



ORIGINAL ARTICLE

A survey of pediatric dentists' caries-related treatment decisions and restorative modalities – A web-based survey



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Abstract Objective: To identify current practices and the preferred caries-related treatment decisions and restorative modalities of primary teeth among pediatric dental practitioners in Saudi Arabia.

Materials and methods: This was a web-based cross-sectional survey conducted among licensed pediatric dental practitioners in Saudi Arabia. Following the retrieval of the email addresses from the Saudi Dental Council, an email explaining the purpose of the study and a link to SurveyMonkey electronic survey consisting of 23 questions was sent to all the members registered under the pediatric dentistry practitioners, starting in September till December 2013. The data obtained was analyzed using descriptive statistics and chi square with and without tabulation processes. The level of significance was set at $p < 0.05$.

Results: A total of 108 [54 (50%) male and 54 (50%) female] pediatric dental practitioners responded to the survey out of 308 targeted individuals for an overall response rate of 35.1%. About 65% of the respondents reported that they have never considered pre-veneered or Zirconia crowns as a restorative option for carious vital anterior primary teeth. About 40% reported doing pulpectomy and restored with composite strip crowns at all times. About 86% of the respondents

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reported doing pulpotomy and stainless steel crown for restoring carious vital posterior primary teeth whereas 73.8% reported restoring with composite resin. However, 83.1% of the respondents reported that they never used pre-veneered or Zirconia crowns after pulpotomy for restoring carious vital posterior primary teeth. A significantly higher number of male participants reported that they used esthetic pediatric crowns in their practice compared to female participants ($p < 0.001$).

Conclusion: The prevalence of use of composite resin to restore primary teeth was higher compared to glass ionomer cements and amalgam whereas a limited use of esthetic pediatric crowns was found among the sample surveyed. Esthetic pediatric crowns were more utilized by male compared to female participants.

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1. Introduction

Despite increase in dental manpower and advances in prevention, dental caries prevalence in children is increasing in developing nations including Saudi Arabia (Miura et al., 1997; Hobdell et al., 2003; Petersen et al., 2005). A systematic review of population-based dental caries studies among children in Saudi Arabia estimated the prevalence of dental caries and its severity in Saudi children to be approximately 80% (mean dmft 5.0) and 70% (mean DMFT 3.5) for the primary and permanent dentition, respectively (Al Agili, 2013).

The rationale for the use of various prevention-oriented treatment modalities in pediatric dentistry is to facilitate the maintenance of the primary dentition thereby reducing the potential for unwanted sequelae of their unplanned extraction (Hunter and Hunter, 2003). Materials and techniques used to restore carious primary teeth have changed over the past decade as new intra- and full-coronal restorations and materials have been developed (Ricketts et al., 2013). However, there have been no consistent agreement on guidelines on the selection of materials and techniques in the pediatric dental literature and hence choice appears based on the practitioner preference (Tran and Messer, 2003). It is important to note that the behavior of the child may affect the choice of the restorative material. For example, when the child is uncooperative and there is a need to restore a tooth, then the restorative material has to be less sensitive to oral environment during placement and so glass ionomer may be better choice rather than resin composite which is technique sensitive.

Behavior management, on the other hand, is vital for establishing communication and an element of trust with pediatric dental patients. The utilization pattern of behavior management techniques has changed over the years (Carr et al., 1999), which is mostly attributed to parental acceptability, legal/ethical concerns, and accessibility and feasibility for the utilization of certain techniques (Davis, 1988; Houpt, 1993; Kuhn and Allen, 1994).

Caries risk assessment, individualized preventive instructions and procedures, behavior management protocols and management of primary teeth caries are vital aspects of pediatric dentistry and are interrelated. The majority of studies on treatment recommendations for the management of primary teeth caries were scenario-based (McKnight-Hanes et al., 1991; Qudeimat et al., 2007; Tickle et al., 2007). However, no studies have investigated the caries risk assessment protocols, individualized preventive instructions and procedures, behavior management protocols and management of

primary teeth caries among pediatric dentists in Saudi Arabia. Therefore, the purpose of this web-based cross sectional survey was to identify current practices related to these aspects, the preferred caries-related treatment decisions and restorative modalities of primary teeth among pediatric dental practitioners in Saudi Arabia.

2. Materials and methods

This study and questionnaire were approved by College of Dentistry Research Center (registration number: FR 0097), College of Dentistry, King Saud University. This was a web-based cross-sectional survey conducted among licensed pediatric dental practitioners in Saudi Arabia. According to the 2013 records of the Saudi Dental Council, there were 308 active pediatric dentists. A request letter was forwarded to administrative officials of the Saudi Dental Council for permission to access the email addresses of all members registered under the pediatric dentistry practitioners. The survey was developed and reviewed by the authors and a pilot study was conducted to validate the questionnaire with a focus group involving seven postgraduate in pediatric dentistry program who were not included in the final survey. Following the retrieval of the email addresses, an email explaining the purpose of the study and a link to SurveyMonkey electronic survey was sent to all the members, starting in September till December 2013. The survey ensured confidentiality as no personal information on the participants' identity was required to be disclosed and was strictly voluntary as mentioned in the recruitment statement of the participant for the survey. The survey consisted of 23 questions including socio-demographic and practice characteristics; whether practitioners assess and record caries risk and dietary habits in their practice; their approach toward preventive dentistry and infant oral health; use of printed educational materials in their dental office; treatment of special needs children; their preferences for different treatment modalities for restoring carious vital and non-vital anterior and posterior teeth and use of topical fluorides. Also, their preference for use of different behavior guidance techniques for uncooperative children aged 2–4 and 5–7 years as well as the use of general anesthesia and oral sedation. A question addressing the personal interest of participant regarding attending future scientific events in pediatric dentistry was also included in the survey.

The responses to the questions varied in format and consisted of dichotomous responses (i.e. Yes/No) and 4 point Likert type scales such as always (on a daily or weekly basis),

sometimes (maximum once a month), rarely (maximum once or twice a year) and never. The estimated participation time to take the survey was 15 min. Some questions allowed multiple responses. Non-respondents were reminded to participate in the survey a second time after 4 weeks.

The responses of the participants were entered electronically into the SPSS for Windows version 20 (SPSS Inc., Chicago, IL, USA). The data obtained was analyzed using descriptive statistics and Chi square test was used to assess the differences between male and female participants. The level of significance was set at $p < 0.05$.

3. Results

A total of 108 [54 (50%) male and 54 (50%) female] pediatric dental practitioners responded to the survey out of 308 targeted individuals for an overall response rate of 35.1%. Demographic and biographic characteristics of the respondents are given in Table 1.

The distribution of the study sample by factors related to preventive aspects of dental caries is shown in Table 2. The respondents were questioned about the approaches they use in their practice for the prevention of dental caries. The majority of the respondents (92.2%) assessed caries risk whereas only (70.6%) recorded caries risk in the patients' chart. More than two-thirds (70.6%) reviewed and analyzed diet history in their clinical practice. About 96% of the respondents provided individualized preventive instructions, all the respondents

Table 1 Demographic and biographic characteristics of the respondents.

Demographic and biographic characteristics	Respondents <i>N</i> (%)
<i>Age range (years)</i>	
25–34	47 (43.9)
35–44	39 (36.5)
45–54	13 (12.1)
55–64	8 (7.5)
<i>Level of specialty</i>	
Consultant pediatric dentist	34 (31.5)
Academic faculty (pediatric dentistry)	33 (30.5)
Specialist pediatric dentist	29 (26.9)
Resident (Saudi Board of Pediatric Dentistry)	12 (11.1)
<i>Number of years since graduation</i>	
1–5	21 (19.6)
6–10	27 (25.2)
11–15	21 (19.6)
16–20	15 (14.0)
21–25	10 (9.4)
26–30	10 (9.4)
> 30	3 (2.8)
<i>Age range of children usually seen in practice^{a,b}</i>	
1–3	84 (80.8)
4–6	100 (91.2)
7–9	101 (97.1)
10–12	96 (92.3)
13–15	47 (45.2)
16–18	10 (9.6)

^a Multiple response possible.

^b 4 missing values.

Table 2 Distribution of the study sample by factors related to preventive aspects of dental caries.

Factors related to preventive aspects of dental caries	Respondents ^a <i>N</i> (%)	
	Yes	No
Assess caries risk	94 (92.2)	8 (7.8)
Record caries risk in the patients' chart	72 (70.6)	30 (29.4)
Do diet history review and analysis	72 (70.6)	30 (29.4)
Use topical fluorides	102 (100)	0 (0)
Give individualized preventive instructions and procedures to the patients	98 (96.1)	4 (3.9)
Use printed or electronic dental educational materials	53 (52.0)	49 (48.0)

^a 6 missing values.

(100%) used topical fluorides and about half of the respondents (52%) provided printed or electronic dental educational materials to the patients and parent in their clinical practice.

The frequency of various treatment options used by the respondents for restoring carious vital anterior primary teeth is shown in Fig. 1. About 81% of the respondents reported restoring carious vital anterior primary teeth with composite resin always, 75.9% reported applying fluoride at all times, 61% reported using glass ionomer cement and 56.6% reported extracting the carious vital anterior primary teeth at all times. About 65% of the respondents reported that they have never considered pre-veneered or Zirconia crowns as a restorative option for carious vital anterior primary teeth. However, a significantly higher ($p < 0.001$) number of male participants ($n = 22$; 44.9%) reported that they use esthetic pediatric crowns compared to female participants ($n = 7$; 13.5%).

The frequency of various treatment options used by the respondents for restoring carious non-vital anterior primary teeth is shown in Fig. 2. About half of the respondents (50.6%) reported extracting carious non-vital anterior primary teeth at all times whereas 40.5% reported doing pulpectomy and restored with composite strip crowns at all times.

The frequency of various treatment options used by the respondents for restoring carious vital posterior primary teeth is listed in Table 3. About 86% of the respondents reported doing pulpotomy and stainless steel crown, 73.8% reported restoring with composite resin 55% reported using topical fluoride and 50.6% reported doing indirect pulp capping and restorations with either composite, amalgam, compomer or glass ionomer cement, at all times. However, 83.1% of the respondents reported that they never used pre-veneered or Zirconia crowns after pulpotomy for restoring carious vital posterior primary teeth.

The frequency of various treatment options used by the respondents for restoring carious non-vital posterior primary teeth is shown in Fig. 3. About 54% of the respondents reported extracting the affected tooth/teeth and 48.2% reported doing pulpectomy and stainless steel crown, at all times.

The frequency of use of behavior guidance techniques for 2–4 year-old uncooperative children is shown in Fig. 4. About 71% of the respondents reported using non-pharmacological behavior guidance techniques and 60.7% reported using general anesthesia, always. However, 43% of the respondents reported that they have never used nitrous oxide for managing 2–4 year-old uncooperative children.

The frequency of use of behavior guidance techniques for 5–7 year-old uncooperative children is given in Fig. 5. About 89% of the respondents reported that they always used non-pharmacological behavior guidance for the management of 5–7 year-old uncooperative children. When asked which is/was the specialized area/s in pediatric dentistry for which they require further training (continuing educa-

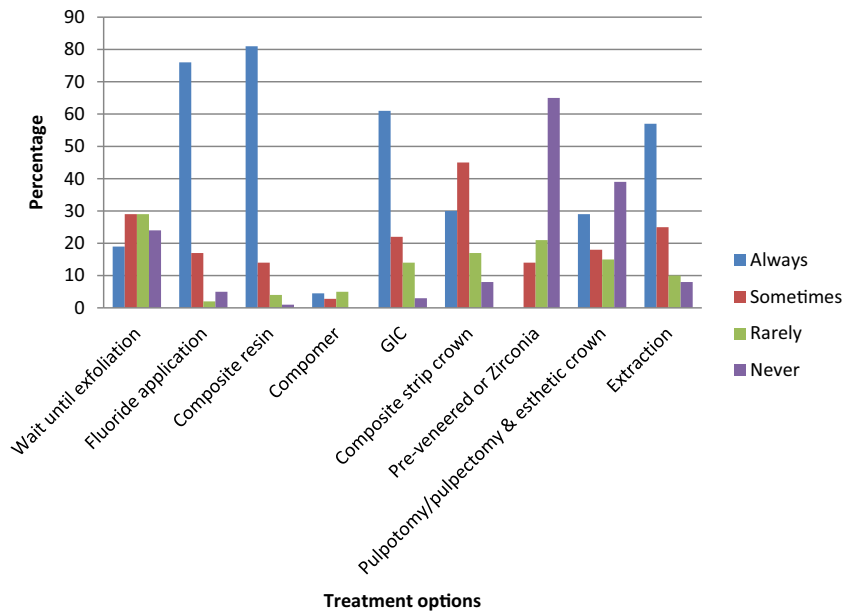


Figure 1 The frequency of various treatment options used by the respondents for restoring carious vital anterior primary teeth.

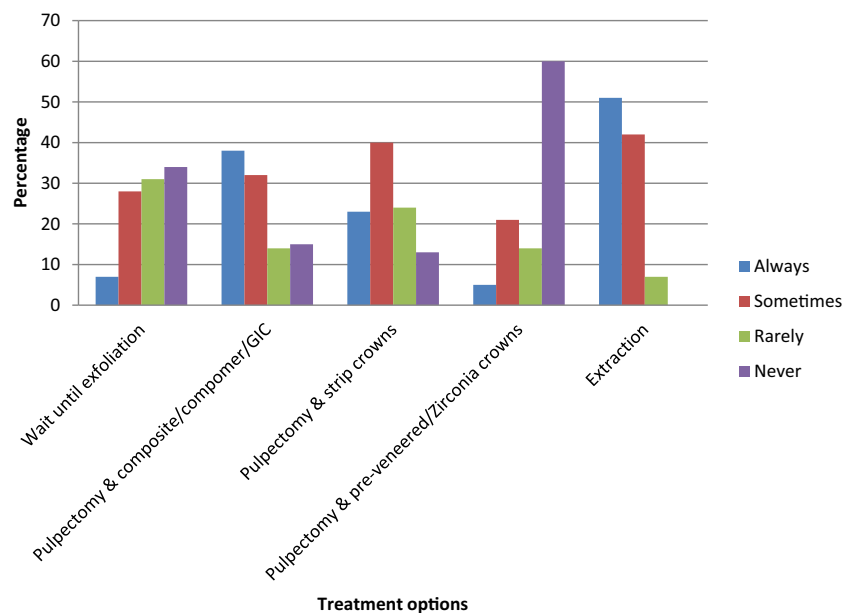


Figure 2 The frequency of various treatment options used by the respondents for restoring carious non-vital anterior primary teeth.

tion/workshop), 71.8% of the respondents reported that they were very much interested in dental management of children with special health needs and 70.2% reported that they were very interested in oral sedation for pediatric dental patients.

The majority of the participants reported that they performed infant oral health education, guidance and treatment ($n = 78$; 75.7%) and treated children with special health needs ($n = 93$; 90.3%) in their practice. Among the participants who responded to the question regarding their interest in attending future scientific events ($n = 85$), the topic of most interest for the majority was 'dental management of children with special health needs' ($n = 61$; 71.8%), followed by 'oral sedation for pediatric dentists' ($n = 59$; 70.2%) and 'early orthodontic treatment' ($n = 54$; 65.8%).

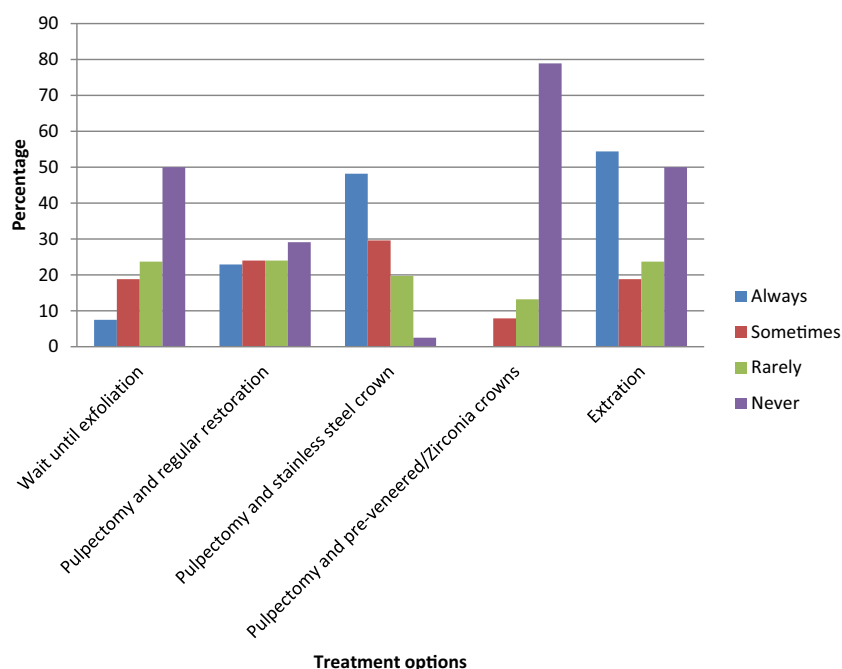
4. Discussion

The prevention of dental caries initiation and progression is one of the hallmarks of contemporary pediatric dental practice (Adair, 2006). The best predictors of dental caries in children are previous caries history, salivary *Streptococcus mutans* levels, prevalence of inadequate oral hygiene practices, deficient fluoride exposure, low socioeconomic status and familial caries pattern (Tinanoff, 1995). Among the many caries preventive dental programs developed by the dentists for their child patients such as patient education, diet modification, plaque control and sealant programs, perhaps none is as impor-

Table 3 Distribution of treatment options for carious vital posterior primary teeth by their frequency of use (%).

Treatment options	Always	Sometimes	Rarely	Never
No treatment (wait until exfoliation)	6.3	11.4	31.7	50.6
Fluoride application	54.9	8.4	11.0	25.6
Amalgam	31.7	17.1	23.2	28.0
Composite resin	73.8	17.9	3.6	4.8
Compomer	19.2	33.3	18.0	29.5
Indirect pulp capping and regular restorations ^a	50.6	27.7	13.3	8.4
Indirect pulp capping and stainless steel crown	45.2	23.8	11.9	19.1
Pulpotomy and regular restorations ^a	34.5	21.5	21.4	22.6
Pulpotomy and stainless steel crown	85.7	9.5	2.4	2.4
Pulpotomy and pre-veneered/Zirconia crown	0.0	7.8	9.2	83.1
Extraction	33.7	25	21.3	20

^a Regular restorations: amalgam, composite, compomer or glass ionomer cement.

**Figure 3** The frequency of various treatment options used by the respondents for restoring carious non-vital posterior primary teeth.

tant and effective as the appropriate application of fluoride. In our study, all the surveyed dentists used fluorides in their dental practice, but the regimen of fluoride application was not enquired. We assume that the acceptable and approved baseline program of the combination of once or twice-yearly professional fluoride applications and twice-daily use of fluoride dentifrice for low caries-risk children is being followed. In addition, other fluoride regimens, such as systemic supplements, mouthrinses, and self-applied gels may be considered only after a thorough caries risk assessment (Adair, 2006). The current study did not address the issue of whether an individual dentist reported using more than one strategy for the prevention of caries. It is possible that the same individuals who reported that they would use the fluoride interventions in 100% of the cases could also always give dietary chart reviews and individualized preventive instructions to the patient, and vice versa.

About 92% of the participants in this study reported performing caries risk assessment. This result is consistent with that of the results of Riley et al. (2010) who studied dentists' use of caries risk assessment among children and found that the majority of the surveyed dentists (75%) reported performing caries risk assessment. Furthermore, more-recent graduates were reportedly more likely to use caries risk assessment compared to older surveyed graduates. However, this aspect was not investigated in the present study.

dos Santos et al. (2011) investigated the inconsistencies in recommendations on oral hygiene practices for children by professional dental and pediatric organizations in ten countries and found that several of these recommendations showed discrepancies and only 11 systematic reviews addressed these recommendations. Dentists are ethically obliged to ensure that oral health education materials disseminated to the public are evidence-based (Watt, 2005). Lack of or poor scientific evi-

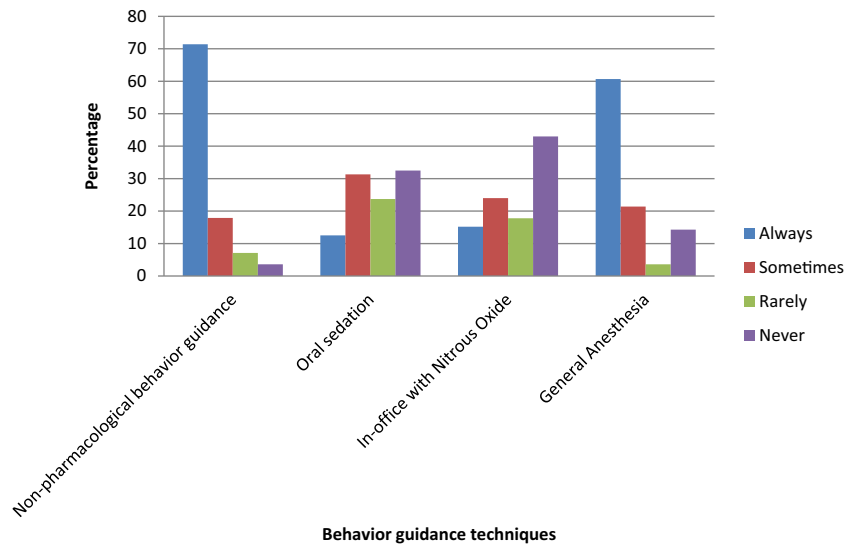


Figure 4 Frequency of use of behavior guidance techniques for 2-4 year-old uncooperative children.

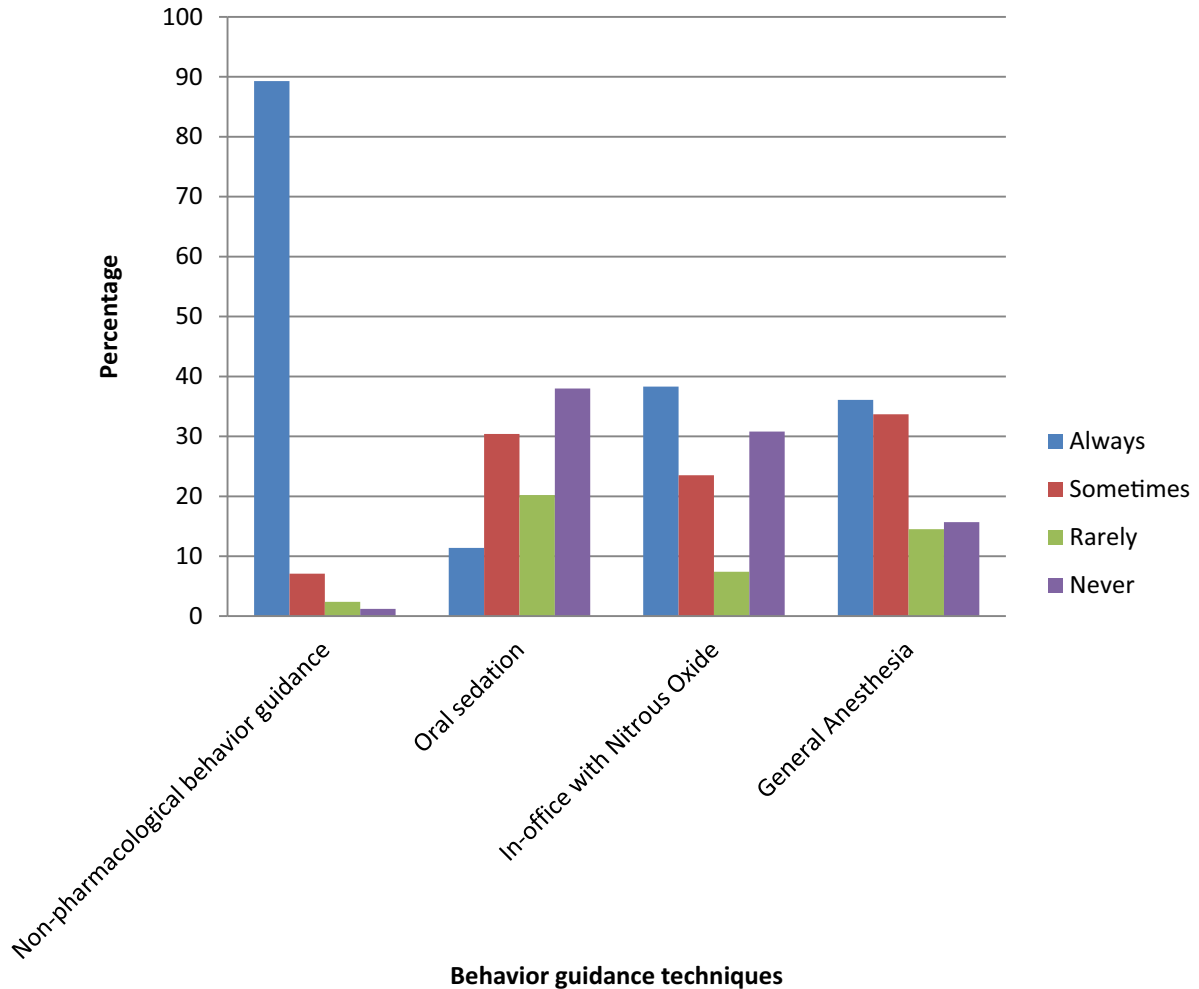


Figure 5 Frequency of use of behavior guidance techniques for 5-7 year-old uncooperative children.

dence may lead to conflicting health messages which restricts the practitioners from providing consistent evidence-based recommendations. This may, in turn, lead the practitioners to rely

on tradition, experience or obsolete evidence (Straus et al., 2005). About 96% of the participants of this study reported that they gave individualized preventive instructions and pro-

cedures to the patients and 52% reported using printed or electronic dental education materials. Although these results may be considered encouraging, whether or not the individualized preventive instructions and procedures delivered to the patients or the contents of the printed or electronic dental education materials used are evidence-based needs to be investigated. This may be essential to ascertain that consistent and up-to-date preventive oral health care messages are disseminated to the patients.

This study has shown an enormous increase in productivity, more patients being treated for caries teeth and at the same time there are indications of higher treatment needs among the pediatric populations. Apparently there seems to be an efficient working attitude among the organization of the pediatric dentistry, particularly with regard to the use of general anesthesia and composite resin restorations. It is imperative to acknowledge that pediatric dentistry means much more than treating dental caries in child patients not willing or able to cooperate. There are enormous reports indicating that pediatric dentists have the highest proficiency regarding dental care for children and adolescents (Klingberg et al., 2010).

In the present study, restorative treatment practices of pediatric dentists were enquired with regard to vitality and dentition. In this regard, dentists' restorative treatment decision-making merits attention because restorative care accounts for a large proportion of the services they provide and gives an idea of the potential for successful patient care outcomes (Bader and Kaplan, 1983). Variability in decision making is obvious in clinical practice and it depends on a number of dentist, patient and treatment system factors (Kay and Locker, 1996). Dentist factors include biases, and personal and practice-related characteristics, and, of the personal characteristics, skills/diligence, age/experience, awareness, and acceptance for uncertainty have been mentioned (Bader and Shugars, 1997). Specifically, differences in dentists' educational background characteristics (Marinho et al., 2001) and different levels of work experience (Omar et al., 2003) could be relevant in the process.

Tickle et al. (2007) conducted a national cross-sectional survey of general dental practitioners and pediatric dentists in England regarding the approaches taken to the treatment of young children with carious primary teeth. In case of a vital carious primary molar tooth, the treatment option for the majority of the surveyed pediatric dentists was 'vital pulpotomy with stainless steel crown' ($n = 55$; 49.1%). In case of a non-vital carious primary molar, the treatment option for the majority of the pediatric dentists was 'non-vital pulpotomy with stainless steel crown' ($n = 57$; 51.8%). The majority of the participants of the present study reported that they always performed pulpotomy with stainless steel crown ($n = 72$; 87.7%) in case of carious lesions of vital primary posterior teeth, which is in accordance with the results of Tickle et al. (2007). However, the majority of the participants reported that they always extracted a non-vital carious primary posterior tooth ($n = 44$; 54.3%), which is not in agreement with the results of Tickle et al. (2007).

It is likely that a disparity exists as to what the dentists say they do in a given situation and what they actually do. This cannot be avoided either by the live or the simulated questioning approach (Helminen et al., 2002). Certainly, this study cannot claim to have clarified this issue. More well-designed clinical research studies evaluating treatment out-

comes in pediatric dentistry are required for dental practitioners to be able to support and defend their treatment decisions.

The results of our study imply that the pre-veneered or zirconia crowns are being significantly underutilized by the pediatric dentists whereas the use of stainless steel crowns seems to be still of value. This finding regarding utilization of stainless steel crowns is consistent with the study done in Indiana. However, in their study, stainless steel crowns were underutilized by the general dentist compared to the pediatric dentists (Kowolik et al., 2007). Similarly, this trend was also reported for the contemporary dental practice in the UK (Wilson et al., 2004). It is the authors' opinion that the mindset of pediatric dentists regarding the use of esthetic crowns is still in the budding stage and it is perhaps of concern that pediatric dentists are not interested in continuing education courses about this subject. Regarding the selection of the most suitable material for the restoration of the vital posterior carious teeth, majority of our participants considered pulpotomy and stainless steel crown followed by composite resins. It would be interesting to know the various over-riding factors that play a role in materials selection based on practice based research among pediatric dentists in the interests of the provision of best quality dental care. We hope that the reporting of the present study will act as a potential baseline stimulus for further development and funding of practice based research not only in pediatric dentistry but also in all other fields of dentistry in Saudi Arabia.

With regard to behavior management of children in the dental office, pediatric dentists have several management strategies at their disposal and the use of them varies (Adair et al., 2004). It would be of interest to evaluate the core skills of pediatric dentists and their utilization of specific treatment modalities like general anesthesia, esthetic pediatric crowns and topical fluorides in the dental practice.

The strength of this study lays in the fact that it is the first among pediatric dentists in Saudi Arabia to investigate the current practices of several aspects of everyday pediatric dental practice ranging from caries risk assessment protocols to the management of primary teeth caries. However, some limitations of this study needs to be considered while interpreting the results which include: the cross-sectional study design, lack of a control group and the lack of calibration of the survey instrument. Furthermore, a relatively low response rate of 35.1% is also a potential drawback of this study. Obtaining a representative sample and therefore the external validity of the data has been reported as major obstacles in conducting on-line surveys. Sending reminder emails have been suggested as a potential solution in this regard (Braithwaite et al., 2003). Nevertheless, a reminder email posted 4 weeks after initial email could not improve the response rate in this study. This may be due to a lack of interest in on-line surveys in general or the surveyed topic in particular.

5. Conclusion

Within the limitations of this study, the prevalence of use of composite resin to restore primary teeth was higher compared to glass ionomer cements and amalgam whereas a limited use of esthetic pediatric crowns was found among the sample surveyed.

Conflict of interest

The authors of this study confirm that there are no known conflicts of interest associated with this publication.

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