estimation of patient interest for moderate sedation.*

When asked to estimate the percentage of all dental patients who would prefer to have deep sedation/general anaesthesia for the following dental procedure: routine scaling; fillings; crowns and bridge; root canal therapy; periodontal surgery; dental extraction and dental implants". Dental practitioners (n = 1011) believed that patients had a variable levels of interest on sedation depending upon the procedure (Pie chart 3).

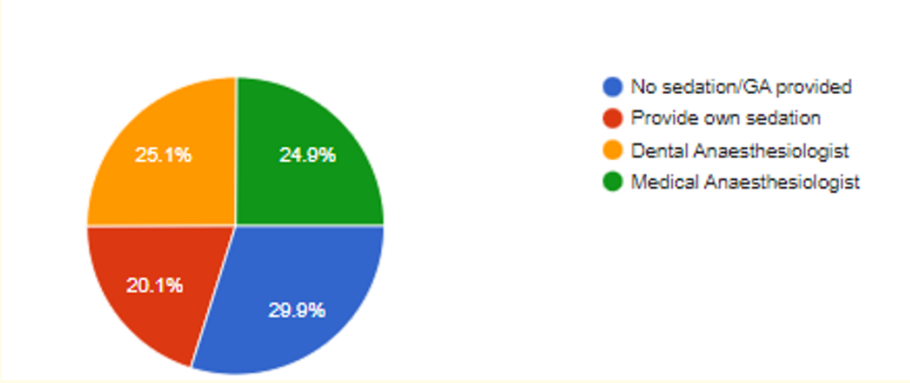
Further analysis was done by the dental practitioners to estimate the patient preference for the listed dental procedures based on the type of sedation/general anesthesia. 23.4% patients preferred dental implants followed by 19% for dental extractions and 18.4% for periodontal surgery and only 14% for RCT and filings/crown and bridges.



Pie Chart 3: *Estimation of patient interest for general anaesthesia.*

Provision of anaesthesia services

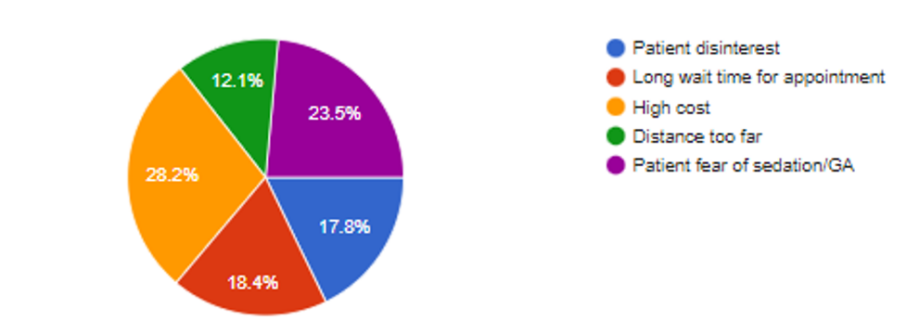
When asked to "identify who provides sedation/anaesthesia services for your patients". Only 20.1% reported the provision of sedation/GA within their practice while 29.9% do not provide sedation/GA their practice (Pie chart 4). 25.1% of dental anaestheologist administered the sedation/GA followed by 24.9% by medical anaestheologist.



Pie Chart 4: *Provision of anaesthesia services.*

Barriers to patient referral for provision of anaesthesia services

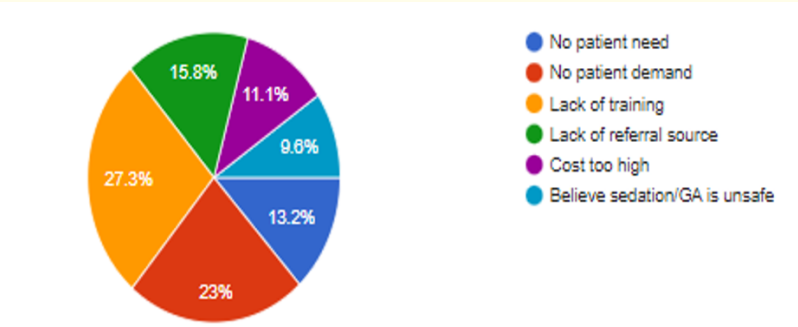
When asked, "have you experienced any of the following barriers to care when referring a patient to an anaesthesia provider" dental practitioners (n = 1011), identified barriers in the following order: 1. high cost (28.2%), 2. Patient fear of sedation/GA (23.5%), 3. Long wait time for appointment (18.4%) 4. Patient disinterest (17.8%) 5. Distance too far (12.1%) (Pie chart 5).



Pie Chart 5: *Barriers to patient referral.*

Limitation to provisions of sedation/Ga in dental practices

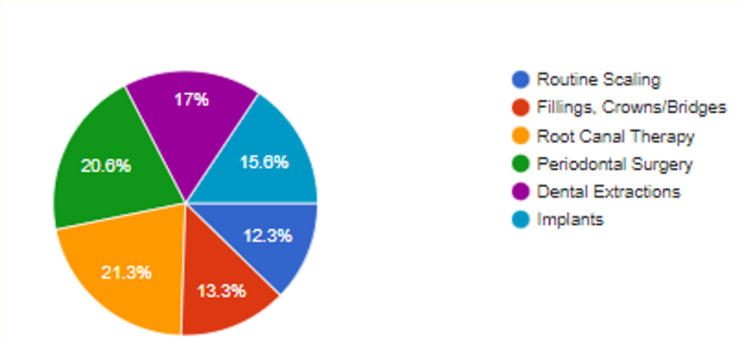
When asked, "if sedation or anaesthesia services are not provided within your office, please indicate the reason". Dental practitioners (n = 1011) indicated the following reasons in order of importance: 1. Lack of training 27.3%, 2. No patient demand (23%) 3. Lack of referral sources (15.8%) 4. The belief that sedation/GA is unsafe (13.2%) 5. Cost too high (11.1%) and 6. No patient need (9.6%) (Pie chart 6).



Pie Chart 6: *Limitations to provisions of sedation/GA in dental practice.*

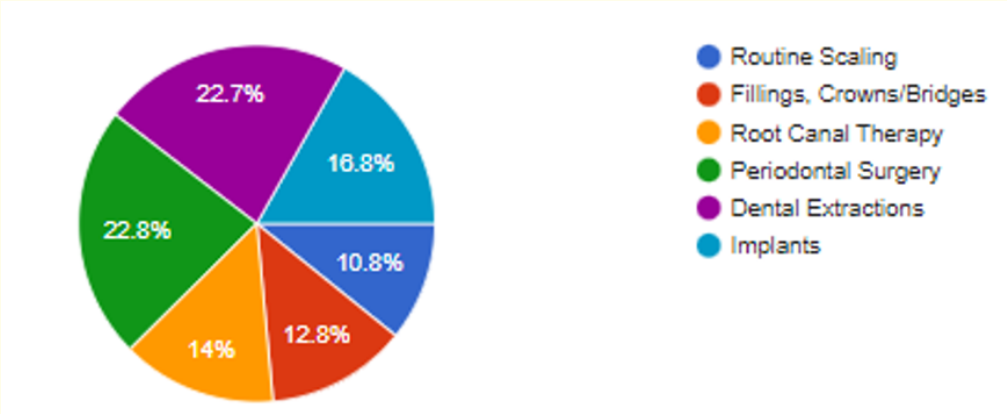
Practice pattern: Use of nitrous oxide/oral/IV/deep sedation

When asked, "for what percentage of your patient practice do you provide nitrous oxide sedation for the following dental procedures". Dental practitioners (n = 1011) reported frequency of use of nitrous oxide for specific dental procedures in the following order: RCT (21.3%), followed by periodontal surgery (20.6%), dental extraction (17%), dental implants (15.6%), filling/crowns and bridges (13.3%) and routine scaling 12.3% (Pie chart 7).



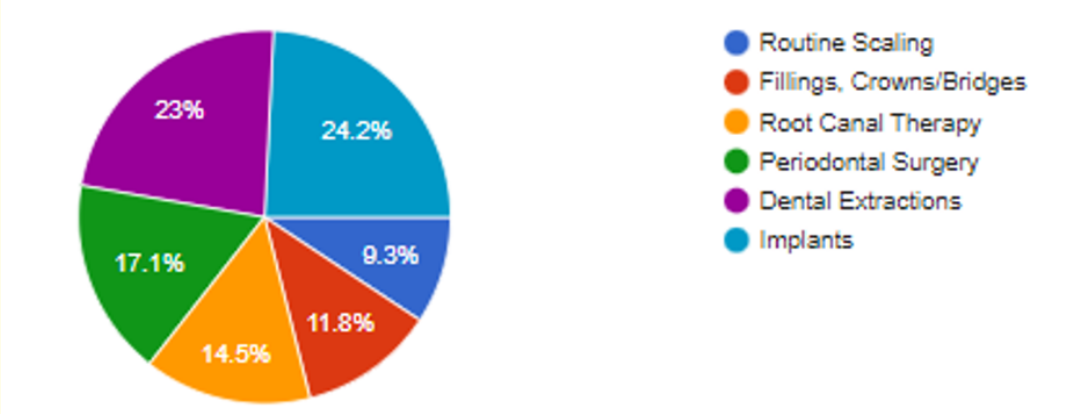
Pie Chart 7: *Use of nitrous oxide.*

When asked, "for what percentage of your patient practice do you provide oral/conscious sedation for the following dental procedures" dental practitioners (n = 1011) reported frequency of use of oral/conscious sedation for specific dental procedures in the following order: periodontal surgery (22.8%) followed by dental extraction (22.7%), dental implants (16.8%), RCT (14%), filling/crowns and bridges (12.8%) and routine scaling (10.8%) (Pie chart 8).



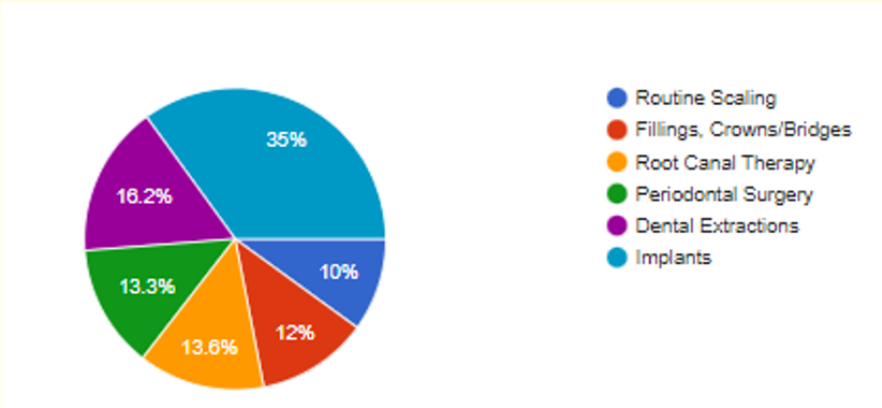
Pie Chart 8: *Use of oral sedation.*

When asked, "for what percentage of your patient practice do you provide intravenous sedation for the following dental procedures" dental practitioners (n = 1011) reported frequency of use of intravenous sedation for specific dental procedures in the following order: dental implants (24.2%), followed by dental extraction (23%), periodontal surgery (17.1%), RCT (14.5%), filling/crowns and bridges (11.8%) and routine scaling (9.3%) (Pie chart 9).



Pie Chart 9: *Use of IV sedation.*

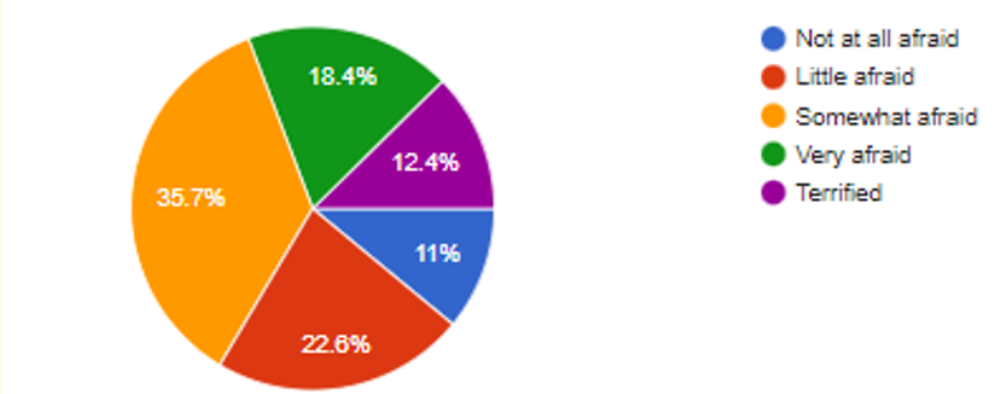
When asked, "for what percentage of your patient practice do you provide deep sedation/ General anaesthesia for the following dental procedures". Dental practitioners (n = 1011) reported with the frequency of use of deep sedation/General anaesthesia for specific dental procedures in the following order: dental implants (35%), followed by dental extraction (16.2%), RCT (13.6%), periodontal surgery (13.3%), filling/crowns and bridges (12%) and routine scaling (10%) (Pie chart 10).



Pie Chart 10: *Use of deep sedation.*

Dentists estimation of patient fear and avoidance of dental services

When asked "what percentage of all dental patients describe feeling of fear or anxiety towards dental treatment". Dental practitioners (n = 1011) summarised that almost 63.8% of patients cancel or avoid dental appointments because of fear or anxiety. Dental practitioners further stated the level of fear or anxiety in patients. 35.7% of dental patients were 'somewhat afraid' with the remaining 64.2% patients experience varying levels of fear and anxiety toward dental treatment (Pie chart 11).



Pie Chart 11: *Estimation of patient fear.*

Discussion

The management of anxiety and fear in dental adult and paediatric patients who are undergoing dental treatment is a very challenging during the clinical practice. Today a wide variety of pharmacological methods have been used to reduce the pain and anxiety in such kind of patients. One of the most common methods is conscious sedation which provides more comfort and less painful dental procedures. Conscious sedation is very useful in encouraging patient cooperation and improving overall patient satisfaction with dental treatment.

Dental anxiety is one of the primary reasons in patients avoid seeing their dentist and for which they request SGA services [3,12]. Thus, the inquiry into patients reported dental anxiety and dentists' perceived patient dental anxiety allows for a direct comparison to evaluate how accurately and precisely dentists assess their patients' dental anxiety, and in turn may appropriately determine if certain patients could benefit from sedation and/or general anaesthesia (SGA) services. The current study indicates that dental practitioners perceive 32.9% of patients are 'not interested' in sedation services with dental treatment. In addition, patients who were 'definitely interested' (24.5%) in SGA were found to have high dental anxiety, which would make them more likely to want SGA services. Cost was also identified as one of the factor in the patients who may be "possibly interested" in sedation services. About half of the respondents reported IV CS and DS/GA as highly effective; yet the financial cost associated with receiving SGA may be a consideration in whether patients decide to have SGA services with dental treatment Therefore, this study supports the finding that dental practitioners do not accurately providing the sedation services in individual patient based on the need, although they can estimate the individual dental procedures with a patient preference for SGA services.

Dental practitioners also estimate the patient preference for sedation/GA matched with respect to the specific dental procedures such as routine scaling, fillings, crowns and bridges, root canal therapy and periodontal surgery. Invasive procedures such as dental implants, periodontal surgery, root canal therapy and dental extraction were found to be the procedures with the greatest need and demand with IV sedation/Conscious Sedation/General Anaesthesia/Oral sedation/nitrous oxide sedation. However, less invasive procedures such as a cleaning and fillings showed increased need and demand. These findings are similar to previous research in this field conducted by Chanpong., *et al*. 2005 who suggests that patients clearly desire SGA services, even though they are not routinely offered them as an option during their dental treatment [12]. Within the current study and others, it is interesting to note patient preference for sedation/GA

may approximate the patient perceived invasiveness of the dental procedure [12,15]. However, in the 2003 nationwide telephone survey conducted by Chanpong., *et al*. 2003 patients were not asked the prevalence or preference of sedation/GA for these procedures.

27.3% of respondents indicated a lack of training in the provision of sedation/GA as a barrier to its administration in their practices. It represents a sizable proportion of the sample but it is almost half of what Irish (73%) [7] and Scottish (70%) [16,17] dentists indicated. Similarly, 58.8% of new American dental graduates did not feel adequately trained in various anaesthesia modalities particularly oral and intravenous techniques [18]. British respondents not using sedation techniques ascribed it to a lack of skill [17]. Irrespective of the percentage, it is clear that dental practitioners do not feel adequately trained to provide sedation/GA in practice. Lack of training may be attributed to few educational resources in the respective countries. The current study survey did not ask participants who would appreciate more training. However, in the literature, dental colleagues expressed a large desire for additional sedation training. Of recent American dental graduates sampled, 78.1% would favour increased dental school tuition to augment their knowledge or ability to acquire an anaesthesia permit [18]. While in United Kingdom 68 - 73% of study participants favoured extra education in sedation [7,16,17]. Of the sampled provincial dentists, no patient demand (23%) and no patient need (9.6%) were the next most commonly cited reasons for absence of sedation/GA in respondents' practices. Similarly, in the United States, 35% of study respondents felt local anaesthesia was adequate for patient care [18]. The inability to find a referral source was cited by 15.8% of respondents as a barrier preventing the provision of anaesthesia services within their practices. Possibly, long wait for appointment times, and the distances being too far for providers potentially contribute to the reason for no identifiable referral source.

Of the sampled respondents, 13.2% felt patient safety may be at risk with sedation/GA. it is hard to know what accounts for practitioner and patient perception alike that sedation/GA is unsafe. Perhaps media cases of anaesthesia mortality magnify the risks disproportionately to the statistics or one mortality is considered prohibitive for elective procedures. In the United Kingdom more respondents, 36% were concerned about patient safety. However, similar statistics in the United Kingdom reveal no mortalities have been attributed to inhalational sedation with two deaths associated with IV sedation possibly resulting from midazolam overdose in a hypothyroid patient [4]. Perhaps the perception of patient safety is heightened in Britain where an expert committee of medical and dental officers expressed concern with respect to the administration of GA within dental offices thus leading to the restriction of GA to British hospitals [7].

Dental practitioners attributed a higher incidence 63.8% missed, cancelled or avoided appointments to patient anxiety than patients did at 36%. Dental literature states patients with moderate levels of anxiety or fear periodically miss, cancel or avoid dental appointments caused by their apprehension [19,20]. Dental anxiety is one of the most prevalent fears and it poses a significant barrier to dental care provision resulting in dental avoidance or irregular attendance. The result of present study indicates that approximately 35.7% of dental patients were 'somewhat afraid' towards the dental treatment.

Conscious sedation is a valuable approach to address anxious patients and treat them with the utmost comfort level. When asked for the ideal candidate for practicing conscious sedation, only 33.2% of the participants chose systemically healthy patients which shows low awareness about the importance of the condition of health while administering conscious sedation. A study by Peden., *et al*. showed increased risks in administering conscious sedation in patients with systemic illnesses [21]. In this study, it was found that only 26.1% of the participants chose to use conscious sedation when dealing with anxious patients. In contrast with the results of the present study, Tingey., *et al*. who showed 49.8% of the participants to be practicing IV sedation [22]. 48.3% said that conscious sedation brings a partial loss of consciousness with response to verbal and physical stimulus. This shows a good amount of knowledge regarding the effect conscious sedation has on the body. When asked about the most common drug used intravenously, only 16.2% answered midazolam. This shows very poor knowledge about the drugs used in conscious sedation. Midazolam is considered to be one of the most widely used sedatives [23]. However, dexmedetomidine has been shown to be an effective drug for sedation, despite being relatively new [24]. Finally, when

asked about a major complication of conscious sedation, only 25.7% chose pain on injection as the major complication. In a study done by Wright., *et al*. pain during administration of the sedative was extensively reported [25].

Limitation of the Study

The primary limitation of the study is inherent to the observational design with a limited number of samples exposed to only one type of study design. Several limitations to study design must be considered in the context of interpreting results. The accuracy of self-report evaluations in the delivery of various sedation and GA modalities for specific dental procedures relies exclusively upon dentist recall and interpretation. Further long-term studies are necessary to illustrate the variation in sedation/GA administration for complex procedures and according to patient type.

Conclusion

Dental anxiety is a key determinant of who should receive and would benefit from the known and proven anxiety-alleviating effects of SGA. It offers novel insights into patterns and themes of sedation and GA adoption among dentists in the province, serving as a general and current practise benchmark. Patients reported a desire to receive SGA services for a wider variety of dental treatments. This was specifically true for invasive procedures, such as tooth extractions dental implants, periodontal surgery and root canal therapy.

At present, no evidence-based guidelines exist delineating the clinical indications for sedation or anaesthesia or for the specific anaesthesia techniques to address its clinical uses within dentistry. Research into enabling consistent administration of sedation/GA, dentist assessment and management of patient anxiety and diagnostic tools to aid practitioners in examining clinical need are required. This is an exciting time for dentistry with wider accessibility and acceptance of the safety of sedation/GA in healthcare, dentists have the ability to provide services based on patients' need and demand.

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